EFFECTS OF ECO-SCHOOL APPLICATION ON ELEMENTARY SCHOOL STUDENTS' ENVIRONMENTAL LITERACY LEVELS

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ABSTRACT

EFFECTS OF ECO-SCHOOL APPLICATION ON ELEMENTARY SCHOOL STUDENTS' ENVIRONMENTAL LITERACY LEVELS

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This study was conducted to investigate the effects of eco-school application on elementary school students' environmental literacy levels. Besides, effects of the application on students' views about environment were explored. The study was carried out during the spring semester of 2008–2009 academic year. Data of the study were gathered from 316 students (grades six to eight) enrolled to two elementary schools. One of the schools was determined as experimental group (n = 156) and students attending this school received eco-school application. The other school was set as control group (n = 160) and students enrolled to this school received traditional school application.

Environmental Literacy Questionnaire with four subscales; environmental knowledge, attitudes, uses and concerns, was used to determine students' environmental literacy before and after the eco-school application. Also, students' views about environment were clarified with a draw-and-explain task. At the end of the treatment, interviews were conducted with some eco-school students and teachers to determine their views about the application.

The results revealed that there were significant differences between control and experimental groups of different grade levels in terms of the all subscales of Environmental Literacy Questionnaire in the favour of experimental group. Additionally, students' pre- and post- drawings showed that elementary school students' views about environment mainly focus on three major themes; clean, polluted and both clean and polluted environment. The Chi-Square analysis revealed that there were significant associations between treatment groups and their views about the environment.

Keywords: Environmental Literacy, Eco-school, Environmental Education, Education for Sustainable Development

ÖZ

EKO-OKUL UYGULAMASININ İLKÖĞRETİM ÖĞRENCİLERİNİN ÇEVRE OKURYAZARLIĞI DÜZEYİNE ETKİSİ

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Bu çalışma, eko-okul uygulamalarının ilköğretim öğrencilerinin çevre okuryazarlığı düzeylerine etkilerini incelemek için yapılmıştır. Bunun yanı sıra, çalışmada yapılan uygulamanın öğrencilerin çevre hakkındaki görüşlerine etkisi de araştırılmıştır. Çalışma, 2008–2009 akademik yılının bahar döneminde yapılmış, çalışmanın verileri iki ilköğretim okulunun altı, yedi ve sekizinci sınıflarına kayıtlı toplam 316 öğrenciden elde edilmiştir. Çalışmada yer alan okullardan bir tanesi deney grubu (n = 156) olarak belirlenmiş, bu okulda çalışma süresince eko-okul uygulaması yürütülmüştür. Kontrol grubu (n = 160) olarak belirlenen diğer okulda ise geleneksel okul uygulaması yürütülmüştür.

Dört boyuttan oluşan Çevre Okuryazarlığı Ölçeği öğrencilerin uygulama öncesi ve sonrasındaki çevre okuryazarlığını belirlemek için kullanılmıştır. Ayrıca, öğrencilerin çevre hakkındaki görüşleri çiz-ve-anlat etkinliği ile belirlenmiştir. Uygulama sonrasında, bazı eko-okul öğrencileri ve öğretmenleri ile uygulama hakkındaki görüşlerini belirlemek için görüşmeler yapılmıştır.

Çalışmanın sonuçları farklı sınıf düzeylerine ait kontrol grubu ve deney grubu öğrencileri arasında Çevre Okuryazarlığı Ölçeğinin tüm alt boyutlarında deney grubu lehine anlamlı farklılıklar olduğunu göstermiştir. Buna ek olarak, çalışmaya katılan ilköğretim öğrencilerinin ön ve son çizimleri incelendiğinde öğrencilerin çevre hakkındaki görüşlerinin üç tema; temiz, kirli, hem temiz hem kirli çevre, altında toplandığı görülmüştür. Yapılan kay-kare analizleri uygulama gruplarının çevre hakkındaki görüşleri arasında anlamlı ilişkiler olduğunu göstermiştir.

Anahtar Kelimeler: Çevre Okuryazarlığı, Eko-okul, Çevre Eğitimi, Sürdürülebilir Kalkınma için Eğitim

This work is dedicated to those who connect me to yesterday, to those who I share today with, and to those who connect me tomorrow.

To:

My mom, Nurdan BALCI

My dad, Hasan BALCI

My sister, İkbâl KARAKOÇ

My little nephew, Ata Görkem KARAKOÇ and

My husband, Gökhan ÖZSOY.

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Sibel ÖZSOY

TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF SYMBOLS and ABBREVIATIONS

CHEAKS: Children's Environmental Attitudes and Knowledge Scale

EE: Environmental Education

EPA: Environmental Protection Agency

ESD: Education for Sustainable Development

DFES: Department of Education and Skills

FEE: Foundation of Environmental Education

ICEE: Independent Commission on Environmental Education

IUCN: International Union for Conservation of Nature and Natural Resources

NEP: New Environmental Paradigm

RELATE: Realizing Environmental Literacy through Advanced Technology Experimentation

TAP: Türkiye Taşınabilir Pil Üreticileri ve İthalatçıları Derneği

UNCED: United Nations Conference on Environment and Development

UNCHE: United Nations Conference on the Human Environment

UNESCO: United Nations Educational Scientific and Cultural Organization

UNEP: United Nations Environment Program

TURÇEV: Türkiye Çevre ve Eğitimi Vakfı

WCED: World Commission on Environment and Development

CG: Control Group

EG: Experimental Group

ESA: Eco-School Application

TSA: Traditional School Application

ELQ: Environmental Literacy Questionnaire

DofE: Drawings of Environment

ERIC: Education Resources Information Center

ANOVA: Analysis of Variance

ANCOVA: Analysis of Covariance

P: Percentage

f: Frequency

SD: Standart Deviation

SE: Standart Error

M: Mean

df: Degrees of Freedom

F: F statistic

p: Significance Level

t: t statistic

SS: Sum of Squares

MS: Mean of Squares

η^2: Eta square

CHAPTER 1

INTRODUCTION

> *Considering the whole span of earthly time… Only within the moment of time represented by the present century has one species-man- acquired significant power to alter the nature of his world.*
>
> (Carson, 1962, p.5)

Environment and man together compose a system in which man is an inseperable part of it. Man has the ability to change the system in positive or mostly in negative way and he is contributing to severe and irreversible changes occurring in the environment. Rapid population growth and over consumption of resources produce increasing pressures on the Earth causing over-exploitation of non-renewable resources, and production of more waste that can be absorbed and processed by the nature (Environmental Protection Agency [EPA], 2003). The results are increasing pollution, poor air and water quality, and the extinction of numerous animal and plant species.

Today, environmental problems are experienced on a global scale and impact more and more of the human population. By overusing the Earth's natural resources we are causing an environmental crisis that influences not only today's generation but also the future generations (Cairns, 2002; Chawla, 1998; Chiras, 1992; Mckibben, 1989). The deterioration of the global environment has become a leading concern for all communities (United Nations Educational Scientific and Cultural Organization [UNESCO], 1992) and interest in environmental problems has increased both in international and national level. To determine the current situation of the planet Earth and find ways to solve the environmental problems many meetings were conducted with the participation of attendees from different

countries. In 1972, in one of these meetings, United Nations Conference on the Human Environment (UNCHE), the term 'sustainable development' was established (Reed, 1996; Williams, 1993) with a hope of leaving future generations a world that is worth to live in it. With the publication of the Brundtland Report of *Our Common Future* (Brundtland, 1987), the concept of 'sustainable development' gained an increasing attention. The mostly cited definition of sustainable development is provided with the Brundtland Commission and the term is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). In the Brundtland Report it is clarified that sustainable development has three bases; environmental protection, social progress and economic development, and it ensures the efficient use of natural resources to meet the needs of human population throughout the world. Date from the Brundtland Commission; many definitions of the term 'sustainable development' are formed in different platforms. Although there are many definitions of sustainable development, all of them focus on some main ideas such as: 'living within limits', 'understanding the interconnections among environment, 'relationship between economy and society' and 'equitable distribution of resources and opportunities' (Mebratu, 1998).

In all major conferences, the role of education as a fundamental tool to improve environmental situation of the Earth has been emphasized (Scoullas & Malotidi, 2004). In these conferences the purpose, goals and principles of environmental education were determined. Throughout the time, environmental education underwent a reconstruction and by the rise of the term 'sustainable development', it evolved as 'education for sustainable development'. Fien (2002) argues that education for sustainable development is a key component in addressing the challenge of sustainability. Fien states that "education for sustainable development is an emerging but dynamic concept that encompasses a new version of education that seeks to empower people of all ages to assume responsibility for creating a sustainable future" (p. 7). To achieve the aim of creating a sustainable future, we must change our lifestyles and learn to live in a sustainable manner. There must be a paradigm shift in human behaviour with respect to the environment. In order to make the shift we have to create an environmentally literate citizenry who is

"knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems and motivated to work towards the solution" (Stapp, 1969, p. 30). A review of literature reveals that, there is no defined equation which clarifies the characteristics of an environmentally literate person and what defines environmental literacy. However, researchers mostly agree on several characteristics that an environmentally literate person has. Roth (1968) defined the characteristics of an environmentally literate person as "someone who possesses the basic skills, understandings and feelings for man-environment relationship". Agreed with Roth, many educators state that environmentally literate person recognizes the connections between science, technology, society and the environment (Bybee & DeBoer, 1994; Palmer, 2003). Derived from different definitions it can be concluded that an environmentally literate person has the ability to make sustainable choices. Additionally, for the purpose of the study it is considered that environmental knowledge, attitudes, uses and concerns forms the environmental literacy.

Environmental educators have been focusing on ways for improving environmental literacy for more than 30 years (Disinger & Roth, 1992). As places of learning, schools have a special role to play; they can help students to understand our impacts on the planet; and become places where sustainable living and working is demonstrated to young people and the community. To serve the major aim of environmental education, that is to form environmentally literate society (Roth, 1996; Rothkrug & Olson, 1991; Wilke, 1995) schools must employ effective strategies.

Foundation of Environmental Education (FEE) runs eco-schools program through 1995 to implement sustainable development education in schools with the aim of educating environmentally literate citizenry (http://www.eco-schools.org/). This program combines learning and action, thus providing an effective method to change behaviour shift. Eco-schools program includes several steps involving both in classroom and outside classroom activities that any school can apply. In all steps students take an active role and have responsibility for the continuity of the program. After a period of participation schools are evaluated about the success of

their application and successful schools are awarded with a green flag. This program is implemented through 44 countries involving 27,000 schools, 6,000,000 students, and 400,000 teachers (http://www.eco-schools.org). Turkey is one of the participants of the program with the support of Turkish Environmental Education Foundation. In Turkey, by the year 2009, there are 271 eco-school applications and 102 schools from 32 cities have green flag. Although the program is implemented in such a wide area, there are not enough research studies questioning the effectiveness of eco-school applications on students' environmental literacy. With this respect, this study questions the effectiveness of eco-school applications to educate environmentally literate children in order to cultivate more sustainable, eco-friendly lifestyles. For this purpose, this study mainly aims to investigate the effects of eco-school application on elementary school students' environmental literacy levels.

1.1 Purpose of the Study

During the last 30 years environmental educators concerned with the idea that how students' environmental literacy can be improved for a sustainable living. Environmental education can contribute to the goal of sustainable development: both formal and nonformal educations can play a critical role to facilitate the societies to transit to sustainable ones (United Nations Conference on Environment and Development [UNCED], 1992). To achieve the goal of sustainable development, environmental education seeks to "enhance a person's understanding of the natural world and to impact positively on attitudes, values, and behaviours" (Wilson, 1994, p. 5). However, related literature reveals that environmental education in schools is problematic and has had limited success (Cutter, 2002; Michael, Stamou & Stamau, 2007). Eco-schools program emerged to fill the need to educate environmentally literate citizens who adopt sustainable living.

Recognizing that educating environmentally literate citizens is needed to solve current environmental problems and to prevent the ones that will happen in the future, this study aimed to determine the effectiveness of eco-school application,

which is a promising approach for sustainable development, on elementary school students' environmental literacy. Besides, the study focused on if eco-school application causes a change in elementary school students' views about the environment. Lastly, the study investigated eco-school students' and teachers' views about the eco-school application.

1.2 Significance of the Study

Today it is known that the Earth is the only planet, where mankind can live. Human beings have an important impact on the Earth through consumption of renewable and nonrenewable resources. To provide the continuity of life, human beings should be aware of their impacts on the environment. To decrease the environmental degradation, educating environmentally literate citizens is important. Thus, education provided in schools has an important role in raising environmentally literate generations. Eco-school program is applied through the world for the purpose of educating environmentally literate students giving sustainable decisions in their lives.

This study is significant because it attempts to investigate the effects of eco-school application on elementary school students' environmental literacy levels. Although there are many national and international eco-schools, there are few research studies investigating effects of these applications. This study aims to fill this gap in the literature. If the eco-school application is found to be effective on elementary school students' environmental literacy levels, the study will encourage teachers, administrators and non-governmental organizations for the application of eco-schools.

Besides, being a study showing the effectiveness of eco-school applications, the study is significant in other aspects. This study is also an attempt to measure the effects of experimental and control group students' demographic characteristics on their environmental literacy levels through eco-school application. If factors like grade level and gender proved to be influential to improve environmental literacy,

then teachers may need to consider the effects of these characteristics during the application. Moreover, the study could serve as background knowledge and an example for teachers and administrators who want to apply eco-school program in their schools.

Furthermore, this study is beneficial because it enhances our understanding of children's views about environment. Finally, the information generated from the findings of the study will contribute to the pool of knowledge on environmental education and education for sustainable development in Turkey.

1.3 Organization of the Study

This study is organized into six major chapters. Chapter 1 starts with the background of the study. After that, the purpose of the study is clarified. Chapter 1 ends with the significance of the research and organization of the study.

Chapter 2 presents the conceptual framework of the study. The chapter starts with a review of literature on global environmental problems followed by a review on environmental education and sustainability education. It also provides a discussion about environmental literacy. Additionally, the chapter presents eco-schools in Turkey which will enable us to trace the progress in Turkey in order to have a clearer understanding of the current situation.

Chapter 3 clarifies the research problem and hypotheses of the study. This chapter also includes sub-problems and null hypotheses of the study.

Chapter 4 describes a comprehensive description of research methodology. This chapter includes information about 'Design of the Study', 'Participants of the 'Study', 'Variables', 'Instruments', 'Data Collection', 'Analysis of the Data', 'Procedure', 'Ethical Concerns', 'Threats to Internal Validity' and 'Assumptions and Limitations of the Study'.

Chapter 5 reveals the results of the study both obtained from qualitative and quantitative data.

Chapter 6 represents the synthesis of preceding five chapters, with further interpretation and discussion. Recommendations for future research are also included.

Following the references, there exist several appendices consisting of full set of questionnaires, teacher's handbook including details of the application, letters of consent, and the vita of the researcher.

CHAPTER 2

LITERATURE REVIEW

> *Today's situation is wholly unprecedented. Whereas it took our species hundreds of thousands of years to reach a population of 10 million, we are now adding 10 million people to the planet every six weeks. Whereas in the past human impacts on the environment were local, reversible, and escapable through migration, they are now typically global, irreversible and inescapable.*
>
> (Ehrlich & Daily, 1997, p. 375)

This chapter presents a review of literature on education for sustainable development, environmental literacy and eco-schools. It starts with a discussion about current state of environmental degradation, traces the historical development of the concepts 'environmental education' and 'education for sustainable development', includes a discussion about environmental literacy and its components, and then explains eco-school applications and it ends with a summary of related studies. The chapter includes six sections; current state of global environmental degradation, environmental education, education for sustainable development, environmental literacy, eco-schools and related studies.

2.1 Current State of Global Environmental Degradation

In the world we live in, environmental degradation became pervasive and accelerating (Barber, 2003; Glasby, 2002). Today, we face serious global problems such as global warming, ozone layer depletion, loss of biodiversity and pollution (Brown, 1991; Brundtland, 1988; Goodland, 1996; Linden, 1997; MacNeill, Winsemius & Yakushiji, 1991; Redclift, 1984; WCED, 1987). Besides, increasing population and consumption are causing increasing pressures on the Earth.

Among the environmental problems, global warming is one of the most serious one we experience. Due to the use of greenhouse gases such as carbon dioxide, methane, nitrous oxide and fluorinated gases, average global temperatures have increased by around ½ °C, over the last 100 years (United Nations Educational Scientific and Cultural Organization-United Nations Environment Program [UNESCO-UNEP], 2002). It is estimated that by the end of this century, global temperatures will rise up to 5.8 °C (UNESCO-UNEP, 2002). An increase in temperature causes ices in the poles melt and results in raising sea levels. Since 1988, the melting rate of polar ice doubled and scientists estimate that sea levels will rise 27 centimeters by 2010 (The World Bank, 2003). This situation will result with floods in coastal areas and severe weather events.

Ozone layer depletion is another serious problem we face. In 1985, scientists recognized a hole in the ozone layer, lying above the Antarctica (UNESCO-UNEP, 2002). In 2000, the size of the hole was 28 million km^2 (UNEP, 2003). Today, ozone layer depletion has reached record levels. Actually, the ozone layer has capability to recover itself, however the recovery will take 40 years if the use of all ozone destroying substances are banned (UNESCO-UNEP, 2002).

Environmental degradation does not only eventuate in global warming and ozone layer depletion. Destruction of environment also causes loss of biodiversity. Today, because of environmental degradation, species become extinct about 1,000-10,000 times faster than its normal rate (Qablan, 2005). Twelve percent of the bird species, 24% of the mammals, 30% of all fish species are in immediate danger of extinction (The World Bank, 2003). It is estimated that with this rate within the next two decades 25% of all species will disappear (Qablan, 2005).

Another problem we are trying to cope with is pollution. Land, air and water pollution affect the quality of human life negatively. Human activities especially daily life habits of people; such as using detergents, using private transportation instead of public transportation, producing increasing amount of waste, results with pollution. According to the UNEP guide for responsible consumption (2002) air

pollution causes health problems on humans and threatens people throughout the world. According to the World Watch Institute (2003), each day 5,500 children die because of diseases linked to pollution. In India breathing the air is the same as smoking 10-20 cigarettes a day. In Delhi 7500 people die every year due to respiratory illnesses (UNESCO-UNEP, 2002). The scene is not different for water. According to the State of the World Report from the World Watch Institute (2007), diseases caused by polluted water contribute to the deaths of a million children each year. Today it is known that only 1% of the world's water is available for drinking, agriculture and industry (UNESCO-UNEP, 2002). In 1995, World Bank vice president Ismail Serageldin predicted an acute water shortage for the new millennium and stated that "many of the wars in this century were about oil, but those of the next century will be over water". Besides this fact, we pump pollution into water supplies, rivers and seas every day.

While concentrated on environmental problems loss of freshwater ecosystems and land degradation are worth to mention. Human activities have caused serious damage to freshwater ecosystems and contributed to the loss of about 50% of the world's wetlands during the 20th century. About 60% of the world's largest 227 rivers have been fragmented by dams, diversion or canals (UNEP, 2003). By 1996, land degradation had affected nearly 2,000 million ha (15%) of the world's land area (UNEP, 2003). Our planet is losing an area of fertile land about the size of Ireland every year as a result of overgrazing and deforestation (UNESCO-UNEP, 2002).

Apart from all these environmental problems human beings are in deep waters with increasing population and consumption. Today, it is estimated that the world population is more than 6 billion people and the number of people living on the world are increasing at a rate of 1.3% per year (Kates, 2000). According to Kates, about 80% of the population, 4.8 billion people, live in the less developed countries and 1.2 billion people live in developed countries of the world. United Nations (1998) predicts that the world's population will be 8.9 billion people in 2050, this number may be as high as 10.6 billion based on fertility assumptions. Exponential growth in population, especially in underdeveloped countries, causes problems with

respect to the food supply and inhumane living conditions. As the world population increases it is inevitable that we are depleting and degrading the air, water, soil, wildlife, minerals, fossil fuels and the Earth's resources at a rate parallel to this increase.

As for consumption, in the *UNEP Guide for Responsible Consumption* (2002) it is stated that average individual needs 2.3 hectares to produce what he consumes every year and to have a place to dump what's left over. Every year we need one more hectare than the previous year. This amount doubles if the individual is European, it is 25 times more if (s)he is American, it is only one third if (s)he is Bangladeshi (UNESCO-UNEP, 2002). According to the *UNEP Guide for Responsible Consumption* 75% of the planet's resources are consumed by the world's 20% richest people. These numbers show that the distribution of consumption is seriously out of balance. Because the unequal distribution of consumption there are 800 million undernourished people in the world. Besides this fact according to the results of a recent United States government study more than a quarter of all food produced does not get eaten (UNESCO-UNEP, 2002). Orr (1992) stated how catastrophic situation of environmental pollution and the world is as:

> If today is a typical day on planet earth, humans will add fifteen million tons of carbon to the atmosphere, destroy 115 square miles of tropical rainforest, create seventy-two square miles of desert, eliminate between forty to one hundred species, erode seventy-one million tons of top soil, add twenty-seven tons of CFCs to the stratosphere, and increase their population by 263,000. Yesterday, today, and tomorrow. By years's end the total numbers will be staggering: an area of tropical rainforest the size of the state of Kansas lost; seven to ten billions of carbon added to the atmosphere; a total population increase of ninety million… It is not too much to say that the decisions about how or whether life will be lived in the next century are being made now. We have a decade or two in which we must make unprecedented changes in the way we relate to each other and to nature. (p. 3)

There is considerable scientific evidence showing that human impact on environment is the reason of environmental problems we face. Buell (2004) stated that there is no place on the Earth that is not affected by human induced environmental degradation. Human being is the only species that is responsible for

the current situation of the world. They generated greenhouse effect by releasing carbon dioxide into the athmosphere faster than the Earth can absorb it, deforested the Earth by cutting trees faster than they can grow, converted grasslands to deserts by overgrazing, caused the extinction of plant and animal species by over-harvesting, depleted the natural resources by over-using them, caused air, water and land pollution by producing more and more wastes.

By the 20th century, humans realized that the Earth has limits and forcing these limits will impact human population negatively (Orr, 1992). Today, environmental problems experienced exist on a global scale and increasingly impact more and more of the human population. Environmental problems call for an urgent need for solutions. Our lifestyles contribute to our present environmental crisis and proceding on our current path is not sustainable. This situation of the world makes the right time to address the question; how we can change our lifestyles to more sustainable ones.

2.2. Environmental Education

From their existence, humans seem to appear to be the enemy of the natural environment (Hadisuwarno, 1997, as cited in Quablan 2005). Paradoxically, they are the key actors to solve the environmental problems. Today, everybody agrees that there is a severe environmental degradation taking place through the world, however, there is little consensus about what can, should be done to solve the environmental problems we are facing. To solve the environmental problems, humans need to develop an understanding about the actions that causes the deterioration of the environment. For an understanding of global environmental problems, it is necessary to develop a consciousness about the environment, because environmental consciousness is a general condition for changing environmental habits (Brunold, 2006). Orr (1992) believes that this can be possible by education and environmental education is the only way to solve the problems that human being is facing today.

Environmental education is a young, dynamic and complex field for study (Palmer, 2003). The early influences of environmental education started with Rousseau. In his novel *Emile* he mentioned that environment should be a part of education (Rousseau, 1762). By Rachel Carson's *Silent Spring* (1962) a debate focusing on the use of chemical pesticides, the responsibility of science and the limits of technological development started. Environmental education became a part of educational policy after the late 1960s. Disinger (1983) reports that one of the earliest definitions of environmental education comes from William Stapp in 1969. As stated in Disinger, Stapp (1969) defined the aim of environmental education as "producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems and motivated to work towards their solution" (p. 30).

The growth of environmental education has occurred through international initiatives. 'International Working Meeting on Environmental Education in the School Curriculum' held in 1970 at Nevada by International Union for Conservation of Nature and Natural Resources (IUCN) was the greatest landmark in the history of attemps to define the term 'environmental education' (Palmer, 2003). In this meeting the term 'environmental education' defined and formulated as:

> The process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his bio-physical surroundings. Environmental education also entails practice in decision making and self-formulation of a code of behavior about issues concerning environmental quality.
>
> (IUCN, 1970, n.p.)

The next major contribution occurred in 1975, with the Belgrade Charter, which was the beginning framework for a global environmental education program. In this decleration a draft vision for environmental education was built up. It provided a widely accepted statement explaining the goal of environmental education:

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.
>
> (UNESCO, 1975, p. 43)

The Belgrade Charter was the first international decleration to define objectives of environmental education. The charter identified six objectives for environmental education as; to create awareness, to acquire knowledge about environmental problems, to develop attitudes, values and behaviours that respect the environment, to acquire problem solving skills, to develop capabilities to assess situations, and to participate in implementing the solution to environmental problems (UNESCO, 1975).

After two years, in 1977, in the Tbilisi Decleration the urgent need for worldwide environmental education is declared (UNESCO, 1977). As a result of the decleration, in conjunction with the UNEP a document that is including the roles, goals, objectives, characteristics and guiding principles of environmental education was published (see Table 1). In Tbilisi Decleration the basic aim of environmental education was stated as:

> making individuals and communities to understand the complex nature of the natural and built environments resulting from the interaction of their biological, physical, social, economic, and cultural aspects, and acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems and in the management of the quality of the environment
>
> (UNESCO, 1977, p.14)

According to the Tbilisi Declaration, environmental education has three primary goals: firstly "to foster a clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas", secondly, "to create new patterns of behaviour of individuals, groups and society as a whole towards the environment" and lastly, "to provide every person with opportunities to acquire the knowledge, values, attitudes, skills, and commitment needed to protect and improve the environment" (UNESCO, 1977, p.15). These goals set out the main framework for educating environmentally literate citizens.

Table 1 *Principles and Recommendations for Environmental Education Drawn out in Tbilisi Decleration (1977)*

Environmental education….
1. is a lifelong process.
2. is interdisciplinary and holistic in nature and application.
3. is an approach to educate as a whole, rather than the subject.
4. concerns the interrelationship and interconnectedness between human and natural systems.
5. uses the environment in its entirety including social, political, economic, technological, moral, aesthetic and spiritual aspects.
6. recognizes that energy and material resources both present and limit possibilities.
7. Encourages participation in the learning experience.
8. Emphasizes active responsibility.
9. uses a broad range of teaching and learning techniques, with stress on practical activities and first-hand experience.
10. is concerned with local to global dimensions, and past/present/future dimensions.
11. should be enhanced and supported by the organization and structure of the learning situation and institution as a whole.
12. encourages the development of sensitivity, awareness, understanding, critical thinking and problem solving skills.
13. encourages the clarification of values and the development of values sensitive to the environment.
14. is concerned with building an environmental ethic.

Adapted from "Mapping Environmental Education", by S. Sterling, 1992, in W.D.S. Leal Filho and J.A. Palmer (eds) Key Issues in Environmental Education, University of Bradford, UNESCO.

In 1980, the World Conservation Strategy, one of the most significant documents focusing on conservation and environmental education, was published. In the World Conservation Strategy the purpose of the environmental education is mentioned as:

> Ultimately the behaviour of entire societies towards the biosphere must be transformed if the achievement of conservation objectives is to be assured… the long term task of environmental education is to foster or reinforce attitudes and behaviour, compatible with a new ethic.
>
> (IUCN, 1980, section 13.)

On the same line with the meetings, Orr defined environmental education as the "instruction directed toward developing citizenry prepared to live well in a place without destroying it" (Orr, 1994, as cited in Woodhouse & Knapp 2000). Additionally, Roth (1996, p. 4) stated that:

> Environmental education is a process aimed at developing a citizenry that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, attitude, motivations, commitments and skills to work individually and collectively toward the solution of current problems, as well as the prevention of the new ones. Environmental education is designed to foster and nurture growth of environmental literacy throughout the human life span.

Independent Commission on Environmental Education Report adds that "environmental education is distinguished by its emphasis on 'responsible environmental behaviour' and informed citizen action, in addition to acquisition of knowledge about the environment" (ICEE, 1997, p. 7). Marcinkowski (1998) pointed out that "recent attempts to develop environmental literacy frameworks and to set forth guidelines have featured behavior and behavior-related variables as critical components" (p. 228) and described this behaviour as 'responsible environmental behaviour'. Iozzi and Marcinkowski (1990) expressed the primary purpose or environmental education as to promote learning that translates into environmentally responsible behaviour.

Regardless of which definition of environmental education is considered, all definitions have common points: humans are not apart from their environment, strong relations are connecting humans and the environment, and to ensure the quality of our life we must try to sustain these relationships (Wright, 2006).

Besides, the major goal of environmental education is expressed as educating environmentally literate citizenry showing responsible environmental behaviour to assure having a healthy, sustainable world.

2.3 Education for Sustainable Development

Environmental education has continued to evolve over the last three decades. Throughout this time environmental education underwent reconstruction and evolved as education for sustainable development. From 1992, education for sustainable development appeared as a sub-movement within environmental education (Barraza, Duque-Aristizábal & Rebelledo, 2003).

Despite the short history of education for sustainable development, the concept of 'sustainable development' roots to early societies such as the ancient Sumerian, Mayan and Mediterranean civilizations (Nath, 2003). Its recent origins can be traced to the UNCHE agenda in 1972 (Reed, 1996; Williams, 1993). In this conference the term 'sustainable development' is established. The term gained currency with the publication of the World Conservation Strategy in 1980 by the International Union for Conservation of Nature and Natural Resources (IUCN) (Trzyna, 1995). The concept came into common usage with the publication of the Brundtland Commission Report (WCED, 1987). The mostly cited definition of sustainable development is provided with the Brundtland Commission and it is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987).

Sustainable development calls for a redefinition of the relationship between man and the environment. It is essentially thought to be "a pattern of development which is not harmful to the environment" (Williams, 1993, p. 18). It aims to find a balance between providing human needs with protecting the environment (Goldman, Yavetz & Pe'er, 2006). With this respect, sustainaible living can be achieved by continuous evaluation of human needs in terms of their potential impacts on future generations (Brown, Flavin & Postel, as cited in Orr, 1992). The concept of sustainable development is multidimensional; it focuses on relationships betwen three areas; environment, society and economy, for the well being of human population (see

Figure 1). According to Goodland (1995) it incorporates the ability of each area to maintain itself without impacting the other areas in negative way. With this respect the goal of sustainable development is to provide secure economic development, social equity and justice, conserve natural resources and support environmental protection. Sustainable development enforces us to think about the welfare of all species both today and tomorrow (Humphries, 2004).

Figure 1. Scheme of sustainable development. (from: http://www.scityvt.co.uk/)

The concept of sustainable development has become further popularized by *Agenda 21* (UNCED, 1992). In 1992, the Earth Summit Conference took place in Rio de Janeiro. *Agenda 21*, a document setting out what nations should do to achieve sustainable development in the 21st century, was produced and signed in this conference.

In many environmental meetings, sustainable development is determined as the most important goal that should be achieved by all nations to ensure that future generations will have adequate resources to maintain their life (Bruyere, 2003).

The main point to consider, in achieving sustainable development is how individuals can contribute this aim. Sustainable living is more than having solar panels on the roof, a windmill in the garden and bottles collected for driving to the bottle bank. It is something about respecting, valuing and loving the environment, and thus minimizing environmental impacts (Day, 2007). For this, a transformation in values, attitudes, skills and behavior is needed. This transformation can be accomplished by broadening and deepening the understanding of issues related with sustainable development.

Through the discussion and formulation of the concept of sustainable development, it became appearent that education is needed to accomplish it. *Agenda 21* is one of the first agreements to emphasize the integration of sustainable development with education (Brody & Ryu, 2006). Two chapters, Chapter 25 (Children and Youth in Sustainable Development) and 36 (Promoting Education, Public Awareness and Training), are devoted to the significance of education to accomplish sustainable development. According to *Agenda 21*, sustainability demands a shift in people's thinking and lifestyles and carrying out this shift is difficult because it relies on a corresponding change in the way we view the world. United Nations (2003, chap. 36, p. 2) asserts that "education is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making".

Another attempt to emphasize the importance of education to succeed sustainable development is taken in 1997. In this year, UNESCO organized the conference on 'Environment and Society: Education and Public Awareness for Sustainability' with the participation of 1,400 representatives from 84 countries. At the end of the conference participants agreed the 'Thessaloniki Decleration' in which education for sustainability is proposed as the carries of the common and single message of hope for the future.

In the sustainability triad sustainability education is positioned at the intersection of the three components. In education for sustainability, equal consideration has been given to economic, social and environmental strands (Herremans & Reid, 2002).

However, covering all the three strands is not enough for sustainable society. Education for sustainable development is more than a knowledge based on environment, economy and society (Hart, 2000; Herremans & Reid, 2002; McKeown, 2002). Sustainability education also addresses learning skills, perspectives, values and local and global issues (McKeown, 2002). Education for sustainability promotes an understanding for the awareness of how the global system works and how all the parts are interconnected (Fien, Kumar, & Ravindranath, 2001). Human beings should understand that they are part of nature and are part of a larger system; therefore, it is needed to view problems in a holistic way. By this way, it will be possible to lessen our impact on the environment.

2.4 Environmental Literacy

Within the development of environmental education, there has been an important discussion about the environmental literacy and how it relates to education for sustainability. UNESCO (1977) acknowledged environmental literacy as the most fundamental goal of environmental education. From its birth, the term has received attention of many educational researchers and environmental scientists. However, there is a debate among environmental educators on what defines an environmentally literate person. Morrone, Mancl and Carr (2001) affirmed that there is no universally accepted definition of environmental literacy and the characteristics of an environmentally literate person are still subject to discussion.

The earliest definition of environmental literacy was made by Roth in 1968. Roth (1968) defined environmentally literate person as “someone who possesses the basic skills, understandings and feelings for man-environment relationship” (p. 2). Roth also suggested four principles to characterize an environmentally literate person. According to Roth an environmentally literate person understands “the interrelationships between natural and social systems”, “the unity of humankind with nature”, “how technology influences environmental decision making” and “learning about the environment is a life-long endeavor” (p. 2). According to Roth environmental literacy consists of six major areas: environmental sensitivity, knowledge, skills, attitudes, values, personal statement, responsibility and active

involvement. In the project 'Realizing Environmental Literacy through Advanced Technology & Experimentation' (RELATE) three strands that are compatible with Roth's definition of environmental literacy were listed. In this project, environmental literacy is defined as; "the ability to comprehend and critically evaluate basic principles which govern natural systems, linkages among living organisms and the physical environment, and consequences of human activity on natural systems" (RELATE, n.d., p.2).

Orr (1992) uses the term 'ecological literacy' instead of 'environmental literacy' and defines the characteristics of an ecologically literate person as having knowledge about the environment, concerning for it and having practical abilities to solve and understand ecological issues. Berkowitz, Ford, and Brewer (2005) have a similar definition for environmental literacy with the Orr's. They state that an environmentally literate person has capability to understand key ecological systems, to develop the ability to think ecologically and to understand how ecological systems interact with society. Clair focuses on different aspect of the environmental literacy concept. Clair (2003) asserts that an environmentally literate individual has the ability to make sustainable choices and have a sustainable lifestyle and she defines environmental literacy as:

> developing and participating in the social practices likely to change the way our societies think about and act upon ecological issues. Literacy is a powerful metaphor that contributes a great deal to thinking through the question of what of each of us can contribute for a more just and sustainable way of life for the planetary community. (p.77)

Fixing a precise definition of environmental literacy is not in the scope of this research. For the purpose of the study, it is assumed that environmental knowledge, attitudes, uses and concern are the components of the environmental literacy. The first and an essential component of environmental literacy is 'environmental knowledge'. The knowledge component of environmental literacy includes the development of understanding of the basic ecological principles that are related with the environment. Environmental knowledge covers an understanding of ecological systems (Berkowitz, Ford & Brewer, 2005), ecological cycles (Capra, 2002), interdependence of human being on the natural world (Orr, 1992), existing

diversity of living organisms (Gruenewald & Smith, 2008; Sobel, 2005) and dynamic nature of life (Capra, 2002). Wilke (1995) defines environmental knowledge as having "an understanding of how humans relate to natural systems and the importance of making wise decisions regarding the use of natural resources and maintaining human habit for life and fit for living" (p.29). Environmental attitude is the second component of environmental literacy. It can be defined as general feelings of the individual towards environmental issues. Environmental attitudes refer to "any of the evaluative beliefs, affect and/or behavioral intentions a person holds regarding environmentally related activities or issues" (Oskamp & Schultz, 2005, p.444). As Gotch and Hall (2004) stated, if the goal is to achieve behaviour change we must focus on attitudes. The third component of environmental literacy is environmental use. It is used to describe the ways in which human beings make use of and manage land, trees, animals, plants and water. It requires sustainable management of natural resources. The last component, environmental concern, is used to refer to "affect or worry, associated with specific or general environmental problems" (Oskamp & Schultz, 2005, p.444). Environmental concern is the first step toward proenvironmental behaviour (Kals & Maes, 2002).

Although there is a disagreement on the definition and components of environmental literacy, many researchers agree that the best way to overcome environmental problems is to develop an environmentally literate society behaving in more environmentally responsible ways (Roth, 1996; Rothrug & Olson, 1991; Wilke, 1995). Being environmentally literate is more than understanding environmental problems, it requires also willing to help to resolve them in a responsible way (Dashefsky, 1993). According to Moseley (2000) environmental literacy increases with increasing sensitivity, awareness and understanding of environmental issues and responsible environmental behaviours are developed as a result of environmental education. However, current educational practices may not be enough to improve students' environmental literacy. Orr (1992) states that in schools environmental subjects are not taught appropriately, so we are failing to produce environmentally literate citizens. In a much cited article, Hungerfold and Volk (1990, p. 437) noted that "environmental educators typically assume that if

they simply impart knowledge to students, responsible action will follow". However, gaining 'responsible environmental behavior' is more than having scientific knowledge about environmental issues.

If the ultimate goal is to succeed sustainable development through showing responsible environmental behaviour, then there is a need to develop strategies to enhance environmental literacy. Indeed, there is a little relationship between environmental literacy and traditional schooling (Daudi, 2008). Today, there are few schools accepted developing environmental literacy as an educational goal (Inda, 2008). In order to move toward sustainability, schools should apply different practices which might develop environmental literacy. Orr (1992) stated that to develop environmental literacy teachers should provide different opportunities for students. To develop environmental literacy, children should spend significant amounts of time within the natural world. Therefore activities conducted in schools should include opportunities for spending time in the nature, collecting data that help environmental understanding and helping students draw connections between local environment and global challenges (Berkowitz et al., 2005).

2.5 Eco-Schools

Just 10 years ago, few people were worried about the situation of the Earth. Only few people were dealing with global warming, ozone layer depletion, increasing pollution and loss of biodiversity. But today, environmental problems and environmental degradation is everybody's concern (Vogel, 2007). This concern is also spreading among schools. Today, it is required that every child should have adequate knowledge, skills and values that enable them to contribute to the future of the environment (Department for Education and Skills [DFES], 2006).

As places of learning, schools are the physical settings for the educational process and children spend a considerable amount of time in schools. The importance of the contribution of schools to achieving environmentally literate citizens cannot be underestimated. In order to provide necessary understanding for the public needed for the solution of environmental problems, environmental education should be

integrated into the whole formal school system (UNESCO, 1977). According to Orr (1992) in schools, students should learn that they are a part of, not apart from, natural systems. Orr believes so strongly in importance of environmental literacy and he states that “no student should graduate from any educational institution without a basic comprehension of the outlined criteria that makes one ecoliterate" (Orr, 1991, n. p.).

In schools, children are the main recipients of environmental education. Therefore, students should be provided with different learning opportunities, so that an improvement in their environmental literacy is expected. To educate environmentally literate students it is not sufficient to learn about environmental problems (Hart & Nolan, 1999; Kollmus & Agyeman, 2002; Rickinson, 2001). To achieve sustainable development something more than building awareness of environmental issues and environmental knowledge should be done (Haigh, 2006). The education provided to the students should affect the way (s)he acts in the world. Haigh (2006) states that it is only possible to contribute to sustainable development if environmental education is constructed as a process that remains with the learner beyond the classroom years.

In his speech in 2004 Tony Blair emphasized that

> sustainable development will not just be a subject in the classroom: it will be in its bricks and mortar and the way the school uses and even generates its own power. Our students won’t just be told about sustainable development, they will see and work within it: a living, learning place in which to explore what a sustainable lifestyle means.

Today, most of the educators would agree that something should be done in schools to educate environmentally literate students. However there are a few school examples that help students better understand how sustainable development can be achieved.With this respect an international award program, named as eco-school, emerged to accomplish sustainable development in schools. Eco-school program was developed by Foundation of Environmental Education as a means of delivering *Agenda21* commitments (http://www.fee-international.org). The major aim of this program is to prepare children for sustainable living and to show that sustainable

living is about finding solutions to the problems we confront and improving the people's quality of life without destroying the environment. The aim of the program is to create awareness of sustainability issues, not just in school but back in the home too (Valios, 2008). Eco-school program encourages environmental management, certification and sustainable development education (Pirrie, Elliot, Mcconnel & Wilkinson, 2006) in schools.

By the rise of the eco-school program, it gained an increased attention throughout the world and today, 27,000 schools from 44 countries including Turkey are enrolled to the program. Eco-schools program is administered in Turkey by Turkish Foundation for Environmental Education since 1995. Hundreds of schools; kindergartens, primary, elementary and secondary schools; enrolled to the project all over the country. By the end of 2008, 102 schools from different cities gained a green flag.

Eco-school program provides a framework including seven steps to guide schools on their sustainable journey (http://www.eco-schools.org.uk). The program starts with forming an eco-committee (http://www.fee-international.org). The school should establish an eco-school committee that includes teachers, students, parents, staff and if it is possible other stakeholders in the local community. The major roles of eco-committee are to inform whole school about the program, to lead in carrying the environmental review and the action plan and to provide a link between students, teachers, administrators and the whole school community (http://www.eco-schools.org.uk). There are no predetermined ways to set up the eco-school committee. In Turkey, schools are advised to form eco-teams which include a coordinator teacher and several students, under the guidance of eco-committee. Mainly, eco-teams carry out the program and the eco-committee supports the eco-teams during the process. At the very beginning of the program, it is advised to prepare an eco-school board to announce the progress in the program to the whole school community.

The second step in eco-school program is conducting an environmental review (http://www.fee-international.org). In this step, eco-teams provide information on

the school's impact on the environment. During the environmental review eco-teams can focus on a series of simple questions to provide required information. Schools can address environmental issues such as litter, waste minimization, energy, health and school grounds. Schools are free to choose one of these environmental issues or they can work on other issues related with environment. Environmental review enables eco-teams to set targets in respect of the environmental issues which the school is addressing.

The third step is forming an action plan (http://www.fee-international.org). As a result of the environmental review, a list of actions is drawn out. Eco-teams select the actions they are going to accomplish and set deadlines for these actions. During this step, members of the eco-teams and whole school community are assigned to accomplish the targets in the action plan. After planning, eco-teams take action to complete each task in the action plan. According to action plan, members of the eco-teams should participate in environmental activities both inside and outside the school.

The fourth step of eco-school program is monitoring and evaluation (http://www.fee-international.org). Through the process, eco-teams should monitor their actions and evaluate their progress. Monitoring and evaluation enable eco-teams to find out whether or not they are successfully achiving their targets they determined (http://www.eco-schools.org). FEE suggests several methods to eco-schools to use during monitoring and evaluation such as "measuring the school's global footprint, meter readings and calculation of energy savings, weighing/counting litter items or waste collected for recycling, taking before, during and after photographs, before and after species list and using questionnaires and surveys to canvass opinions/record data" (http://www.eco-schools.org). Coordinator teachers are advised to encourage students to take an active role during monitoring and evaluation. By this way students will have a greater sense of ownership towards the program (http://www.eco-schools.org.uk).

The next step in eco-school program is the curriculum work. FEE suggests "infusing environmental education concepts into the already existing subjects and

not that of presenting a new subject" (http://www.fee-international.org). Teachers are expected to make an effort for integrating environmental issues throughout the curriculum and different areas of study such as mathematics, language, religion and social sciences.

Informing and involving the whole school and wider community is the sixth step of eco-school program (http://www.fee-international.org). The program aims to raise the environmental awareness of the whole school and wider community. For this reason, activities that provide the involvement of the wider community are advised.

Last step in eco-school program is producing the eco-code (http://www.fee-international.org). Eco-code is a mission statement demonstrating the school's commitment to improving its environmental performance (http://www.eco-schools.org). It is advised to produce the eco-codes with students and display on eco-school board, classrooms, staff rooms and corridors.

At the end of the process, schools are evaluated in developing students' awareness and in changing their behaviour in respect of environment (http://www.fee-international.org). In the evaluation phase there are some differences in the application through countries. In some of the countries such as United Kingdom and Scotland, schools work to gain one of the three awards; bronze, silver and the green flag award. However, in Turkey instead of bronze and silver awards only the green flag is given to the successful schools. To gain a green flag, schools should carry the eco-school activities for four semesters. Turkish Environmental Education Agency evaluates the schools applying for the green flag and decides whether or not they are successful.

2.6 Related Studies

Over the past 30 years, environmental literacy was questioned by environmental education researchers. Surveys conducted to determine students' environmental literacy constitute an important part of the environmental literacy literature. In these studies, various instruments were developed and used to measure students'

environmental literacy levels. Besides, students' environmental knowledge and their attitudes toward environment have been evaluated by a number of researchers. In all these studies, effects of several demographic characteristics were also evaluated. Gender and grade level are the mostly studied demographic characteristics. Results of these studies indicated different patterns for gender and grade level. Some results of these and other selected studies are summarized below.

Among all the studies about environmental literacy, it is firstly worth to mention about the studies focusing on measuring students' environmental literacy levels. In their study, Negev, Sagy, Garb, Salzberg and Tal (2008) conducted a national survey of 1,591 sixth grade students from 39 schools and 1,530 twelfth grade students from 38 schools in Israel to evaluate students' environmental literacy, including the dimensions of environmental knowledge, attitudes and behaviour. Results of the study revealed that 12th grade students get higher environmental knowledge scores than 6th grade students. However, researchers reported that neither group exhibited impressive environmental knowledge scores. Analysis of environmental attitudes revealed that both 12th grade and 6th grade students have high environmental attitudes. In the survey, environmentally positive behaviour was significantly lower among 12th graders than among 6th graders.

Ökesli (2008) conducted a study to determine environmental literacy levels of 848 elementary school students enrolling to 6th, 7th and 8th grades of four public schools. In the study researcher used Environmental Literacy Questionnaire developed by Kaplowitz and Levine (2005). The results of the study revealed that students have low levels of environmental knowledge but they have positive attitudes toward environment, positive views on environmental use and high levels of concern about environmental problems.

In another research conducted by Istanbullu (2008) 6th grade students' environmental literacy levels were questioned by Environmental Literacy Questionnaire (Kaplowitz & Levine, 2005). The study was conducted with 681 sixth grade students. The results of the study revealed that students have high levels

of environmental knowledge, have positive attitudes toward environment, and have high levels of environmental use and concern.

In another study, Culen and Mony (2003) assessed the environmental literacy in a nonformal youth program. To determine environmental literacy of participants, they used the Middle School Environmental Literacy Instrument developed by Hungerford, Ramsey, Volk and Bluhm (1993). Data of the study were collected from 4-H participants. As a part of the study, in 1988 170 youth in 11 Florida counties participated in the study. Among these participants some of them enrolled to environmental education activities and some of them did not. The results investigated that 4-H participants who have used environmental education activities scored higher on the survey than those who had not used any such activities.

Bogan and Kromrey (1996) conducted a survey to measure Florida's high school students' environmental literacy levels. In this study, researchers attempted to measure students' knowledge, attitude, behavior and political actions. The results revealed that students demonstrated a limited knowledge about environment, demonstrated a positive attitude toward environment, have knowledge about environmentally responsible behaviors, however students demonstrated limited knowledge of political action.

In the environmental education literature, there also exist many studies focusing on students' environmental knowledge and their attitudes toward environment. In one of these studies Alp, Ertepınar, Tekkaya and Yılmaz (2008) investigated elementary school students' environmental knowledge and attitudes and the relationship between self-reported environmentally friendly behaviour to environmental knowledge. To collect the data of the study, researchers administered Children's Environmental Attitudes and Knowledge Scale (CHEAKS) to 532 sixth grade and 608 eight grade environmental school students. The results of the study revealed that students have low levels of environmental knowledge, but favourable attitudes toward environment. The results of the study also showed that girls have significantly higher attitudes toward environment than boys. Besides, the results

also showed that elementary school students' behaviours toward the environment were independent from their knowledge of environmental issues.

Lee (2008) conducted a study to examine 292 African American college students' environmental attitudes, everyday environmental behaviours and major sources for local, national and international environmental issues. The researcher used New Environmental Paradigm (NEP) scale to measure students' environmental attitudes. The questionnaire also included five items on self-reporting recycling behaviours for five categories of materials; newspapers and magazines, glass bottles and jars, plastic bottles and jugs, cardboard boxes, and e-waste such as televisions, monitors, printers, self-phones, and other household electronics. Conservation behaviours were measured by six items electricity conservation, water conservation, use of public transportation, decreased use of paper towels, use of high-efficiency laundry detergents, and carpooling. Students were also asked to indicate the number of hours they watch television on a typical day, and their degree of exposure to nature based programs on the Discovery Channel, National Geographic Channel and the Public Broadcasting System. The results of the scores obtained from NEP revealed that participants took a moderest degree of proenvironmental behaviours. The researcher found no significant gender difference on students' NEP scores. For local environmental news, 35% of the participants reported that television, 7.2% reported the Internet and 6.5% reported that family and friends as the information sources. Besides for national environmental news, 37.2% of students reported television and 12.1% reported the Internet as the major information sources. The findings were similar for global environmental news; 44% of participants chose television and 16.4% chose the Internet as the major information source. Although students reported that television is their major source of information for environmental news, majority of them reported that they have never watched nature-based programs on the *Discovery Channel*, *National Geographic Channel* and *Public Broadcasting System*. Among the students expressed they are watching these channels, it is found that male students watched more nature based programs than female students.

Additionally, Tuncer, Sungur, Tekkaya and Ertepınar (2007) conducted a research to compare pre-service teachers' and elementary school students' attitudes toward

environment. The researchers collected the data of the study from 1,235 elementary school students from different grade levels and 334 pre-service teachers by a 45-item 'Environmental Attitude Questionnaire' consisting four dimensions; awareness of environmental problems, national environmental problems, solutions to the problems and awareness of individual responsibility. In the study researchers found that although pre-service teachers had significantly higher environmental attitudes than elementary school students both groups got moderate scores from the instrument.

Another study is conducted with Oweini and Houri in 2006. The researchers studied the factors affecting environmental knowledge and attitudes of Lebanase college students. Gender and age were among the demographic variables they have investigated. They collected the data of the study with a questionnaire assessing four major domains related to environmental attitude: concern, knowledge, willingness to act, present and past behaviour and experience with nature. In the study researchers found that age showed no correlation with any of the measured variables. Besides, they found that males scored higher than females on willingness to act, actual behaviour and experience with nature.

In their study Kaplowitz and Levine (2005) examined the Michigan State University students' environmental knowledge levels with a survey including 12 environmental knowledge questions and compared the results obtained with the results of national survey conducted by 2000 adults in United States. The results of the study revealed that although Michigan State University students are more knowledgeable about environmental issues and problems than the average American adult, students' overall environmental knowledge was deficient. Students' self-evaluated their environmental knowledge and 41.5% of them expressed that that have 'only a little' environmental knowledge. Besides, the effects of students' academic level and field of study on their environmental knowledge is investigated. The results revealed that environmental knowledge is increasing with academic level. It is also found that environmental knowledge levels change with the field of study.

In another research conducted by Tuncer, Ertepinar, Tekkaya and Sungur (2005), researchers investigated effects of school type and gender on elementary school students' attitudes towards environment. Totally, 1,497 students from different grade levels attended their study. The researchers collected the data by using a 45-item Likert-type questionnaire. As a result researchers found that students enrolled in private schools have a higher awareness on all dimensions of the questionnaire. The results also revealed that a significant difference exists between boys' and girls' attitudes towards the environment in favour of girls.

Socio-economic status was another demographic characteristic studied mostly in environmental education. Uzun and Sağlam (2005) investigated the effects of socio-economic status on students' environmental knowledge and awareness. In their study, researchers administered two kinds of scales named as 'Scale for Environmental Awareness' and 'Scale for Environmental Academic Success' to 258 high school students in Ankara. In the study students were grouped according to their parents' level of income, which produced high, middle and low socio-economic groups. The results revealed that students from middle socio-economic group had higher environmental awareness scores and environmental knowledge scores than students from low and high socio-economic group.

In another study Ivy, Lee and Chuan (1998) conducted a survey to gather baseline data on the level of environmental knowledge, attitudes and behaviour of secondary and junior college students in Singapore. They administered a 55-item instrument to 1,256 ninth and eleventh grade students. The study represented that students have high environmental knowledge but in certain areas they are not adequately informed. The results also showed that students have moderately positive attitudes toward environment and they frequently practised positive environmental behaviour. In the study participants were asked the source of environmental knowledge and printed and electronic media were found to be the most important sources of environmental knowledge.

CHAPTER 3

PROBLEMS AND HYPOTHESES

3.1 The Main Problem and Sub-problems

3.1.1 The Main Problem

The purpose of this study is to compare the effectiveness of eco-school application and traditional school application on elementary school students' environmental literacy levels. Based on this purpose, the main problem of the study is: "What is the effect of eco-school applications on the improvement of elementary school students' environmental literacy compared to traditional school applications?" Besides, the study focuses on if eco-school applications cause a change in elementary school students' views about the environment. Lastly, the study deals with eco-school students' and teachers' views about the application.

3.1.2 Sub-problems

The sub-problems expelled from the first main problem and that will be addressed in the study are:

1. Is there a significant mean difference between the effects of eco-school application and traditional school application on elementary school students' knowledge about environment?

2. Is there a significant mean difference between the effects of eco-school application and traditional school application on elementary school students' attitudes toward environment?

3. Is there a significant mean difference between the effects of eco-school application and traditional school application on elementary school students' environmental uses?

4. Is there a significant mean difference between the effects of eco-school application and traditional school application on elementary school students' environmental concerns?

5. Is there a significant mean difference between girls and boys with respect to their knowledge about environment?

6. Is there a significant mean difference between girls and boys with respect to their attitudes toward environment?

7. Is there a significant mean difference between girls and boys with respect to their environmental uses?

8. Is there a significant mean difference between boys and girls with respect to their environmental concerns?

10. Are there significant mean differences among students' from different grade levels with respect to their environmental knowledge?

11. Are there significant mean differences among students' from different grade levels with respect to attitudes toward environment?

12. Are there significant mean differences among students' from different grade levels with respect to their environmental uses?

13. Are there significant mean differences among students' from different grade levels with respect to their environmental concerns?

Besides these sub-problems, also changes of students' descriptions of environment before and after the eco-school application, differences between the descriptions of students enrolled eco-school applications and traditional school applications and eco-school students' and teachers' views about the application will be investigated. To do this three more sub-problems are devoted:

14. What are elementary school students' views about what defines an environment?

15. In what ways do elementary school students' views change with eco-school application?

16. What are eco-school students' and teachers' views about the application?

3.2 Hypotheses

3.2.1 Research Hypotheses

Elementary school students enrolling eco-school will improve their environmental literacy by improving their environmental knowledge, attitudes, uses and concerns, as compared to students enrolling traditional school.

3.2.2. Null Hypotheses

The null hypotheses that will be tested in the study are:

***H_o*1-** There is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their knowledge about environment.

***H_o*2-** There is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their attitudes toward environment.

***H_o*3-** There is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their environmental uses.

***H_o*5-** There is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their environmental concerns.

***H_o*6-** There is no significant mean difference between the post-test mean scores of boys and girls on their knowledge about environment.

***H_o*7-** There is no significant mean difference between the post-test mean scores of boys and girls on their attitudes toward environment.

***H_o*8-** There is no significant mean difference between the post-test mean scores of boys and girls on their environmental uses.

***H_o*9-** There is no significant mean difference between the post-test mean scores of boys and girls on their environmental concerns.

***H_o*10-** There are no significant mean differences among students from different grade levels with respect to their environmental knowledge.

***H_o*11-** There are no significant mean differences among students from different grade levels with respect to attitudes toward environment.

***H_o*12-** There are no significant mean differences among students from different grade levels with respect to environmental uses.

***H_o*13-** There are no significant mean differences among students from different grade levels with respect to environmental concerns.

CHAPTER 4

DESIGN OF THE STUDY

This chapter aims to present the way in which the study was conducted. The chapter is composed of; 'Design of the Study', 'Participants of the Study', 'Variables', 'Instruments', 'Data Collection', 'Analysis of Data', 'Procedure', 'Treatment Fidelity and Treatment Verification', 'Ethical Concerns', 'Threats to Internal Validity' and 'Assumptions and Limitations of the Study'.

4.1. The Design of the Study

This study is dealing mainly with the effects of eco-school application on elementary school students' environmental literacy and their views about environment. Besides, eco-school students' and teachers' views about the application is determined at the end of the application. For the study, quasi-experimental design (Gay, 1987) was utilized, since it was not possible to assign the participants to experimental and control groups randomly. The research design of the study is outlined in Table 2.

Table 2 *Research Design of the Study*

Groups	Pretest	Treatment	Posttest
EG	ELQ DofE	ESA	ELQ DofE Interviews
CG	ELQ DofE	TSA	ELQ DofE

Note. **EG: E**xperimental **G**roup, **CG: C**ontrol **G**roup, **ELQ: E**nvironmental **L**iteracy **Q**uestionnaire, **DofE: D**rawings **of E**nvironment, **ESA: E**co-**S**chool **A**pplication, **TSA: T**raditional **S**chool **A**pplication

4.2 Participants of the Study

The target population of this study consists of all elementary school students attending in the private elementary schools in Turkey. However, since it is impossible to conduct an experimental study with all these schools, the accessible population was chosen as all private elementary schools in Aksaray. There are three private schools in Aksaray and two of them were chosen conveniently for the study. One of these private elementary schools was chosen as the experimental group and the other school was chosen as the control group.

Participants of the study consisted of 316 students' enrolling to 6th, 7th and 8th grades of these two schools. There are three experimental groups and three control groups for each grade level. The experimental group included totally 156 students (84 boys and 72 girls), and the control group included 160 students (92 boys and 68 girls). The distribution of the sample according to gender and grade level is given in Table 3.

Table 3 *Distribution of Participants According to Gender and Grade Level*

	Experimental Group		Control Group		Total
	Boys	Girls	Boys	Girls	
6th grade	40	30	28	19	117
7th grade	27	18	38	35	118
8th grade	17	24	26	14	81
Total	84	72	92	68	316

4.3. Variables

4.3.1 Independent Variables

The independent variables of the study consist of; two different applications in two private elementary schools which are eco-school and traditional school applications, participants' gender and grade level.

4.3.2 Dependent Variables

Dependent variables of the study consist of elementary school students' environmental knowledge, attitude, uses and concerns measured by ELQ. Also the change in students' views about the environment which is determined by DofE is another dependent variable of the study.

4.4 Instruments

The data of the study were collected by 'Environmental Literacy Questionnaire (ELQ)' and 'Drawings of Environment (DofE)'. Additionally, interviews were conducted with students and teachers participating experimental group.

4.4.1 Environmental Literacy Questionnaire (ELQ)

Elementary school students' environmental literacy was measured by administering the instrument Environmental Literacy Questionnaire (ELQ) developed by Kaplowitz and Levine (2005) and translated and adapted into Turkish by Tuncer, Tekkaya, Sungur, Çakıroğlu, Ertepınar and Kaplowitz (2009). The questionnaire includes 45 closed-ended questions which make it easy to use, score and code for statistical analysis (see Appendix A). The questionnaire includes questions covering four components of environmental literacy; environmental knowledge, attitudes, uses and concerns (Kaplowitz & Levine, 2005). Tuncer et al. found internal consistency of the environmental knowledge, attitudes, uses, and concern item sets to be 0.88, 0.64, 0.80 and 0.88, respectively, using Cronbach alpha. In the present study, the internal consistency values for each subscale were calculated as 0.78, 0.60, 0.86 and 0.90 respectively.

The knowledge component of ELQ consists of 11 multiple choice questions to assess respondents' knowledge of environmental issues. Besides the correct choice and three distractors, each answer set for the knowledge questions include 'I do not know' choice.

The other three sections consist of Likert-type statements to determine students' environmental attitudes, uses and concerns. Ten environmental attitude questions aim to determine students' attitudes toward the environment. The environmental use component consists of 19 questions and targeted to measure students' ideas about the ways in which human beings make use of and manage land, trees, animals, plants and water. Eight concern questions used to collect data on students' concern toward the environmental problems.

Besides questions covering four components of environmental literacy, information about students' gender, grade level, parent's education level and views about the importance of environmental problems are also collected by related items. The questionnaire also includes questions for self-assessment of environmental knowledge and interest about environmental problems as well as questions concerning involvement of participants' in outdoor activities, their parents' interest in environmental problems and their involvement in environmental activities.

4.4.2. Drawings of Environment (DofE)

More recently, children's drawings have been gaining increasing interest in studying children's views within the field of environmental education (Alerby, 2000; Fleer, 2002). Drawings are powerful tools because they make it possible to gain insight about how children view the world. In the present study, students' views about the environment were determined by draw-and-write technique (Brackett-Milburn, 1999; Shepardson, 2005). This technique includes drawings accompanied by written comments either describing the picture or adding additional information. Students were asked to draw a picture of an environment and explain their drawing before and after the treatment. Students' explanation of their drawing was used to correctly determine the images they draw. Students were provided an activity sheet for their drawings (see Appendix B).

4.4.3. Interviews

As a research tool, interviews offer a means of understanding informants' perspectives of their realities expressed in their own voices (Bogdan & Biklen, 1992; Taylor & Bogdan, 1998). In the present study, interviews were used to determine eco-school students' and teachers' views about eco-school application. To prepare the interview schedule, the researcher carried out a literature review about eco-school applications and considered the critical points about the application conducted. By focusing on these points, interview questions were determined appropriate for the purpose of the study (see Appendix C and D). Then, the questions were examined by two experts and according to their comments, questions were revisited. By this way final form of interview questions were formed.

Five students from each grade level and five teachers enrolling to eco-school were interviewed. The number of interviewees was determined by the subjective judgement of the researcher. The interviews were semi-structured and conducted individually. The interviews were audiotaped and transcribed for analysis and interpretation.

4.5 Data Collection

The ELQ was applied as the pre-test and the post-test to both experimental and control groups. Eco-school and traditional school teachers administered the instruments as a regular process of lessons. Before administration, on a meeting with teachers, the researcher explained the purpose of the study and how the instrument should be applied in classrooms. Since there are many Likert-type statements, the researcher gave examples of uses of the Likert scale. ELQ was reviewed with teachers and possible problems that will be confronted during the application were discussed.

The gender and the grade levels of students were obtained via demographic questions in the instrument. To ensure the confidentiality of the data, students were

told not to write their names on the papers. Students were assured that there will be no grading involved for this or any of the activities in this study and their participation would in no way influence their grades.

The DofE was applied to both treatment groups in two sessions; before and after the application, by teachers attending the application. It was completed during regular class period, in approximately 20 minutes. Before the application, students were told that their thoughts about the environment are very important for the research, they should work independently during the task and that 'right' or 'wrong' answers did not exist. Activity sheets prepared were distributed to students and they were asked to draw a picture of the environment and to explain their drawings.

Interviews took place after the application with teachers and students from eco-school. After selecting a sample of interviewees from students' enrolling different grades of eco-school and teachers working at eco-school, the researcher made appointments with interviewees. Interviews were conducted either in the classroom or in the staff room to create a comfortable atmosphere. Before the interview starts, the researcher informed the interviewees on the purpose of the interview, asked permission for audio recording, ensured the confidentiality of the data, gave an estimated time for interview period and asked if the interviewee has any questions. During the interview, researcher asked only one question at a time and waited until the question had been answered before asking the other question. She did not interrupt the interviewee and did not try to change the direction of the conversation. The researcher also tried to keep the interviewees at ease and talk freely about their points of view. During the interview, impromptu follow-up questions were used to tease out additional information. Each interview took approximately 20 minutes. A voice recorder was used to record the conservation. Further, the recordings were transcribed for the data analysis.

4.6 Analysis of the Data

The participants' responses to the ELQ, data obtained from DofE and the transciptions of interviews comprise the data set used for analysis. ELQ includes

four parts; environmental knowledge, attitude, uses and concern. Environmental knowledge part includes multiple choice questions. For the data analysis, two data sheets including different coding of the knowledge items are provided. In one of the sheets, the responses were coded with the representative letter to find out the frequencies and percentages of students' answers for each choice. In the other sheet, each correct response was coded as '1' and incorrect response was coded as '0'. By this way it was possible to get a total score for each participant. Scores for the knowledge part ranged from 0 (investigates no correct responses) to 11 (all correct responses). Scores closer to 11 represented a greater content knowledge of the environment.

Environmental attitude and uses parts include items with Likert-scale responses; strongly agree, agree, undecided, disagree and strongly disagree. For positive statements, 5 points were assigned to 'strongly agree', 4 to 'agree', 3 to 'undecided', 2 to 'disagree' and 1 to 'strongly disagree'. As for the statements representing a negative statement the score was reversed. For the representation of the data the 'strongly agree' and 'agree' responses and 'disagree' and 'strongly disagree' responses were combined to give the proportions of students who affirmed the data.

Environmental concern part includes nine environmental problems and Likert-scale responses ranging from 'very concerned' to 'not at all concerned'. For each environmental problem, 5 points were assigned to 'very concerned', 4 points were assigned to 'somewhat concerned', 3 to 'undecided', 2 to 'a little concerned' and 1 to ' not at all concerned'.

Responses to the different parts of the instrument were scored and recorded in Statistical Package for the Social Sciences (SPSS) version 15.0. To analyze the data obtained from ELQ both descriptive statistics and inferential statistics were used. The results of these analyses reported to be significant at the $p < .05$ level statistical significance and medium effect size. Descriptive statistics (frequency distributions and percentages) were used to determine students' demographic characteristics, students' self evaluation about their environmental concerns and knowledge,

distribution of students' responses for the engagement of outdoor activities, distribution of students' pre- and post- responses for environmental knowledge, attitude, use and concern subscales. Inferential statistics were used to find out the relationships between independent variables (applications, gender, grade level) and scores obtained from subscales of environmental literacy. Independent samples *t*-test, one-way analysis of covariance (one-way ANCOVA) and two-way analysis of covariance (two-way ANCOVA) were used as inferential statistics.

The data obtained from DofE and interviews were analyzed by using content analysis procedures (Ball & Smith, 1992; Banks, 2001). Bogdan and Biklen (1998) defines qualitative data analysis as "working with data, organizing them, breaking into manageable units, synthesizing them, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others" (p.157). According to Patton (2002), "developing some manageable classification or coding scheme" (p.463) is the first step of qualitative analysis. Before coding, the researcher overviewed all the drawings and read the transcriptions of interviews to get general ideas and to determine meaningful data units. Then, a list of codes was created by noting all the features included in the drawings and interviews. Throughout the analysis this list was revised as new features were identified. After coding the data, categories were emerged. The codes were compiled into categories; i.e. codes were organized under related categories. The researcher overviewed all the transcripts again to validate the appropriateness of codes and categories emerged. The data obtained from DofE and interviews were read and coded by another researcher. Inter-coder reliability was calculated by dividing the number of agreements to the total number of disagreements. The results of coding and generating categories of this study were compared between two coders and interrater reliability was calculated as 90% for DofE and 82% for the interviews. These values are acceptable for the reliability of the instruments, since it is larger than 70% (Yıldırım & Şimşek, 1999). After completing the steps of data analysis the findings were reported. A statistical approach was used to analyze the results of drawings to find out the variations across the sample.

4.7 Procedure

The study started with a wide research related with environmental education, education for sustainable development, environmental literacy, eco-schools and their national and international applications. For the research, databases such as Education Resources Information Center (ERIC), Social Science Citation Index (SSCI) and Dissertation Abstracts searched with related keywords. Also, national theses database in Council of Higher Education of the Republic of Turkey, library of Middle East Technical University, Turkish online journals were searched for the studies focusing on the topic. In addition, search engines Yahoo and Google were searched to get information especially about eco-school applications. The keywords used for the research were; education for sustainable development, environmental education, environmental literacy, eco-school(s), green school(s), sustainable school(s), eco-school application(s), eco-school activitie(s). The Boolean operators such as "and" and "or" were used together with the keywords such as; "environmental education" and "eco-schools".

After accessing the related information, the researcher examined the website www.eco-schools.org, planned the application according to the seven steps for eco-schools and prepared a handbook for teachers (see Appendix E). Before starting the application, the researcher attended the 9th National Eco-Schools Seminar held in Akçakoca. Teachers from the eco-schools attended this seminar and shared their experiences. They explained the difficulties they confront during the application and possible solutions to these difficulties were discussed. This seminar helped the researcher to be aware of obstacles she will confront during the application. After this seminar, the researcher overviewed the handbook and to start the application, the researcher asked the permission of local educational directories. To request for the permission, a cover letter and a report including research problem, purpose, method and significance of the study were held (see Appendix F). With the official permission, the researcher contacted with the school administrators she is going to conduct the study. The study was conducted in the spring semester of 2008-2009 academic year. It took a full semester to complete it.

The pre-tests were administered to elementary school students at the very beginning of the research. Prior to distribution of the instruments, participants were informed that their participation in this study is completely voluntary and were assured of anonymity and confidentiality. A consent form for volunteer participation was prepared (see Appendix G) and distributed to all the participants. Students' parents were informed about the study in a meeting by school administrators.

4.7.1 Applications in Experimental Group: Eco-School Applications

After the administration of the pre-tests, steps of eco-school application were conducted in the experimental group. Throughout the study several photographs were taken to document the activities conducted. These photographs are used in the study with the permission of the school director (see Appendix H).

Step 1- Forming the Eco-School Committee: At the very beginning of the application, a meeting was conducted with all teachers and administrators of the school. In this meeting a detailed description of the study was made with a presentation (see Appendix I), handbooks prepared for the teachers were distributed, five eco-teams (Healthy Living, Energy, Waste and Recycle, Water, School Building and School Ground) were formed and two volunteer teachers were assigned for each group. Co-director of the school who is also physical education teacher was chosen as the leader of eco-school committee.

After this meeting, the study was announced to all students. All the teachers informed students in their classrooms and volunteer students were assigned for each team. Ten to 15 students were enrolled to each team. After that, each team made meetings separately and determined how they are going to conduct the environmental review. These meetings were conducted by the attendance of all students enrolled to eco-team.

During the application, to monitor the process, researcher and the eco-team teachers came together several times (see Figure 2). In these meetings, the things done were discussed and the next step was planned. Researcher found chance to handle any

problems confronted during the application and the teachers found chance to ask their questions in their minds.

Figure 2. Meeting with eco-school teachers.

Step 2- Carrying out an environmental review: Students in eco-teams carried out an environmental review with their leader teachers to form a realistic picture of school's current situation. For a detailed and organized environmental review, the leader teachers prepared a set of questions that should guide the review and students and the leader teachers determined the places they have to examine. For example; Healthy Living Eco-team decided to examine the restrooms, canteen, refectory and all classrooms. During the environmental review students took notes and determined the existing problems. Each eco-team tried to find out answers to several questions during the environmental review. Each environmental review took approximately 4-5 hours totally and conducted in 3-5 days. Since students were from different classrooms and grade levels, the environmental review held in free hours of students.

In the following, examples of questions guiding the environmental review of each eco-team are represented.

Healthy Living Eco-Team:

These are the questions investigated by healthy living eco-team during their environmental review. Figure 3 represents the students' examination of the food sold in canteen.

- Does the school provide and promote healthier food at break times and lunchtimes?
- Does the school have drinking water easily available throughout the day?
- Is there a whole school approach to the promotion of physical activity?
- Are there green plants growing in pots in any classrooms?
- Does the school use environmentally friendly cleaning products?
- Do the school toilets have toilet paper, paper towels, sanitary product dispensers etc.?

Figure 3. Environmental review of 'Healthy Living Eco-Team'

Energy Eco-Team:

The following are the questions represented by energy eco-team. Figure 4 belongs to the determination of the classrooms and rooms in which the lights left on when there are not people in them.

- Are the lights left on in classrooms and in rooms when people are not in them?
- Are the energy meters (e.g. electricity meters) visible to students? Are students involved in taking and displaying readings?
- Has the school taken any of the low-cost steps to reduce heat loss through windows?
- Are any external/internal doors self-closing?
- Are low-enegy light bulbs and fluorescent tubes used in school?
- Does the shool have any sources of renewable energy?
- Does each classroom have its own heating thermostat?
- Is there someone in the school, who has special responsibility for monitoring the consumption of energy?
- Are there any methods developed to use the sunlight effectively?

Figure 4. Environmental review of 'Energy Eco-Team'

Waste and Recycle Eco-Team:

Below are the questions studied by waste and recycle eco-team during their environmental review. Figure 5 shows the recycle bins in the school garden.

- Is there too much litter on the ground in the school grounds? How serious is the problem of litter in the school?
- Does the school have organized litter picking sessions?
- Are there enough bins inside and outside in the school grounds?
- Does the school recycle used paper?
- Does the school compost its organic waste?
- Does the school try to buy goods made from recycled materials?
- Does the school control the use of resources such as paper, cartridges etc.?
- Does the school encourage the reuse of materials such as paper, water bottles, and cans?
- Does the school have any policies to reduce waste?

Figure 5. Environmental review of 'Waste and Recycle Eco-Team'.

Water Eco-Team:

Following questions are considered in the environmental review of Water Eco-team. Figure 6 designates the investigation of the taps left running.

- Are the toilets designed to reduce water loss e.g. low-volume flush, flush on demand urinals etc.?
- Are taps left running?
- Are dripping taps fixed quickly?
- Is there a water meter to record water use in school? Is this water meter easily visible to students?
- Does the school run water saving campains? How often?
- Are hand-basin taps of the push-on or self-stopping type?
- How often are the plants in the school ground and inside the school watered? Are they watered by a hose? Are there any types of efficient watering method used?
- Are there any warning signs to reduce water use?
- Are there any precautions taken to reduce the water use?
- Are there any machines working with water? Washing machines? Dishwashers? How often are they used?

Figure 6. Environmental review of 'Water Eco-Team'.

School Building and School Grounds Eco-Team:

School Building and School Grounds Eco-team studied the below questions in their environmental review. Figure 7 belongs to the environmental review of School Building and School Grounds Eco-team.

- Does the school have a growing area?
- Are there enough places for students to sit at playtime?
- Does the school have a wildlife area?
- How else does the school try to attract wildlife into the school grounds?
- Does the school have any plants in containers or pots in the school grounds?
- Do the staff use chemical pesticides and herbicides?
- Do the teachers ever hold lessons or part of lessons outside? How often?
- Does the school building have any spare rooms for students to spend their time effectively?
- Does the school have bird boxes, bird baths, log piles for invertebrates etc.?
- What kinds of animals are living in the school ground?

Figure 7. Environmental review of 'School Building and Grounds Eco-Team'

Step 3- Developing an Action Plan:

After carrying out the environmental review and determining the needs of the school, teachers and students from each eco-team came together and determined an action plan for each team. These plans were developed using the results of environmental review. In these plans, actions the teams are going to take to improve environmental performance were listed. The teams examined the environmental review, decided which ones they can improve then determined a deadline to complete the task. In the action plan the teams also decided timetable for each action ranging from a few weeks to a few months. An example of an action plan developed by Waste and Recycle Eco-team is given in Appendix J. The action plans the teams developed were announced to whole school community by eco-school board (see Figure 8). After completing the action plan they started the tasks they determined.

Figure 8. Eco-school board

Action Plan for Healthy Living Eco-Team:

The first thing that the Healthy Living Eco-team examined in the environmental review was the kinds of food provided in the canteen and in the refectory. School was providing the breakfast and the lunch for students. Students examined the

monthly list of meals. After the examination they decided that meals were appropriate for healthy living. They also examined the tools used for serving the meals; meals were served in table d'hote, cups were made up of glass. In any case, a recycle bin was placed by the team in the refectory in case of need. The staff serving the meal were wearing hats, coats and gloves. The dishes and the cups used were washed in dishwashers. The tables were cleaned after the meals regularly. The refectory was clean and hygienic all the time. The team decided there is not much thing to do for refectory.

Then, students made a list of food sold in the canteen. They observed that this list consist of carbonated drinks, fast food etc. They decided to talk with the owner of the canteen to change this kind of food with the healthier ones. They made an appointment with the owner and talked about the things they wanted to change in the canteen. However, this talk did not change many things because the owner expressed that these were the food that students like to eat and it is not possible for him to change them with different ones. In canteen, hot drinks were served in paper cups, and the team decided to put a recycle bin in the canteen (see Figure 9).

Figure 9. Recycle bin in the canteen

The next thing, ‘Healthy Living Team’ inspected was availability of the drinking water throughout the day. There were only four carboys in the school and all of them were located in the staff rooms. There exists a fountain in the garden providing clean drinking water for students. Some students were drinking water from fountains existing in the rest rooms, some were bringing from home, some were buying from the canteen and some were drinking from the fountain in the garden. At first, the team decided to buy carboys and place them in different locations in the school. However, the cost was too much to finance and the paper cups used will increase the amount of waste produced. Then, they decided to prepare warning messages explaining that drinking water from rest rooms is not healthy and the best way is bringing the drinking water from home. These warning messages were posted up in different locations of the school, also on the eco-school board.

Then, the ‘Healthy Living Eco-Team’ took action to promote physical activity. The only times students were doing physical activities were physical education class hours. And they were playing several games in the garden during the short breaktimes. To promote the physical activities they decided to organize a spring festival. By the support of the leader teacher of the eco-school committee, they planned a one-week-spring festival full of different games, competitions and tournaments. By this way it became possible to include whole school in an activity. Spring festival was made between the dates 20-24 April in the school garden (see Figure 10).

The next task for the team was to determine if there are green plants growing inside the school building. The aim to focus on this task was to make the school greener. To do this, the team determined the number of plants in classrooms, staff rooms and also in corridors. There was at least one plant in many of the rooms and in the corridors. The team determined that there were no plants in 8 classrooms belonging to different grades. They also decided that although there were many plants in different places of the school, since the building area is large, the number of plants

was insufficient. To increase the number of plants, each classroom collected money and bought at least one plant that can be grown inside the school.

Figure 10. Spring festival in eco-school

The next task that the team should handle was about the hygiene of rest rooms. This was the most problematic task they have to work on, because in environmental review they found that although there was an effort to keep the toilets clean, since the number of students is large, this effort was not sufficient. Besides, the toilets were lack of toilet papers, paper towels, and even soap. Waste baskets were located outside the cabins and the number of them was not adequate. To heal the situation, team members made up a list of necessary things to provide hygiene in rest-rooms delivered to their leader teacher. School administration provided the stuff and placed in all 16 rest-rooms in the whole school. The number of waste baskets increased, all the rest-rooms were provided with toilet paper and paper towels, also with liquid soap. Also administrators provided the continuity of these materials in rest rooms with regular control. But these precautions were not enough, also team members post up several warning messages for the necessity of efficient use of these materials. Besides all these issues related with rest rooms, team members also examined the type of cleaning products and they noticed that most of the products

were not environmentally friendly. However, since the cost of environmentally friendly products was too much to finance and it was difficult to find these kinds of products in Aksaray, they could not do anything about the cleaning products.

The next two tasks the team handled were about the quality of air inside the classrooms. Team members determined that blackboards and chalks were existing in all the classrooms. It was not efficient to change all the blackboards into white boards and the ventilation of classrooms to decrease the amount of dust in the air was found sufficient. Classrooms were ventilated both during class hours and breaktimes.

The last but not least task was about smoking policy of the school. The school had no-smoking policy for all staff. Besides, smoking in closed areas was prohibited by the Ministry of Health. So, it was not possible to smoke inside the school.

Action Plan for Energy Eco-Team

The first task that the energy eco-team was going to handle was to determine whether the lights are left on in classrooms when people are not in them. The team looked round the classrooms and they observed that although it is early in the morning some of the lights were left on (see Figure 11). So they decided that it is better to post up warning messages in all rooms to take attention of other students. During this observation team members realized that some of the lights were broken. They decided to change these with the working ones.

Then, the team focused on energy meters. However, energy meters were not visible to students and their location was not appropriate for children. So, it was not possible for students to be involved in taking and displaying the readings. Students also interested in electricity bills. They collected bills from September 2008. When they examined the bills, they observed that the cost was higher for the winter time. They decided to examine the effects of the application. Since the bills come for a two-months-period they decided to control whether there is an increase or decrease in electricity expenses next semester.

Figure 11. A room with turned on lights when it is empty

Then, the team focused on precautions taken to decrease energy loss. First of all, they realized that all external doors were self closing, and the school windows have double glazing energy saving glass. Also the windows of the schools were large enough to benefit from sunlight. These were effective to decrease the heat loss. Second, the team focused on use of low-energy light bulbs and fluorescent tubes. In the whole school, fluorescent tubes were using. So there was nothing to do much to decrease the energy expenses.

The next task for the team was to determine sources of energy used for heating. There was a central heating working with natural gas. Besides, electric heaters were used in too cold days. Actually, this was the reason of high electricity bills of winter months. The next and the last task was about the use of renewable resources used in school. The team determined that there were no uses of renewable resources.

Action Plan for Waste and Recycle Eco-team

The waste and recycle eco-team was one of the biggest team with 15 members in the application. The team started with determining how the litter problem is serious in the schoool. For this, team members move around the school garden, classrooms, staff rooms, refectory and the canteen. Among all these areas rest-rooms, school garden and the canteen was the most problematic ones. To decrease the amount of waste, they decided to do litter picking sessions with the whole school. They organized the sessions with their leader teachers and decided that two different classrooms will run a session together to pick litters each week.

After that they determined the number of waste baskets in different locations of the school. This examination revealed that all the classrooms, staff rooms, corridors, refectory and the canteen have enough waste baskets, however, the garden did not have. So they decided to increase the number of waste baskets in the garden.

The next issue that the team should handle was about recycling. The school did not take any actions for recycling. Team members decided to put recycle bins in several locations of the school to encourage recycling of paper, cans and bottles. Team members communicated with civil government and asked for free recycle bins. Waste and recycle eco-team provided recyle bins used to collect paper and placed them in different locations. Besides, they decided to run a campaign to collect paper, cans, and bottles for recycling. For this, leader teacher of this eco-team informed other teachers and asked to participate in the campaign. By this way it was possible to include all the students to run a whole school campaign. All the classrooms collected paper, cans and bottles throughout the semester (see Figure 12) and sold them to a place which collects and delivers these stuff to a recycling center.

Figure 12. Paper, cans, plastics and bottles collected by the students

Collecting batteries was an important issue in the recycling process. To collect batteries the team members communicated with *Türkiye Taşınabilir Pil Üreticileri ve İthalatçıları Derneği (TAP)* to get special battery collecting bins (see Figure 13). Students provided 12 collecting bins and placed them in different locations of the school.

Figure 13. Battery collecting bins provided from TAP

Action Plan for Water Eco-Team

Water eco-team especially examined the situation in rest-rooms. Firstly they dealed with the taps and examined whether the taps were left running. They observed that several taps and siphons were left running. They decided that it will be better to prepare several warning messages and post up them in the restrooms. Team members also decided that it will be better to run water saving campaigns. During their examination they observed that several taps were dripping. They noted the numbers and places of these taps and made them fixed.

Then, the team focused on water meters. However, water meters were not visible to students and their location was not appropriate for children. So, it was not possible for students to be involved in taking and displaying the readings. Students also interested in water expenses. They collected bills from September 2008. When they examined the bills, they observed that the cost was higher for the spring time. The reason for this increase was due to the increasing use of swimming pool during the spring. They decided to examine the effects of the application. Since the bills come for a two-months-period they decided to control whether there is an increase or decrease in electricity expenses next semester.

The next issue that the team members investigated was the frequency of the watering of plants in the garden. For this they talked with the gardener and learned from him that plants were watered twice or three times a week by a hose. Although there were not any special method used for watering, they learned that the gardener was careful not to waste too much water.

Action Plan for School Grounds Eco-Team

First thing the team investigated was whether the school have a growing area. The school has a big garden surrounded by fences. However, it was not possible to increase the area of school garden. Like most of the schools in Turkey, the land of school garden was covered by concrete. There was a limited green area, with limited number of plants. Team members decided to increase the number of green

plants in the school garden and their leader teacher announced this activity to whole school and a planting day was organized in the school garden (see Figure 14).

Figure 14. Eco-school students are planting trees in school garden

The examination of the school garden revealed that there were not many kinds of animal species living in the school garden. There was a bird box and bird baths in different locations however no birds were living in (see Figure 15). So team members decided to buy some pets and take care of them. First of all they decided to buy some dogs but then they thought that there may be some difficulties to look after dogs in the garden. Then, the team decided to buy a huge aquarium and several kinds of fish. This task was very entertaining for all the students in the school. All students were interested in fish and came to see them several times during a day.

Figure 15. Bird box in the eco-school garden

The last thing that this team handled was about the chemical pesticides and herbicides used in the school garden. Team members talked with the gardener and learned about the chemicals used in the garden. This talk revealed that there were several chemicals used to protect plants from insects and illnesses. Although use of pesticides and herbicides were not supported by the team, there were not much thing to do about this issue.

These were the actions taken by all the eco-teams. Besides these actions there are many activities related with energy, waste, water etc. that will be explained in the 'Linking to the Curriulum' part.

Step 4- Monitoring and Evaluating: After some time passed in the application, eco-teams assessed their progress towards the targets that have been established. In a meeting they checked their action plans, their timing and the actions they were able to take. During these meetings several modifications were made in the timescales and targets. Monitoring the process was a very effective strategy for teachers; by this way they were able to include environmental activities into their lessons at the same time with the actions that eco-team members took. To evaluate the process there are several steps suggested by FEE such as; measuring the school's ecological footprint, meter readings and calculation of energy bill savings,

before, during and after photographs, using questionnaires and surveys to canvass opinions. Eco-teams preferred to take before, during and after photographs. All the teams presented their progress with photographs and shared with whole school by eco-school board.

Step 5- Linking to the Curriculum

In this step classroom activities about energy, waste and water are conducted by students. This step ensures integration of the whole school to the environmentally related activities. In this step, most of the work was done mostly by teachers; they planned and integrated several activities to their lessons. This may seem easy especially for science teachers but the most important part of this step was to integrate environmentally related activities to all disciplines. Below, the activities conducted in different courses by different grade levels are listed.

Activities conducted by Grade 6th Grade Students

- **Computer Courses:** In this grade level students learn to use Microsoft Office Powerpoint program to prepare their presentations. In computer lessons, 6th grade students prepared presentations about environmental issues. They were free to choose the topic; increasing population, global warming, biodiversity loss, effects of technology on environmental problems etc. They were asked to add several visual images to their presentations. After the task is completed they made their presentations to their friends in a class hour.
- **English Courses:** In English courses 6th grade students picked an animal and a plant, collected some information about them from Internet, and prepared a poster describing their properties. They listed the kinds of plants existing in their school garden; for this a class-hour was spent in the garden, simply described their properties. 6th grade students prepared a memory game by using the names of food that can be included in a well-balanced diet. They picked up a kind of sport and explained their benefits to human health.
- **Music Courses:** Students designed musical instruments from glasses, cans, bottles etc. They used these instruments to play songs.

- **Science and Technology Courses:** In this grade level students were studying human body systems. They discussed the effects of well-balanced-diet on the health of human body systems. They prepared posters showing the effects of smoking on respiratory system. A discussion was conducted about the effects of air pollution on respiratory system. They discussed the ways of insulation to prevent heat loss and discussed the ways of insulation used in their school. Lastly, they focused on erosion; they examined the website of Turkish Foundation for Combating Erosion, Reforestation and the Protection of Natural Habitats and prepared an essay explaining the projects of this foundation. They discussed the effects of planting a tree on preventing erosion. 6th grade students planted trees both in their school garden and in campus of Aksaray University.
- **Social Sciences Courses:** Students discussed demographical and economical situation of the world and the reasons for the distribution of population and resources throughout the world. In this course they also discussed the effects of science and technology on environmental problems.
- **Turkish Courses:** Students watched the animation film wall-e and they described their thoughts about recycling before and after watching the film. Also they made an activity in which they explain the points they liked and disliked about the film.
- **Visual Arts Courses:** In visual arts courses students represented the effects of smoking on human health by their drawings.

Activities conducted by 7th Grade Students

- **Computer Courses:** In this grade level students specialize in using Microsof Office Word program. In this grade level they prepared warning messages related with several issues; efficient use of water, recyling, turning off the lights when it is not necessary etc. They also used several drawings and pictures in their designs.
- **English Courses:** 7th grade students wrote an essay about the advantages and disadvantages of using technology on environmental problems. In their essay, they mentioned pros and cons and decided one of them. They listed

the kinds of plants in their school garden and described their properties; for this a class-hour was spent in the garden.

- **Music Courses:** Students in this grade level conducted a search to find out folksongs representing the beauty of the nature. In the lesson hour, they shared the songs with their friends, select some of them and song together.
- **Science and Technology Courses:** In 7th grade there is a chapter focusing on the relationship human and the environment. In this course, students took several lessons in school garden and they determined living things in the garden and the relationships between them. Global environmental problems were emphasized in science classes; students focused on one environmental problem and gave detailed information about the problem with a presentation. Besides global problems, they also focused on environmental problems in Aksaray; pollution in Salt Lake, air and water pollution in Aksaray. They discussed how environmental problems affect living things. Students worked on the ways for saving water and electricity. They examined the website (http://www.suyunubosaharcama.org/) to calculate the amount of water they used, to learn ways to save water, how they can decrease the cost of water and electricity use.
- **Social Sciences Courses:** In this course students discussed the roles of non-governmental foundations to take people's attention to environmental problems. Students also discussed their personal responsibilities to solve environmental problems.
- **Turkish Courses:** In this grade level students wrote an essay explaining their feelings about the future of environmental problems. They thought about the situation of the world 50 years later and explain their feelings in an essay.
- **Visual Arts Courses:** In a class hour students picked up an environmental problem and showed how this problem affects living things in their drawings.

Activities conducted by 8th Grade Students

- **Computer Courses:** Computer courses were not efficiently performed in this grade level. So it was not possible to conduct any activities in computer courses in this grade level.
- **English Courses:** In this course, 8th grade students read short stories related with environmental problems and discussed the events explained in the stories. They prepared posters to raise awareness of people about environmental problems.
- **Music Courses:** Students composed a song focusing on their feelings about the nature. Then, they presented their songs to their friends.
- **Science and Technology Courses:** Recycling was one of the major science issues in 8th grade. An experiment showing the recycling of paper was represented by the teacher. Symbols used for recycling were investigated; students examined several products with different packaging and determined whether they can be recycled. Students enrolled to this grade level helped waste and recycling eco-team for the organization of the recycling campaign. Students discussed renewable and nonrenewable energy sources conducted a research about the vehicles working with renewable sources and their working principles. They listed the machines in their homes working with electricity, calculated the amount of electricity they used in a month and discussed the ways to decrease this amount.
- **Turkish Courses:** In this grade level, students conducted a debate focusing on whether the world be a better or worse place to live with respect to environmental problems 50 years later. All the students from other grade levels had chance to watch this debate. At the end of the debate they decided that the world will be a worse place to live and environmental problems will increase dramatically through this time.
- **Visual Arts Courses:** In visual arts course, 8th grade students designed recycling bin from used paper and used these bins in different locations in the school.

Step 6- Involving the Whole School and Wider Community:

One of the key aims of eco-schools is to success the whole school participation in environmental activities. Throughout the process whole school kept updated about the progress of the project by using eco-school board. Besides, to enable all students to participate in the project, teachers and the researcher designed several activities:

- Students from different grade levels participated in the planting trees both in their school garden and in the campus of Aksaray University (see Figure 16).

Figure 16. Students are planting trees in the campus of Aksaray University

- A whole school recycling campaign was held. Throughout the semester students collected paper, glass, cans etc. and each classroom brought what they collected to a place buying these stuff (see Figure 17). Each classroom sold their collection and bought something to their classrooms. In these places, students had chance to observe the processes to deliver recycling materials to recycling centers; squeezing, packaging etc.

Figure 17 Students are selling the recycling materials they have collected

- Students watched the movie Wall-E; a computer animated science fiction movie about the story of a robot named as Wall-E who is designed to clean up waste covered Earth.
- Researcher made a presentation to whole school about the waste, things that should be done to reduce waste; reducing, reusing and recycling.

Step 7- Producing the Eco-Code: To state values and objectives what each eco-team striving to achieve, students determined their eco-codes and presented their eco-codes in eco-school board.

Eco-codes of Eco-Teams:

Healthy Living Eco-Team: “Sağlam Kafa Sağlam Vücutta Bulunur.”

Energy Eco-Team: “En Ucuz Enerji, Tasarruf Edilen Enerjidir.”

Waste and Recycle Eco-Team: “Geri Dönüştürelim, Dünyayı Değiştirelim.”

Water Eco-Team: “Damlaya Damlaya Çöl Olur.”

School Building and School Grounds Eco-Team: “Yeşili Sevelim, Koruyalım.”

4.7.2 Applications in Control Group: Traditional School Applications

Students in control group were exposed to a learning environment wherein learning proceeded primarily through a traditional approach. Control group teachers generally used lecturing and questioning method during their instruction. Throughout the semester, the teachers in the control group explained the topic and asked several questions during the instruction. After explaining the topic, teachers mainly focus on solving multiple choice questions related with the topic. By this way they ensured that students get ready for the SBS examination. Except several issues related with environment and environmental problems teachers did not emphasis any related topic in courses. No additional environmental activities were done during the semester. All the courses were completed in the classrooms. Students' did not plan and participate in any kind of environmental activities. Science teachers did not spend much time on topics related with environment, because they thought that environmental topics are really easy to learn for students. In the control group, environmental lessons are restricted to the classroom at the discretion of teachers.

4.8 Ethical Concerns

Fraenkel and Wallen (2001) listed three important ethical issues that a researcher should address in a study; protection of participants, ensuring the confidentiality of research data and the question of deception of subjects. Present study does not contain anything harmful for participants. Before the study, both experimental group and control group participants were informed about the study and its purpose. A consent form for volunteer participation was distributed to all participants. Participants were informed of the right to decline to participate, as well as withdraw from the research any time. For confidentiality, the names of participants and the institutions were not identified within the study. All participants were assured that any data collected from them would be held in confidence. Deception is not the concern, because every detail about the study is explained to the participants. The proposal for this research study was approved by the Middle East Technical University- Ethics Review Committee.

4.9 Threats to Internal Validity

Internal validity assures that any difference observed in dependent variable is directly related to independent variables and not to any other unintended variable (Fraenkel & Wallen, 2001). Subject characteristics, mortality, location, instrumentation, testing, history, maturation, attitude of subjects, regression and implementation are listed as some threats to internal validity (Fraenkel & Wallen, 2001). Each of possible threats for the present study will be discussed in detail.

In this study, students' pre scores are compared with independent samples t-test for each subscale and if a significant difference exists pre-scores were treated as a covariate in the analysis to prevent prior differences that exist between the groups. The students enrolling control group and experimental group are approximately at the same age, so age is not a threat in this study. Considering the participants, subject characteristics is not a major threat for the study.

Participation of all students to the pre-test and post test was carefully planned. Every student participated to the study and completed ELQ in the pre-test and the post-test. Also all the participants completed DofE in the pre-test and the post-test. Mortality is not a threat for the study.

The location threat was controlled by holding the location of the application of test and treatment constant. Experimental group and control group students received both tests and application in their regular classes.

There was no regression threat since the participants were not selected on the basis of extremely low or high scores.

ELQ included questions with multiple choice and Likert-scale responses.Therefore different interpretations of results were not possible. Testing can be also a threat for the analysis of interviews and drawings. To control this threat, researcher scheduled the data collection and scoring. So, instrument decay is not a threat for this study.

Data collector characterics is another threat to internal validity. In this study, teachers enrolling to study applied the instrument. Before the application, to control this threat, teachers were trained about the administration of the instrument.

The amount of time between the pre-test and the post-test application can be another threat for studies. In this study, sufficient time; approximately 4 months, passed after the pre-test application.

There were no significant events occurred during the application. So history was not a threat for the study.

4.10 Assumptions and Limitations of the Study

In this study it is assumed that; eco-school applications provide the context needed for students to change their environmental literacy, teachers and administrators were not biased during the treatment, students and teachers in the experimental group did not interact with the students and teachers in the control group, all students' and teachers' responses to the test items were sincere, all the instruments used to collect data are administered under normal conditions.

Limitations to this study include the relatively short period of time during which it was conducted. One semester may not be enough to change students' environmental literacy. Additionally, the instruments that were used may not have been able to detect small-scale changes in students' environmental literacy.

While this study looks to compare elementary school students' environmental literacy from an eco-school with those from a non-ecoschool, the study is limited in making generalizations beyond the two schools because the sample of the study does not fully represent the population. However, relatively little is known about the elementary school students' environmental literacy and how eco-school applications change elementary school students' environmental literacy, studies such as this will provide a starting point for further exploration. A study with more participants would be required in order to make country-wide inferences.

CHAPTER 5

RESULTS AND CONCLUSIONS

This chapter presents the data analysis gathered from the instruments described in Chapter 4. First, results including the analysis of the data obtained from the instrument ELQ will be presented. Then, results obtained from drawings of environment and interviews conducted with students and teachers will be represented.

5.1 Results of the Analyses of the Data Obtained From ELQ

In this part, results of the analyses of the data obtained from ELQ will be represented. The results of these analyses reported to be significant at the $p < .05$ level of statistical significance and medium effect size. Independent samples t-test, one-way analysis of covariance (ANCOVA) and two-way analysis of covariance (two-way ANCOVA) were used to test the hypotheses. The quantitative data were analyzed using SPSS 15.0 software.

This part starts with descriptive statistics. Then, assumptions of parametric tests, equivalency of control and experimental groups are discussed and quantitative results are represented with inferential statistics. In descriptive statistics, frequency distributions for each dimension of ELQ are evaluated and in inferential statistics, relationships between independent variables and subscales of environmental literacy have been set up.

5.1.1 Descriptive Statistics

5.1.1.2 Students' Profile

Students' profile has been drawn out by the analysis of demographic questions asked in ELQ. Gender, grade level and parents' graduate levels are asked to gather the related data. Table 4 summarizes the demographic characteristics of students in the experimental and control group.

Table 4 *Demographic Characteristics of Participants*

Characteristics	Experimental Group		Control Group	
	f	*P*	*f*	*P*
Gender				
Male	84	53.8	92	57.5
Female	72	46.2	68	42.5
Grade Level				
6th Grade	70	44.9	47	29.4
7th Grade	45	28.8	73	45.6
8th Grade	41	26.3	40	25
Mother's Graduate Level				
Primary School	6	3.8	33	20.6
Secondary School	13	8.3	18	11.3
High School	60	38.5	30	18.8
Vocational School	3	1.9	6	3.8
University Graduate	66	42.3	66	41.3
Post-Graduate	7	4.5	7	4.4
Missing	1	.6	0	0
Father's Graduate Level				
Primary School	6	3.8	12	7.5
Secondary School	11	7.1	15	9.4
High School	45	28.8	25	15.6
Vocational School	5	3.2	3	1.9
University Graduate	69	44.2	84	52.5
Post-Graduate	19	12.2	21	13.1
Missing	1	.6	0	0

5.1.1.2 Students' Self Evaluation about Their Environmental Concern and Knowledge

ELQ starts with three questions asking students to evaluate their environmental concern and knowledge. Related results and frequency distributions for each item are presented below.

Item 1: How concerned are you personally about environmental problems?

The first question asks students to evaluate their concern about environmental problems. Results revealed that in the experimental group, 48.6% of 6th grade students, 46.7% of 7th grade students and 41.5% of 8th grade students evaluated themselves as having 'a fair amount' of concern about environmental problems. In the experimental group, totally 46.2% of students evaluated their concern as 'a fair amount' and 32.1% of students evaluated themselves as having 'somewhat'concern about environmental problems. Table 5 shows the frequency (*f*) and percentages (*P*) of students in the experimental group with respect to their self-evaluation of environmental concern levels.

Table 5 *Experimental Group Students' Self Evaluation of Their Environmental Concerns*

Choices	6th Grade		7th Grade		8th Grade		Total	
	f	*P*	*F*	*P*	*f*	*P*	*f*	*P*
A great deal	12	17.1	8	17.8	6	14.6	26	16.7
A fair amount	34	48.6	21	46.7	17	41.5	72	46.2
Somewhat	20	28.6	14	31.1	16	39.0	50	32.1
Not very much	3	4.3	0	0	2	4.9	5	3.2
Not at all	1	1.4	2	4.4	0	0	3	1.9

Control group students' self assessment revealed that 53.2% of 6th grade students, 53.4% of 7th grade students and 40% of 8th grade students evaluated themselves as having 'a fair amount' of concern about environmental problems. Totally, 50% of control group students evaluated their environmental concern as 'a fair amount' and 31.3% of them evaluated their level of environmental concern as 'somewhat'.

Table 6 *Control Group Students' Self Evaluation of Their Environmental Concerns*

Choices	6th Grade		7th Grade		8th Grade		Total	
	f	*P*	*F*	*P*	*F*	*P*	*f*	*P*
A great deal	6	12.8	10	13.7	4	10	20	12.5
A fair amount	25	53.2	39	53.4	16	40	80	50
Somewhat	12	25.5	22	30.1	16	40	50	31.3
Not very much	1	2.1	1	1.4	2	5	4	2.5
Not at all	3	6.4	1	1.4	2	5	6	3.8

Table 6 shows the frequency and percentages of control group students with respect to their self-evaluation of environmental concern levels. Figure 18 shows the bar chart representing both control group and experimental group students' self evaluation of their environmental concerns.

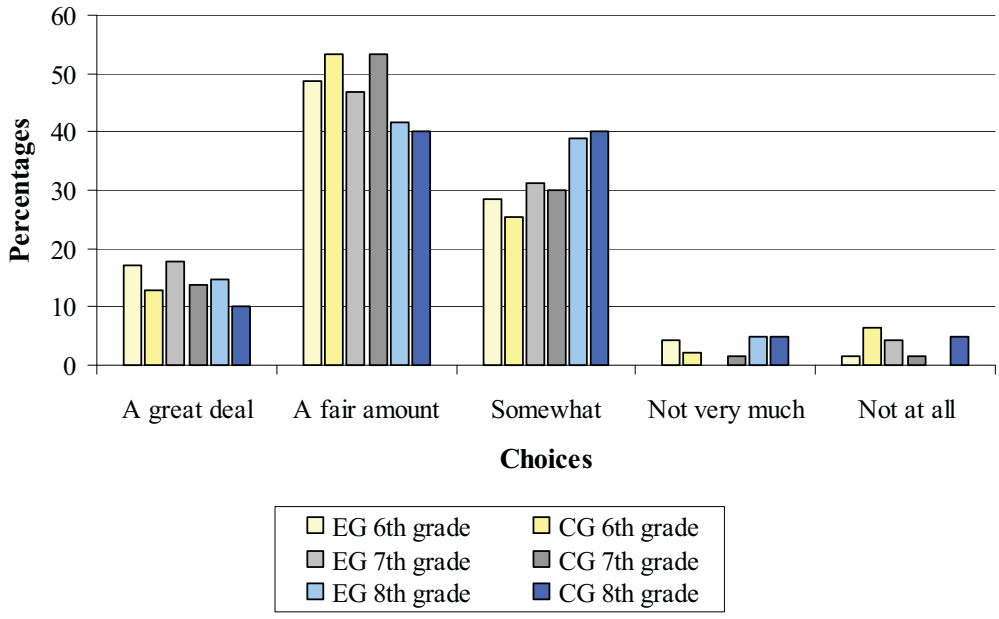

Figure 18. Bar chart representing self evaluation of students' environmental concerns

Item 2: Which one of the statements related with the importance of environmental problems comes closest to your view?

Second question in ELQ asks students to choose the closest statement, related with the importance of environmental problems, to their view. In the experimental group, majority of students in all grades; 68.6% of 6th grade, 66.7% of 7th grade and 70.7% of 8th grade, reported the environmental problems as one of the two or three most important problems that people currently face. In total, only 2.6% of experimental group students stated that environment is not a problem. Table 7 shows the frequencies and percentages of experimental group students' answers to Item 2.

Table 7 *Experimental Group Students' Views about the Importance of Environmental Problems*

Choices	6th Grade		7th Grade		8th Grade		Total	
	F	*P*	*f*	*P*	*f*	*P*	*f*	*P*
It is one of the 2 or 3 most important problems that people currently face.	48	68.6	30	66.7	29	70.7	107	68.6
It is an important problem, but there are other important problems.	21	30	11	24.4	11	26.8	43	27.6
Environment is not an important problem.	1	1.4	0	0	1	2.4	2	1.3
Environment is not a problem.	0	0	4	8.9	0	0	4	2.6

Similar results are obtained from the control group. Majority of control group students, 63.8% of 6th grade, 68.5% of 7th grade, 45% of 8th grade, totally 61.3% of control group students stated the environmental problems to be one of the two or three most important problems that people currently face. Table 8 represents control group students' answers to item 2 and Figure 19 represents both control group and experimental group students' views about the importance of environmental problems.

Table 8 *Control Group Students' Views about the Importance of Environmental Problems*

Choices	6th Grade		7th Grade		8th Grade		Total	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
It is one of the 2 or 3 most important problems that people currently face.	30	63.8	50	68.5	18	45	98	61.3
It is an important problem, but there are other important problems.	15	31.9	20	27.4	18	45	53	33.1
Environment is not an important problem.	2	4.3	2	2.7	2	5	6	3.8
Environment is not a problem.	0	0	1	1.4	2	5	3	1.9

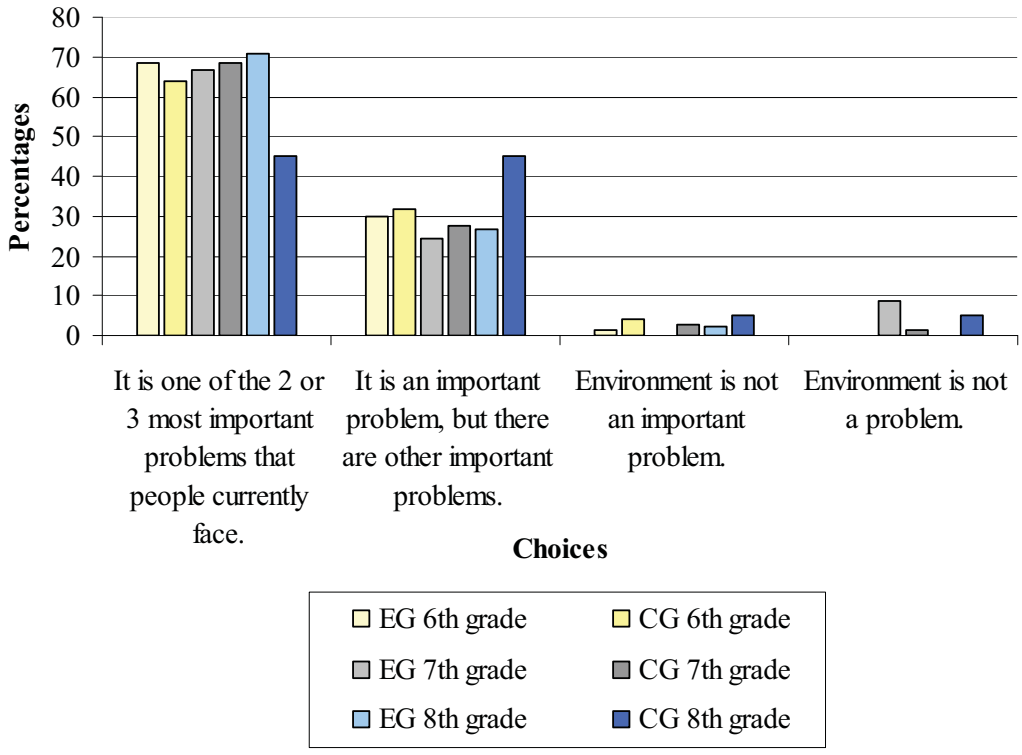

Figure 19. Bar chart representing students' views about environmental problems

Item 3: In general, how much do you feel you know about environmental issues and problems?

In item 3 students were asked to evaluate their knowledge about environmental issues and problems. Majority of 6th grade experimental group students (62.9%) stated that they have a fair amount of knowledge about the environment. Similar results are obtained from 7th grade and 8th grade; 66.7% of 7th grade and 63.4% of 8th grade students reported that they have a fair amount of knowledge. Table 9 shows the experimental group students distribution with respect to their self evaluation about the amount of their environmental knowledge.

Table 9 *Experimental Group Students' Self Evaluation of Their Level of Environmental Knowledge*

Choices	6th Grade		7th Grade		8th Grade		Total	
	F	*P*	*f*	*P*	*f*	*P*	*f*	*P*
A lot	7	10	6	13.2	5	12.2	18	11.5
A fair amount	44	62.9	30	66.7	26	63.4	100	64.1
Only a little	16	22.9	5	11.1	10	24.4	31	19.9
Practically nothing	2	2.9	1	2.2	0	0	32	1.9
Don't know	1	1.4	3	6.7	0	0	4	2.6

Similar results are obtained in the control group. Majority of control group students in all grades; 53.2% of 6th grades, 63% of 7th grade, 60% of 8th grades, reported that they have a fair amount of environmental knowledge. Table 10 represents the distribution of control group students self evaluation about their amount of environmental knowledge. Figure 20 shows the bar chart representing the distribution of both control group and experimental group students' self evaluation of their amount of environmental knowledge.

Table 10 *Control Group Students' Self Evaluation of Their Level of Environmental Knowledge*

Choices	6th Grade		7th Grade		8th Grade		Total	
	F	*P*	*f*	*P*	*f*	*P*	*f*	*P*
A lot	10	21.3	10	13.7	4	10	24	15
A fair amount	25	53.2	46	63	24	60	95	59.4
Only a little	10	21.3	16	21.9	6	15	32	20
Practically nothing	1	2.1	0	0	0	0	1	.6
Don't know	1	2.1	1	1.4	6	15	8	5

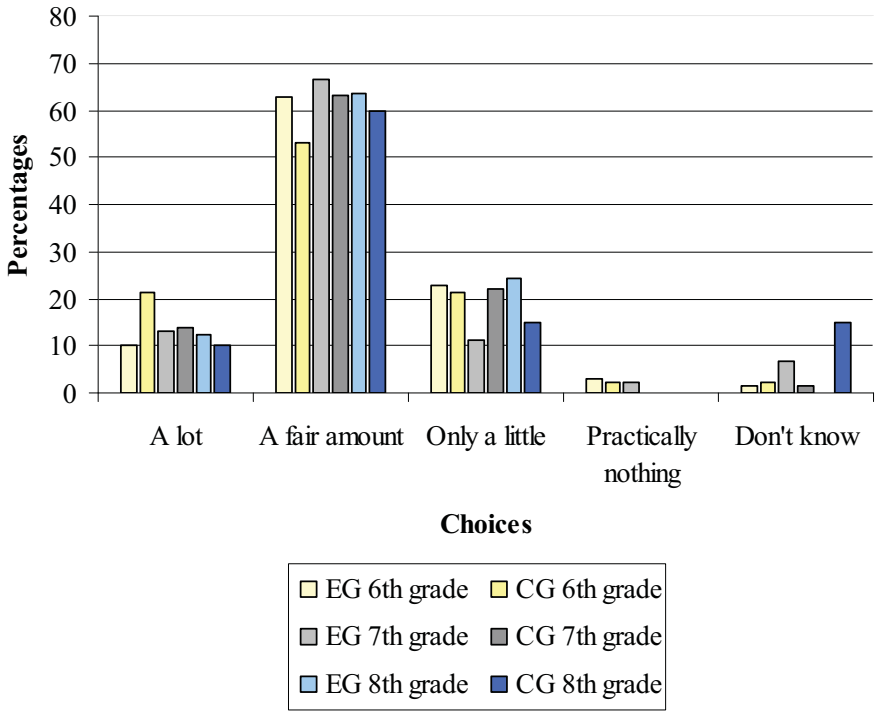

Figure 20. Bar chart representing control group students' self evaluation of their environmental knowledge.

Item 4: How often, in a typical year, do you engage in each of the outdoor activities?

When experimental group students were asked about their engagement in a range of outdoor activities, most of them; 54.3% of 6th grade students', 48.9% of 7th grade

students' and 49.3% of 8th grade students' reported that they usually go for hiking. Majority of experimental group students; 54.3% of 6th grade students', 68.9% of 7th grade students' and 52.1% of 8th grade students', reported that they never go fishing. Similar results were also obtained for hunting. In the experimental group, 77.1% of 6th grade students', 82.2% of 7th grade students' and 76.1% of 8th grade students reported that they have never gone for hunting. Table 11 shows the distribution of experimental group students' responses for the engagement of outdoor activities.

Table 11 *Experimental Group Students' Responses for the Engagement of Outdoor Activities*

Outdoor Activities	Usually		Sometimes		Seldom		Never	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
6th Grade Experimental Group Students' Responses								
Camping	8	11.4	12	17.1	6	8.6	44	62.9
Hiking	38	54.3	16	22.9	10	14.3	6	8.6
Bird watching	10	14.3	17	24.3	17	24.3	26	37.1
Fishing	12	17.1	8	11.4	12	17.1	38	54.3
Hunting	7	10	6	8.6	3	4.3	54	77.1
7th Grade Experimental Group Students' Responses								
Camping	2	4.4	14	31.1	19	42.2	10	22.2
Hiking	22	48.9	16	35.6	4	8.9	3	6.7
Bird watching	5	11.1	7	15.6	12	26.7	21	46.7
Fishing	2	4.4	5	11.1	7	15.6	31	68.9
Hunting	1	2.2	3	6.7	4	8.9	37	82.2
8th Grade Experimental Group Students' Responses								
Camping	4	5.6	12	16.9	17	23.9	38	53.5
Hiking	35	49.3	27	38	4	5.6	5	7
Bird watching	15	21.1	10	14.1	21	29.6	25	35.2
Fishing	11	15.5	9	12.7	14	19.7	37	52.1
Hunting	4	5.6	4	5.6	9	12.7	54	76.1

The tendencies for outdoor activities did not change very much in control group. 53.2% of 6th grade students', 61.6% of 7th grade students' reported that they usually go for hiking. 40% of 8th grade students reported that they sometimes go for hiking. Besides, in the control group, majority of students reported that they have never gone for fishing and hunting. Distribution of control group students' responses for the engagement of outdoor activities is given in Table 12.

Table 12 *Control Group Students' Responses for the Engagement of Outdoor Activities*

Outdoor Activities	Usually		Sometimes		Seldom		Never	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
6th Grade Control Group Students' Responses								
Camping	0	0	7	14.9	13	27.7	27	57.4
Hiking	25	53.2	13	27.7	6	12.8	3	6.4
Bird watching	7	14.9	10	21.3	14	29.8	16	34
Fishing	3	6.4	6	12.8	12	25.5	26	55.3
Hunting	2	4.3	5	10.6	4	8.5	36	76.6
7th Grade Control Group Students' Responses								
Camping	2	2.7	15	20.5	14	19.2	42	57.5
Hiking	45	61.6	17	23.3	9	12.3	2	2.7
Bird watching	7	9.6	20	27.4	19	26	27	37
Fishing	2	2.7	13	17.8	17	23.3	41	56.2
Hunting	4	5.5	4	5.5	8	11	57	78.1
8th Grade Control Group Students' Responses								
Camping	6	15	6	15	10	25	18	45
Hiking	10	25	16	40	8	20	6	15
Bird watching	10	25	8	20	6	15	16	40
Fishing	4	10	4	10	8	20	24	60
Hunting	6	15	4	10	4	10	26	65

5.1.1.3 Descriptive Statistics of the Pre-test and the Post-test Results of Knowledge Subscale of ELQ

Students' environmental knowledge was evaluated by their correct responses to the 11 knowledge items. Table 13 and Figure 21 represent the frequencies and percentages of students who gave correct answers to related knowledge questions in the pre-test and in the post-test. When the results are examined it can be observed that in the experimental group for each knowledge questions the number of students who gave correct answers increased in the post-test. However, this situation cannot be observed in the control group. Although the number of students who gave correct answers increased in some of the questions; such as, K2, K7, K8, K10, K11, there were also decreases in correct responses for some knowledge questions; such as, K1, K3, K4, K5, K6 and K9.

Table 13 *Percentages (P) of Students who Gave Correct Answers to Knowledge Questions*

Environmental Knowledge Statements	Correct Response (*P*) EG		Correct Response (*P*) CG	
	Pre	Post	Pre	Post
K-1 Definition of biodiversity	51.9	55.8	57.5	50
K-2 Motor vehicles as the largest contributor of carbon monoxide	21.2	55.8	13.8	20
K-3 Electricity generation in Turkey by hydroelectric power plants	41.7	67.9	33.1	20.6
K-4 Industrial discharges as one of the major sources for surface water pollution	65.4	75.6	63.8	53.1
K-5 Trees are renewable resources	47.4	75	53.1	40
K-6 Role of ozone as a protective layer from cancer-causing sunlight	40.4	47.4	45.6	31.3
K-7 Most garbage in Turkey ends up in solid waste storage areas	38.5	58.3	23.8	28.1
K-8 Primary governmental agency for environmental protection in Turkey is the Ministry of Environment and Forestry	59.6	66	52.5	54.8
K-9 Batteries are household hazardous waste	62.8	84.6	63.8	45
K-10 Human activities of habitat is the major reason for animal extinction	63.5	67.9	58.8	59
K-11 The common method for storing nuclear waste throughout the world is storing and monitoring	19.9	53.8	15	39.4

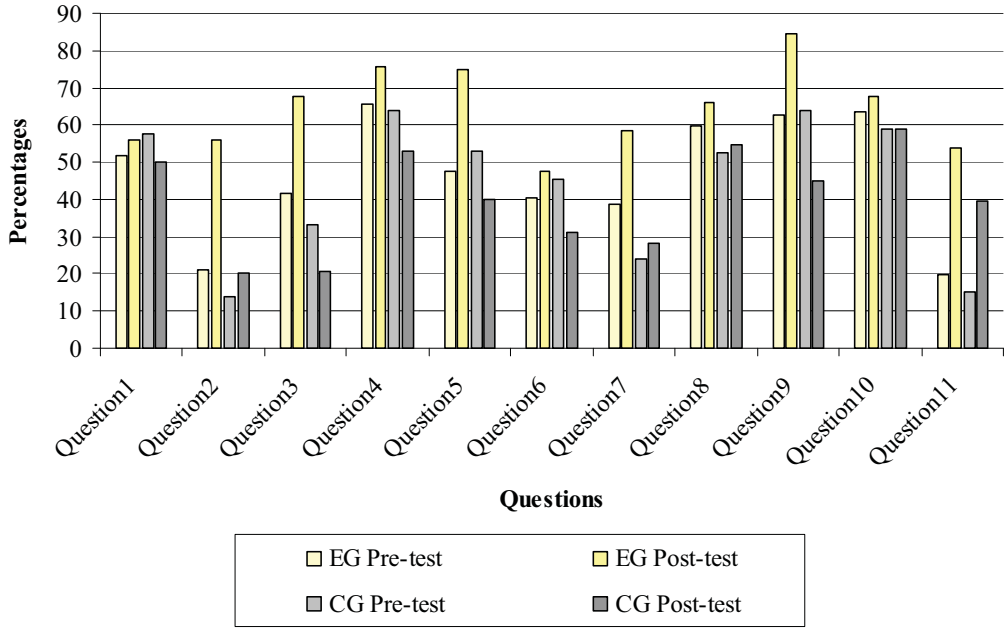

Figure 21. Bar chart representing the frequency and percentages of students who gave correct answers to knowledge questions

In experimental group, the biggest change in the percentages occurred in K2, K3, K5, K9 and K11. K2 is about the contribution of motor vehicles to the carbon monoxide level. The descriptive statistics for this item revealed that 21.2% of experimental group students answered this item correctly in the pre-test. In the post-test the percentages of students answering this item correctly increased to 55.8%. The third knowledge item, K3, was about the way of electricity generation in Turkey. As the percentages displayed, there is an 26.2% of increase in experimental group students answers between the pre-test and the post-test. One of the biggest change in the pre-test and the post-test percentages occurred in K5. In the pre-test 47.4% of experimental group students answered this item correctly and in the post-test the percentages increased to 75.0%. K9 was about the most hazardaous household waste and 84.6% of experimental group students answered this item correctly in the post-test. The change of percentages between the pre-test and the post-test was found as 21.8%. K11 was about the common method used for storing nuclear waste throughout the world. In experimental group, 19.9% of students gave correct answers to this question in the pre-test and 53.8% in the post-test. In other

questions, there are small increases in the percentages of experimental group students answering the knowledge questions correctly.

In control group, the number of students answering the knowledge items correctly increased only in few questions; K2, K7, K8, K10, K11. The dramatic increase occurred in K11. In the pre-test 15% of control group students answered this question which is about the common method used for storing nuclear waste throughout the world correctly. In the post-test the percentage of students increased to 39.4. Besides increases there are also decreases in the correct answers in the post-test. The most dramatic decrease occurred in K9. This item was about the most hazardaous household waste. With 18.8% of change, the percentages of students answering correctly decreased from 63.8% to 45%.

5.1.1.4 Descriptive Statistics of the Pre-test and the Post-test Results of Attitude Subscale of ELQ

Environmental attitude is the second subscale of ELQ. This part consists of five-point Likert-type statements to measure students' environmental attitude. For the presentation of the data 'strongly agree' and 'agree' responses and also 'strongly disagree' and 'disagree' responses were combined. Table 14 shows the frequencies and percentages of students' agreement with environmental attitude statements.

When the table is examined it can be observed that after the application experimental group students' agreement with positive statements and their disagreement with negative statements increased for all the statements except for the statement A6. The striking differences occurred for A1, A2, A5 and A7. In A1 it was stated that "We are approaching the limit of the number of people the earth can support." In the pre-test 35.9%, in the post-test 65.3% of experimental group students agreed with this statement. Also, in the pre-test 52.6%, in the post-test 78.2% of experimental group students expressed that they agree with the statement A2, "When humans interfere with the nature it often produces disastrous consequences." For A5, "The balance of nature is strong enough to cope with the impacts of modern industrial notions", before the application 31.4%, after the

application 70.5% of students expressed their disagreement with the statement. In A7, it was stated that "The so-called 'ecological crisis' facing humankind has been greatly exaggerated.". Although in the pre-test 22.4% of experimental group students expressed their disagreement about the statement this number increased to 71.8 after the application. In experimental group, the percentages of students decreased only for one statement A6. In this statement it was expressed that "Despite our special abilities humans are still subjects to the laws of nature." In the pre-test 62.8%, in the post-test 56.4% of experimental group students expressed that they agree with this statement.

The situation is not the same in control group. When the results are examined it is observed that there is an increase in the percentages of students for only two statements: A5 and A7. In A5, it was stated that "The balance of nature is strong enough to cope with the impacts of modern industrial notions". In the pre-test 41.9%, in the post-test 51.3% of control group students expressed that they disagree with this statement. The second striking result is obtained from A7. In this statement, it was expressed that, "The so-called 'ecological crisis' facing humankind has been greatly exaggerated'. Although the percentages of students disagree with this statement was 26.3 in the pre-test, this number increased to 42.5 in the post-test. Besides, these two statements, there was a decrease in the percentages for all other statements. The most striking decreases occurred in A4 and A10. In A4, students were asked their agreement about the statement "Plants and animals have as much right as humans to exist". Before the application 75%, after the application 53.2% of control group students stated that they agree with this statement. For A10, "If things continue on their present course, we will soon experience a major ecological catastrophe.", although the percentage of students was 65.6% in the pre-test, the percentage decreased to 48.2% in the post-test.

Table 14 *Percentages of Students' Agreement with Environmental Attitude Statements*

Environmental Attitude Statements	Agree				Undecided				Disagree			
	EG		CG		EG		CG		EG		CG	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A1- We are approaching the limit of the number of people the earth can support.	35.9	65.3	35	26.9	42.9	12.8	38.8	34.4	21.2	21.8	26.3	38.8
A2- When humans interfere with the nature it often produces disastrous consequences.	52.6	78.2	49.4	44.4	24.4	15.4	21.3	15	23.1	6.4	29.4	40.6
A3- The earth has plenty of natural resources if we just learn how to develop them.*	19.9	14.7	26.3	30	15.4	16.7	15.6	24.4	64.8	68.6	58.1	45.7
A4- Plants and animals have as much right as humans to exist.	74.4	86.6	75	53.2	13.5	7.1	8.1	8.1	12.2	6.4	16.9	38.8
A5- The balance of nature is strong enough to cope with the impacts of modern industrial notions.*	27.6	16	21.9	26.3	41	13.5	36.3	22.5	31.4	70.5	41.9	51.3
A6- Despite our special abilities humans are still subjects to the laws of nature.	62.8	56.4	43.8	29.4	15.4	19.2	25.6	35.6	21.8	24.4	30.6	35
A7- The so-called 'ecological crisis' facing humankind has been greatly exaggerated.*	51.9	17.3	48.8	42.6	25.6	10.9	25	25	22.4	71.8	26.3	42.5
A8- Humans were meant to rule over the rest of nature.*	22.5	25	20.6	22.5	21.8	11.5	34.4	33.8	55.8	63.5	45	43.8
A9-Humans will eventually learn enough about how nature works to be able to control it.*	12.8	17.3	20.6	31.9	18.6	11.5	18.1	20.6	68.6	71.2	61.3	47.6
A10- If things continue on their present course, we will soon experience a major ecological catastrophe.	72.4	76.3	65.6	48.2	15.4	14.7	23.1	22.5	12.2	9	34.4	29.4

* During statistical analysis, the statement was recoded so that the more favorable response was 1 and the least favorable response was 5.

5.1.1.5 Descriptive Statistics of the Pre-test and the Post-test Results of Environmental Use Subscale of ELQ

Students participating the study were also asked a series of questions about their views on environmental uses. This part consists of 19 five-point Likert-type statements. For the presentation of the data, the 'strongly agree' and 'agree' responses and also 'strongly disagree' and 'disagree' responses were combined. Table 15 shows the percentages of students' agreement with environmental use statements.

When the percentages are examined, it can be observed that for positive statements, experimental group students' agreement increased for all statements after the application except for U11. The striking differences between the pre-test and the post-test results occurred in U9, U15, U16, U17, U18 and U19. In U9, students were asked whether they agree with the statement, "Government should regulate the use of private land to protect wildlife habitat." Before the application 60.9%, after the application 80.1% of experimental group students stated that they agree with this statement. The second striking result occurred in U15. In this statement it is expressed that "Science and technology will be very important in solving our environmental problems". In the pre-test 53.8%, in the post-test 81.4% of experimental group students agreed with this statement. In the statement U16, it was expressed that "Cultural changes will be very important in solving environmental problems". The percentages of students agreed with this statement increased from 56.4 to 77.0. Similar increases in the percentages of experimental group students' agreement with environmental use statements also observed for U17 (50% in the pre-test, 78.2% in the post-test), U18 (56.4% in the pre-test, 78.2% in the post-test) and U19 (60.9% in the pre-test, 80.1%). Among positive statements besides these increases there was a decrease in percentages for the statement U11. Although the decrease was small, in the pre-test 76.9% in the post-test 75.0% of experimental group students stated their agreement with the statement "All plants and animals play an important role in the environment."

When the percentages for negative statements are examined, students in experimental group expressed their disagreement for U4, U5, U7 and U14. The

most striking result was obtained from U4; “Poisonous snakes and insects that pose a threat to people should be killed”. In the pre-test 15.4%, in the post-test 62.2% of experimental group students expressed their disagreement with the statement. The second striking results was obtained for U5; “Landowners should be allowed to drain wetlands for agricultural or industrial use.” For this statement; in the pre-test 23.7%, in the post-test 48.7% of experimental group students expressed their disagreement with the statement. Among the negative statements, students disagreement decreased for only one statement U3; “Wild animals that provide meat for people are the most important species to protect”. Interestingly, most of the experimental group students (42.9% in the pre-test, 73.8% in the post-test) agreed with this statement. Besides, although 18.6% of experimental group students expressed their disagreement with this statement this number decreased to 17.9% in the post-test.

For control group students, among the positive statements, an increase was observed for only U6 and U17. In U6 it was stated that “It is important that everyone be aware of environmental problems”. In the pre-test 58.1%, in the post-test 70.0% of control group students expressed their agreement with the statement. Another increase occured in U17; “Changes in people’s values will help to solve environmental values”. For this statement in the pre-test 45.2%, in the post-test 60.5% of control group students stated that they agree with this statement.

Among the negative statements, control group students’ disagreement increased for the statements U3, U4 and U5. The most striking difference occurred in U4; “Poisonous snakes and insects that pose a threat that should be killed”. For this statement; in the pre-test 20.6%, in the post-test 51.3% of control group students expressed their disagreement with this statement. Among the negative statements, control group students disagreement decreased for statements U7 and U14. For U7, although 60.6% of control group students expressed their disagreement, this number decreased to 25.6% in the post-test. For U14; “Air pollution laws are already strict enough”, the percentages of control group students”, disagreement decreased from 48.1% to 27.5%.

Table 15 *Percentages of Students' Agreement with Environmental Use Statements*

Environmental Use Statements	Agree				Undecided				Disagree			
	EG		CG		EG		CG		EG		CG	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
U1- Special areas should be aside for endangered species.	77.6	86.5	65.6	43.1	12.8	5.8	11.9	16.3	9.6	7.7	22.5	40.6
U2- Laws regarding water quality should be strickter.	72.5	83.3	60.7	40.6	20.5	12.2	24.4	26.3	7.1	4.5	15	33.1
U3- Wild animals that provide meat for people are the most important species to protect.*	42.9	73.8	37.5	28.7	38.5	8.3	38.1	36.9	18.6	17.9	24.4	34.4
U4- Poisonous snakes and insects that pose a threat to people should be killed.*	63	18.6	59.4	23.7	21.8	19.2	20	25	15.4	62.2	20.6	51.3
U5- Landowners should be allowed to drain wetlands for agricultural or industrial uses*	38.5	38.5	38.8	38.1	37.8	12.8	30	26.3	23.7	48.7	31.3	35.6
U6- It is important that everyone be aware of environmental problems.	77.6	85.9	58.1	70	15.4	3.8	18.1	18.1	7.1	10.3	23.8	11.9
U7- Individuals should be allowed to use private land as they see fit.*	14.7	24.4	21.3	50	30.8	12.2	18.1	24.4	54.5	63.4	60.6	25.6
U8- I feel personally responsible for helping to solve environmental problems.	68.6	83.9	56.9	38.1	16	9	23.1	19.4	15.4	7.1	20	42.5
U9- Government should regulate the use of private land to protect wildlife habitat.	60.9	80.1	46.2	41.2	28.2	14.1	33.8	22.5	10.9	5.8	20	36.3
U10- People should be held responsible for any damages they cause to the environment.	64.7	75.7	55	36.2	20.5	11.5	23.1	31.3	14.7	12.8	21.9	32.5

Table 15 *(continued) Percentages of Students' Agreement with Environmental Use Statements*

	Agree				Undecided				Disagree			
	EG		CG		EG		CG		EG		CG	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
U11- All plants and animals play an important role in the environment.	76.9	75.0	61.3	56.9	16	12.2	24.4	20.6	7.1	12.8	14.4	22.5
U12- Technological changes often do as much harm to the environment as they do well for the environment.	75	79.4	58.8	47.5	16.7	13.5	21.9	24.4	8.3	7.1	19.4	28.1
U13- Government should pass laws to make recycling mandatory.	66.7	75.7	57.5	47.4	21.8	16	28.1	23.8	11.5	8.3	14.4	28.8
U14- Air pollution laws are already strict enough.*	12.8	21.2	22.5	47.5	29.5	4.5	29.4	25	57.7	74.3	48.1	27.5
U15- Science and technology will be very important in solving our environmental problems.	53.8	81.4	48.8	38.7	29.5	10.9	34.4	28.8	16.7	7.7	16.9	32.5
U16- Cultural changes will be very important in solving environmental problems.	55.4	78.2	41.9	35.6	32.1	10.9	40.6	37.5	9.6	10.9	17.5	26.9
U17- Changes in people's values will help to solve environmental problems.	50	78.2	45.2	60.5	34.8	10.9	36.8	14.5	15.2	10.9	18	25
U18- Collective action (i.e., movements) is central to solving environmental problems.	56.4	77	40.6	29.3	23.7	17.9	35	28.8	19.9	5.1	24.4	41.9
U19- Lifestyle changes (i.e., consumption) will help solve environmental problems.	60.9	80.1	50.6	34.4	28.2	12.8	31.3	30	10.9	7.1	18.1	35.6

* During statistical analysis, the statement was recoded so that the more favorable response was 1 and the least favorable response was 5.

5.1.1.6 Descriptive Statistics of the Pre-test and the Post-test Results of Environmental Concern Subscale of ELQ

Environmental concern is the fourth subscale of ELQ. In this subscale participants were asked to share their level of concern about current environmental issues. For the presentation of the data the 'very concerned' and 'somewhat concerned' responses and also 'a little concerned' and 'not concerned' responses were combined. Table 16 shows the percentages of experimental group and control group students' pre-test and post-test answers to the environmental concern subscale of ELQ.

Results revealed that experimental group students' concern levels increased for 'smoke pollution', 'automobile emissions', 'industrial pollutions', 'hazardous wastes', 'poor water quality', 'ozone depletion' and 'global warming' after the treatment. The most drastic change occurred in 'global warming'. In the pre-test 56.5%, in the post-test 73.1% of EG students stated that they are concerned about global warming. Striking differences occurred for also 'smoke pollution', 'hazardous wastes' and 'poor water quality'. Besides, although the change is small, experimental group students' environmental concern levels decreased for 'noise pollution' 'indoor air pollution'.

Results also showed that control group students' concern levels increased for only 'hazardous wastes' and 'ozone layer depletion'. In the pre-test 48.7%, in the post-test 63.4% of CG students expressed their concern level for hazardous wastes as high. Also, although the change is small, in the pre-test 50.6%, in the post-test 62.8% of CG students stated that they are concerned for ozone layer depletion. For all other issues; 'smoke pollution', 'noise pollution', 'automobile emissions', 'industrial pollution', 'poor water quality', 'indoor air pollution' and 'global warming', CG students' concern levels decreased after the application.

Table 16 *Percentages of Students' Concern Levels for Environmental Problems*

	Concerned				**Undecided**				**Not Concerned**			
	EG		**CG**		**EG**		**CG**		**EG**		**CG**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
C1- Smoke Pollution	58.3	69.9	73.3	50	10.9	9.6	11.2	24.3	30.8	20.5	15.5	25.7
C2- Noise Pollution	66.1	60.3	60	46.8	12.1	9	11.4	17.5	21.8	30.7	28.6	35.7
C3- Automobile Emissions	52	58.3	55.8	45	15.4	5.8	19.9	21.9	32.6	35.9	24.3	33.1
C4- Industrial Pollution	63.5	64.1	59.6	51.3	7.7	12.2	14.3	18.1	28.8	23.7	26.1	30.6
C5- Hazardous Wastes	63.5	75	48.7	63.4	14.1	7.7	21.9	6.8	22.4	17.3	29.4	29.8
C6- Poor Water Quality	66.1	75	64.5	52.4	15.9	7.1	5.6	16.9	18	17.9	29.9	30.7
C7- Indoor Air Pollution	71.7	67.9	71.4	54.9	7.1	10.9	8.1	14.4	21.2	21.2	20.5	30.7
C8- Ozone Layer Depletion	74.4	80.1	50.6	62.8	6.4	2.6	10.6	4.3	19.2	17,3	38.8	32.9
C9- Global Warming	56.5	73.1	69.6	59.3	18	5.1	3.7	8.8	25.5	21.8	26.7	31.9

5.1.2 Inferential Statistics

This section includes the results of analysis of null hypotheses stated in Chapter III. Independent samples t-test, one-way analysis of covariance (one-way ANCOVA) and two-way analysis of covariance (two-way ANCOVA) were used to test the hypotheses. Since the study was conducted with three grades (6th, 7th and 8th grades) results of analysis will be represented for each grade level separately. Before representing the results of inferential statistics, assumptions of parametric tests and equivalency of treatment groups will be laid out.

5.1.2.1 Assumptions of Parametric Tests

Discussing the assumptions of parametric tests is important before going to use them. Five assumptions; level of measurement, random sampling, independence of observations, normal distribution and homogeneity of variances should be met to decide whether using the parametric tests or not. In this part, how these assumptions of parametric tests and additional four assumptions; influence of treatment on covariate measurement, reliability of covariates, a linear relationship between the dependent variable and the covariate(s) and homogeneity of regression slopes, for ANCOVA analysis are met in the study will be discussed.

- **Level of Measurement**

For parametric tests, the dependent variable should be measured at the interval or ratio level; that is using a continuous scale rather than discrete categories (Pallant, 2007). One of the dependent variables of the study, environmental knowledge, was measured by multiple choice questions, which means that it is measured at continuous scale. The other dependent variables, attitudes toward environment, environmental uses and concerns, were measured with Likert-type questions. There is a debate about whether it is legitimate to use Likert-type data in parametric statistical procedures. It is expressed that although the Likert-type item is ordered, using it in parametric tests is valid (Lubke & Muthen, 2004).

- **Random Sampling**

The second assumption of parametric tests is using the scores obtained from random sampling from the population (Pallant, 2007). However, this is often not the case in real-life also in this study. Since students from intact classes were participated in the study random sampling was not possible.

- **Independence of Observations**

To use parametric tests, measurements in the study must not be influenced by any other measurement, that is, they must be independent of one another (Pallant, 2007). The independence of observation were tried to be as much as possible while data collecting.

- **Normal Distribution**

Fourth assumption of parametric tests is normal distribution. For using parametric tests, it is assumed that the populations from which the samples are taken are normally distributed (Pallant, 2007). Skewness and kurtosis values and the histograms with normal curve were used for normality assumption. If the distribution is perfectly normal, a skewness and kurtosis value of 0 will be obtained. As with kurtosis, a skewness value ranging from -1 to +1 is considered excellent and values between -2 and +2 are also acceptable. Normal distribution of each grade level for each subscale of ELQ; environmental knowledge, attitude, uses and concern, are represented below.

Normal Distribution of 6th Grade Sample

Table 17 shows the descriptive statistics for 6th grade students' scores obtained from subscales of pre-ELQ. Also Figure 22, Figure 23 and Figure 24 show the histograms of distribution of sixth grade students' scores for each subscale with normal curve. When the Table 17 and the histograms are examined it can be observed the skewness and kurtosis values change between -1 to +1. With these values it can be concluded the 6th grade sample shows normal distribution for each subscale of ELQ.

Table 17 *Descriptive Statistics for the 6th Grade Students' Scores of Pre-ELQ Subscales*

Subscales	*N*	Min.	Max.	*M*	*SD*	Skewness		Kurtosis	
						Stat.	*SE*	Stat.	*SE*
Env. Knowledge	117	0	9	4.34	1.94	-.16	.22	-.28	.44
Env. Attitude	117	14	46	32.49	6.79	-.82	.22	.34	.44
Env. Use	117	30	86	63.52	12.35	-.55	.22	0	.44
Env. Concern	117	9	45	32.73	9.79	-.65	.22	-.38	.44

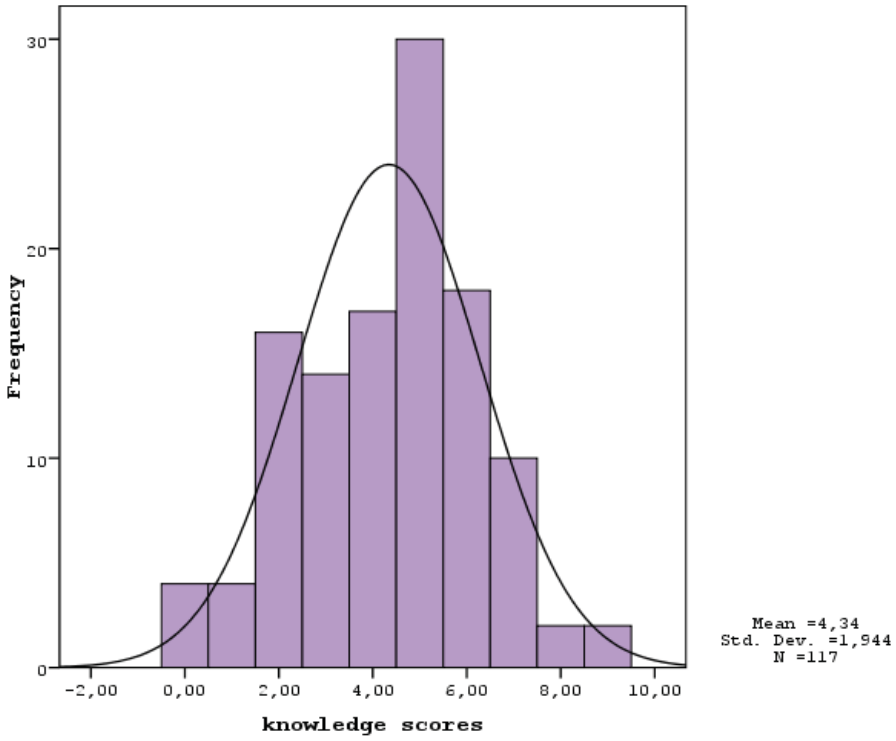

Figure 22. Distribution of 6th grade students' pre-ELQ knowledge scores

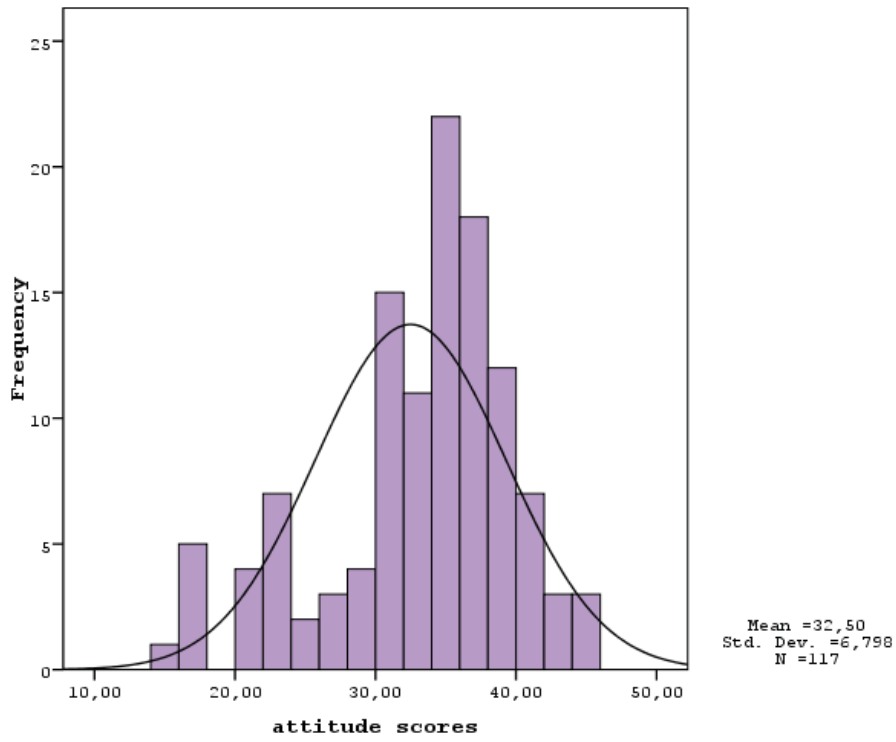

Figure 23. Distribution of 6th grade students' pre-ELQ attitude scores

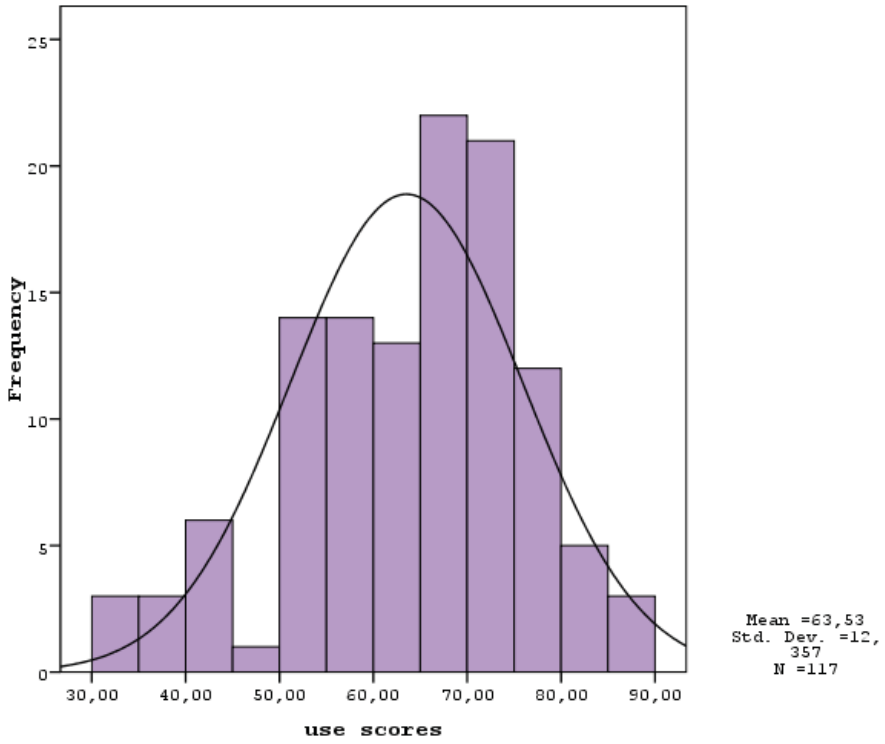

Figure 24. Distribution of 6th grade students' pre-ELQ use scores

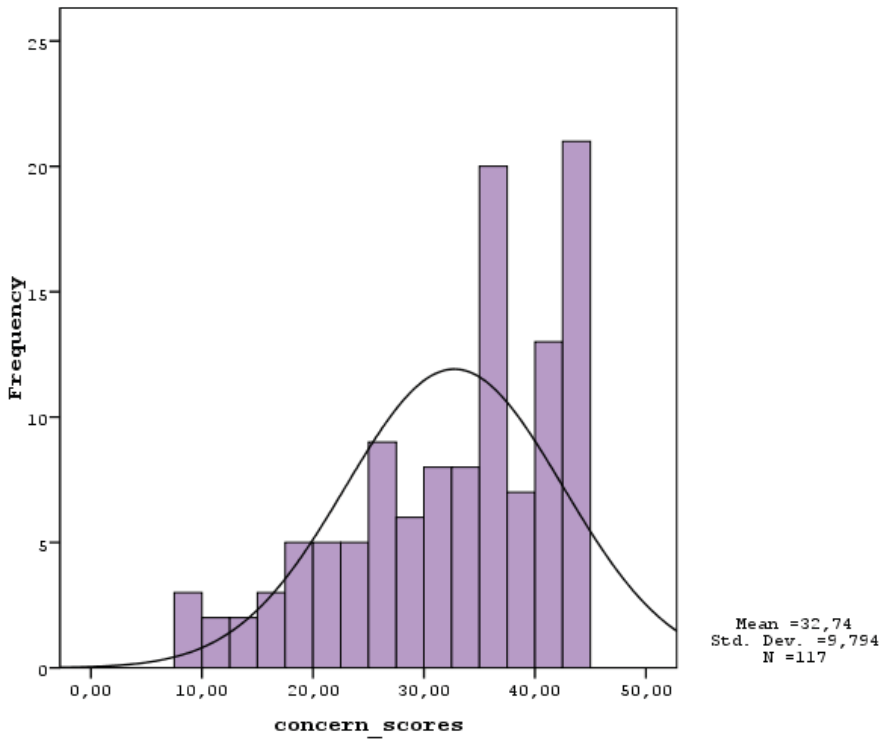

Figure 25. Distribution of 6th grade students' pre-ELQ concern scores

Normal Distribution of 7th Grade Sample

Table 18 shows the descriptive statistics for the distribution of 7th grade students' scores of subscales of pre-ELQ. Also Figure 26, Figure 27, Figure 28 and Figure 29 show the histograms for the distribution of 7th grade students' scores for each subscale with normal curve. All four variables fall within the acceptable range for skewness and kurtosis values; the skewness and kurtosis values all range between ±2. Histograms drawn for the distribution of 7th grade students' scores for pre-ELQ subscales also show that 7th grade sample has a normal distribution.

Table 18 *Descriptive Statistics for the 7th Grade Students' Scores of Pre-ELQ Subscales*

						Skewness		Kurtosis	
Subscales	*N*	Min.	Max.	*M*	*SD*	Stat.	*SE*	Stat.	*SE*
Env. Knowledge	118	0	9	5.1	2.19	.01	.22	-.84	.44
Env. Attitude	118	23	46	35.2	4.83	-.22	.22	-.23	.44
Env. Use	118	40	86	69.5	10.44	-.91	.22	.21	.44
Env. Concern	118	9	45	35.3	8.07	-1.09	.22	.85	.44

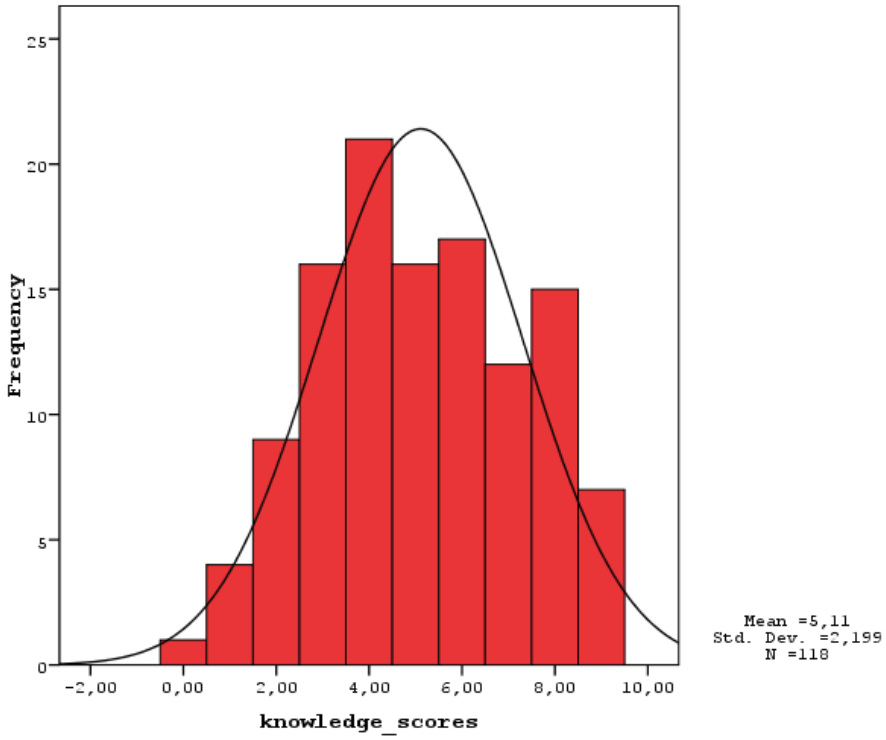

Figure 26. Distribution of 7th grade students' pre-ELQ knowledge scores

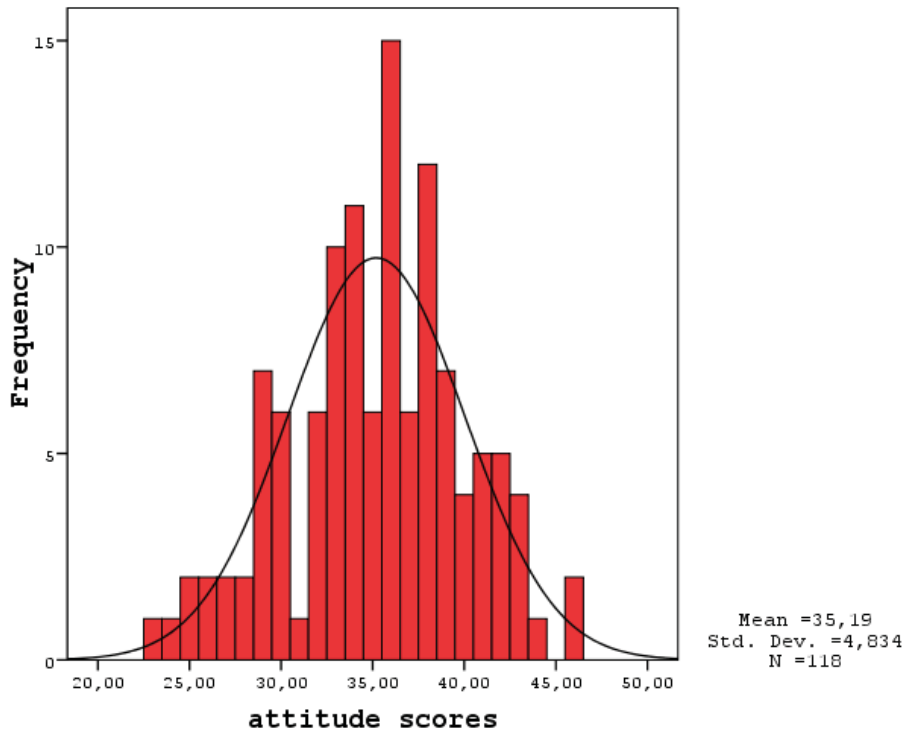

Figure 27. Distribution of 7th grade students' pre-ELQ attitude scores

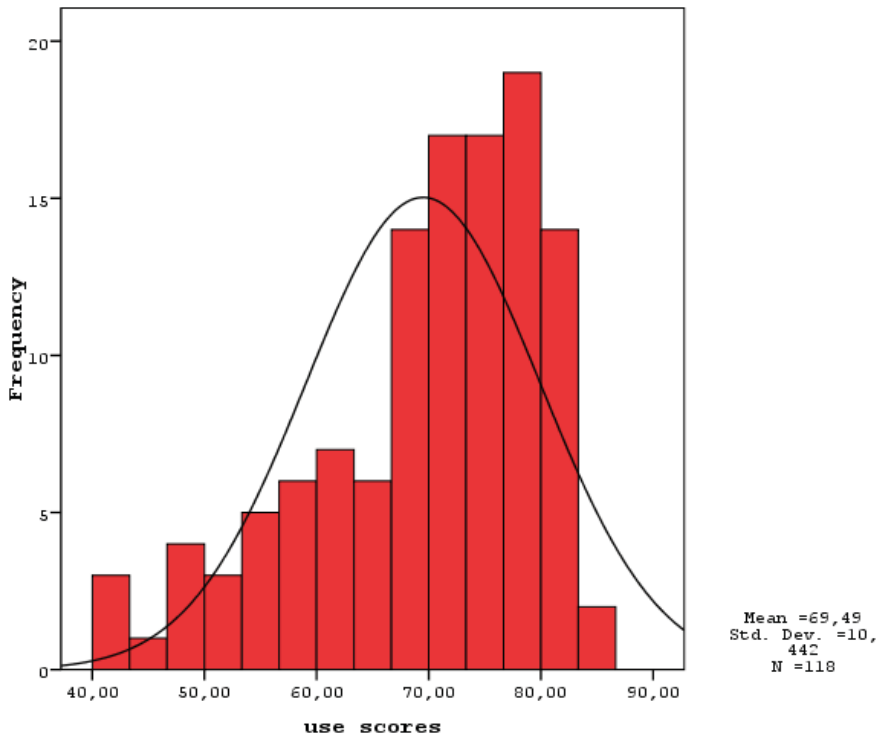

Figure 28. Distribution of 7th grade students' pre-ELQ use scores

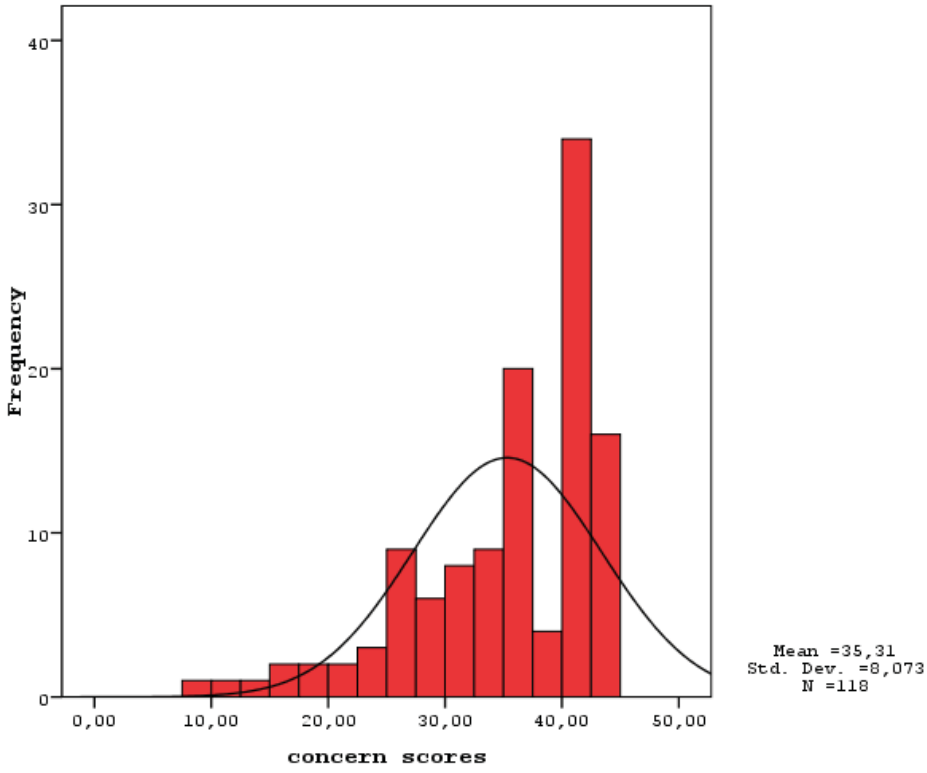

Figure 29. Distribution of 7th grade students' pre-ELQ concern scores

Normal Distribution of 8th Grade Sample

The skewness and kurtosis values represented in Table 19 and distributions of 8th grade students' scores for each subscale of pre-ELQ reveal that 8th grade sample shows normal distribution (see Figure 30, 31, 32 and 33).

Table 19 *Descriptive Statistics for the 8th Grade Students' Scores of Pre-ELQ Subscales*

						Skewness		Kurtosis	
Subscales	*N*	Min.	Max.	*M*	*SD*	Stat.	*SE*	Stat.	*SE*
Environmental Knowledge	81	0	9	5.64	2.05	-.24	.27	-.19	.53
Environmental Attitude	81	16	47	33.35	5.91	-.48	.27	.88	.53
Environmental Use	81	23	86	64.38	13.32	-.68	.27	.57	.53
Environmental Concern	81	13	45	33.92	8.44	-.49	.27	-.59	.53

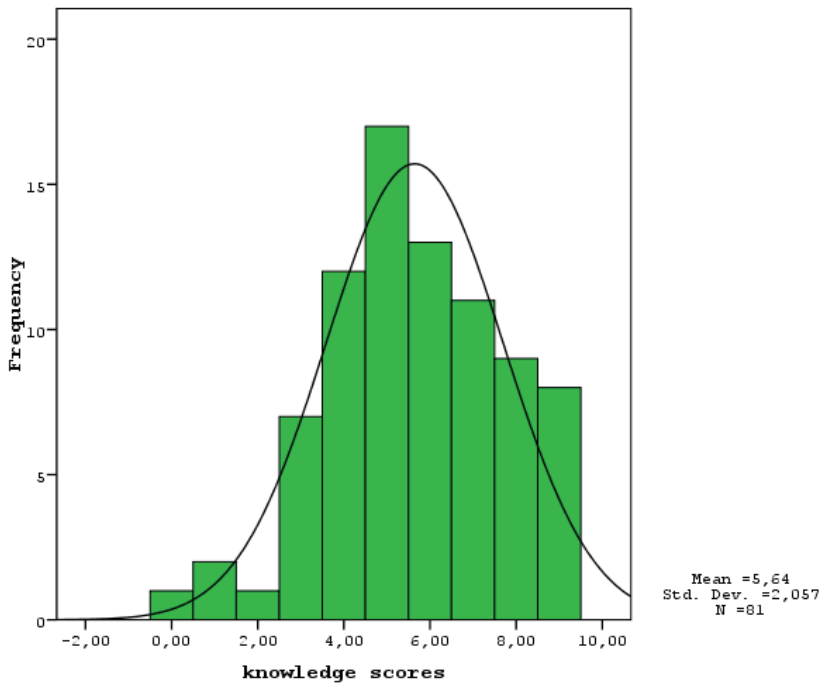

Figure 30. Distribution of 8th grade students' pre-ELQ knowledge scores

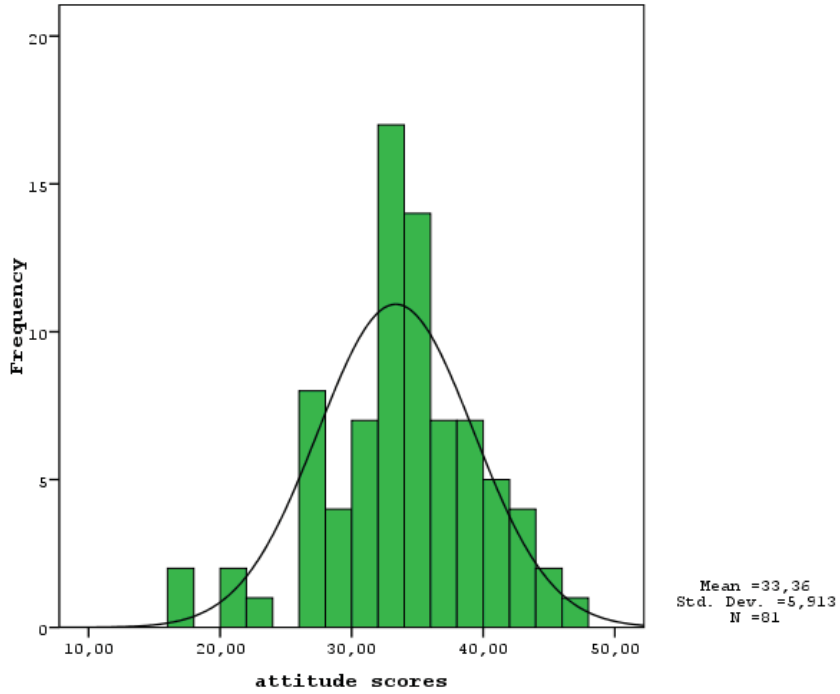

Figure 31. Distribution of 8th grade students' pre-ELQ attitude scores

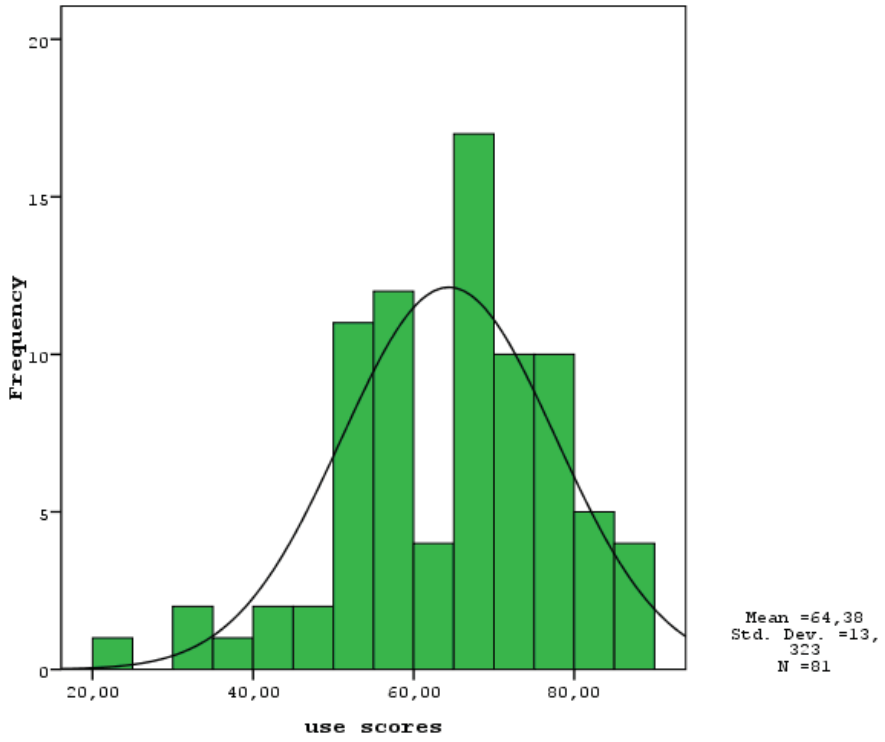

Figure 32. Distribution of 8th grade students' pre-ELQ use scores

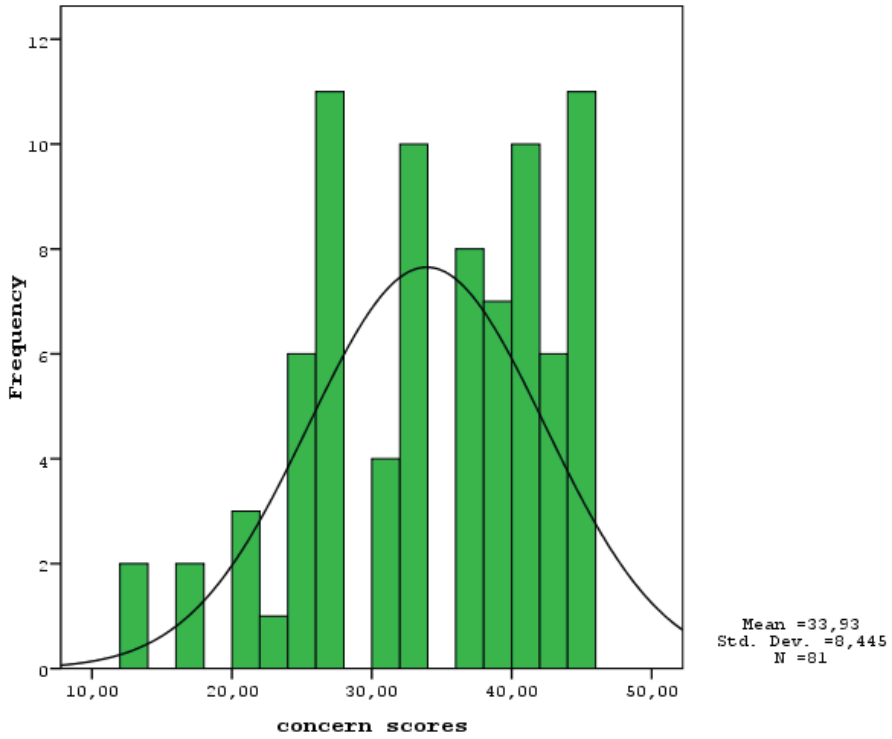

Figure 33. Distribution of 8th grade students' pre-ELQ concern scores

- **Homogeneity of Variances**

The fifth assumption of parametric tests is homogeneity of variances. Parametric tests assume that samples obtained from populations have equal variances (Pallant, 2007). To test this assumption, SPSS performs Levene's test for equality of variances. Obtaining significance values higher than .05, suggests that variances of two groups are equal, and therefore this assumption is met. Test of homogeneity of variances for each subscale of ELQ is represented in Table 20 for each grade level. When the table is examined, it is observed that in some cases significance values less than .05 is obtained, that is in some cases this assumption is not met. However, ANOVA is reasonably robust to violations of this assumption when the size of treatment groups is reasonably similar, which is in this case. And *t*-tests provide two set of results, one for the situations where the assumption is violated and one for when it is not. When a *t*-test result is analysed, the set of results appropriate for the data is selected. Taking all these situations into consideration it can be said that homogeneity of variances assumption do not cause much trouble for the study.

Table 20 *Test of Homogeneity of Variances for Students' Scores for Subscales of Pre-ELQ*

Subscales	Levene Statistic	*df*1	*df*2	Sig.
6th grade				
Environmantal Knowledge	.929	1	115	.337
Environmental Attitude	5.781	1	115	.018
Environmental Use	1.805	1	115	.182
Environmental Concern	.048	1	115	.827
7th grade				
Environmantal Knowledge	6.854	1	116	.010
Environmental Attitude	.672	1	116	.414
Environmental Use	4.611	1	116	.034
Environmental Concern	4.240	1	116	.042
8th grade				
Environmantal Knowledge	.573	1	79	.451
Environmental Attitude	6.789	1	79	.011
Environmental Use	3.278	1	79	.074
Environmental Concern	1.075	1	79	.303

Besides the assumptions for parametric tests there are additional assumptions that should be met for covariate analysis. Analysis of covariance rests on the same assumptions as analysis of variance plus four additional assumptions regarding the regression part of the covariance analysis. The assumptions of ANOVA (independence of observations, normal distribution, and homogeneity of variances) are discussed for each subscale and grade level. Besides these assumptions, ANCOVA also assumes:

- **Influence of Treatment on Covariate Measurement**

This assumption ensures that avoiding scores on the covariate also being influenced by the treatment. To meet this assumption, researcher should ensure that the covariate is measured prior to the treatment (Pallant, 2007). All the covariates in the

study, pre-environmental knowledge, attitude, use and concern scores, are measured before the treatment. So this assumption of ANCOVA is met in the study.

- **Reliability of Covariates**

Reliability of covariates is another assumption for covariate analysis. Pallant (2007) suggests that to ensure this assumption is met, researchers should look for good, well validated questionnaires and they should check the internal consistency of the questionnaire by calculating Cronbach alpha values. ELQ has all these properties so this assumption is also met in this study.

- **A linear relationship between the dependent variable and the covariate(s)**

ANCOVA assumes that the relationship between the dependent variable and each of the covariates is linear. In the study, the post-test environmental knowledge, attitude, use and concern scores constitute the dependent variables and the pre-test scores for each subscale constitute the covariates respectively. Scatterplots are usually used to explore the relationship between two variables. They give an indication of whether the variables are related in a linear or curvilinear fashion (Pallant, 2006).

Scatterplots showing the relationships between the dependent variables and the covariates are shown for each grade in Figures 34-45. Although, the scatterplots do not show a perfect linear relationship, it can be assumed that the assumption is not violated seriously.

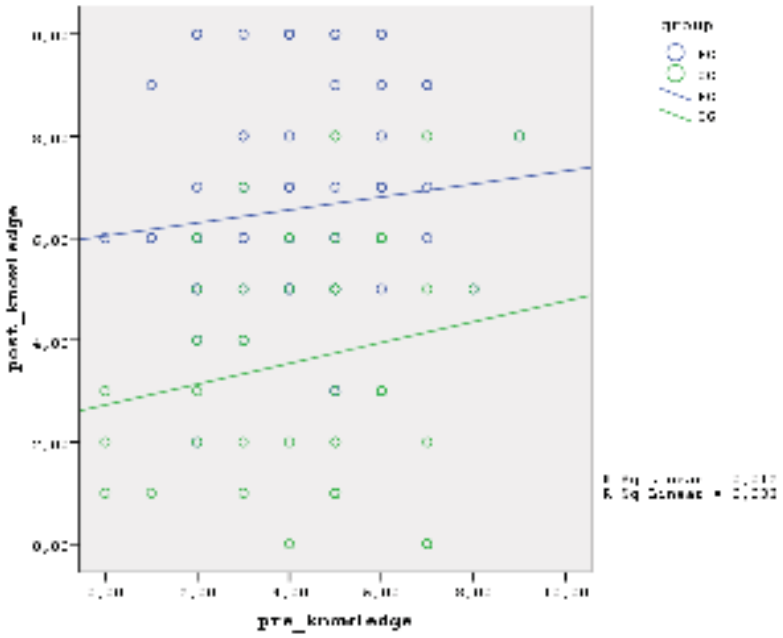

Figure 34. Scatterplot showing the relationship between 6th grade students' post-knowledge and pre-knowledge scores

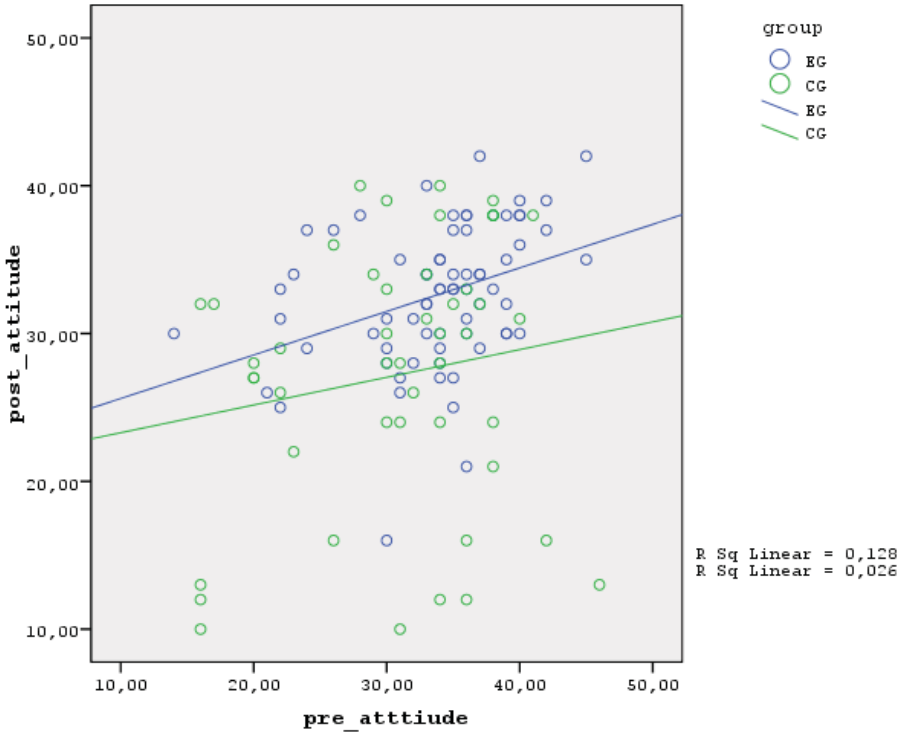

Figure 35. Scatterplot showing the relationship between 6th grade students' post-attitude and pre-attitude scores

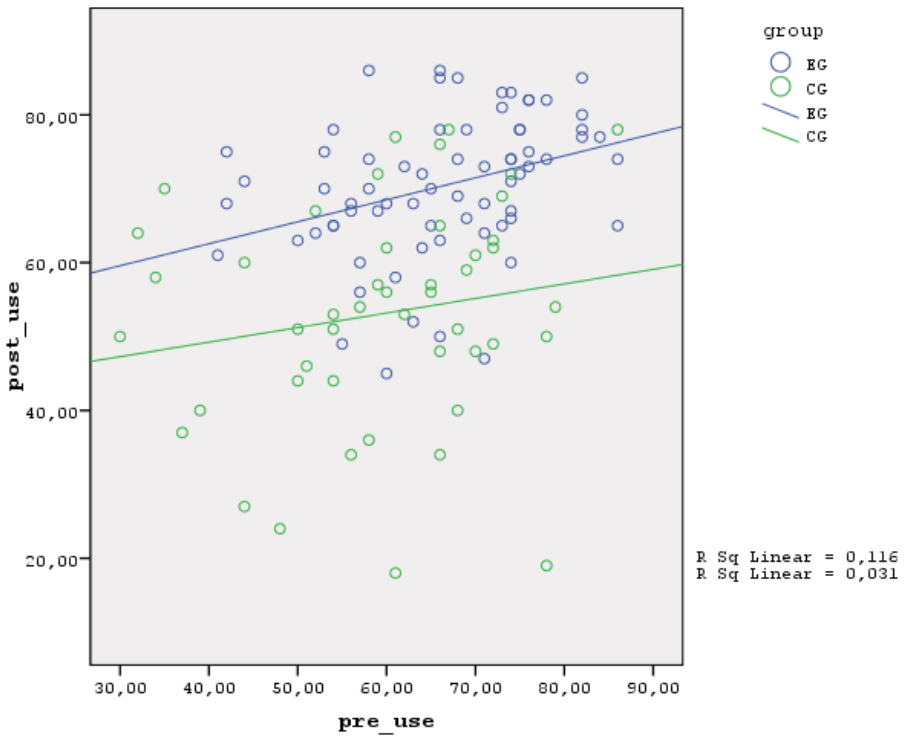

Figure 36. Scatterplot showing the relationship between 6th grade students' post-use and pre-use scores

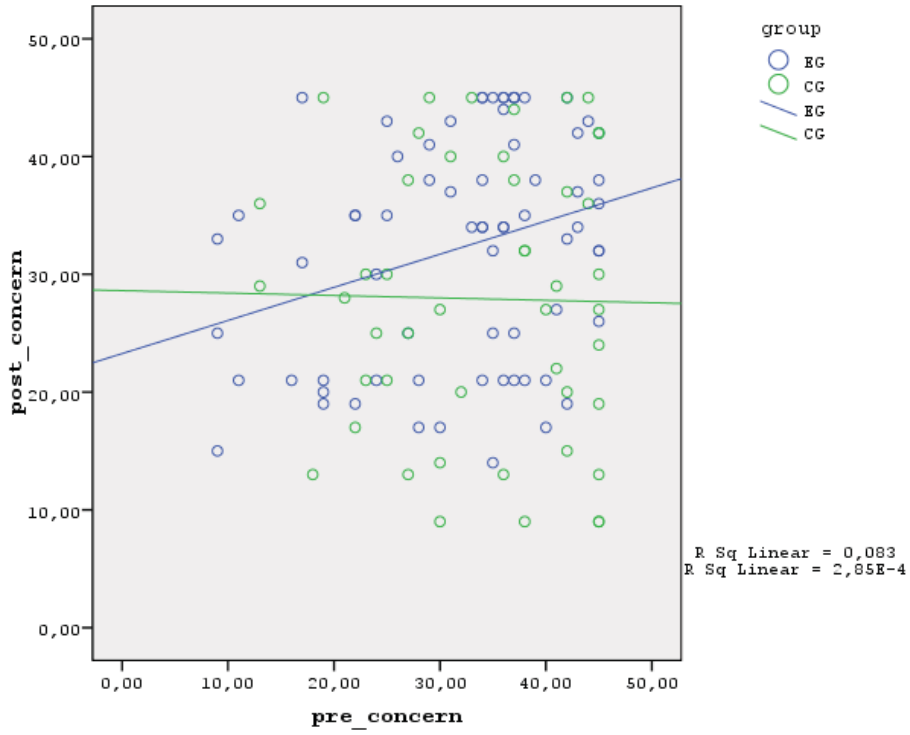

Figure 37. Scatterplot showing the relationship between 6th grade students' post-concern and pre-concern scores

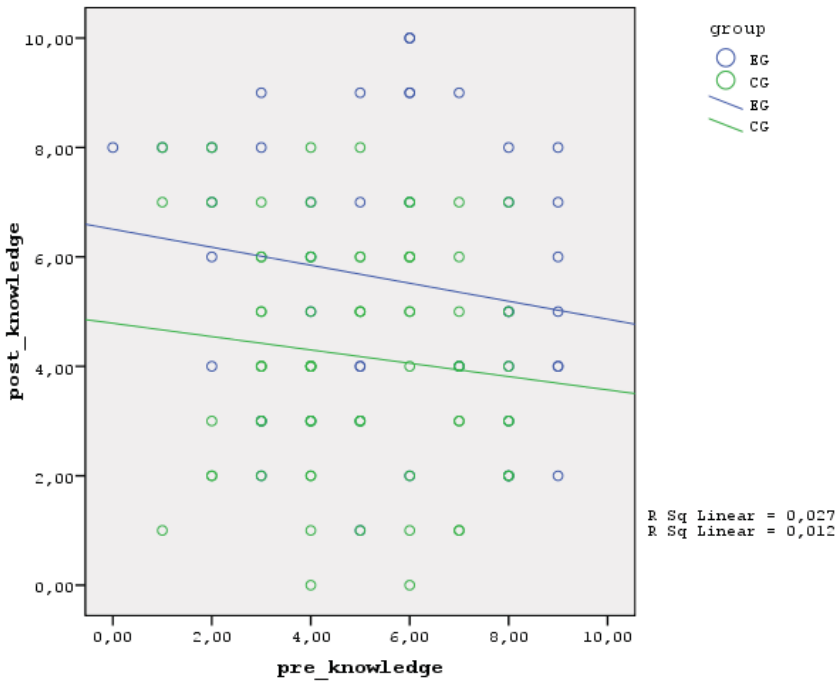

Figure 38. Scatterplot showing the relationship between 7th grade students' post-knowledge and pre-knowledge scores

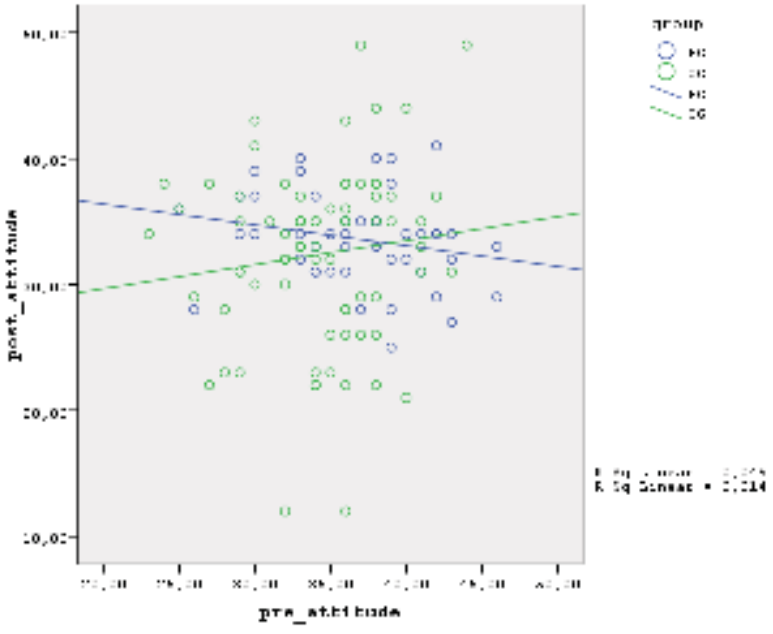

*Figure 39***.** Scatterplot showing the relationship between 7th grade students' post-attitude and pre-attitude

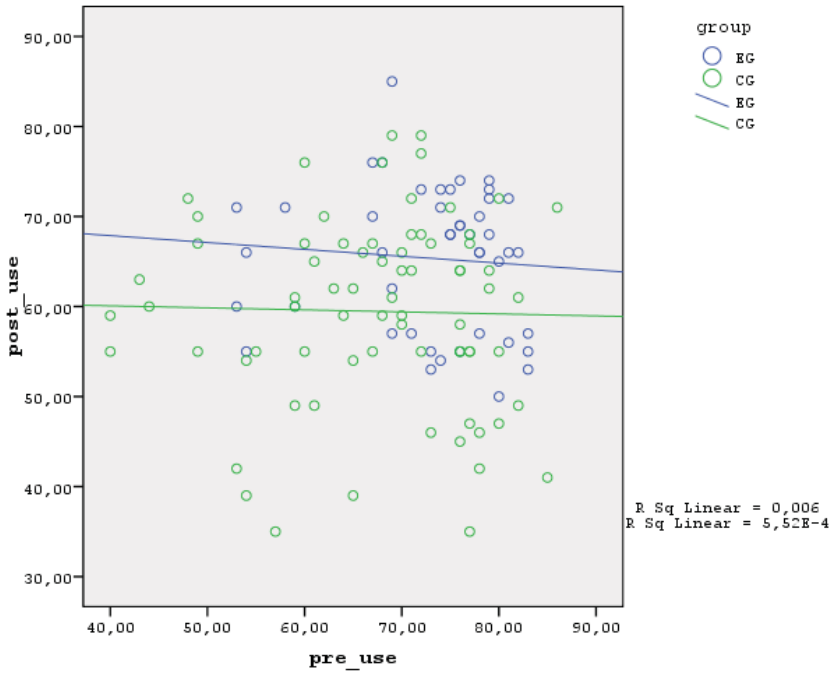

Figure 40. Scatterplot showing the relationship between 7th grade students' post-use and pre-use scores

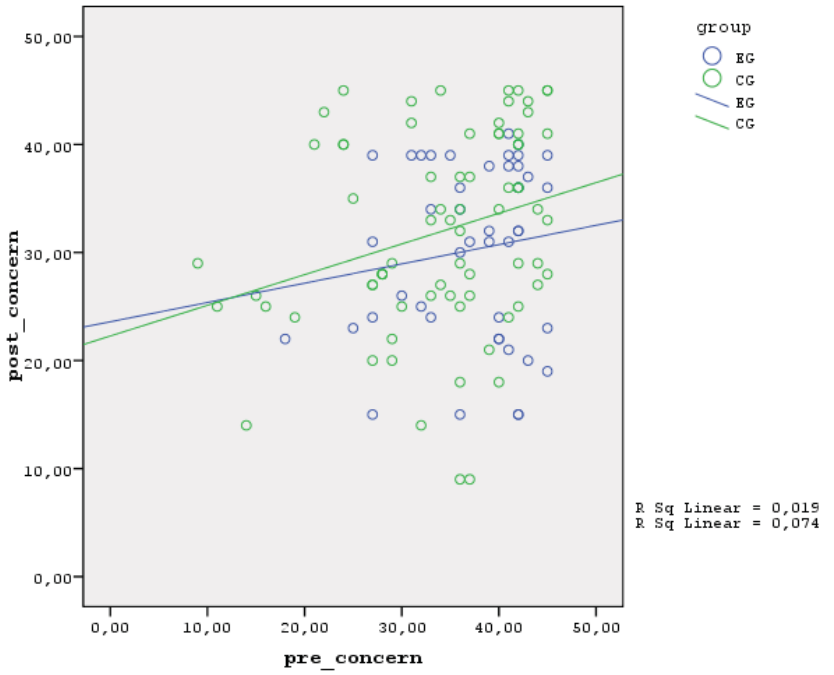

Figure 41. Scatterplot showing the relationship between 7th grade students' post-concern and pre-concern scores

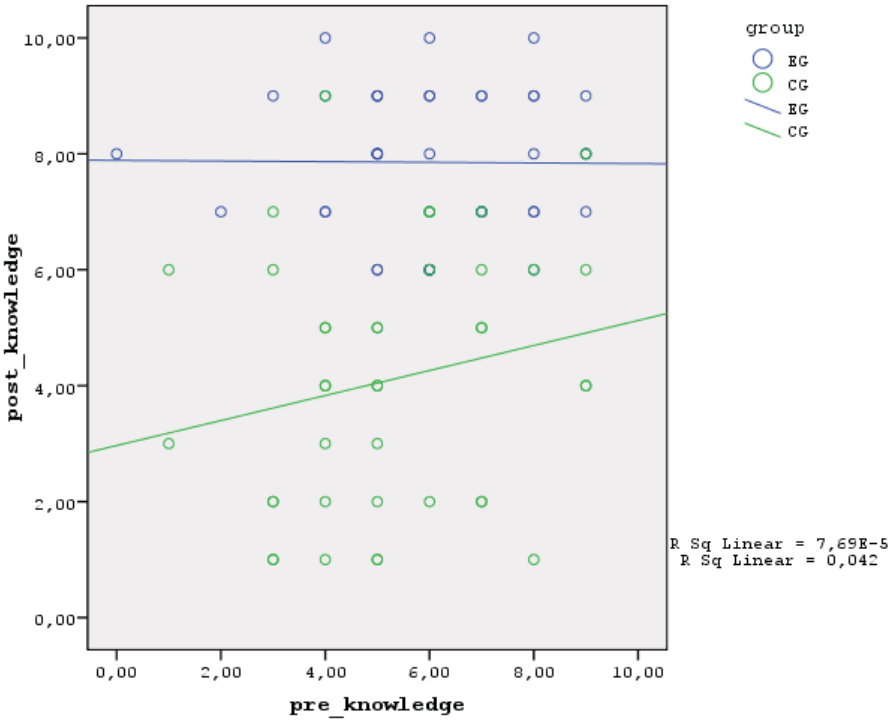

Figure 42. Scatterplot showing the relationship between 8th grade students' post-knowledge and pre-knowledge scores

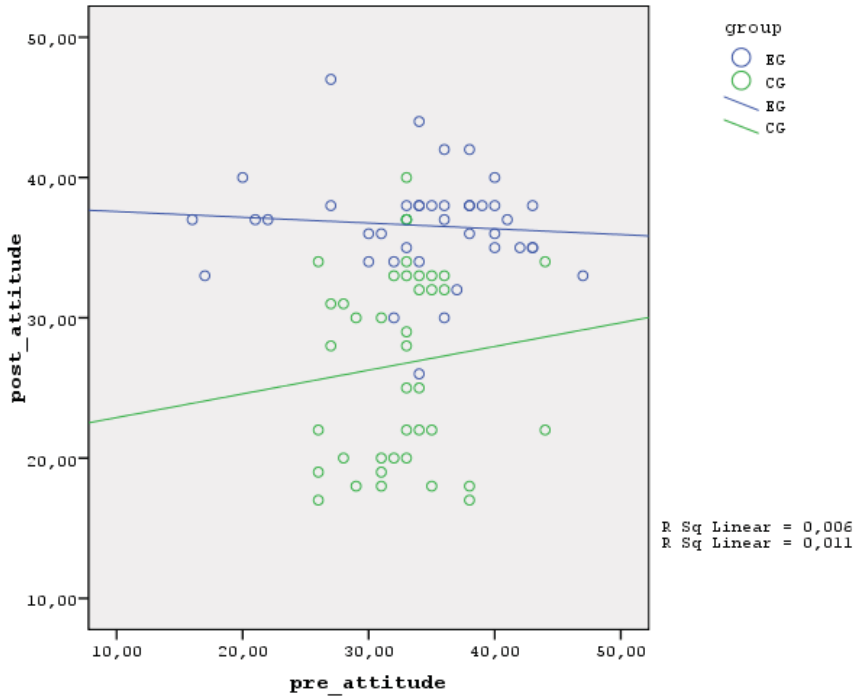

Figure 43. Scatterplot showing the relationship between 8th grade students' post-attitude and pre-attitude scores

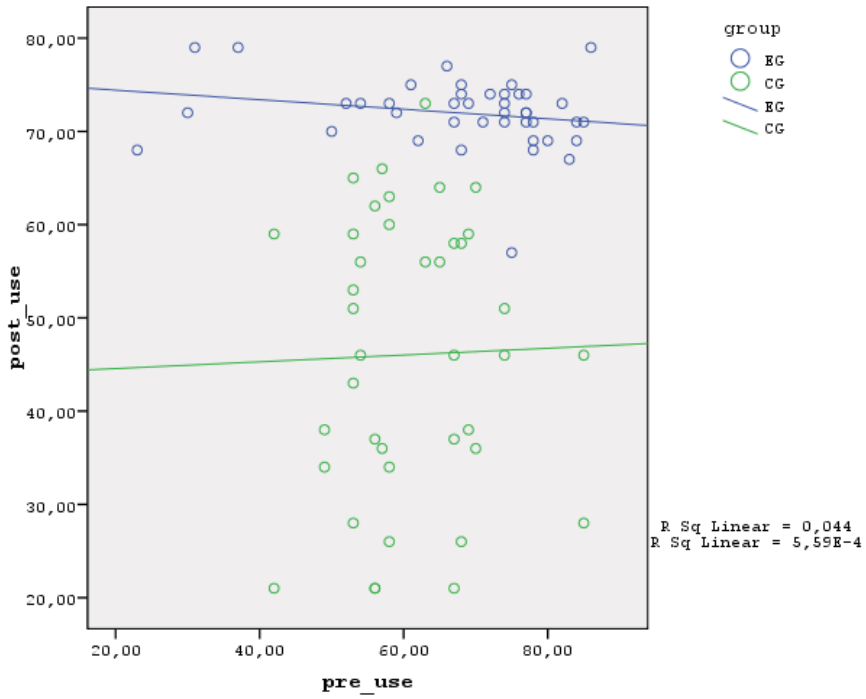

Figure 44. Scatterplot showing the relationship between 8th grade students' post-use and pre-use scores

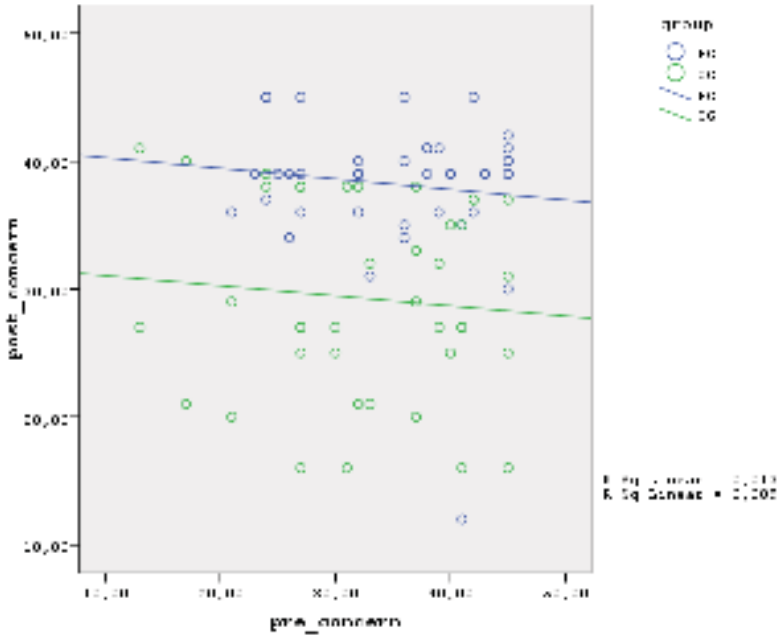

Figure 45. Scatterplot showing the relationship between 8th grade students' post-concern and pre-concern scores

- **Homogeneity of Regression Slopes**

The last assumption of ANCOVA is homogeneity of regression slopes. This assumption checks whether there is an interaction between the covariate and the dependent variable for each groups (Pallant, 2007). Having significance levels higher than .05 means that the interaction is not significant. When the interaction between the covariates and treatment groups is examined it can be observed that the assumption of homogeneity of regression slopes is not violated. Summary of analysis is represented in Table 21.

Table 21 *Test of Homogeneity of Regression Slopes for the Subcales of Pre-ELQ*

Subscales	Group	Gender
6th grade		
Environmental Knowledge	.981	.430
Environmental Attitude	.511	.621
Environmental Use	.530	.300
Environmental Concern	.157	.686
7th grade		
Environmental Knowledge	.682	.125
Environmental Attitude	.109	.357
Environmental Use	.997	.143
Environmental Concern	.720	.990
8th grade		
Environmental Knowledge	.375	.311
Environmental Attitude	.721	.890
Environmental Use	.922	.796
Environmental Concern	.761	.125

With meeting all the assumptions it is decided that using parametric tests and ANCOVA will be appropriate for the study.

5.1.2.2 Equivalency of the Control and Experimental Groups with respect to Their Environmental Literacy Levels

To determine whether the control and experimental groups are equivalent to each other with respect to their environmental literacy levels, pre-ELQ scores of students participating to control group and experimental group were compared for each subscale of the instrument. An independent sample t-test was run to determine whether there are significant mean differences between the experimental and control groups with respect to their environmental knowledge, attitude, uses and concerns scores. Since there are three grades (6th, 7th and 8th grades) included in the study, equivalency of control and experimental groups for each grade level will be investigated separately.

- *Equivalency of 6th Grade Control and Experimental Groups with respect to Subscales of ELQ*

The results revealed that there were no significant mean differences between 6th grade control and experimental groups with respect to their environmental knowledge (t = -.574, p = .567) and environmental concern (t = -1.049, p = .296) pre-test scores. The results for 6th grade experimental and control groups also showed that there were significant mean differences between groups with respect to their environmental attitude (t = 2.42, p = .017) and environmental use (t = 3.081, p = .003) pre-test scores. Table 22 represents the results of t-test analysis run for the equivalency of 6th grade control and experimental groups with respect to subscales of ELQ.

Table 22 *Results of t-test Analysis Run for the Equivalency of 6th Grade Control and Experimental Groups with respect to Subscales of ELQ*

Variable	Group	*N*	*M*	*SD*	*t*	*p*
Environmental Knowledge	EG	70	4.25	1.83	-.574	.567
	CG	47	4.46	2.11		
Environmantal Attitude	EG	70	33.78	5.82	2.42	.017
	CG	47	30.57	7.70		
Environmental Use	EG	70	66.31	10.86	3.081	.003
	CG	47	59.38	13.36		
Environmental Concern	EG	70	31.95	9.94	-1.049	.296
	CG	47	33.89	9.55		

- *Equivalency of 7th Grade Control and Experimental Groups with respect to Subscales of ELQ*

For 7th grade experimental and control groups, t-test analysis revealed that there were no significant mean differences between environmental knowledge (t = 1.965, p = .053) pre-test scores. The results also showed that there were significant mean differences between experimental and control group environmental attitude (t = 2.792, p = .006), environmental use (t = 3.196, p = .002) and environmental concern (t = 2.259, p = .026) pre-test scores. The results of analysis were shown in Table 23.

Table 23 *Results of t-test Analysis Run for the Equivalency of 7th Grade Control and Experimental Groups with respect to Subscales of ELQ*

Variable	Group	*N*	*M*	*SD*	*t*	*p*
Environmental Knowledge	EG	45	5.644	2.541	1.965	.053
	CG	73	4.780	1.902		
Environmantal Attitude	EG	45	36.733	4.983	2.792	.006
	CG	73	34.246	4.517		
Environmental Use	EG	45	73.044	8.393	3.196	.002
	CG	73	67.301	11.017		
Environmental Concern	EG	45	37.266	6.333	2.259	.026
	CG	73	34.109	8.805		

- *Equivalency of 8th Grade Control and Experimental Groups with respect to subscales of ELQ*

The results of analysis run for the equivalency of 8th grade control and experimental groups revealed that there were no significant mean differences between groups with respect to their environmental knowledge (t = 1.714, p = .09), environmental attitude (t = 1.226, p = .225) and environmental concern (t = 1.568, p = .121) pre-test scores. The results also revealed that there was a significant mean difference between two groups with respect to their environmental use (t = 2.428, p = .017) pre-test scores. The results of analysis were shown in Table 24.

Table 24 *Results of t-test Analysis Run for the Equivalency of 8th Grade Control and Experimental Groups with respect to Subscales of ELQ*

Variable	Group	*N*	*M*	*SD*	*t*	*p*
Environmental Knowledge	EG	41	6.024	1.968	1.714	.090
	CG	40	5.250	2.097		
Environmantal Attitude	EG	41	34.146	7.167	1,226	.225
	CG	40	32.550	4.205		
Environmental Use	EG	41	67.829	15.404	2.428	.017
	CG	40	60.850	9.767		
Environmental Concern	EG	41	35.365	7.601	1.568	.121
	CG	40	32.450	9.089		

5.1.2.3 Hypothesis 1

Hypothesis 1 states that there is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their knowledge about environment.

Analysis of 6th Grade Experimental and Control Groups' Scores with respect to Environmental Knowledge Subscale

To test this hypothesis, independent samples *t*-test was conducted. The results of the analysis are summarized in Table 25.

Table 25 *Results of t-test Analysis Run for the 6th Grade Students' Environmental Knowledge Scores*

Variable	Group	*N*	*M*	*SD*	*t*	*p*
Environmental Knowledge	EG	70	6.585	2.095	7.059	.000
	CG	47	3.638	2.381		

The results showed that there is a significant mean difference between mean scores of elementary school students enrolling eco-school and traditional school on their knowledge about environment ($t_{(115)} = 7.059$, $p = .000$) with a large effect size ($\eta^2 = .30$). This means that the result is both statistically and practically significant.

Results also revealed that mean of experimental group students (M = 6.585, SD = 2.095) is higher than mean of control group students (M = 3.638, SD = 2.381). Figure 46 shows the distribution of 6th grade experimental and control group students' correct responses to the knowledge questions.

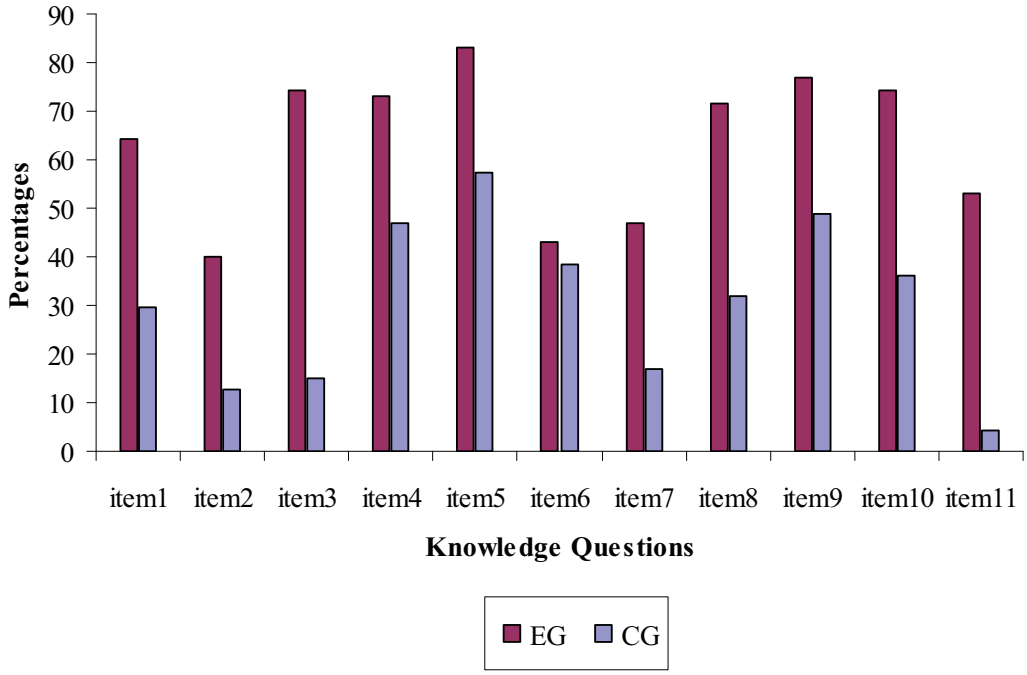

Figure 46. Proportions of 6th grade students' correct responses to the questions in environmental knowledge subscale in post-ELQ

The percentages of 6th grade experimental group students who replied the environmental knowledge questions correctly is higher than control group students for all questions. The biggest differences between the percentages of correct responses of experimental and control group students occurred in Questions 1, 3, 8, 10, 11.

Question 1 was about the definition of biodiversity. The pre-test results revealed that 37.1% of experimental group students answered this item as 'multiplicity' and 38.6% of them answered as 'biodiversity'. After the treatment, the percentage of eco-school students who gave correct answer to this item increased to 64.3. Also the percentage of students who answered this item as 'multiplicity' decreased to 27.1%. The post-test results of ELQ also revealed that 29.8% of control group students

answered this question correctly. The percentages of experimental group and control group students' responses to Question 1 are given in Table 26.

Table 26 *Frequencies and Percentages of Experimental and Control Group Students' Responses to Question 1*

There are many different kinds of animals and plants, and they live in many different environments. What is the word used to describe this idea?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	F	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Multiplicity	26	37.1	19	27.1	18	38.3	14	29.8
Biodiversity*	27	38.6	45	64.3	20	42.6	14	29.8
Socio-economics	1	1.4	2	2.9	2	4.2	6	12.8
Evolution	6	8.6	3	4.3	2	4.3	6	12.8
Don't know	10	14.3	1	1.4	5	10.6	7	14.9
Total	70	100	70	100	47	100	47	100

In question 3, students were asked about the way of electricity generation in Turkey. They are supposed to answer this question as 'by hydro electric power plants'. Analysis revealed that before the treatment 34.3% of experimental group students and 42.6% of control group students answered this item correctly. After the treatment while there was an increase in the percentage of experimental group students answering this item correctly (74.3%), a decrease occurred in the percentage of control group students answered correctly (14.9%). The percentages of experimental and control group students' responses to Question 3 are given in Table 27.

Table 27 *Frequencies and Percentages of Experimental and Control Group Students' Responses to Question 3*

How is most electricity in Turkey generated?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*F*	*P*	*f*	*P*	*f*	*P*
By burning oil, coal and wood	7	10.0	6	8.6	6	12.8	15	31.9
With nuclear power	14	20.0	6	8.6	13	27.7	12	25.5
Through solar energy	7	10.0	6	8.6	1	2.1	6	12.8
By hydro electric power plants*	24	34.3	52	74.3	20	42.6	7	14.9
Don't know	18	25.7	0	0.0	7	14.9	7	14.9
Total	70	100.0	70	100.0	47	100.0	47	100.0

Another striking result was gathered from the results of Question 8. This question was asking the primary federal agency that works to protect the environment in Turkey. In the pre-test, 55.7% of experimental group students and 44.7% of control group students answered this question correctly as 'Ministry of Environment and Forestation'. After the treatment, although the number of experimental group students replied this question correctly increased, there was a decrease in the number of control group students who answered this question correctly. In the post-test, majority (71.4%) of experimental group students replied this question correctly. According to the results of post-ELQ the percentage of correct responses in control group was 31.9%, respectively lower than experimental group. Table 28 represents the percentages of experimental and control group students' responses to Question 8.

Table 28 *Frequencies and Percentages of Experimental Group and Control Group Students' Responses to Question 8*

What is the name of the primary federal agency that works to protect the environment in Turkey?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	F	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Ministry of Environment and Forestry*	39	55.7	50	71.4	21	44.7	15	31.9
Turkish Foundation for Combating Erosion, Reforestation and the Protection of Natural Habitats	16	22.9	15	21.4	13	27.7	16	34
Nature Protection Agency	7	10	2	2.9	4	8.5	3	6.4
Turkish Environmental Education Agency	4	5.7	3	4.3	3	6.4	2	4.3
Don't know	4	5.7	0	0	6	12.8	11	23.4
Total	70	100	70	100	47	100	47	100

Question 11 was about the most common reason that an animal species becomes extinct. In the pre-test, 45.7% of experimental group students and 46.8% of control group students answered this item correctly. In the post-test, 74.3% of eco-school students stated correctly that the cause of extinction of animals is the destruction of their habitats by humans. The percentage of correct responses in the control group was only 36.2. The distribution of responses to question 11 is given in Table 29.

Table 29 *Frequencies and Percentages of 6th Grade Experimental and Control Group Students' Responses to Question 11*

What is the most common reason that an animal species becomes extinct?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*F*	*P*	*f*	*P*	*f*	*P*
Pesticides are killing them.	11	15.7	2	2.9	7	14.9	11	23.4
Their habitats are being destroyed by humans*	32	45.7	52	74.3	22	46.8	17	36.2
There is too much hunting	11	15.7	1	1.4	11	23.4	7	14.9
There are climate changes that affect them.	4	5.7	15	21.4	0	0	2	4.3
Don't know	12	17.1	0	0	7	14.9	10	21.3
Total	70	100	70	100	47	100	47	100

Analysis of 7th Grade Experimental and Control Group Students' Scores with respect to Environmental Knowledge Subscale

To test whether there is a significant mean difference between 7th grade experimental and control group students' environmental knowledge scores, independent samples t-test was conducted. The results of *t*-test analysis are represented in Table 30.

Table 30 *Results of t-test Analysis Run for the 7th Grade Students' Environmental Knowledge Scores*

Variable	Group	*N*	*M*	*SD*	*t*	*P*
Environmental Knowledge	EG	45	5.577	2.544	3.041	.003
	CG	73	4.205	2.088		

The results showed that there is a significant mean difference between experimental and control group with respect to their environmental knowledge scores ($t_{(116)} = 3.041$, $p = .003$) with medium effect size ($\eta^2 = .07$). Results also showed that between 7th grade treatment groups, experimental group students got higher

scores (M = 5.577, SD = 2.544) than control group students (M = 4.205, SD = 2.088). Figure 47 shows the distribution of experimental and control group students' correct responses to the knowledge questions.

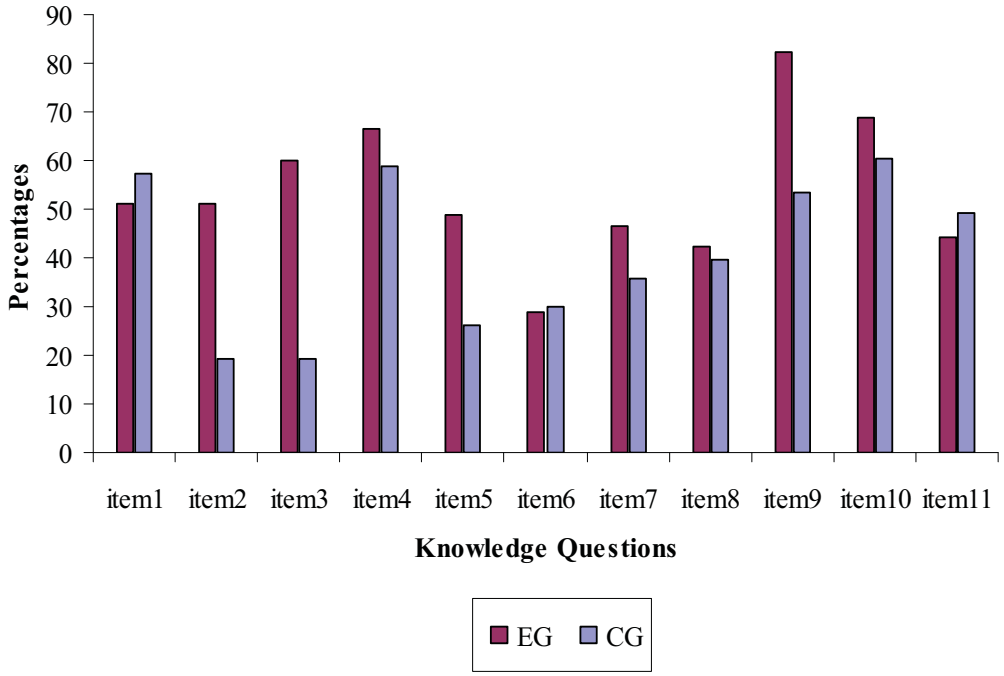

Figure 47. Proportions of 7th grade students' correct responses to the questions in environmental knowledge subscale in post-ELQ

When the Figure 47 is examined it can be observed that more of the experimental group students answered knowledge questions correctly than control group students except the questions; 1, 6 and 11. Although the difference is small, number of control group students answered these 3 items correctly is more than experimental group students.

Question 1 was about the definition of biodiversity. According to the post-test ELQ results 51.1% of experimental group, 57.5% of control group students answered this item correctly. Question 6 was about the role of ozone layer. In this question students are supposed to state that 'ozone layer protects us from harmful, cancer causing sunlight'. However, only 28.4% of experimental group students answered this item correctly in the post-test. The percentage of control group students was 30.1. The distribution of responses to Question 6 is given in Table 31.

Table 31 *Frequencies and Percentages of 7th Grade Experimental and Control Group Students' Responses to Question 6*

Ozone forms a protective layer in the earth's upper athmosphere. What does ozone protect us from?

Choices	EG				CG			
	Pre		Post		Pre		Post	
	F	*P*	*F*	*P*	*f*	*P*	*f*	*P*
Acid rain	4	8.9	10	22.2	14	19.2	13	17.8
Global warming	12	26.7	14	31.1	16	21.9	21	28.8
Sudden changes in temperature	1	2.2	0	0	3	4.1	7	9.6
Harmful, cancer causing sunlight*	19	42.2	13	28.9	26	35.6	22	30.1
Don't know	9	20	8	17.8	14	19.2	10	13.7
Total	45	100	45	100	73	100	73	100

Question 11 was about the way of disposing nuclear waste. According to the post-test results of ELQ 44.4% of experimental group students and 44.3% of control group students answered this item correctly. The percentages of students' answering this item was 20% for experimental group students and 8.2% for control group students in the pre-test ELQ. Although there is an increase in the number of students answering this item correctly in both groups, the increase is larger in control group than in experimental group. The distribution of responses to question 11 is given in Table 32.

Table 32 *Frequencies and Percentages of 7th Grade Experimental and Control Group Students' Responses to Question 11*

Scientists have not determined the best solution for disposing of nuclear waste. What is the way used for storage of nuclear waste throughout the world?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	F	*P*	*F*	*P*	*f*	*P*	*f*	*P*
Use it as nuclear fuel	10	22.2	5	11.1	21	28.8	15	20.5
Sell it to other countries	3	6.7	6	13.3	2	2.7	2	2.7
Dump it landfills	8	17.8	12	26.7	7	9.6	12	16.4
Store and monitor the waste*	9	20	20	44.4	6	8.2	8	11
Don't know	15	33.3	2	4.4	37	50.7	36	49.3
Total	45	100	45	100	73	100	73	100

Besides these three questions, more experimental group students than control group students answered questions 2, 3 and 9 correctly. Question 2 was asking the biggest source of carbon monoxide. And in the post-test the majority of eco-school students (51.1%) gave the correct answer. The proportion was 19.2 for control group students. Question 3 was about the way of electrity generation in Turkey. 60% of experimental group and 19.2% of control group students responded this item correctly in the post-test ELQ. Question 9 was asking the most hazardous household waste. In pre ELQ 73.3% of experimental group students, and 64.4% of control group students replied that batteries are the most hazardous household waste. In post ELQ the percentages changed to 82.2 for experimental group students and 53.4 for control group students. Table 33 displays the distribution of responses to Question 9.

Table 33 *Frequencies and Percentages of 7th Grade Experimental and Control Group Students' Responses to Question 9*

Which of the following household wastes is considered as a hazardous waste?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Plastic packaging	6	13.3	5	11.1	17	23.3	21	28.8
Glass	2	4.4	3	6.7	0	0	2	2.7
Batteries*	33	73.3	37	82.2	47	64.4	39	53.4
Spoiled food	3	6.7	0	0	6	8.2	8	11
Don't know	1	2.2	0	0	3	4.1	3	4.1
Total	45	100	45	100	45	100	73	100

Analysis of 8th Grade Experimental and Control Group Students' Scores with respect to Environmental Knowledge Subscale

To test whether there is a significant mean difference between 8th grade experimental and control group students' environmental knowledge scores independent samples t-test was conducted. Table 34 summarizes the results of t-test analysis run for the 8th grade students' scores for the environmental knowledge subscale.

Table 34 *Results of t-test Analysis Run for the 8th Grade Students' Environmental Knowledge Scores*

Variable	Group	*N*	*M*	*SD*	*t*	*P*
Environmental Knowledge	EG	41	7.853	1.236	9.443	.000
	CG	40	4.100	2.216		

The results showed that there is a significant mean difference between 8th grade experimental and control group with respect to their environmental knowledge scores in favor of experimental group ($t_{(79)} = 9.443$, $p = .000$) with large effect size

(η^2 = .53). The results also showed that eco-school students (*M* = 7.853, *SD* = 1.236) scored more than traditional school students (*M* = 4.100, *SD* = 2.216).

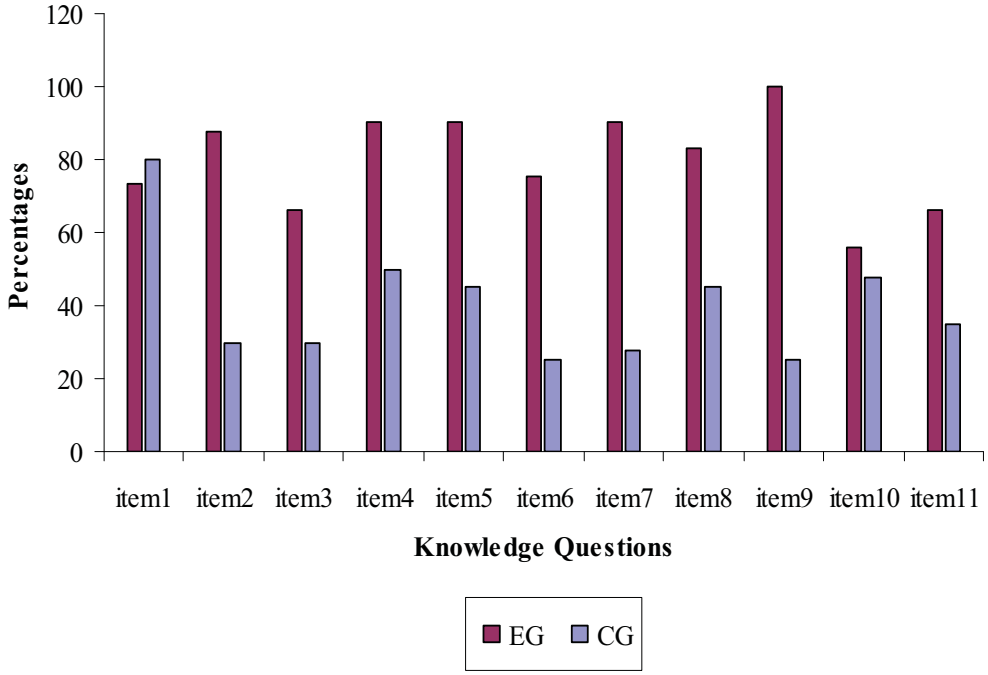

Figure 48. Proportions of 8th grade students' correct responses to the questions in environmental knowledge subscale in post-ELQ

As seen in Figure 48, 8th grade eco-school students scored higher than control group students in knowledge questions except question4. This item was about the definition of biodiversity and 73.2% of experimental group students and 80% of control group students answered this item correctly in the post-ELQ. Besides question4, the difference between the percentages of experimental group and control group students' correct responses was striking for questions 2, 5, 6, 7 and 9.

Question2 was asking the largest source of carbon monoxide. The pre-test results of ELQ revealed that 4.9% of experimental group students and 5% of control group students answered this question as motor vehicles. In the pre-test 95.1% of experimental students and 85.0% of control group students replied that factories and businesses are the major contributor of carbon monoxide. The proportions changed

in the post-test ELQ. According to results of the post-test ELQ scores 87.8% of experimental group replied that motor vehicles are the largest contributor of carbon monoxide. In control group, 30% of students also answered this question correctly. Although the percentages for both groups increased, increase in the experimental group was higher in experimental group. The distribution of responses to Question 2 is given in Table 35.

Table 35 *Frequencies and Percentages of 8th Grade Experimental and Control Group Students' Responses to Question 2*

Carbon monoxide is a major contributor to air pollution. Which of the following is the biggest source of carbon monoxide?

Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*F*	*P*	*f*	*P*	*f*	*P*
Factories and businesses	39	95.1	4	9.8	34	85	23	57.5
People breathing	0	0	0	0	2	5	2	5
Motor vehicles*	2	4.9	36	87.8	2	5	12	30
Trees	0	0	1	2.4	2	5	1	2.5
Don't know	0	0	0	0	0	0	2	5
Total	41	100	41	100	40	100	40	100

Striking differences between experimental and control group also observed in Question 5. This question was focusing on the renewable resources. Majority of students from both groups (73.2% of experimental group and 65.0% of experimental group) represented trees as renewable resources in the pre-test. Although the number of students answering this item in the post-test increased in experimental group, it is decreased in control group. Table 36 represents the frequencies and percentages of students' responses enrolling both groups.

Table 36 Frequencies and Percentages of 8th Grade Experimental and Control Group Students' Responses to Question 5

Which of the following is a renewable resource?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*F*	*P*	*f*	*P*	*f*	*P*
Oil	1	2.4	0	0	4	10	6	15
Iron ore	2	4.9	2	4.9	4	10	3	7.5
Trees*	30	73.2	37	90.2	26	65	18	45
Coal	3	7.3	2	4.9	2	5	1	2.5
Don't know	5	12.2	0	0	4	10	12	30
Total	41	100	41	100	40	100	40	100

Question 6 was assessing students' knowledge about the role of ozone layer. According to the results of post ELQ 75.6% of experimental group students answered this item correctly. The decrease in the percentage of students answering this item was striking in the control group. Although 70% of control group students gave the correct answer in pre ELQ, only 25% of them gave correct answer in post-ELQ. The distribution of responses to Question 6 is given in Table 37.

Table 37 *Frequencies and Percentages of 8th Grade Experimental and Control Group Students' Responses to Question 6*

Ozone forms a protective layer in the Earth's upper athmosphere. What does ozone protect us from?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*F*	*P*	*f*	*P*	*f*	*P*
Acid rain	2	4.9	1	2.4	2	5	11	27.5
Global warming	12	29.3	6	14.6	4	10	13	32.5
Sudden changes in temperature	1	2.4	3	7.3	0	0	2	5
Harmful, cancer causing sunlight*	25	61	31	75.6	28	70	10	25
Don't know	1	2.4	0	0	6	15	4	10
Total	41	100	41	100	41	100	40	100

Question 7 was asking the place where the garbage ends up in Turkey. Both the percentages of control group and experimental group students answering this item correctly increased in post test. However, increase in the experimental group is much higher than control group. The distribution of responses to Question 7 is given in Table 38.

Table 38 *Frequencies and Percentages of 8th Grade Experimental and Control Group Students' Responses to Question 7*

Where does most of the garbage ends up in Turkey?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Seas	15	36.6	1	2.4	18	45	13	32.5
Incinerators	2	4.9	2	4.9	4	10	1	2.5
Recycling centers	3	7.3	1	2.4	10	25	13	32.5
Landfills*	19	46.3	37	90.2	4	10	11	27.5
Don't know	2	4.9	0	0	4	10	2	5
Total	41	100	41	100	40	100	40	100

The most striking result is obtained in Question 9. All the students enrolling to eco-school answered this item correctly in the post-test. In control group, although 65% of students gave correct answer in the pre-test, the percentage of correct answers decreased to 25.0% in the post-test. The distribution of responses to Question 9 is given in Table 39.

Table 39 *Frequencies and Percentages of 8th Grade Experimental and Control Group Students' Responses to Question 9*

Which of the following household wastes is considered as a hazardous waste?								
Choices	EG				CG			
	Pre		Post		Pre		Post	
	F	*P*	*F*	*P*	*F*	*P*	*f*	*P*
Plastic packaging	10	24.4	0	0	10	25	14	35
Glass	2	4.9	0	0	0	0	6	15
Batteries*	24	58.5	41	100	26	65	10	25
Spoiled food	3	7.3	0	0	4	10	8	20
Don't know	2	4.9	0	0	0	0	2	5
Total	41	100	41	100	40	100	40	100

5.1.2.4 Hypothesis 2

This hypothesis states that there is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their attitudes toward environment.

Analysis of 6th Grade Experimental and Control Group Students' Scores with respect to Attitudes toward Environment Subscale

To answer the question posed by hypothesis 2 analysis of covariance (ANCOVA) was run taking the pre-ELQ scores for attitude subscale as covariate. The ANCOVA results revealed that there is a significant mean difference between 6th grade experimental and control group students with respect to their attitudes toward environment subscale ($F(1,114) = 13.597$, $p = .000$) with a large effect size (partial $\eta 2 = .107$). For this subscale, experimental group students got higher scores ($M = 32.614$, $SD = 4.79$) than control group ($M = 27.148$, $SD = 8.88$). This means that, the treatment groups differ from each other statistically and the actual difference in the mean values is large practically. Table 40 represents the results of analysis for 6th grade students.

Table 40 *ANCOVA Summary for 6th Grade Students' Environmental Attitude Scores*

Source	*SS*	*Df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EA scores)	284.517	1	284.517	6.571	.012	.054
Group	588.749	1	588.749	13.597	.000	.107
Group*EA pretest scores	14.463	1	14.463	.332	.566	
Error	4936.026	114	43.298			
Total	114321	117				

Analysis of 7th Grade Experimental and Control Group Students' Scores with respect to Attitudes toward Environment Subscale

To answer the question posed by hypothesis 2 analysis of covariance (ANCOVA) was run taking the pre-ELQ scores for attitude subscale as covariate. Results showed that there is no significant mean difference between 7th grade treatment groups with respect to their attitudes toward environment ($F(1,115) = 34.023$, $p = .344$). Results of the analysis are summarized in Table 41.

Table 41 *ANCOVA Summary for 7th Grade Students' Environmental Attitude Scores*

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (Pre-EA scores)	3.869	1	3.869	.103	.749	.001
Group	34.023	1	34.023	.902	.344	.008
Group* EA pretest scores	79342	1	79.342	2.125	.148	.018
Error	4335.969	115	37.704			
Total	131765	118				

Analysis of 8th Grade Experimental and Control Group Students' Scores with respect to Attitudes toward Environment Subscale

To test whether there is a significant mean difference between 8th grade experimental group and control group students with respect to their attitudes toward environment the post-test scores, independent samples *t*-test was conducted.

Results revealed that there is a significant mean difference between groups in favor of experimental group ($t_{(79)} = 8.096$, $p = .000$) with large effect size ($\eta^2 = .45$). After the application, eco-school students ($M = 36.585$, $SD = 3.701$) had higher attitudes toward environment than traditional school students ($M = 26.700$, $SD = 6.801$). The results of *t*-test analysis are represented in Table 42.

Table 42 *Results of t-test Analysis Run for 8th Grade Students' Environmental Attitudes*

Variable	Group	*N*	*M*	*SD*	*t*	*p*
Environmental Attitude	EG	41	36.585	3.701	8.096	.000
	CG	40	26.700	6.801		

5.1.2.5 Hypothesis 3

The null hypothesis 3 states that there is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their environmental uses.

Analysis of 6th Grade Experimental and Control Group Students' Scores with respect to Environmental Use Subscale

To analyze whether there is a significant mean difference between 6th grade students enrolling two different treatment groups, with respect to their environmental use scores, ANCOVA was run. The results of ANCOVA are summarized in Table 43.

Table 43 *ANCOVA Summary for 6th Grade Students' Environmental Use Scores*

Source	*SS*	*Df*	*MS*	*F*	*P*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	998.688	1	998.688	7.289	.008	.060
Group	6328.956	1	6328.956	46.195	.000	.288
Group*pre-EU Scores	41.342	1	41.342	.300	.585	.003
Error	15618.707	114	137.006			
Total	495749	117				

Results of ANCOVA analysis revealed that there is a significant mean difference between 6th grade treatment groups with respect to their environmental use scores ($F(1,114) = 46.195$, $p = .000$) with a large effect size ($\eta^2 = .28$). Results also investigated that experimental group students got higher scores ($M = 70.385$, $SD = 9.507$) than control group students ($M = 53.063$, $SD = 15.022$).

Analysis of 7th Grade Experimental and Control Group Students' Scores with respect to Environmental Use Subscale

To check whether there is a significant mean difference between 7th grade students' environmental use scores ANCOVA analysis was run. The results of ANCOVA are summarized in Table 44.

Table 44 *ANCOVA Summary for 7th Grade Students' Environmental Use Scores*

Source	*SS*	*Df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	15.760	1	15.760	.169	.681	.001
Group	961.123	1	961.123	10.325	.002	.082
Group*pre-EU Scores	6.677	1	6.677	.071	.790	.001
Error	10704.715	115	93.084			
Total	461072	118				

ANCOVA analysis revealed that there is a significant mean difference between 7th grade treatment groups with respect to their environmental use scores ($F(1,115) = 10.325$, $p = .002$) with a medium effect size ($\eta 2 = .082$). The mean difference between 7th grade treatment groups is both statistically and practically significant. In environmental use subscale, experimental group students got higher scores ($M = 63.355$, $SD = 7.997$) than control group students ($M = 59.465$, $SD = 10.478$).

Analysis of 8th Grade Experimental and Control Group Students' Scores with respect to Environmental Use Subscale

A one-way analysis of covariance was conducted to compare the effectiveness of two treatments. The results of ANCOVA are summarized in Table 45.

Table 45 *ANCOVA Summary for 8th Grade Students' Environmental Use Scores*

Source	*SS*	*Df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	9.317	1	9.317	.078	.781	.001
Group	12845.187	1	12845.187	106.934	.000	.578
Group*pre-EU Scores	20.504	1	20.504	.169	.682	.002
Error	9369.558	78	120.123			
Total	306603	81				

According to ANCOVA analysis, it can be concluded that there is a significant mean difference between eco-school application and traditional school application with respect to their environmental use scores ($F(1,78) = 106.934$, $p = .000$), with a large effect size ($\eta^2 = .578$). The difference found between treatment groups is both statistically and practically significant. Experimental group students got higher scores ($M = 71.975$, $SD = 3.778$) than control group students ($M = 46.050$, $SD = 15.028$).

5.1.2.6 Hypothesis 4

This hypothesis states that there is no significant mean difference between the post-test mean scores of elementary school students enrolling eco-school and traditional school on their environmental concerns.

Analysis of 6th Grade Experimental and Control Group Students' Scores with respect to Environmental Concern Subscale

To test this hypothesis for 6th grade students, independent samples t-test was conducted. The results of t-test analysis run for 6th grade students' environmental concerns are summarized in Table 46. The results of the analysis revealed that there is a significant mean difference between mean scores of students enrolling eco-school application and students enrolling traditional school ($t(115) = 2.189$, $p = .031$) with small effect size ($\eta 2 = .04$). Eco-school students' ($M = 32.257$, $SD = 9.690$) environmental concerns is more than traditional school students' environmental concerns ($M = 27.914$, $SD = 11.648$).

Table 46 *Results of t-test Analysis Run for 6th Grade Students' Environmental Concerns*

Variable	Group	*N*	*M*	*SD*	*t*	*P*
Environmental Concerns	EG	70	32.257	9.690	2.189	.031
	CG	47	27.914	11.648		

Analysis of 7th Grade Experimental and Control Group Students' Scores with respect to Environmental Concern Subscale

A one-way analysis of covariance is conducted to compare the effectiveness of treatments on 7th grade students' environmental concerns. Results of ANCOVA are summarized in Table47. Results of analysis revealed that there are no significant differences between treatment groups with respect to their environmental concern scores ($F(1,115) = 2.308$, $p = .131$). Table 47 summarizes the ANCOVA results run for the effects of treatments on 7th grade students' environmental concerns.

Table 47 *ANCOVA Summary for 7th Grade Students' Environmental Concern Scores*

Source	*SS*	*Df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EC Scores)	491.500	1	491.500	6.602	.011	.054
Group	171.843	1	171.843	2.308	.131	.020
Group*pre-EC Scores	14.903	1	14.903	.199	.657	.001
Error	8561.688	115	74.449			
Total	124776	118				

Analysis of 8th Grade Experimental and Control Group Students' Scores with respect to Environmental Concern Subscale

To compare the effects of treatments on 8th grade students' environmental concerns, independent samples t-test was run. Results of analysis showed that there is a significant mean difference between eco-school applications and traditional school application with respect to their effects on 8th grade students' environmental concerns ($t(79) = 6.026$, $p = .000$) with large effect size ($\eta 2 = .31$). Experimental group students ($M = 38.170$, $SD = 5.444$) have higher environmental concerns than control group students ($M = 29.275$, $SD = 7.632$). The results of the test are summarized in Table 48.

Table 48 *Results of t-test Analysis Run for 8th Grade Students' Environmental Concerns*

Variable	Group	*N*	*M*	*SD*	*t*	*P*
Environmental Concerns	EG	41	38.170	5.444	6.026	.000
	CG	40	29.275	7.632		

5.1.2.7 Hypothesis 5

Hypothesis 5 was stating that there is no significant mean difference between the post-test mean scores of boys and girls on their knowledge about environment. To test this hypothesis two-way ANCOVA was run for each grade level.

Results for 6th grades revealed that the interaction effect between group and gender was not significant ($F(1,112) = 1.838$, $p = .178$). The main effect for gender did not reach statistical significance ($F(1,112) = 1.039$, $p = .310$). This means that 6th grade males and females enrolling to experimental group and control group do not differ in terms of post-knowledge scores.

Two-way ANCOVA results for 7th grades revealed that the interaction effect between gender and group was not significant ($F(1,113) = 2.607$, $p = .109$). When the main effects are examined there was no statistically significant main effect for gender ($F(1,113) = .632$, $p = .428$). Males and females do not differ from each other with respect to their post ELQ knowledge scores.

Lastly, the analysis for 8th grade level represents that there is no significant interaction effect for gender and group ($F(1,76) = .634$, $p = .428$). Besides, the results revealed that there was a statistically significant main effect for gender ($F(1,76) = 8.737$, $p = .004$) with a large effect size ($\eta 2 = .103$). Girls get lower scores ($M = 5.94$, $SD = 2.61$) than boys ($M = 6.05$, $SD = 2.60$) from post ELQ in knowledge subscale. In Table 49 the results of the analysis are reported for each grade level.

Table 49 *ANCOVA Summary for Gender Difference on Environmental Knowledge*

Test of two-way ANCOVA analysis for 6th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EK Scores)	13.348	1	13.348	2.766	.099	.024
Group	259.067	1	259.067	53.685	.000	.324
Gender	5.013	1	5.013	1.039	.310	.009
Group*Gender	8.869	1	8.869	1.838	.178	.016
Error	540.479	112	4.826			
Total	4222	117				

Test of two-way ANCOVA analysis for 7th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EK Scores)	13.129	1	13.129	2.618	.108	.023
Group	64.870	1	64.870	12.934	.000	.103
Gender	3.169	1	3.169	.632	.428	.006
Group*Gender	13.077	1	13.077	2.607	.109	.023
Error	566.757	113	5.016			
Total	3290	118				

Test of two-way ANCOVA analysis for 8th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EK Scores)	2.582	1	2.582	.885	.350	.012
Group	288.973	1	288.973	99.004	.000	.566
Gender	25.503	1	25.503	8.737	.004	.103
Group*Gender	1.851	1	1.851	.634	.428	.008
Error	221.828	76	2.919			
Total	538	81				

5.1.2.8 Hypothesis 6

There is no significant mean difference between the post-test mean scores of boys and girls on their attitudes toward environment. A two-way ANCOVA was conducted to test the hypothesis.

Results for 6th and 7th grade represent that the interaction effect for group and gender was not significant; for sixth grade, ($F(1,112) = .418$, $p = .519$) and for seventh grade ($F(1,113) = .100$, $p = .752$). And also for these two grade levels there was not a significant main effect for gender. For grade levels 6 and 7, it can be concluded that boys and girls do not differ from each other with respect to their post ELQ attitude scores; for sixth grade, ($F(1,112) = .103$, $p = .749$) and for seventh grade ($F(1,113) = .263$, $p = .609$).

For 8th grade, the interaction effect for group and gender was not significant ($F(1,76) = .448$, $p = .505$). When the main effect of gender was examined, it is observed that there is a significant main effect for gender ($F(1,76) = 5.365$, $p = .023$) with a medium effect size ($\eta 2 = .066$). Girls get lower scores ($M = 31.66$, $SD = 7.40$) than boys ($M = 31.73$, $SD = 7.40$) from post ELQ in attitudes toward environment subscale. In Table 50 the results of the analysis are reported for each grade level.

Table 50 *ANCOVA Summary for Gender Difference on Environmental Attitudes*

Results of two-way ANCOVA analysis for 6th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-ATE Scores)	284.212	1	284.212	6.485	.012	.055
Group	535.738	1	535.738	12.224	.001	.098
Gender	4.514	1	4.514	.103	.749	.001
Group*Gender	18.303	1	18.303	.418	.519	.004
Error	4908.464	112	43.826			
Total	114321	117				

Results of two-way ANCOVA analysis for 7th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-ATE Scores)	6.528	1	6.528	.171	.680	.002
Group	25.973	1	25.973	.679	.412	.006
Gender	10.083	1	10.083	.263	.609	.002
Group*Gender	3.844	1	3.844	.100	.752	.001
Error	4324.574	113	38.721			
Total	131765	118				

Results of two-way ANCOVA analysis for 8th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-ATE Scores)	.003	1	.003	.000	.992	.000
Group	2098.923	1	2098.923	72.930	.000	.490
Gender	154.406	1	154.406	5.365	.023	.066
Group*Gender	12.893	1	12.893	.448	.505	.006
Error	2187.292	76	28.780			
Total	85746	81				

5.1.2.9 Hypothesis 7

There is no significant mean difference between the post-test mean scores of boys and girls on their environmental uses. To explore the impact of gender on environmental uses scores obtained from post-ELQ a two-way analysis of covariance was conducted.

When the results obtained from 6th grade scores are examined it is observed that the interaction effect between gender and group is not significant ($F(1,112) = .294$, $p = .589$). Besides, the main effect for gender was not statistically significant also ($F(1,112) = .635$, $p = .427$). According to results it can be concluded that boys' and girls' environmental use scores obtained from post-ELQ do not differ from each other very much.

The analysis of test results for 7th grade revealed that there is a significant interaction effect between gender and group ($F(1,113) = 7.367$, $p = .008$) with a medium effect size ($\eta 2 = .061$). This significant interaction effect suggests that boys and girls respond differently to two treatments. Girls enrolling to eco-school program showed a substantial increase in their environmental use scores. Boys, on the other hand, appeared to benefit more from the traditional school applications. Figure 49 shows the interaction effect between gender and group for 7th grade students' environmental use scores.

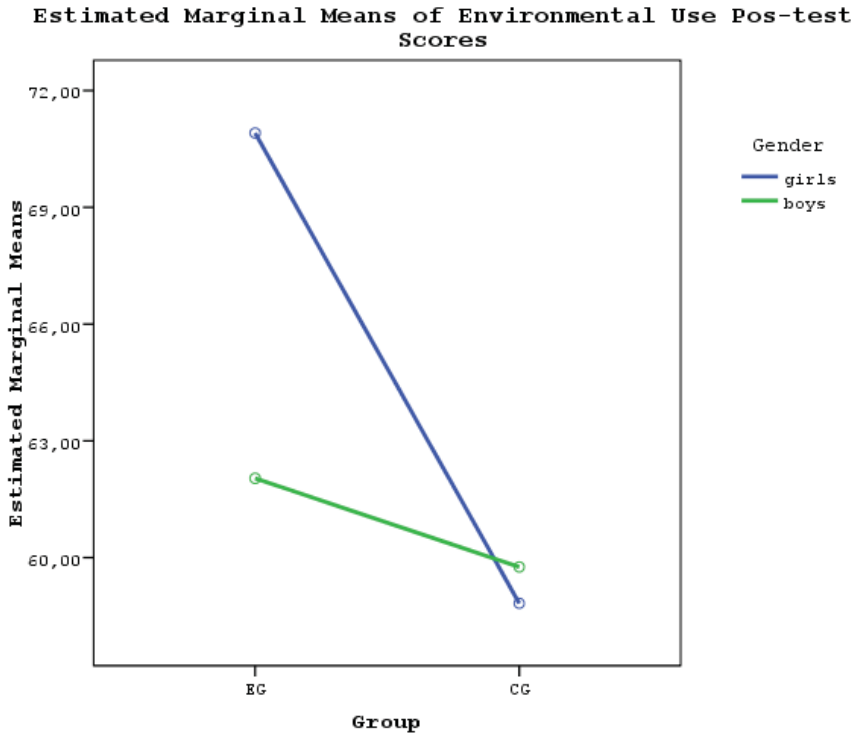

Figure 49. Interaction effect between gender and group for 7th grade students' environmental use scores.

The results obtained for 8th grade revealed that there is not an interaction between gender and group ($F(1,76) = .486$, $p = .488$). Besides, the main effect for gender was not statistically significant also ($F(1,76) = 2.028$, $p = .159$). This means that for this grade level, boys' and girls' environmental use scores obtained from post-ELQ do not differ from each other very much. The results of analysis for each grade level are represented in Table 51.

Table 51 *ANCOVA Summary for Gender Difference on Environmental Uses*

Results of two-way ANCOVA analysis for 6th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	1058.320	1	1058.320	7.643	.007	.064
Group	6260.580	1	6260.580	45.210	.000	.288
Gender	87.935	1	87.935	.635	.427	.006
Group*Gender	40.756	1	40.756	.294	.589	.003
Error	15509.480	112	138.478			
Total	495749	117				

Results of two-way ANCOVA analysis for 7th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	48.911	1	48.911	.561	.455	.005
Group	1285.135	1	1285.135	14.746	.000	.115
Gender	426.169	1	426.169	4.890	.029	.041
Group*Gender	642.090	1	642.090	7.367	.008	.061
Error	9848.248	113	87.153			
Total	461072	118				

Results of two-way ANCOVA analysis for 8th grade

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	14.320	1	14.320	.120	.730	.002
Group	12971.356	1	12971.356	1080619	.000	.588
Gender	242.144	1	242.144	2.028	.159	.026
Group*Gender	58.004	1	58.004	.486	.488	.006
Error	9075.985	76	119.421			
Total	306603	81				

5.1.2.10 Hypothesis 8

There is no significant mean difference between the post-test mean scores of boys and girls on their environmental concerns. A two-way ANCOVA was conducted to assess the effectiveness of two treatments in increasing environmental concern scores obtained from post-ELQ for male and female students.

Results obtained from 6th grade students environmental concern scores revealed that there is no significant interaction effect between gender and group ($F(1,76) = .856$, $p = .357$). When the main effect of gender was examined, it is observed that there no significant main effect for gender ($F(1,76) = .214$, $p = .644$). According to results it can be concluded that boys' and girls' environmental use scores obtained from post-ELQ do not differ from each other very much. 7th grade results showed that there is a significant interaction effect between gender and group ($F(1,113) = 8.526$, $p = .004$) with a medium effect size ($\eta^2 = .070$). Figure 50 shows the interaction effect between gender and group for 7th grade students' environmental concern scores. The figure shows that girls enrolling to eco-school program showed a substantial increase in their environmental use scores. Boys, on the other hand, appeared to benefit more from the traditional school applications.

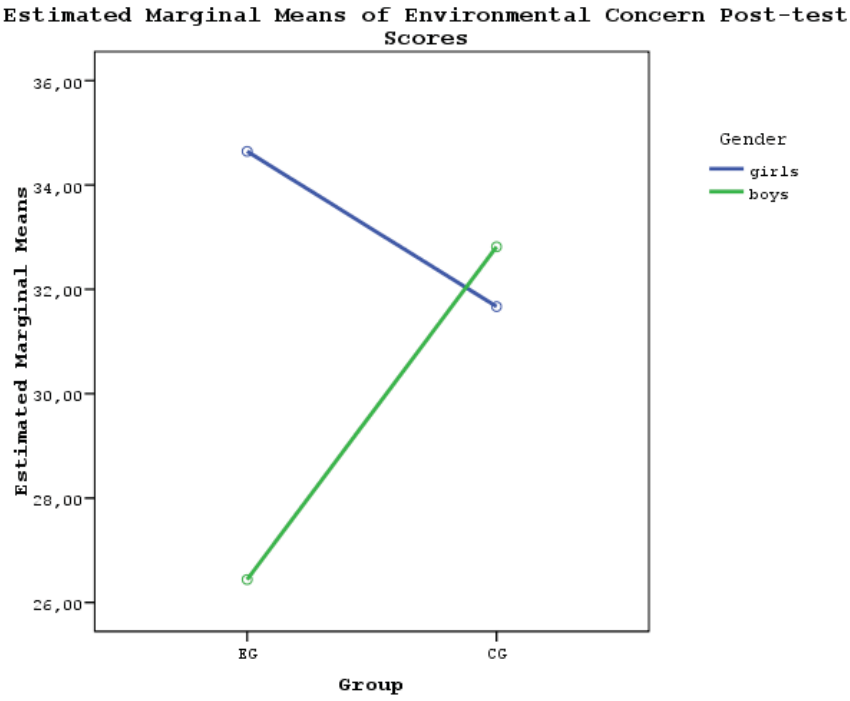

Figure 50. Interaction effect between gender and group for 7th grade students' environmental concern scores

Analysis of 8th grade environmental concern scores obtained from post-ELQ indicated that there is no significant interaction between gender and group ($F(1,76) = .052$, $p = .820$). The investigation of the main effect of gender also presented that there is no significant main effect of gender ($F(1,76) = .023$, $p = .880$). For grade level 8, it can be reported that boys and girls do not differ from each other with respect to their post environmental concern scores for two treatments. Table 52 presents the ANCOVA results for each grade level.

Table 52 *ANCOVA Summary for Gender Difference on Environmental Concern*

Results of two-way ANCOVA for 6th grade						
Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EC Scores)	316.278	1	316.278	2.886	.092	.025
Group	673.310	1	673.310	6.144	.015	.052
Gender	23.478	1	23.478	.214	.644	.002
Group*Gender	93.811	1	93.811	.856	.357	.008
Error	12274.855	112	109.597			
Total	122182	117				
Results of two-way ANCOVA for 7th grade						
Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EC Scores)	523.851	1	523.851	7.578	.007	.063
Group	75.796	1	75.796	1.096	.297	.010
Gender	336.912	1	336.912	4.874	.029	.041
Group*Gender	589.406	1	589.406	8.526	.004	.070
Error	7811.392	113	69.127			
Total	124776	118				
Results of two-way ANCOVA for 8th grade						
Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EC Scores)	36.721	1	36.721	.816	.369	.011
Group	1512.585	1	1512.585	33.62	.000	.307
Gender	1.040	1	1.040	.023	.880	.000
Group*Gender	2.337	1	2.337	.052	.820	.001
Error	3418.639	76	44.982			
Total	97476	81				

5.1.2.11 Hypothesis 9

There are no significant mean differences among students from different grade levels with respect to their environmental knowledge. To test this hypothesis two-way ANCOVA was run. The results of ANCOVA are summarized in Table 53. The analysis of the test illustrated that there is an interaction between grade level and group ($F(2,309) = 7.943$, $p = .000$) with a small effect size ($\eta^2 = .049$). This means that although the significance is small practically, students enrolling different grades respond differently to two treatments with respect to their post-environmental knowledge scores.

Table 53 *ANCOVA Summary for Grade Level Difference on Environmental Knowledge*

Results of two-way ANCOVA

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EK Scores)	.647	1	.647	.141	.707	.000
Group	528.204	1	528.204	115.362	.000	.272
Grade level	56.517	2	28.258	6.172	.002	.038
Group*Grade level	72.739	2	36.370	7.943	.000	.049
Error	1414.807	309	4.579			
Total	10966	316				

Figure 51 illustrates the interaction between grade level and group. This figure illustrates that the 6th and 8th grade students enrolling to eco-school program showed a substantial increase in their environmental knowledge scores. 7th grade students, on the other hand, seems to benefit from the traditional school applications.

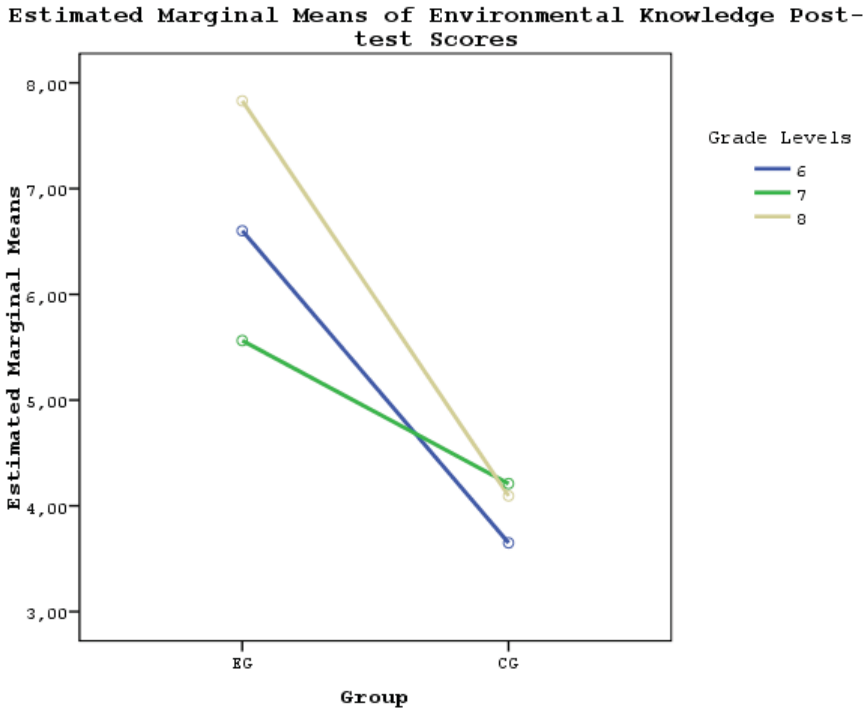

Figure 51. Interaction effect between group and grade level with respect to their post-environmental knowledge scores

5.1.2.12 Hypothesis 10

There are no significant mean differences among students from different grade levels with respect to attitudes toward environment.

Two-way ANCOVA analysis conducted for hypothesis 10 illustrated that the interaction between grade level and group is significant ($F(2,309) = 11.876$, $p = .000$) with a medium effect size ($\eta 2 = .071$). Table 54 summarizes the results of two-way ANCOVA. Figure 52 represents the interaction between grade level and group. When this figure is examined it can be concluded that while 8th grade level benefits from eco-school applications, 6th and 7th grades benefit from traditional school applications.

Table 54 *ANCOVA Summary for Grade Level Difference on Environmental Knowledge*

Results of two-way ANCOVA						
Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-ATE Scores)	171.166	1	171.166	4.505	.035	.014
Group	1944.481	1	1944.481	51.172	.000	.142
Grade level	389.146	2	194.573	5.121	.006	.032
Group*Grade level	902.571	2	451.286	11.876	.000	.071
Error	11741.567	309	37.999			
Total	15123.089	315				

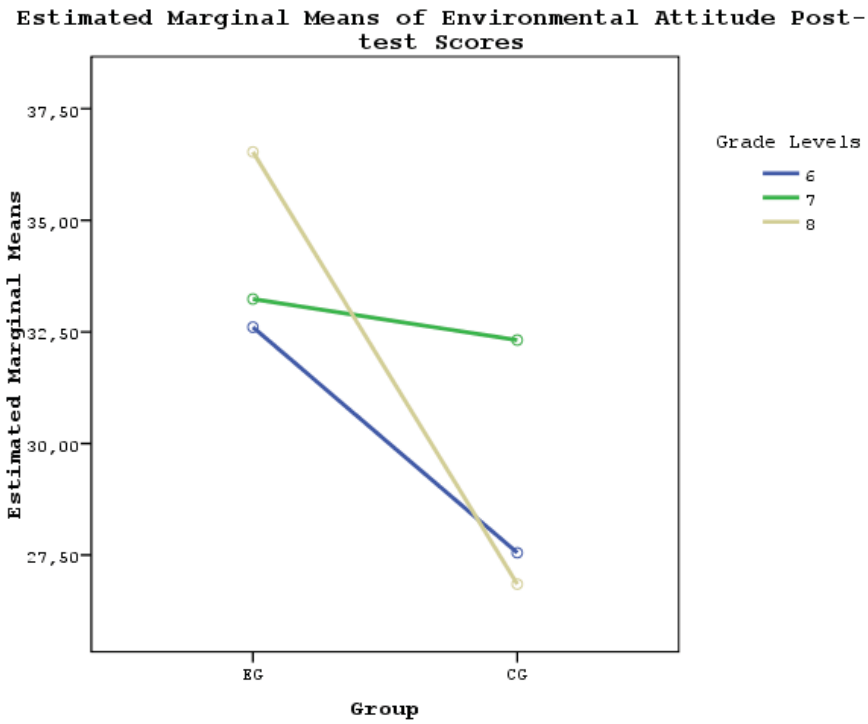

Figure 52. Interaction effect between group and grade level with respect to their post-attitudes toward environment scores

5.1.2.13 Hypothesis 11

There are no significant mean differences among students from different grade levels with respect to environmental uses. A two-way ANCOVA was conducted to assess the effectiveness of two treatments in increasing environmental uses scores obtained from post-ELQ for students from different grade levels. The results investigated that there is a significant interaction between group and grade level ($F(2,309) = 20.387$, $p = .000$) with a large effect size ($\eta^2 = .117$).

This significant interaction effect suggests that students from different grade levels respond differently to two treatments. 8th grade students enrolling to eco-school program showed a substantial increase in their environmental use scores. 7th grade students, on the other hand, appeared to benefit more from the traditional school applications. Table 55 shows the details of two-way ancova analysis and Figure 53 shows the interaction effect between group and grade level for environmental use scores.

Table 55 *ANCOVA Summary for Grade Level Difference on Environmental Uses Results of two-way ANCOVA*

Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EU Scores)	256.543	1	256.543	2.174	.141	.007
Group	17395.131	1	17395.131	147.424	.000	.323
Grade level	491.390	2	245.695	2.082	.126	.013
Group*Grade level	4811.120	2	2405.560	20.387	.000	.117
Error	36460.202	309	117.994			
Total	1263424	316				

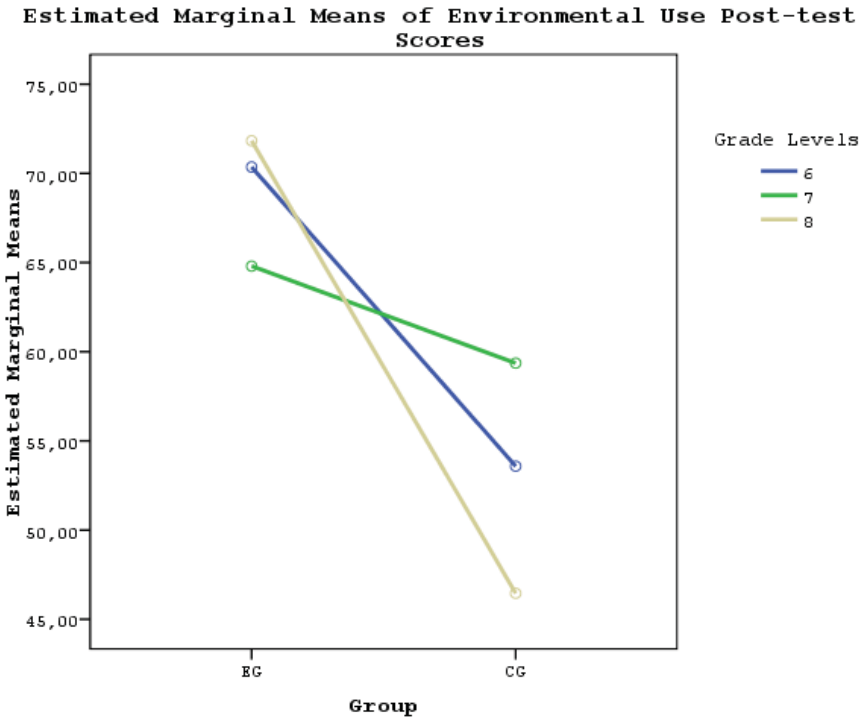

Figure 53. Interaction effect between group and grade level with respect to their post-environmental use scores

5.1.2.14 Hypothesis 12

There are no significant mean differences among students from different grade levels with respect to environmental concerns. Two-way ANCOVA analysis conducted to test hypothesis revealed that there is a significant interaction between groups and grade levels with respect to their post-environmental concern scores ($F(2,309) = 8.838$, $p = .000$). Although the interaction is small practical significance ($\eta 2 = .054$), it can be stated that while the students from 6th and 8th grade levels benefit from eco-school applications, students from7th grade benefit from traditional school applications. The results are summarized in Table 56 and the interaction between groups and grade levels are represented in Figure 54.

Table 56 *ANCOVA Summary for Grade Level Difference on Environmental Concerns*

Results of two-way ANCOVA						
Source	*SS*	*df*	*MS*	*F*	*p*	Partial Eta Squared (η^2)
Covariate (pre-EC Scores)	451.803	1	451.803	5.634	.018	.018
Group	986.997	1	986.997	12.307	.001	.038
Grade level	626.046	2	313.023	3.903	.021	.025
Group*Grade level	1417.531	2	708.765	8.838	.000	.054
Error	24780.195	309	80.195			
Total	344434	316				

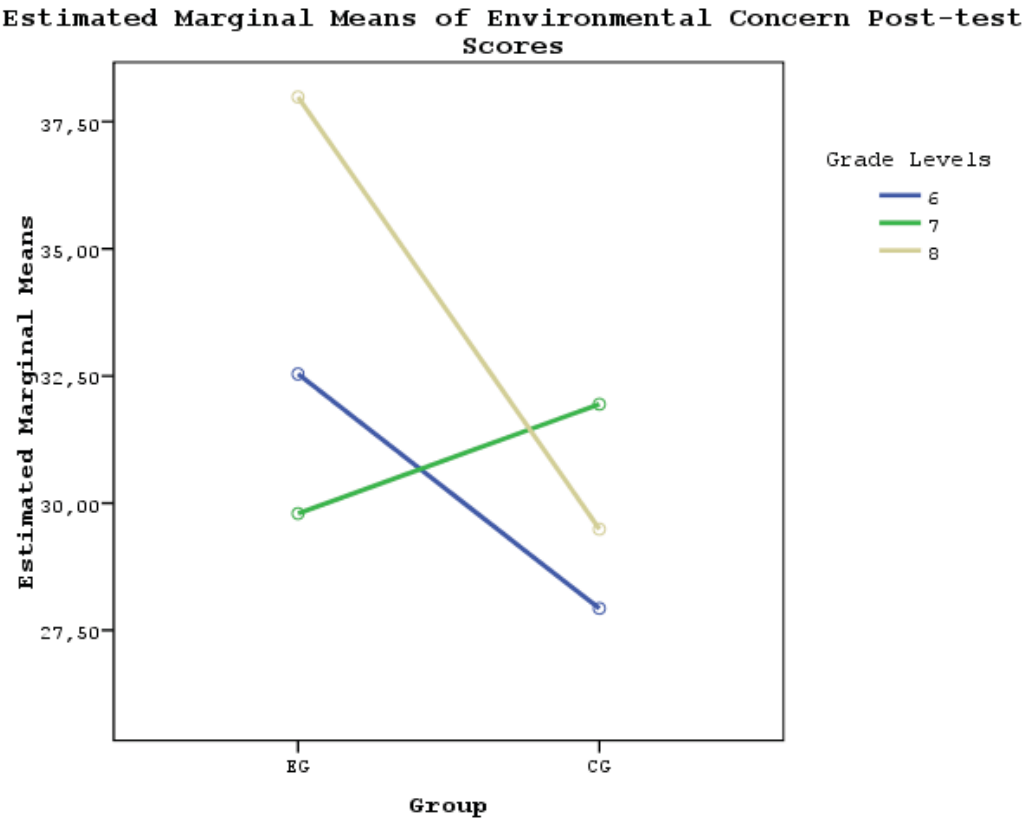

Figure 54. Interaction effect between group and grade level with respect to their post-environmentalconcern scores

5.1.3 Summary of the Quantitative Results

The quantitative results of the study can be summarized as follows:

For the environmental knowledge subscale;

- A significant mean difference was found between mean scores of 6th grade elementary school students enrolling eco-school and traditional school on their knowledge about environment ($t(115) = 7.059$, $p = .000$) with a large effect size ($\eta 2 = .30$) in the favour of experimental group.
- A significant mean difference was found between 7th grade experimental and control group with respect to their environmental knowledge scores ($t(116) = 3.041$, $p = .003$) with medium effect size ($\eta 2 = .07$) in the favour of experimental group.
- A significant mean difference was found between 8th grade experimental and control group with respect to their environmental knowledge scores in favor of experimental group ($t(79) = 9.443$, $p = .000$) with large effect size ($\eta 2 = .53$).
- For 6th grade students, the main effect for gender did not reach statistical significance ($F(1,112) = 1.039$, $p = .310$). This means that 6th grade males and females enrolling to experimental group and control group do not differ in terms of post-knowledge scores.
- For 7th grade students, the main effect for gender did not reach statistical significance ($F(1,113) = 0.632$, $p = .428$). Males and females do not differ from each other with respect to their post ELQ knowledge scores.
- The results revealed that for 8th grade students, there was a statistically significant main effect for gender ($F(1,76) = 8.737$, $p = .004$) with a large effect size ($\eta 2 = .103$). Girls get lower scores ($M = 5.94$, $SD = 2.61$) than boys ($M = 6.05$, $SD = 2.60$) from post ELQ in knowledge subscale.
- The results of the study illustrated that there is an interaction between grade level and group ($F(2,309) = 7.943$, $p = .000$) with a small effect size ($\eta 2 = .049$). This means that although the significance is small practically, students enrolling different grades respond differently to two treatments with respect to their post-environmental knowledge scores. 6th and 8th grade students enrolling to eco-school program showed a substantial

increase in their environmental knowledge scores. 7th grade students, on the other hand, seems to benefit from the traditional school applications.

For the environmental attitude subscale;

- A significant mean difference was found between 6th grade experimental and control group students with respect to their attitudes toward environment subscale ($F(1,114) = 13.597$, $p = .000$) with a large effect size ($\eta 2 = .107$) in the favour of experimental group.
- No significant mean difference was found between 7th grade treatment groups with respect to their attitudes toward environment ($F(1,115) = 34.023$, $p = .344$).
- A significant mean difference was found between 8th grade treatment groups in favor of experimental group ($t(79) = 9.443$, $p = .000$) with large effect size ($\eta 2 = .45$) in the favour of experimental group.
- Results for 6th and 7th grade represented that the interaction effect for group and gender was not significant; for sixth grade, ($F(1,112) = .418$, $p = .519$) and for seventh grade ($F(1,113) = .100$, $p = .752$). And also for these two grade levels there was not a significant main effect for gender. For grade levels 6 and 7, it can be concluded that boys and girls do not differ from each other with respect to their post ELQ attitude scores; for sixth grade, ($F(1,112) = .103$, $p = .749$) and for seventh grade ($F(1,113) = .263$, $p = .609$).
- For 8th grade, the interaction effect for group and gender was not significant ($F(1,76) = .448$, $p = .505$). When the main effect of gender was examined, it is observed that there is a significant main effect for gender ($F(1,76) = 5.365$, $p = .023$) with a medium effect size ($\eta 2 = .066$). Girls get lower scores ($M = 31.66$, $SD = 7.40$) than boys ($M = 31.73$, $SD = 7.40$) from post ELQ in attitudes toward environment subscale.
- Two-way ANCOVA analysis illustrated that the interaction between grade level and group is significant ($F(2,309) = 11.876$, $p = .000$) with a medium effect size ($\eta 2 = .071$).

For the environmental use subscale;

- No significant mean difference was found between 6th grade treatment groups with respect to their environmental use scores ($F(1,114) = 46.195$, $p = .288$).
- A significant mean difference was found between 7th grade treatment groups with respect to their environmental use scores ($F(1,115) = 10.325$, $p = .002$) with a medium effect size ($\eta 2 = .082$) in the favour of experimental group.
- A significant mean difference was found between 8th grade eco-school group and traditional school group with respect to their environmental use scores ($F(1,78) = 106.934$, $p = .000$), with a large effect size ($\eta 2 = .578$).
- When the results obtained from 6th grade scores are examined it is observed that the interaction effect between gender and group is not significant ($F(1,112) = 0.294$, $p = .589$). Besides, the main effect for gender was not statistically significant also ($F(1,112) = 0.635$, $p = .427$). According to results it can be concluded that boys' and girls' environmental use scores obtained from post-ELQ do not differ from each other very much.
- The analysis of test results for 7th grade revealed that there is a significant interaction effect between gender and group ($F(1,113) = 7.367$, $p = .008$) with a medium effect size ($\eta 2 = .061$). This significant interaction effect suggests that boys and girls respond differently to two treatments. Girls enrolling to eco-school program showed a substantial increase in their environmental use scores. Boys, on the other hand, appeared to benefit more from the traditional school applications.
- The results obtained for 8th grade reveal that there is not an interaction between gender and group ($F(1,76) = 0.486$, $p = .488$). Besides, the main effect for gender was not statistically significant also ($F(1,76) = 2.028$, $p = .159$). This means that for this grade level, boys' and girls' environmental use scores obtained from post-ELQ do not differ from each other very much.
- A two-way ANCOVA was conducted to assess the effectiveness of two treatments in increasing environmental uses scores obtained from post-ELQ for students from different grade levels. The results investigated that there is a significant interaction between group and grade level ($F(2,309) = 20.387$,

p = .000) with a large effect size (η2 = .117). This significant interaction effect suggests that students from different grade levels respond differently to two treatments. 8th grade students enrolling to eco-school program showed a substantial increase in their environmental use scores. 7th grade students, on the other hand, appeared to benefit more from the traditional school applications.

For the environmental concern subscale;

- A significant mean difference between mean scores of 6th grade students enrolling to eco-school and students enrolling to traditional school (t(115) = 2.189, p = .031) with small effect size (η2 =.04) in the favour of experimental group.
- No significant difference was found between 7th grade treatment groups with respect to their environmental concern scores (F(1,115) = 2.308, p = .131).
- A significant mean difference was found between eco-school applications and traditional school application with respect to their effects on 8th grade students' environmental concerns (t(79) = 6.026, p = .000) with large effect size (η2 = .31) in the favour of experimental group.
- When the main effect of gender for 6th grade students was examined, it is observed that there no significant main effect for gender (F(1,76) = 0.214, p = .644). According to results it can be concluded that boys' and girls' environmental use scores obtained from post-ELQ do not differ from each other very much.
- 7th grade results showed that there is a significant interaction effect between gender and group (F(1,113) = 8.526, p = .004) with a medium effect size (η2 = .070). Girls enrolling to eco-school program showed a substantial increase in their environmental use scores. Boys, on the other hand, appeared to benefit more from the traditional school applications.
- Analysis of 8th grade environmental concern scores obtained from post-ELQ indicated that there is no significant interaction between gender and group (F(1,76) = 0.052, p = .820). The investigation of the main effect of gender also presented that there is no significant main effect of gender

($F(1,76) = 0.023$, $p = .880$). For grade level 8, it can be reported that boys and girls do not differ from each other with respect to their post environmental concern scores for two treatments.

- The results revealed that there is a significant interaction between groups and grade levels with respect to their post-environmental concern scores ($F(2,309) = 8.838$, $p = .000$). Although the interaction has small practical significance ($\eta 2 = .054$), it can be stated that while the students from 6th and 8th grade levels benefit from eco-school applications, students from7th grade benefit from traditional school applications.

To more fully understand and assimilate the study results, a detailed discussion is presented in the following chapter.

5.2 Results Obtained from the Drawings of Environment

The aim of this part is to find the answers to below questions:

1. What are experimental and control group students' ideas about what defines an environment? and,
2. In what ways do elementary school students' ideas change with eco-school application?

To answer the first question, common features and their frequencies in students' drawings are drawn out. Drawings were analyzed using the content analysis procedures (Ball & Smith, 1992; Banks, 2001). First of all, a coding taxonomy focusing on individual characteristics of the drawings is developed. To do this all the drawings were analysed to find out the structures and patterns in the drawings. Data were analyzed inductively, that is, codes and categories were allowed to emerge from the data rather than determined a priori. During this procedure, each drawing is viewed as a unit.

In the pre-test drawings, through the data analysis, 59 codes emerged. Students mainly involved plants, humans, different kinds of animals, buildings such as houses and factories, abiotic elements such as mountains and rivers in their drawings. In the post-test, during the data analysis it is observed that 13 more codes

emerged. All new codes emerged from the experimental group students' drawings. Among new codes, the most interesting one is different kinds of dead animals; dead cats, dogs etc. and plants, dead flowers etc. in addition to fish and trees. Six experimental group students (3.8%) drew dead animals and plants in their post-drawings. Besides, two students (1.3%) from experimental group included ill humans in their drawings. Also, different from pre-drawings students in the experimental group included different kinds of living things such as a penguin, a duck, a panda, an octopus, a starfish and moss, in their drawings. Both in pre-drawings and in post-drawings the most frequent figure existing was 'tree'. In pre-drawings great majority of experimental group (90.1%) and control group (83.9%) students included trees in their drawings. In post-drawings 65.4% of experimental group students and 75.0% of control group students included tree in their drawings. 'Humans' are also included in some of the drawings. In pre-drawing 36.8% of EG and 30% CG, in post-drawing 22.4% of EG and 47.5% of CG students included humans in their drawings. Bird is the animal which is the most included in the drawings; in pre-drawings 9.2% of experimental group students and 10% of control group students, in post-drawings 9.4% of EG students and 3.1% of CG students drew birds in their drawings. Besides these figures, houses, mountains, clouds, flowers, sun were the mostly used by students. Table 57 represents the pre- and post-application frequencies of some codes drawn out from drawings of experimental and control group students.

Table 57 *Frequencies and Percentages of Codes Obtained from Pre- and Post-Drawings of Environment*

	Experimental Group				Control Group			
	Pre		Post		Pre		Post	
	F	*P*	*f*	*P*	*F*	*P*	*f*	*P*
Setting								
Clean	70	46.1	56	35.9	83	51.9	115	71.9
Polluted	66	43.4	85	54.5	71	44.4	45	28.1
Clean & Polluted	16	10.6	15	9.6	6	3.8	0	0.0
Human	56	36.8	35	22.4	47	29.4	76	47.5
Plants								
Tree	137	90.1	102	65.4	134	83.9	120	75.0
Flower	42	27.6	33	21.2	27	16.9	26	16.3
Grass plot	25	16.4	22	14.1	8	5.0	13	8.1
Animals								
Bird	14	9.2	13	8.3	15	9.4	5	3.1
Fish	8	5.3	12	7.7	7	4.4	9	5.6
Butterfly	5	3.3	2	1.3	5	3.1	8	5.0
Dog	2	1.3	1	0.6	3	1.9	0	0.0
Rabbit	2	1.3	0	0.0	0	0.0	0	0.0
Abiotic Elements								
Mountain	25	16.4	15	9.6	21	13.1	17	10.6
Cloud	41	27	26	16.7	24	15.0	26	16.3
Sun	48	31.6	45	28.8	43	26.9	31	19.4
River	43	28.3	16	10.3	27	16.9	33	20.6
Sea	4	2.6	11	7.1	9	5.6	2	1.3
Lake	5	3.3	18	11.5	8	5.0	7	4.4
Buildings/Cars								
House	40	26.3	25	16.0	49	30.6	16	10.0
Apartment	22	14.5	30	19.2	7	4.4	0	0.0
Factory	24	15.8	26	16.7	19	11.9	15	9.4
Car	28	18.4	27	17.3	26	16.3	4	2.5
Waste								
Smoke	48	31.6	43	27.6	37	23.1	13	8.1
Litter	30	19.7	37	23.7	25	15.6	10	6.3
Litter Bin	14	9.2	9	5.8	18	11.3	3	1.9
Industrial waste	18	11.8	25	16.0	15	9.4	12	7.5

Students either draw clean or dirty settings in their drawings. Besides, some students include both of settings usually by drawing a line separating them. These three situations emerged during the data analysis and consist of the themes; ‘views focusing on clean environment’, ‘views focusing on polluted environment’, ‘views focusing on both clean and polluted environment’. These themes are formed with

considering the quantity and quality of other features. Below emerging themes will be explained in detail with particular examples of student drawings.

Views Focusing on Clean Environment

This theme consists of drawings that show environments as clean and beautiful landscapes. These drawings mostly include trees, grass plots, flowers, single flat homes, mountains as well as lakes and rivers. Some of these drawings in this theme also include animals such as birds, rabbits and fish. Figure 55 shows a classic view of a clean environment.

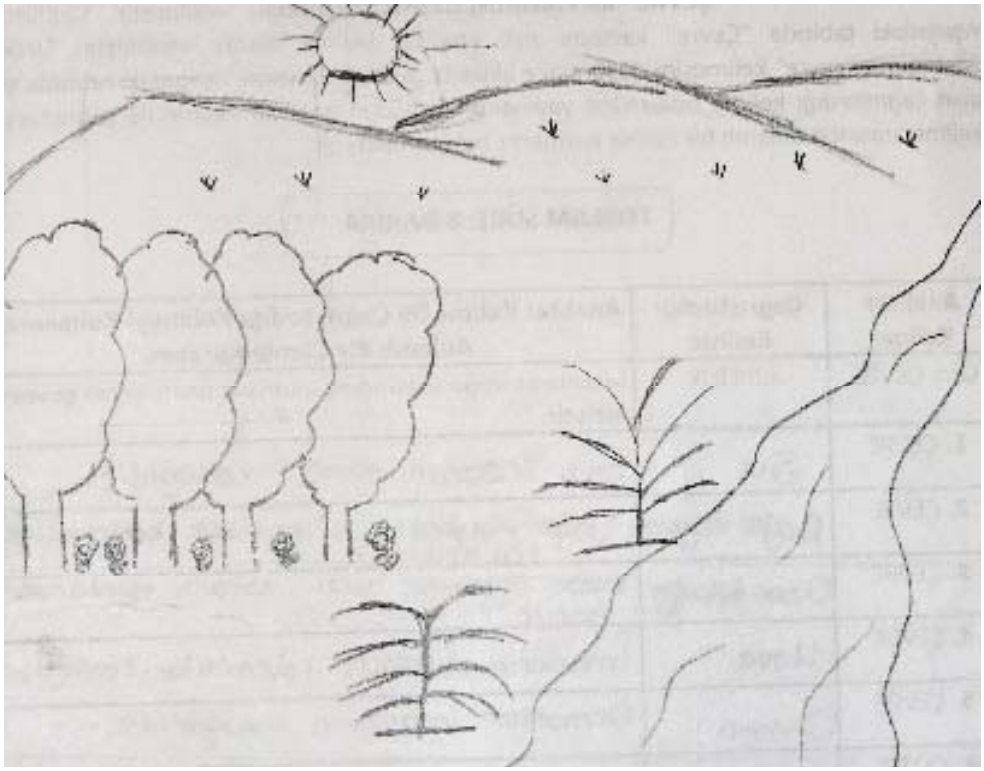

Figure 55. A classic view of a clean environment

Students usually included humans in clean environments. They usually drew happy children playing in a park or standing in such a clean environment. In this theme, students drew similing faces to the figures such as trees, clouds, homes and sun. There follows some of the drawings in the themes of the clean environment (see Figure 56, Figure 57 and Figure 58).

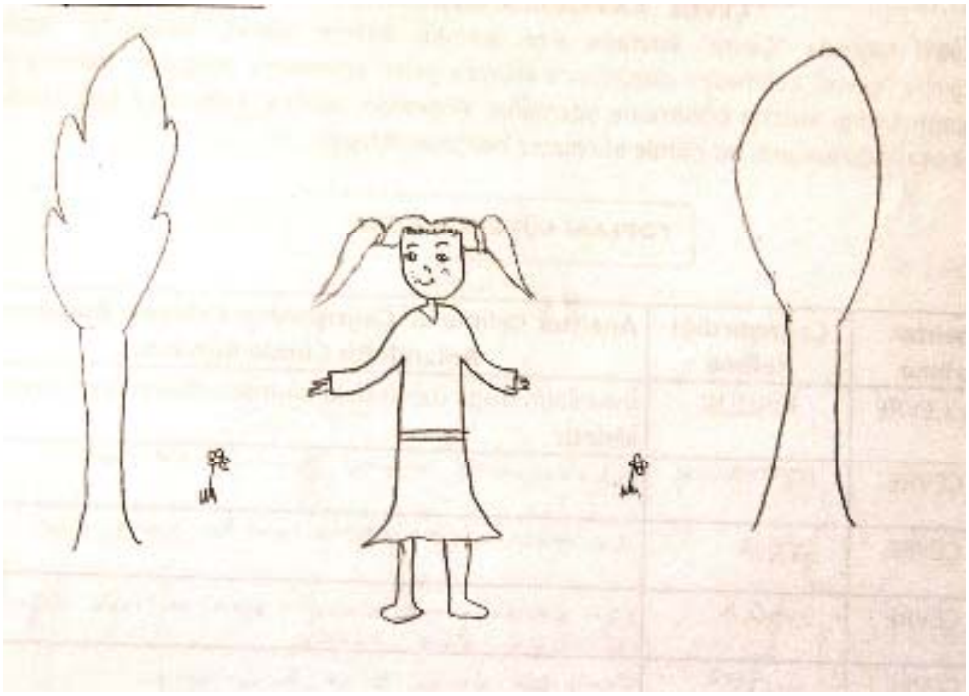

Figure 56. A happy girl standing in a clean environment

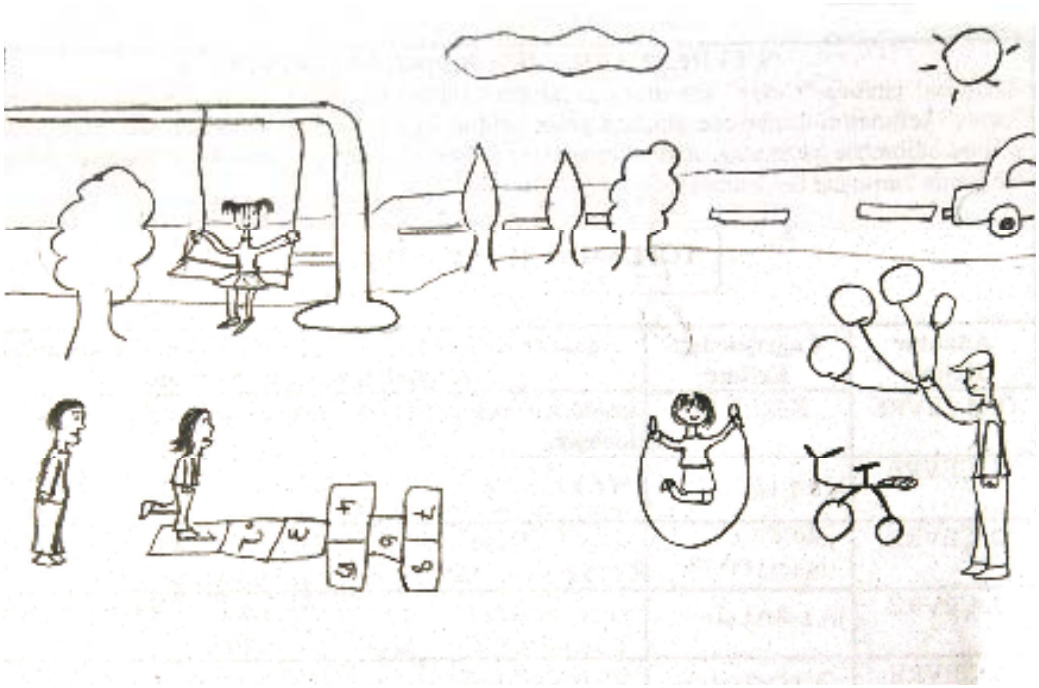

Figure 57. Children playing in a clean environment

Figure 58. Figures with facial expressions

In this theme, students preferred not to include any kind of wastes; they drew a clean air, a shining sun, clean rivers etc. Factories do not appear in this kind of drawings. Houses are rarely shown with smokes coming from their chimneys and cars appear in some with exhaust smoke and but this seems to be done to be sign of life, not for representing an air pollution. Even students did not draw chimneys for the house drawings in this theme. Figure 59 shows a house and Figure 60 shows a car in a clean environment.

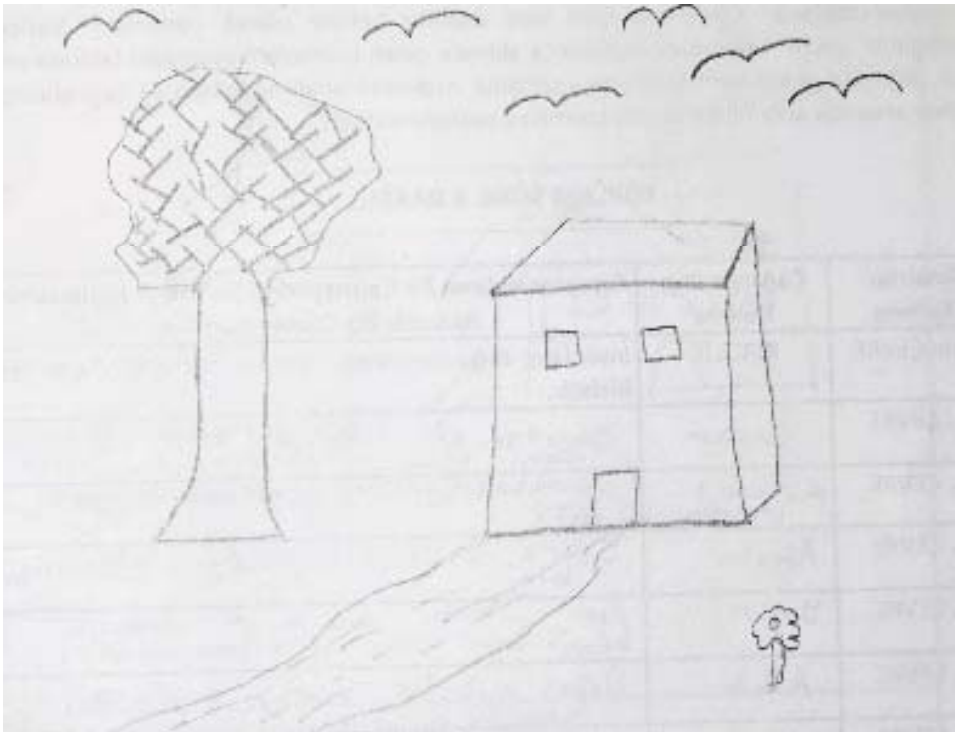

Figure 59. A house without a chimney

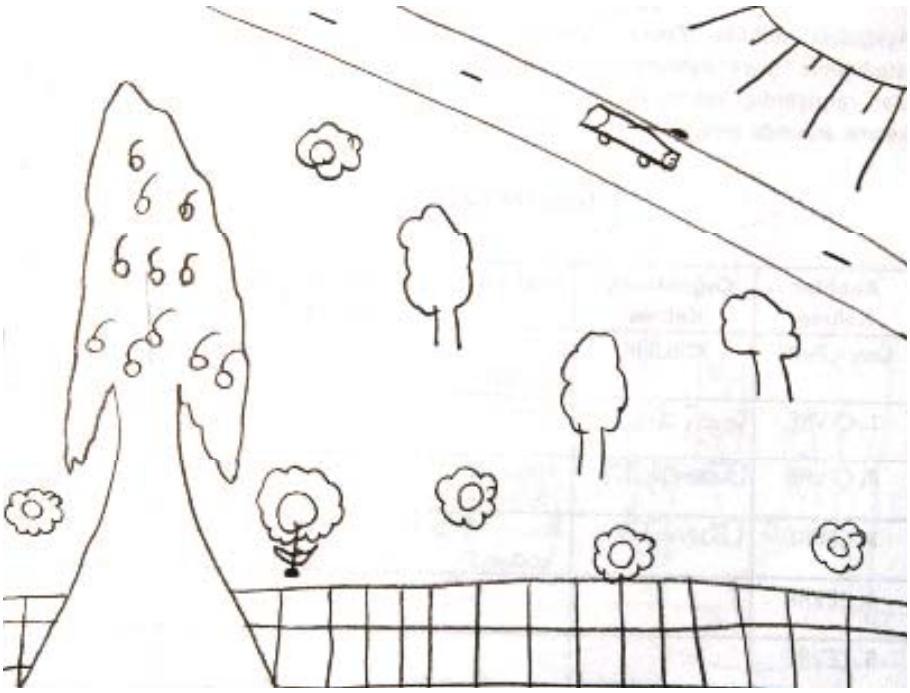

Figure 60. A car in a clean environment

Before the application 70 students from experimental group; that is 46.1% of the group, drew views focusing on the good world. Besides, 93 (58.1%) students from control group drew views focusing on the good world. After the application the number of students drawing a clean environment decreased to 56 (35.9%) in experimental group. However, in control group there was a striking increase in the number of students drawing a clean environment. One hundred and fifteen; that is 71.9% of control group students included a clean environment in their post-drawings.

Views Focusing on Polluted Environment

The drawings in this theme mainly show various kinds of environmental destruction, such as air pollution, water pollution, and deforestration. In this theme, students mainly included smoke coming from cars and factories, industrial wastes, litter spread over lands, seas and rivers. Figure 61 represents a drawing focusing on water pollution and Figure 62 shows a drawing focusing on air pollution.

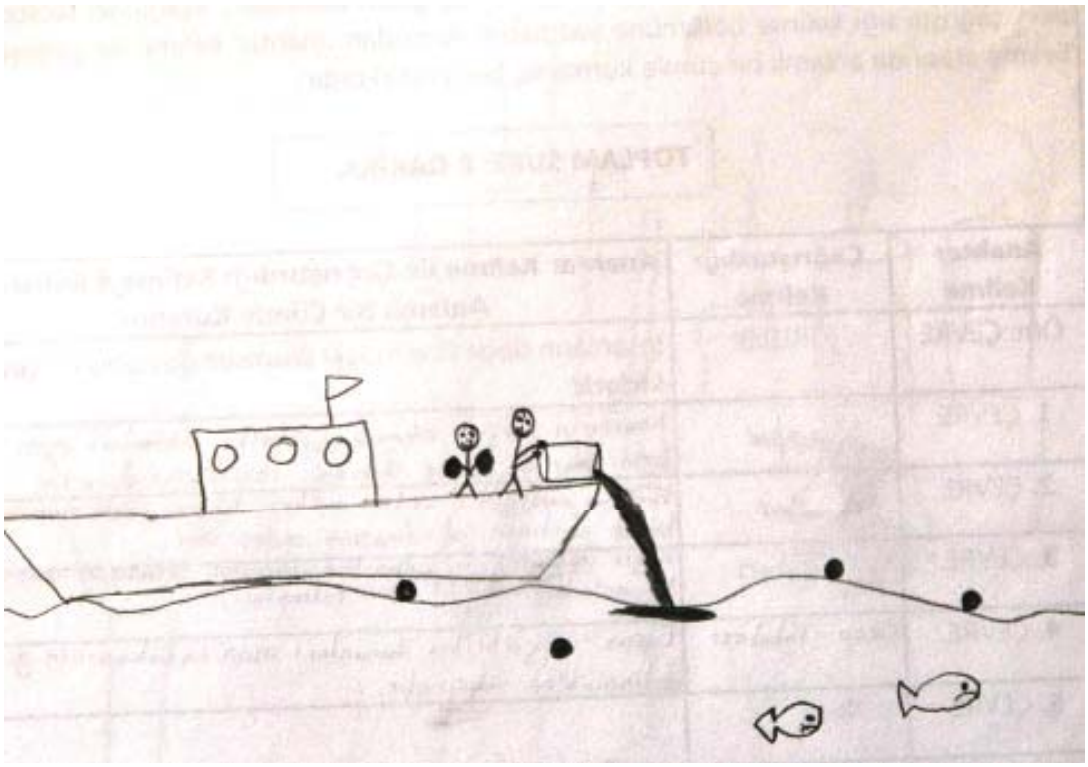

Figure 61. A drawing showing water pollution

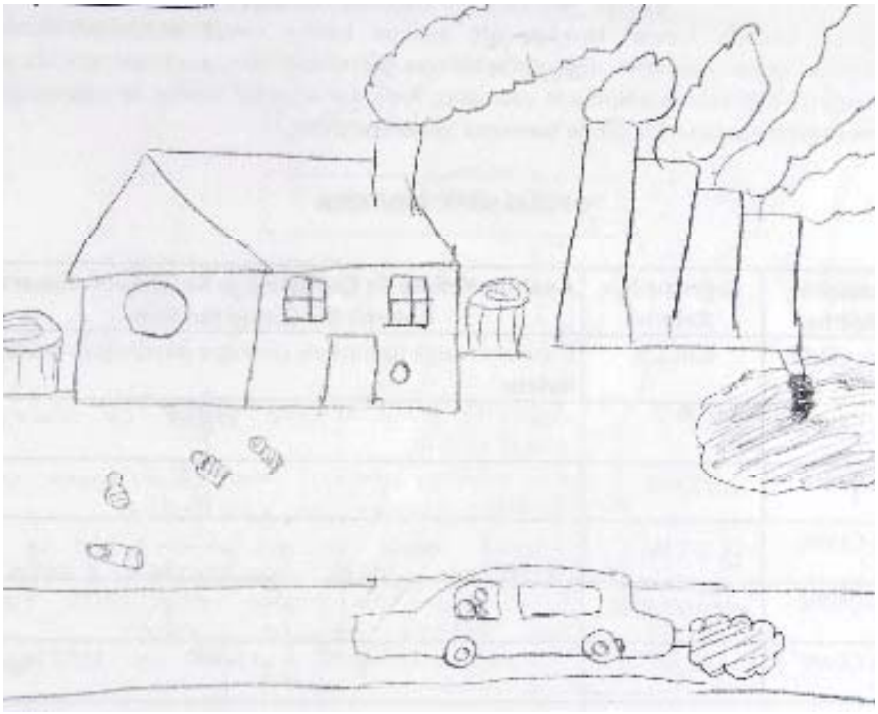

Figure 62. A drawing showing air pollution

They preferred to draw apartments instead of single flat houses with smoke coming from their chimneys (see Figure 63).

Figure 63. A drawing of a house and a car in a polluted environment

Students also used facial expressions within this theme, but this time they drew unhappy trees, clouds, suns etc. Figure 64 shows an example of a tree having a facial expression.

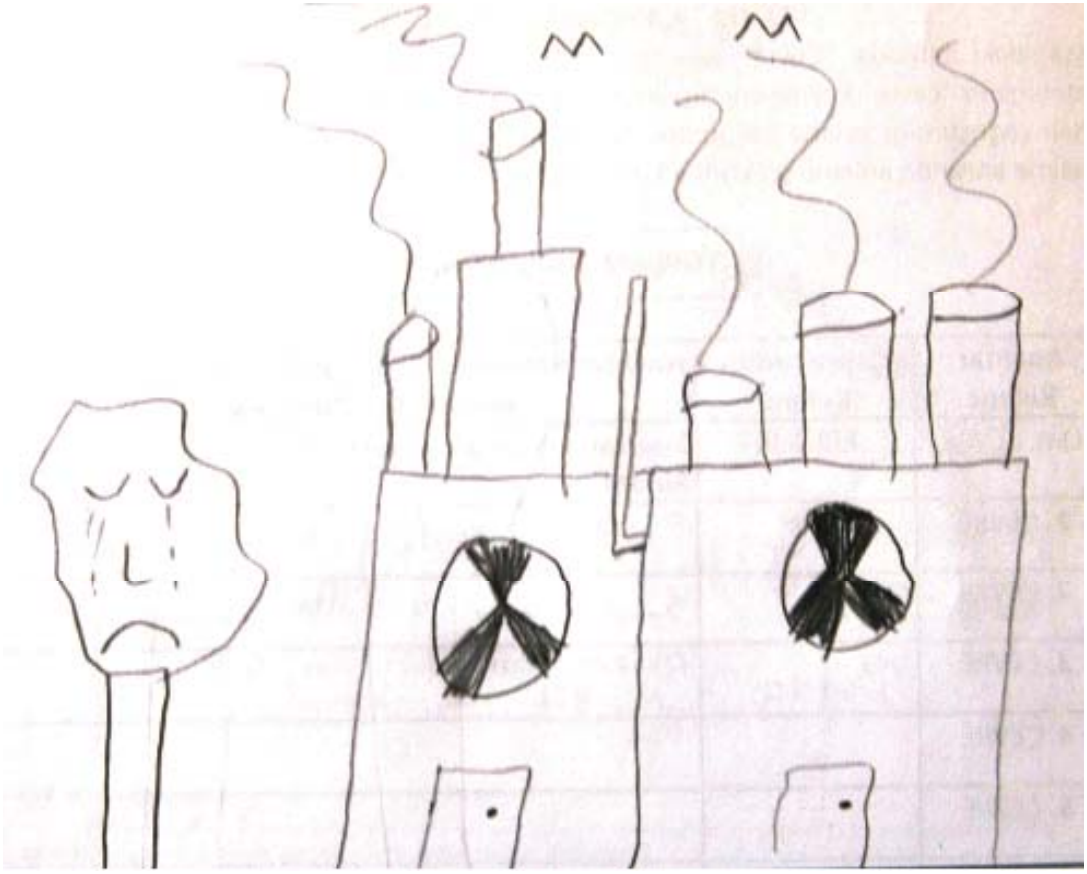

Figure 64. A drawing of a tree in a polluted environment with a facial expression

Students draw dead fish in seas and rivers. Also they represented trees as cut or dead (see Figure 65). Humans are also a part of the drawings included in this theme. This time, humans are viewed as they are standing in a dirty environment, cutting trees, polluting the environment or sometimes cleaning a polluted environment (see Figure 66). It seems students think that human based activities and factories are the major reasons of environmental pollution.

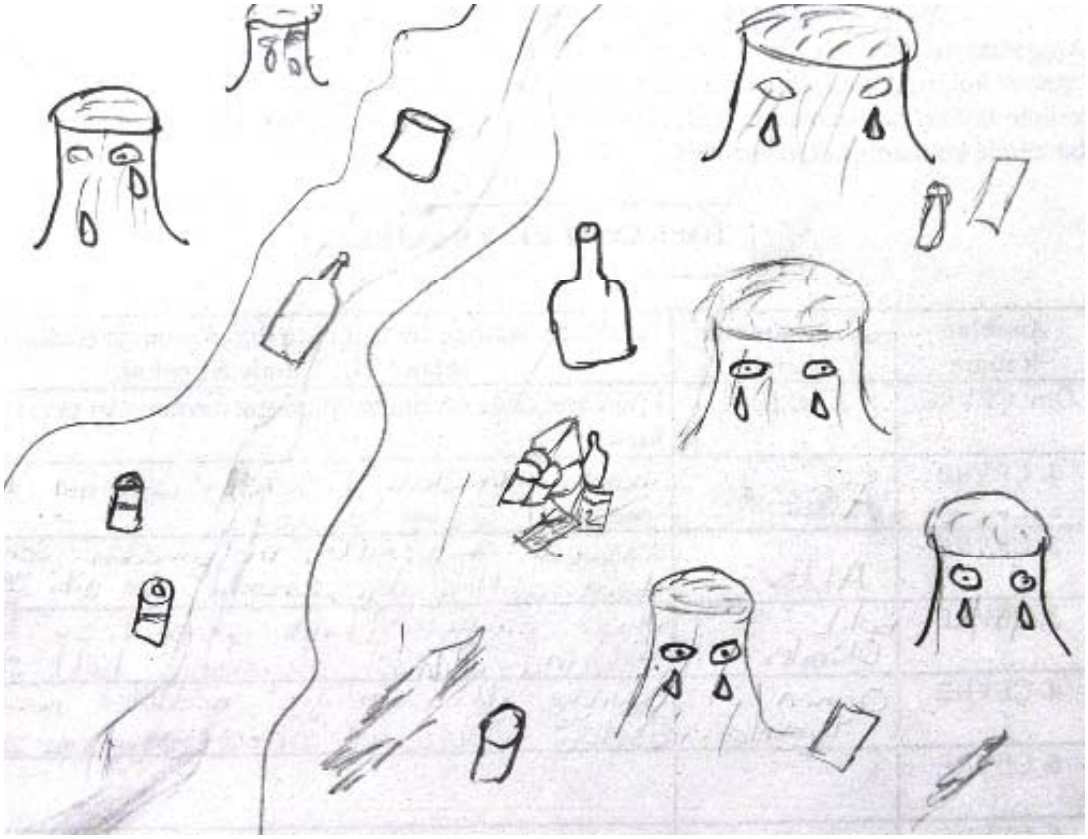

Figure 65. Drawing representing that trees are cut

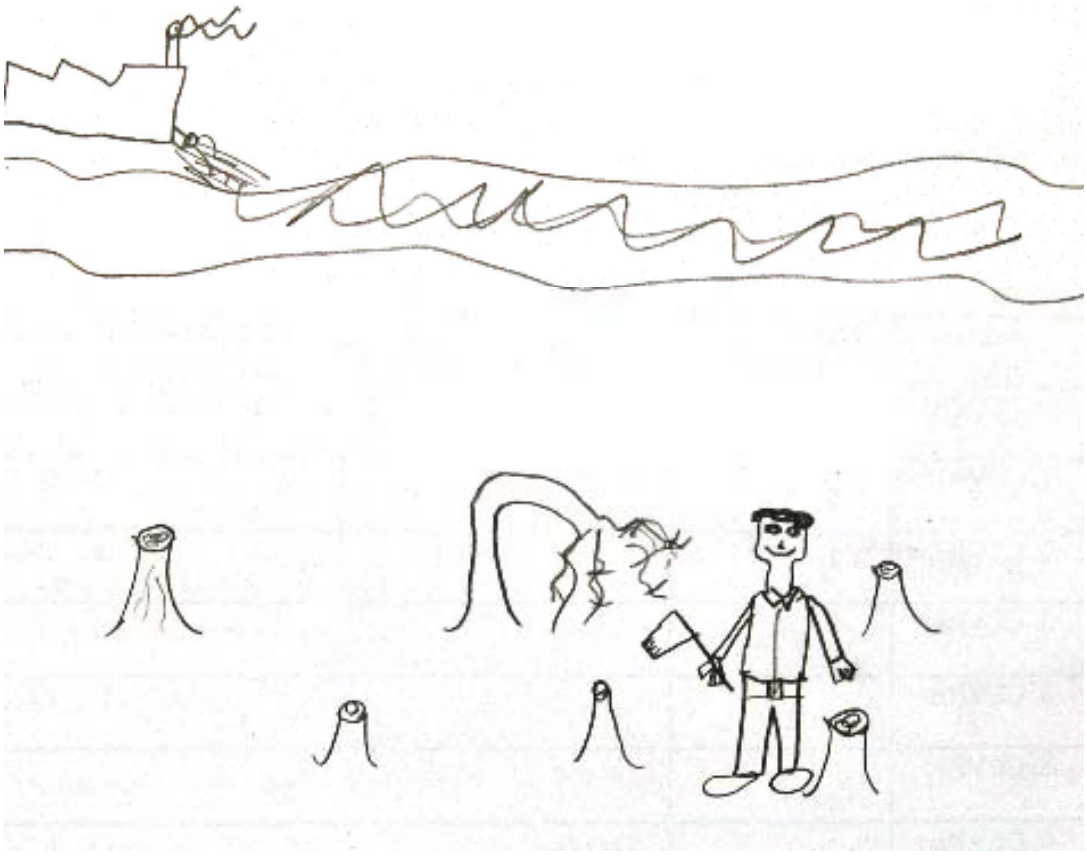

Figure 66. Drawing showing a man cutting trees

Before the application the percentages of experimental group students depicting views focusing on polluted environment was 43.4. This means that 66 students' from experimental group drawings belong to this theme. Besides, 61 students from control group, 43.4%, drew pictures which belong to this theme. In post-drawings a striking increase observed in experimental group; 85 students (54.5%) drew polluted environment. In control group there was a decrease in the number of students drawing a polluted environment in their post-drawings. Forty five students; that is 28.1% of control group, included polluted environments in their drawings.

Views Focusing on both Clean and Polluted Environment

The third theme consists of students' drawings focusing on both clean and polluted environment in a single page. Usually in this kind of drawings students draw a line to separate the page in two parts and they draw clean environment on one part and polluted environment on the other part. So these kinds of drawings include characteristics of both themes. In the following, some examples of drawings within the theme focusing on both clean and polluted environment are represented.

Figure 67. Drawing focusing on both clean and polluted environment

In the drawing represented in Figure 67 student showed the clean environment on left and polluted environment on the right part of the paper. He included several animals (a horse, a cow and butterflies), a tree, a river and also a happy man on the left part. He preferred to draw a dog, some dead fish, several flies, some litter spread over the land and a river in the polluted part. Also there is an unhappy man standing in the polluted environment. The figures existing on both sides are very consistent with the theme1 and theme2 respectively.

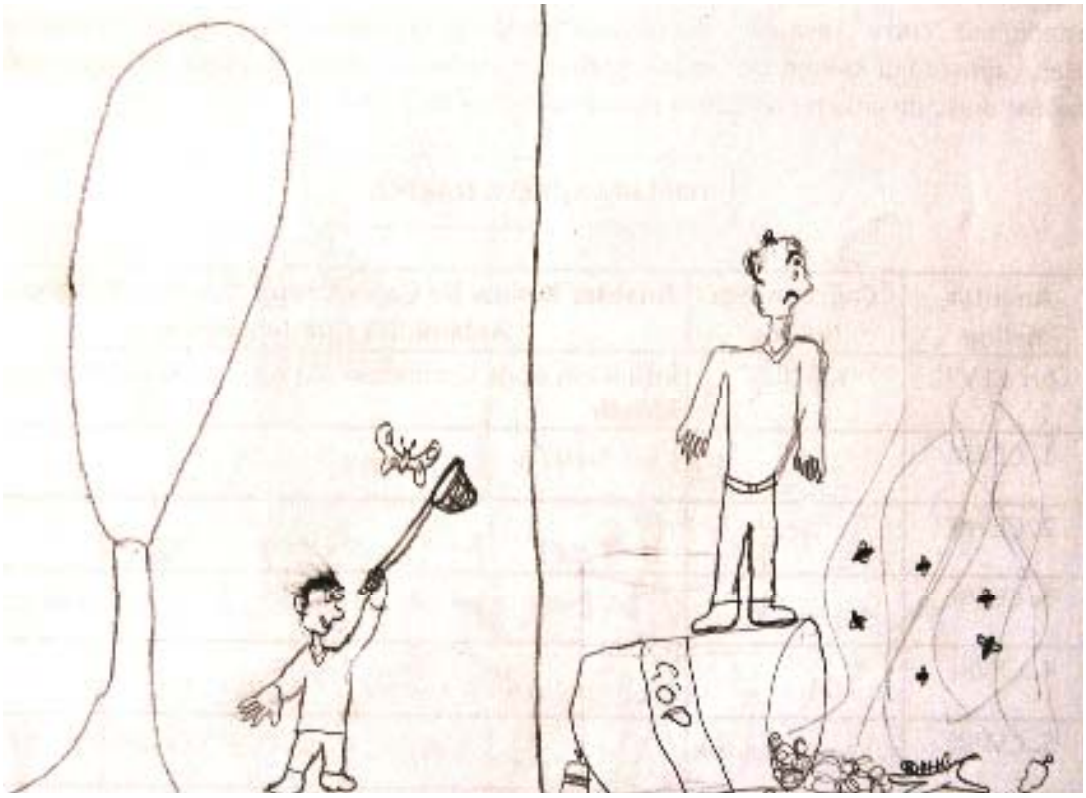

Figure 68. Drawing focusing on both clean and polluted environment

Second example of drawing focusing on both clean and polluted environment shows many similarities with the previous one (see Figure 68). In this drawing, on the lefthand side there is a healthy tree and a happy man trying to catch a butterfly. However, on the righhand side, a litter bin fall over the floor and litter is spread over the land. An unhappy man is standing over the litter bin. In both of the examples, preference of animals drawn is striking. Although, butterflies are drawn in clean environments, flies seem to be the representative of polluted environments.

In the last example of the drawing belonging to theme3 (see Figure 69), a road is used to separate the sheet of the paper into two parts. And in the left part there are

children playing, healthy trees and a sun with a smiling face. On the right part, which represents the polluted environment, the trees are dead, children are lying down the floor (maybe dead?) and the sun is crying. All the figures again are very representative of the ones in theme1 and theme2.

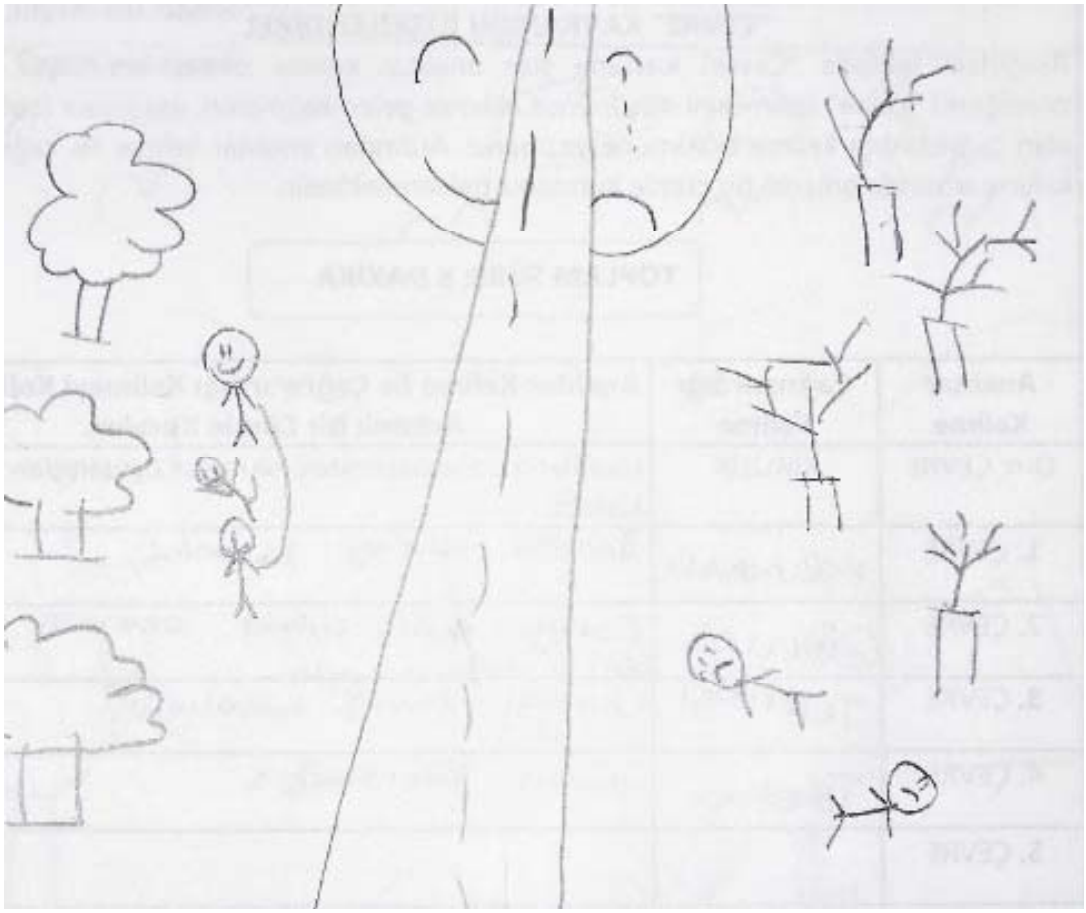

Figure 69. Drawing focusing on both clean and polluted environment.

The number of students whose drawings are included in this theme is less with repect to the other two themes. Before the application, 16 drawings (10.6%) from the experimental group represented views focusing on both clean and dirty environment. Besides, 6 drawings from control group, that is 3.8%, are included this theme. After the application, six students from experimental group, that is 3.8%, showed both clean and polluted environment in their drawings. There was not any drawing representing the features of this theme in the control group after the application.

After a description of the codes and themes emerged from the analysis of drawings, its time to answer that whether students' views differ from each other before and after the eco-school application. To do this a chi-square test for independence was run for each grade level. Frequencies and the proportions of students for each theme are compared with respect to the group they belong. For chi-square analysis the lowest frequency in any cell should be 5 or more. In the study, since the number of drawings belonging to theme3 is small sometimes this assumption is violated. In these cases it is better to use Fisher- Freeman-Halton Test (Pallant, 2007) which is also provided as part of the chi-square analysis in SPSS. So during data reporting the results of this test will be reported. The results of chi-square analysis for each grade level are represented below.

Comparison of 6th Grade Students' Pre- and Post Views about the Environment

To compare 6th grade students' pre-views about the environment a Chi-square test for independence was run. Chi-square analysis revealed that 50% of 6th grade experimental group students represented clean environments in their drawings. Besides, 41.4% of 6th grade students drew polluted environments and only 8.6% included both clean and polluted environments in their drawings. These percentages showed similarity in control group. In their drawings, 52.6% of control group students represented clean, 41.0% of them represented polluted and 4.3% of them represented both clean and polluted environments in their drawings. The results of the test indicated that there is no significant association between experimental and control groups views about the environment, prior to application χ^2 (1, n=117) = 0.842, ρ=0.698. Table 58 shows the number and percentages of 6th grade students' pre-drawings with respect to three themes emerged.

Table 58 *Crosstabulation of 6th Grade Students' Pre-drawings with respect to Each Theme*

			Theme1 Clean	Theme2 Polluted	Theme3 Clean/Polluted
Group	1	Count	35	29	6
		% with group	50.0	41.4	8.6
	2	Count	26	19	2
		% with group	52.1	41.0	4.3

Post-drawings analysis showed that 28.6% of 6th grade experimental group students drew clean environments, 61.4 % of students drew polluted environments and only 10% drew both clean and olluted environments. The Chi-square analysis after the application revealed that there is a significant association between experimental group and control group students views about the environment $\chi 2$ (1, n = 117) = 13.577, $\rho = 0.001$. Phi coefficient (phi = 0.341) suggested a medium relationship between groups and drawings belonging to the themes. The Chi-square analysis also revealed that among control group students there are more drawings belonging to Theme1 than expected. Table 59 shows the number and percentages of 6th grade students' post-drawings with respect to the themes.

Table 59 *Crosstabulation of 6th grade Students' Post-drawings with respect to Each Theme*

			Theme1 Clean	Theme2 Polluted	Theme3 Clean/Polluted
Group	1	Count	20	43	7
		% with group	28.6	61.4	10
	2	Count	28	19	0
		% with group	59.6	40.4	0.0

Comparison of 7th Grade Students' Pre- and Post Views about the Environment

Analysis of 7th grade students' pre-drawings represented that 46.7% of experimental group students included clean, 40.0% of them included polluted and 13.3% of them included both clean and polluted environments in their drawings. The situation is not different for control group students. According to Chi-square analysis, 48.3% of 7th grade control group students drew clean environments in their pre-drawings. Besides 44.9% of them drew polluted and 2.7% of them drew both clean and polluted environments in their pre-drawings. A Chi-square test for independence indicated that there is no significant association between group and pre-views about the environment, $\chi 2$ (1, n = 118) = 4.741, $\rho = 0.103$. Table 60 shows the number and percentages of 7th grade students' pre-drawings with respect to the themes.

Table 60 *Crosstabulation of 7th Grade Students' Pre-drawings with respect to Each Theme*

			Theme1 Clean	Theme2 Polluted	Theme3 Clean/Polluted
Group	1	Count	21	18	6
		% with group	46.7	40.0	13.3
	2	Count	36	35	2
		% with gender	48.3	44.9	2.7

In post-drawings 42.2% of 7th grade experimental group students drew clean, 51.1% of them drew polluted and 6.7% of them drew both clean and polluted environments. Besides, 68.5% of 7th grade students drew clean and 31.5% of them drew polluted environments. In control group there were no students included both clean and polluted environment in their drawings. Post-drawing Chi-square analysis revealed that there is a significant association between group and post-views about the environment ($\chi 2$ (1, n = 118) = 10.304, $\rho = 0.003$) with a medium effect size (phi = 0.304). The Chi-square analysis also showed that among control group students there are less drawings belonging to Theme1 than expected. Table 61 shows the number and percentages of 7th grade students' post-drawings with respect to the themes.

Table 61 *Crosstabulation of 7th Grade Students' Post-drawings with respect to Each Theme*

			Theme1 Clean	Theme2 Polluted	Theme3 Clean/Polluted
Group	1	Count	19	23	3
		% with group	42.2	51.1	6.7
	2	Count	50	23	0
		% with group	68.5	31.5	0.0

Comparison of 8th Grade Students' Pre- and Post Views about the Environment

Analysis of 8th grade students' pre-drawings revealed that 36.6% of experimental group students drew clean, 51.2% of them drew polluted and 12.2% of them drew both clean and polluted environments. Besides, 52.5% of control group students included clean, 42.5% of them included polluted and 5.0% of them included both clean and polluted environment in their drawings. A Chi-square test for independence indicated that there is no significant association between group and views about the environment, χ^2 (1, n = 81) = 2.614, ρ = 0.265. Table 62 shows the number and percentages of 8th grade students' pre-drawings with respect to the each theme.

Table 62 *Crosstabulation of 8th Grade Students' Pre-drawings with respect to Each Theme*

			Theme1 Clean	Theme2 Polluted	Theme3 Clean/Polluted
Group	1	Count	15	21	5
		% with group	36.6	51.2	12.2
	2	Count	21	17	2
		% with group	52.5	42.5	5.0

Chi-square analysis revealed that 41.5% of experimental group students' post-drawings represented clean, 46.3% of them represented polluted and 12.2% of them represented both clean and polluted environments. Besides, 92.5% of control group students' drawings represented clean, 7.5% of them represented polluted environment. There were no students drawing both clean and polluted environment in their post drawings. Chi-square analysis for conducted for post-drawings revealed that there is a significant association between groups and themes χ^2 (1, n = 117) = 24.580, ρ = 0.000 with a large effect size (phi = 0.54). The Chi-square analysis also revealed that among experimental group there are less drawings belonging to Theme1 than expected and more drawings belonging to Theme2 than expected values. Also Chi-square analysis revealed that among control group students there are more drawings belonging to Theme1 than expected and less

drawings belonging to Theme2 than expected. Table 63 shows the number and percentages of 8th grade students' post-drawings with respect to the themes.

Table 63 *Crosstabulation of 8th Grade Students' Post-drawings with respect to Each Theme*

			Theme1 Clean	Theme2 Polluted	Theme3 Clean/Polluted
Group	1	Count	17	19	5
		% with group	41.5	46.3	12.2
	2	Count	37	3	0
		% with gender	92.5	7.5	0.0

5.3. Results Obtained from the Analysis of the Interviews

In this part results obtained from the analysis of the interviews were reported. First of all the results of the interviews with eco-school students and then the interviews with teachers will be discussed.

5.3.1. Interviews with Eco-School Students

Interviews with students enrolling to eco-school were conducted after the treatment with the purpose of gaining deep insight about the views of students about eco-school applications. Fifteen eco-school students, eight males and seven females, participated the interviews. For the analysis of interviews, codes were drawn out from the responses given to interview questions and themes were emerged from a collection of codes. Table 64 represents the organization of codes obtained from the analysis of interviews with eco-school students. Through the data analysis students' views were focused on three major themes; characteristics of an eco-school, comparison of old and new school environment, advices for future eco-school applications.

Table 64 *Organization of Codes Obtained from the Analysis of Interviews with Eco-School Students*

Characteristics of an Eco-School • Having different kinds of animals, such as cats, birds, dogs, fish living inside it • Having different kinds of plants inside • Being a part of a nature • Having clean classrooms and garden • Places of learning in which environmentally activities are conducted • Clean and green places of learning
Old and New School Environment • Change in physical characteristics of the school • Increase in recycle bins, number and kinds of plants inside and outside the school, number of warning signs about effective use of water, electricity and other resources in different places of the school building. • Change in the behaviors of students • Turning off electricity, turning off taps, collecting used paper
Advices for Future Eco-School Applications • Different kinds of activities focusing on environment

Below emerging themes will be explained in detail with particular excerpts of the interviews.

Views that Focus on Characteristics of an Eco-school

In the interviews eco-school students were asked to define eco-school. To define eco-school, instead of giving specific definitions, students from different grade levels listed several characteristics that they think an eco-school has. After asking the definition of eco-school, several follow-up questions were asked to the participants. In the first follow-up question students were asked if their school is an example of an eco-school or not. In the second follow-up question students were asked the purposes of eco-school.

The common feature of the talks falling in this part is that students portray the physical characteristics of an eco-school. Students mainly focus on increasing number of animals as a major characteristic of an eco school. Among the interviewees, nine eco-school students emphasized that there should be animals living in the school garden. Birds, dogs, rabbits, cats and fish are the mostly stated animals that can be raised in the school. Besides, eco-school students emphasized having different kinds of animals will improve their love to nature.

A sixth grade student expressed the characteristics of an eco-school as:

> *An eco-school should have different animals living in its garden. For example birds… And also bird boxes… Because birds need a place to be shielded. We have a bird box in our garden but there are no birds living in it. Actually there are not lots of birds in Aksaray.*

After this reply this student is asked the probing question: "Is your school an eco-school or not?", and his reply is:

> *Yes. Our school is an eco-school. We bought fish and we are looking after them. How many schools have fish inside it?*

Another example of talk emphasising the importance of animals in eco-school comes from a seventh grade student. She defined the eco-school as:

> *I think an eco-school should have many animals such as bird, dogs and cats inside it. And students should look after these animals. By this way it will be possible to love the nature. I would like to have different kinds of animals in our school. At least we may have dogs.*

Besides having animals, eco-school students expressed that plants are indispensable part of an eco-school. Seven students emphasized in their replies that eco-schools should have increasing number of plants both inside the school and in the school garden. In the example excerpts, eco-school students also represent the eco-school as a place not apart from but a part of the nature. They also highlighted that by having an increased number of plants; school will be a greener place.

In an example talk, a sixth grade student stated that,

> *There should be lots of plants in eco-school. Both in its garden and inside it. An eco-school should be a part of the nature. By this way a school will be greener and a better place for us.*

This participant replied the first follow-up question as:

> *Our school garden has a concrete land and has a small garden. But we try to increase the number of plants growing in our garden. This year we have planted many trees in our garden. Also we sow seeds of flowers. We have bought several plants in pots to grow them in our classrooms. Yes, our school is an eco-school. My previous school did not have this amount of plants.*

And the second follow-up question as:

> *As I said before, an eco-school should be a part of the nature. Since nature has lots of living things, an eco-school should have also.*

Besides talks focusing on living things in eco-schools, this theme also comprises talks that emphasize the importance of environmentally responsible behaviors. In their talks, four eco-school students' emphasized that eco-schools should be clean places of learning in which many environmental friendly activities such as recycling, saving water, energy etc. are conducted.

A representative example comes from a sixth grade student. He said that:

> *An eco-school has clean classrooms and a clean garden. I think if a school is not an eco-school it will not be clean. Anyway, many schools are not clean. Besides, there must be a person who teaches what should be done to prevent environmental problems. In eco-school, students should be informed about environmental problems by this way they can be better individuals. For example this person may teach students how to use recycle bins. Teachers always warn us not to throw wastes to the land, but they do not teach us how to use recycle bins.*

And a seventh grade student replied that;

> *An eco-school should be sensitive to the environmental problems. For example there are many environmental problems. Air pollution is one of the most important environmental problems. There are many factories causing air pollution. Schools can cause air pollution too. Eco-schools should have filters in their chimneys. By this way they will not cause air pollution.*

Another example talk emphasising environmentally responsible behaviors comes from a seventh grade student. She replied that;

> *Many environmental activities should be done in eco-schools. This is the way to prevent environmental problems.*

And an eighth grade student expressed that;

> *An eco-school should be clean. It has students that throw up their wastes to the waste baskets instead of land. And also we should recycle used paper, cans and bottles. For example, there are recycle bins in our school. When I see them I think that there are many environmental problems and I should bin the used paper, water bottles inside it.*

This student replied the first follow-up question as:

> *In previous semesters there was only one recycle bin in our school but we did not use it effectively. In this semester, the number of recycle bins increased and we collected paper, cans and bottles. We started to use them effectively. For example, in this semester we have battery recycling bins. We collected dead batteries also. These are very important to prevent environmental pollution. Our school is an example of an eco-school.*

This student replied to the second follow-up question as:

> *The purpose of eco-school should be educating environmentally responsible students. If we gain awareness of environmental problems in school we can prevent environmental problems in later years.*

Views that Focus on Old and New School Environment

The second major part that students' views focus on is about old and new school environment. With several interview questions students are asked to report any changes that they can observe by eco-school applications in physical school environment and their and other students' behaviours toward environment. For the physical changes in school environment nine students' mainly reported an increase in the number of recycle bins, number and kinds of plants inside and outside the school, number of warning signs about effective use of water, electricity and other resources in different places of school building. Students also emphasized that the classrooms, restrooms, school garden became cleaner with the application. Besides these changes, seven students also emphasized an increase in the number of environmental activities conducted through the semester and an increase in their teachers' attention on environmental issues.

A sixth grade student reported the changes that he observed in the school environment as:

> *In our school the number of recycle bins increased. We can collect batteries, paper, cans and bottles in different bins. Also, our school is cleaner with respect to the previous semester. Number of plants increased this semester.*

Another sixth grade student expressed that:

> *We made many environmental activities throughout the semester. Now, we are collecting the waste in different waste baskets. We collected paper throughout the semester and sold them. It was amazing.*

A seventh grade student mainly emphasized the increase in activities about environmental activities and stated that:

> *Our teachers were more sensitive to environmental issues. We have conducted many activities this semester. We have an aquarium and several fish living in it.*

Another seventh grade student also reported an increase in environmental activities and stated that:

> *Before we were not doing that many activities related with the environment. Now, we are doing more. For example, we have provided a place to plant trees. This kind of opportunities increased.*

Similar replies also come from eighth grade students. An eighth grade student expressed that:

> *There are now enough waste baskets in the restrooms. Also there are warning messages on the walls to use water efficiently.*

An eighth grade student compared the old and new school environment as:

> *We have conducted many informative activities this semester in our courses. We have planted many trees in our garden. We have post up many warning messages in different places. We have formed several eco-teams. We have designed an eco-school board. We have determined the negative situations existing in the school and tried to correct them.*

Besides the physical changes, students' were also asked about the changes in their and other students' behaviours toward environment. Although two students' reported that they did not realized any changes in their friends' behaviour, other students participated in the interviews reported several behavioural changes. Turning off electricity, turning off taps, collecting used paper were some of the changes students' reported.

A representative quote for behaviour change is from a sixth grade student. He stated that:

> *I did not realize many changes in my friends' behaviours. However, I have changed some of behaviours. For example, I have started to turn off the lights when there is nobody in a classroom.*

Another student enrolling to the seventh grade of eco-school application was focusing on the effect of the application on water save and expressed that:

> *Before, I did not care about whether the tap is on. But now I do not leave the restroom before turn it off.*

Two of the interviewees expressed how the application changed their behaviors on collecting used paper. A seventh grade student expressed that:

> *Before, sheets of paper were everywhere. But now we are collecting them for recycling.*

And an eighth grade student replied that:

> *Yes, I am more careful about the environment. For example, there are many used papers in our home and it was not possible for me to bring them to the school for recycling. My mother is also a teacher. I told my mother and she took these papers to her school. I feel upset when I throw used papers to the garbage dumps.*

An eighth grade student exampled throwing wastes to the waste basket instead of school ground as a behavioral change and stated that

> *I have realized small changes. For example, my friends were throwing up the wastes to the school ground. But now they are more careful about throwing the wastes to the waste basket. And I also make an effort to throw the wastes to the waste baskets.*

In one of the representative replies a seventh grade student stated the change in their environmental behaviors as:

> *My friends are more aware of environmental problems. For example they warn their families to lessen the use of cars to decrease air pollution.*

Views Focusing on Advices for Future Eco-school Applications

The last part that the interviews focus on was about the advices for future eco-school applications. In this part eco-school students were mainly asked about the activities they liked and kinds of activities they want to be included in the

application. Also, eco-school students were asked if they liked the application or not.

In the interviews students were asked which environmental activities they have participated throughout the semester. Most of the students; 10 of them, stated that they have attended the spring festival, they have watched the film wall-e, they have planted trees, flowers in the garden, and they have collected paper for recyling, collected waste from school garden. Three interviewees there were some members of eco-teams. So they mentioned about environmental review and their action plans. Two students stated that they have not involved any eco-school activities because they have to study for SBS.

As a follow-up question students are asked which activity did they like most. Majority of the students; 12 of them, replied that they liked participating in recycling activity and watching the film Wall-e. Members of eco-teams reported that they liked to participate in eco-teams.

Students are also asked which kind of activities can be included in eco-school applications. Majority of them; 12 students, stated that the application was adequate and no need to include any kind of activities. Besides, three students offered different kinds of activities.

A seventh grade student offered that:

> *We can design a system to decrease electricity use. For this we can organize a competition.*

Another seventh grade student replied that:

> *We can include more activities for examining the nature.*

And an eighth grade student expressed that:

> *We may pollute a small area in the garden and can observe the differences between the polluted environment and the clean environment.*

Lastly, participants were asked that whether they want the application to continue in the next semester. All the respondents expressed that they find the application beneficial so it should continue in the next semester.

5.3.2. Interviews with Eco-School Teachers

After the treatment, several eco-school teachers were also interviewed to take their views about eco-school applications. Like students' interviews, teachers' interviews were also focused on three major parts: characteristics of an eco-school, old and new school environment and advices for future eco-school applications. Different from students' interviews, the parts in teachers' interviews include a deeper content. Five teachers, three women and two men, from eco-school participated in the interviews. Table 65 represents the organization of codes obtained from the analysis of interviews with eco-school teachers.

Table 65 *Organization of Codes Obtained from the Analysis of Interviews with Eco-School Teachers*

Characteristics of an Eco-School • Providing a natural environment for students to observe the characteristics of nature • Making the school cleaner and greener • Providing better learning environments • Helping students to be aware of how their actions affect environment • Providing an active participation to environmental activities
Old and New School Environment • Change in the school environment • Change in the behaviors of students • Change in teachers' instruction
Advices for Future Eco-School Applications • Obstacles: Money and Time

Below emerging themes will be explained in detail with particular excerpts of the interviews.

Views Focusing on Characteristics of an Eco-school

This part consists of teachers' definition of eco-school and its positive and negative sides. In their definitions teachers interviewed mainly emphasized physical and social characteristics that they think an eco-school has. For physical characteristics of an eco-school, all the teachers mainly emphasized that eco-schools should represent the features the nature; i.e. clean and green environment. One of the teachers emphasized that:

> *Eco-schools represent that schools are not places separated from nature. On the contrary, eco-schools represent the nature. They are greener than other schools. Eco-schools should have characteristics that make a student feel that schools as being a building can also be a part of the nature.*

Another teacher enrolled in the interviews described the characteristics of eco-school as:

> *Eco-schools provide a natural environment for students to observe the characteristics of nature. By the application, our aim was to make our school a place cleaner and greener than it is used to be. By this way, we created a better learning environment for students.*

One of the teachers was the leader of the healthy living team. And she explained the characteristics of eco-school as:

> *By the eco-school application it became possible to become aware of the environmental situation of the school. We were providing healthy food in the refectory. However, not in school canteen. We hope to improve the quality of the food sold in the canteen in the next semester. By the application we realized the importance of physical activities. We aimed to increase the number of physical activities. Spring festival was a very good idea to accomplish this task. We are going to do it every year. This was one of the best parts of the application.*

For social characteristics of eco-schools, teachers mainly stated that eco-schools provided a healthy and productive learning environment for learning environmentally responsible behaviors. Teachers mainly emphasized that by the

application students became aware of environmental problems and they had chance to develop solutions to these problems. And they also stated that this is one of the positive sides of the application. Besides, interviewed teachers agreed that being an active participant, students learned how their actions change the environmental situation of the school.

The examples of the excerpts from the interview conducted with the teacher are presented below:

One of the teachers stated that:

> *Eco-school application helped students to be aware of how their actions affected environment in both positive and negative way. Steps of eco-school application let students to become active participants of the project. By this way students' realized that they can do something to change the environmental situation of the school.*

Being agreed with this excerpt another teacher expressed that:

> *Students enrolled to eco-teams and took actions to improve the conditions of the school. They worked together to solve the problems and during this task they spent numerous hours in the team. They learned how a team work is done. This was the positive side of the project.*

Besides these characteristics and positive effects of eco-school application, three of the teachers also mentioned the negative sides of it. Teachers mainly emphasized that planning and conducting the activities took extra time and effort. One of the teachers stated the negative sides of the application as:

> *If we consider the application as a whole, it was actually very beneficial for students. Although there are several environmental issues in the science curriculum we did more than that. However, carrying all the steps of the application took too much time. Planning…… conducting the activites….. It also requires too much effort. You know, students are entering to SBS. We also have to prepare them to these exams.*

Views Focusing on Old and New School Environment

Teachers were also asked about the changes in school environment, students' behaviours and their instruction. This part consists of teachers' views about old and new school environment. One of the teachers stated that:

> *First of all, I believe that this application is very effective to change students' behaviours. Although we conducted the application only one semester, at the end of it students' showed more responsible environmental behaviours. Even I saw that one of one of the sixth grade student was warning his friend who is throwing his waste to the school ground. I hope we can carry on the application in the next semesters. Because to change students' behaviors we need some time.*

This teacher also expressed the change in his instruction as:

> *I am teaching social sciences to sixth and seventh grade students. The application helped me to realize that I can mention about different environmental issues in my courses. In the next semester I will plan my courses with this idea in my mind.*

Being agreed with this excerpt another teacher expressed the change in his instruction as:

> *By the change in the curricula, there is a more focus on environmental issues already. However, by eco-school application I realized that I do not explain environmental issues as the way it should be. I was explaining the topics in the classroom. And you know, if we think about SBS exam, these are very easy subjects for students. Most of the students gave correct answers to questions about environmental issues. I was not spending too much time on environmental issues. However, this semester I have spent some of my course hours outside the classroom. Explaining the environmental subjects outside the classroom, in the nature, was very enthusiastic both for me and for students.*

Another teacher stated that:

> *By this application, students will increase the number of questions they answered correctly in SBS exam. Not only for environmental issues but also for the questions related with other science topics. Even they will increase the number of mathematics and science questions they answered correctly. This is not because they learned many things in the application; this is because they found chance to spend time in the nature. This time period was full of fun, joy and enthusiasm.*

Views Focusing on Advices for Future Eco-school Applications

This part consists of teachers' advices for future eco-school application. Teachers were asked to express the difficulties confronted, activities that want to be included in the application and obstacles that they may be confront during application. Two of the teachers expressed that eco-school application can be carried out with minor changes. One of the teachers expressed that:

> *There are many activities that can be done out of the classroom. And students like studying outside very much. I will try to increase the number of activities that can be done outside the classroom even outside the school.*

Another teacher stated that:

The major problem in eco-school application is the time limitation and money. Although this is a private school, we could not do some of the activities we planned. And time…. it is barely enough to complete all the topics in one semester.

CHAPTER 6

DISCUSSION, IMPLICATIONS and RECOMMENDATIONS

This chapter presents discussion of the results obtained from data analysis. In addition, implications of the findings are discussed and recommendations for further studies are represented.

6.1. Discussion

Increasing population and consumption of natural resources in an unplanned way resulted in increasing pollution, poor air and water quality and the extinction of animal and plant species. Today, environmental problems are experienced through the world and cause a threat for the continuity of human life. For the sake of human beings, environmental problems need to be solved in the near future. Solving environmental problems is only possible with environmentally literate citizens who are knowledgable about the environmental issues and aware of environmental problems. Environmental education is suggested as one of the most effective ways to educate children as environmentally literate citizens.

Schools play an important role to raise environmentally literate generations and having a sustainable future (Loughland, Reid, Walker & Petocz, 2003). In schools, children should learn basic ecological principles, obtain the knowledge about environmental issues, explore their attitudes regarding the environment, be aware of environmental problems and learn how to implement the knowledge to solve these problems. If environmental education seeks to save the world, then various kinds of environmental programs which will help to educate environmentally literate children should be integrated to school programs. Eco-schools program was run through 1995 to implement sustainable development education in schools with the aim of educating environmentally literate citizens (www.eco-schools.org). Although

the program is implemented in a wide area, there is little research to indicate the effectiveness of eco-schools on elementary school students' environmental knowledge, attitude, uses and concerns; that is measures of environmental literacy. Thus, in this study, effects of eco-school applications on elementary school students' environmental literacy were investigated. Two learning environments were used: eco-school application and traditional school application. To determine elementary school students' environmental literacy, Environmental Literacy Questionnaire (ELQ) developed by Kaplowitz and Levine (2005), translated and adapted into Turkish by Tuncer et al. (2009) was used. Besides, it is questioned that if eco-school applications cause a change in elementary school students' views about the environment. Students' views about the environment were determined by their drawings about the environment. All participants, whether participating in eco-school or traditional school, completed the ELQ and the drawings as both the pre-tests and the post-tests. Additionally, in the study eco-school students' and teachers' views about the application were investigated by interviews.

In this part, first the results of the descriptive statistics obtained from ELQ, the major outcomes of the study along with the data analysis, then the results of students' drawings will be discussed in order by the research questions described in chapter 3. Lastly, the results of the students' and teachers' interviews will be handled delicately to expose their views about eco-school applications.

6.1.1. Discussion of the Results of the Descriptive Statistics Obtained from ELQ

ELQ consists of several background questions involving participants' self-evaluation of their level of environmental concern, environmental knowledge and their engagement in a range of environmental activities.

Elementary school students' self evaluation of their level of environmental concern revealed that nearly half of the experimental group students; 46.2% of them, reported their level of environmental concern as 'a fair amount'. The results obtained from control group were similar with experimental group. Half of the control group students (50.0%) reported their level of environmental concern as 'a

fair amount'. The results of the self evaluation of environmental concern were consistent through grade levels; that is, there were not large differences between students' self evaluation of environmental concerns from different grade levels with respect to their environmental concerns. Similar results were reported with different studies. In a study designed to determine elementary school students' environmental literacy levels, Ökesli (2008) reported that 54% of participants reported that they have 'a fair amount' of environmental concern. Besides, in the same study only 12% of participants reported that they have 'a great deal' of concern about environmental problems. Similarly, in the current study, approximately 17% of experimental group students and 13% of control group students reported that they have 'a great deal' of concern about environmental problems. Although the characteristics of participants were different, similar results were reported by Tuncer et al. (2009). In their study, Tuncer et al (2009) determined pre-service teachers' environmental literacy. In this study participants' self assessment of their environmental concern revealed that more than half of the respondents; 51% of them, evaluated themselves as having 'a fair amount' of concern with only 11% of respondents reported having 'a great deal' of concern about environmental concerns. A different result is reported with İstanbullu (2008). In her study İstanbullu (2008) reported that 58% of 6th grade students are 'not very much' concerned about environmental problems.

When students were asked to choose the closest statement expressing the importance of environmental problems, majority of the experimental; in total 68.6%, and control group students; in total 61.3%, reported that environmental problems are among the two or three important problems that people currently face. Similarly, Ökesli (2008) expressed that 62% of elementary school students participating in the study view environmental problems as one of the most important problems that humans face. And another similar result was reported by Tuncer et al. (2009). In their study researchers reported that 75% of participants reported the environmental problems as one of the two or three most important problems currently being faced.

In another question, students were asked to evaluate their level of environmental knowledge. The responses of experimental group students showed that, most of the experimental group students; in total 64.1% of them, reported that they have 'a fair amount' of environmental knowledge. The results of students' self-evaluation of their environmental knowledge were similar for control group students. In the control group in total 59.4% of students reported their environmental knowledge as 'a fair amount'. Students' self-evaluation of environmental knowledge showed that results were consistent through different grade levels. Similar results were obtained from previous studies. Ökesli (2008) found that most of the elementary school students; 61% of participants, replied that thay have 'a fair amount' of environmental knowledge. Although the characteristics of participants were different from the present study, Tuncer et al. (2009) found that 55% of pre-service teachers expressed that they have 'a fair amount' of environmental knowledge. Besides similar results, some researchers found different results also. In one of these studies İstanbullu (2008) found that 64.2% of 6th grade students reported their level of environmental knowledge as 'practically nothing' whereas 1.5% of students reported their environmental knowledge as 'a lot' and only 0.7% of students reported their environmental knowledge as 'a fair amount'.

In another question, treatment group students were asked to report the frequency of their engagement in outdoor activities. In both control group and experimental group, majority of students expressed that they usually go hiking. Hiking is one of the most frequently done outdoor activities in Turkey. This is the possible cause of students' replies to this question.

6.1.2 Effects of Eco-school Applications on the Improvement of Elementary School Students' Environmental Knowledge

ELQ consists of questions to assess elementary school students' environmental knowledge, attitudes, uses and concerns. After self-evaluation questions, participants were asked 11 environmental knowledge questions. The pre-test percentages of both experimental and control group showed that students are not fully knowledgeable about environment. According to the pre-tests, students got

higher scores for only some of the questions. Question 4 was about the major sources for surface water pollution. In the pre-tests 65.4% of experimental group students and 63.8% of control group students replied this answer correctly. Although it is not represented in the study, it is well known that most of the students' parents are working in factories. It is thought that for this reason students were aware of the reason for the surface water pollution. This situation may be also the reason for the high percentages of students answering question 10 correctly. In this item, in the pre-test, most of the participants from both groups; 63.5% of experimental group students and 58.8% of control group students, designated human activities as the major reason for animal extinction.

The analysis of the data obtained from environmental knowledge part also exposed that after the treatment, both statistically and practically significant mean differences exist between elementary school students enrolling eco-school and traditional school in the favour of eco-school students. This result is relevant for all grade levels which are concerned in the present study. These results are expected because during the study, experimental group students conducted many environmental activities as part of the eco-school application. In eco-school, experimental group students conducted environmental review and as a result of this review they conducted several environmental activities to improve the situation of the school. Besides, in experimental group enviromental issues were explained not only in science lessons but also in other courses such as social sciences, English, visual arts, music etc. In a computer course 6th grade experimental group students conducted a research about environmental issues and prepared a presentation about them. In science and technology course they focused on erosion and the role of environmental agencies for environmental protection in Turkey. They have determined the kinds of plants in school garden in their English course. By this way students realized the diversity of living organisms. In 7th grade, in their English course experimental group students discussed the advantages and disadvantages of using technology on environmental problems. They also studied global and local environmental problems in the science courses. Besides, they discussed the roles of nongovernmental foundations to solve environmental problems in social sciences courses. In visual arts course they selected an environmental problem and showed

how this problem affects living things. Eigth grade students also conducted several activities focusing on environment. They read short stories focusing on environmental problems in English course. They discussed recycling, renewable and nonrenewable resources in science and technology course. Additionally, in Turkish courses they conducted a debate focusing on the possible situation of the world by considering the environmental problems. These activities are the possible causes in the increases in the percentages of students answering the knowledge items correctly.

While the situation in the experimental group was in this way, it was very different in the control group. Although there were many environmental issues in science and technology curriculum, teachers in the control group thought that these issues are easy for students to learn. For this reason, science teachers did not mainly emphasize environmental topics in science lessons. Besides, the teachers of the other courses did not perform any environmental activities. Even, some courses were not performed regularly such as computer classess, visual art classess etc, during the whole semester. During these class hours, control group students preferred to solve several multiple choice questions and to administer several multiple choice tests for the preparation of students to the SBS examination. But, this approach seems to be ineffective for students to learn environmental issues appropritately.

The results of this study are consistent with the results of previous research. Although there are not any studies focusing on eco-school students' environmental literacy, there are some studies focusing on effects of different kinds of environmental activities on students' environmental knowledge, attitudes, behaviour etc. In one of these studies Donovan (2001) is focusing on environmental knowledge, attitudes and opinions of Texas State Envirothon students and East Texas twelfth –graders. Envirothon is America's largest high school environmental team competition conducted to enhance students' environmental literacy. Donovan found that students' attended the Envirothon had significantly higher environmental knowledge scores than others. In another study, Culen and Mony (2003) investigated the effectiveness of a nonformal youth program on participants'

environmental literacy levels. During the youth program some of the participants enrolled to environmental education activities and some of them did not. This study suggested that the environmental education program used in nonformal youth program can increase participants' environmental knowledge.

Present study has also analyzed the effects of gender and grade level upon environmental knowledge. Considering the gender difference, for grade levels 6 and 7 no significant difference was found between girls and boys with respect to their environmental knowledge scores. This means that for these grade levels boys and girls do not differ from each other with respect to their environmental knowledge scores. However, for the 8th grade level a significant difference exists between two genders. Girls get lower scores than boys from post-ELQ environmental knowledge subscale. The result obtained for 8th graders is consistent with previous research studies. Previous research studies revealed that males have greater environmental knowledge than females (Arcury & Christianson, 1993; Arcury, Scollay & Johnson, 1985; Arcury & Johnson, 1987; Tikka, Kuitunen & Tynys, 2000; Zimmerman, 1996). Based on the results obtained from previous studies it can be concluded that a treatment that aims to increase the environmental knowledge may be more effective for boys than girls. During any kind of instruction about environmental issues, teachers should consider this gender difference and try to increase girls' involvement in environmental activities.

6.1.3 Effects of Eco-school Applications on the Improvement of Elementary School Students' Environmental Attitudes

The second subscale of ELQ was 'environmental attitudes'. The analysis of the related data exposed that experimental group students' agreement for positive attitude items and their disagreement for negative attitude items increased at post-tests. Additionally, considering the post-test results, statistically and practically significant differences exist between 6th grade and 8th grade experimental and control group students. Besides, no significant difference was found for 7th grade treatment groups with respect to their environmental attitudes. Based on these results, it can be concluded that eco-school program made a measurable difference

in 6th and 8th grade elementary school students' environmental attitudes. Related literature shows that traditional courses about environment do not affect one's attitudes toward environmental issues. Various kinds of life experiences are needed in shaping children's environmental attitudes (Kinsey & Weatley, 1984). Eco-school application differs from traditional school application in many aspects. First of all, eco-school students were actively participated in all steps of the application through eco-teams. They carried out environmental review to determine environmental problems, developed an action plan to improve the environmental situation of their school, monitored and evaluated their progress. Second, eco-school activities provided elementary school students' life experiences both in school and outside school. During eco-school applications, students planted trees in their school garden and in the campus of Aksaray University, planned one-week spring festival, recycled cans, papers, glass, increased the number and kinds of plants inside the school. With all these activities, eco-school students found chance to involve in environmental activities actively. This active involvement is the possible cause for an increase in eco-school students' environmental attitudes. Another reason for the significant difference in environmental attitudes may be due to the increase in environmental knowledge. According to Arcury (1990) increased environmental knowledge would foster positive environmental attitudes. In the present study, the increase in 6th and 8th grade eco-school students' environmental attitudes may be due to their increased levels of environmental knowledge.

In the present sudy, gender appears to play a role in the variation of environmental attitudes. Although no significant difference was found between girls and boys enrolling to 6th and 7th grades, in 8th grade it is found that boys tend to have more positive attitudes than girls. This result is not consistent with the findings of previous research (Alp, et al., 2008; Berberoğlu & Tosunoğlu, 1995; Huang & Yore, 2003; Chu et al., 2007; Tikka et al., 2000; Yılmaz, Boone & Andersen, 2004; Worsley & Skrzypiec, 1998). In most of the studies focusing on gender difference on environmental attitudes, a gender difference was found in favour of girls. Beside these studies there are ones investigating high correlation between environmental knowledge and environmental attitudes (Goldman et al., 2006; Chu, Shin & Lee, 2006). Increasing levels of environmental knowledge may be a potential

explanation for the gender difference found in the study. As it was reported in previous section there was a gender difference between 8th grade treatment groups with respect to their environmental knowledge. Girls get lower scores than boys from post-ELQ environmental knowledge subscale. So their low scores in environmental attitudes may be due to their limited environmental knowledge.

6.1.4 Effects of Eco-school Applications on the Improvement of Elementary School Students' Environmental Use

The third subscale of ELQ was 'environmental use'. When the post-test results are examined, it can be observed that experimental group students' agreement with positive statements and their disagreement with negative statements increased after the treatment. Results of the present study also revealed that a significant difference exists between 7th grade and 8th grade treatment groups with respect to their environmental use scores. Besides, no significant difference was found for 6th grade treatment groups. Involving in many environmental activities may be the possible explanation of the findings. Experimental group students discussed the advantages and disadvantages of using technology to solve environmental problems, studied the relationship between human and the environment, focused on global and local environmental problems and the ways to solve them, dealed with the roles of nongovernmental foundations and our personal responsibilities to solve the environmental problems and considered the future of environmental problems.

6.1.5 Effects of Eco-school Applications on the Improvement of Elementary School Students' Environmental Concerns

The fourth and the last subscale of ELQ was 'environmental concerns'. After the treatment, experimental group students' concern levels increased for 'smoke pollution', 'automobile emissions', 'industrial pollutions', 'hazardous wastes', 'poor water quality', 'ozone layer depletion' and 'global warming'. Besides, control group students' concern levels increased for only 'hazardous wastes' and 'ozone layer depletion'. Results of the study revealed that although practically small, statistically significant mean difference exists for 6th grade treatment groups. Results also showed that both statistically and practically significant mean differences exist for 8th grade treatment groups.

Studies have shown that experiences in nature increase students' environmental concern (Palmberg & Kuru, 2000). An increased number of activities conducted in nature may be the cause of increasing environmental concern. Experimental group students planted trees, recycled cans, bottles, papers, dealed with the quality of air inside the classrooms, collected batteries in separate boxes, observed the plant and animal species in the garden, discussed the effects of pesticides and herbicides used, did litter picking sessions through the school.

Besides, Malkus and Musser (1997) as cited in Yılmaz et al. (2004) expressed that if students have enough environmental knowledge and positive attitudes toward environment then they would be more sensitive to environmental problems. Being consistently with this research, experimental group students' increased levels of environmental concerns may be due to their increasing levels of environmental knowledge and attitudes.

Concerning gender difference, previous research studies have shown that females express greater concern about environmental problems than do males (Davidson & Freudenburg, 1996). In the present study, being consistent with previous research findings, gender difference was found for 7th grade students. Girls enrolling to eco-school program showed a substantial increase in their environmental concern scores.

6.1.6 Effects of Eco-school Applications on Elementary School Students' Views about Environment

To determine elementary school students' views about the environment and how eco-school applications affect these views both experimental and control group students were asked to draw a picture of an environment before and after the treatment. Students mainly involve plants, humans, different kinds of animals, houses, factories, mountains and rivers in their drawings. In pre-drawings although there were 59 codes, 13 more codes emerged in post-drawings. Educational experiences seem to expand students' views about environment.

Analysis of the drawings also showed that students' views about the environment clustered around three main themes; clean, dirty and both clean and dirty environment. These results were consistent with the previous findings (Alerby, 2000). Alerby found that four themes emerged from the analysis of children's drawings about the environment: views which focus on the good world, views that focus on the bad world, views that focus on the dialectics between the good and the bad world and views which focus on symbols and actions protecting the environment. Chi-square analysis conducted for the post drawings of 6th grade students revealed that a significant association exists between groups with a medium effect size. In the post-tests, in 6th grade control group there are more drawings belonging to Theme1 than expected. This means that after treatment there are more control group students drawing clean environment than experimental group students. Based on this result in can be concluded that 6th grade control group students became more optimistic than experimental group students considering the environment.

Analysis of post-drawings of 7th grade students exposed that a significant association exists between groups with a medium effect size. The Chi-square analysis revealed that among control group students there are less drawings belonging to Theme1 than expected. Besides, among experimental group students there are less drawings belonging to Theme1 than expected and more drawings belonging to Theme 2 than expected values. In the experimental group 41.5% of students involved clean and 46.3% of them involved polluted environment in their drawings. Besides, 92.5% of control group students' drawings represented clean and only 7.5% of them represented polluted environment. Depending on these results it can be concluded that experimental group students are more pessimistic than control group students considering the environmental problems.

Eigth grade students' post drawings showed that a significant association with a large effect size exists between treatment groups. The Chi-square analysis also revealed that among experimental group there are less drawings belonging to Theme1 than expected and more drawings belonging to Theme2 than expected values. Also Chi-square analysis revealed that among control group students there

are more drawings belonging to Theme1 than expected and less drawings belonging to Theme2 than expected. Considering all these results, consistently with other grade levels, it can be concluded that after treatment experimental group students became more pessimistic than control group students about environmental problems.

When the drawings are examined carefully, one can interpret, understand, measure and compare students' experiences. Depending on the results that emerged from the views of elementary school students on the environment, by eco-school applications students developed more understanding about environmental problems.

6.1.7. Eco-School Students' and Teachers' Views about Eco-School Applications

Interviews were conducted to determine eco-school students' and teachers' views about the eco-school application. In these interviews, both eco-school students and teachers mainly emphasized the characteristics of an eco-school, compared old and new school environment and gave advices for future eco-school applications. During the interviews, eco-school students emphasized that eco-schools should have different kinds of living things inside it and they should be clean places of learning in which many environmental friendly activities are conducted. Besides, eco-school students emphasized physical changes in their school environment after the application such as; an increase in the number of recycle bins, number and kinds of plants inside and outside the school, number of warning signs about effective use of water, electricity and othere sources in different places of school building. Additionally, students also emphasized an increase in the number of environmental activities conducted throughout the year and changes in their behaviours toward environment. Depending on the analysis of interviews, it can be concluded that students are aware of the characteristics and importance of eco-schools.

Eco-school teachers' interviews revealed similar results with a deeper content. Eco-school teachers emphasized that eco-schools should represent the features of the nature, provide a healthy, productive learning environment for students to learn how

their actions change the environmental situation of the school. They also emphasized that by eco-school applications, students found chance to be actively involved in environmental activities. In the interviews, 'time limitation', 'SBS examination', 'money' emerged as potential difficulties for eco-school applications.

6.2 Implications

The results of this study have some implications for teachers, school administrators and the researchers who deal with education for sustainable development. The goal of environmental education is to increase environmental literacy in terms of increased environmental knowledge, attitude, uses and concerns. Schools have the opportunity to influence the knowledge, attitudes, and views of future citizens. With this study it is proved that eco-schools are effective to develop elementary school students' environmental literacy. Therefore, teachers are advised to apply eco-school program and implement the steps in their schools. It is recommended that school administrators support and encourage teachers to participate in eco-school applications. Additionally, school administrators should encourage teachers to participate in in-service programs that focus on environmental education.

Searching ways to develop students' environmental literacy must be a regular part of the instruction in schools. Teachers are advised to increase opportunities for students' active participation in activities that may develop environmental literacy.

Overall, gender seems to be effective on the improvement of elementary school students' environmental literacy through eco-schools. For this reason, teachers are advised to take the gender difference in consideration during the application of environmental activities. Teachers are responsible to provide all students with opportunities to become environmentally literate citizens. They are advised to apply various kinds of environmental activities to actively involve both girls and boys.

This study has also some implications for researchers working on environmental education. Ko and Lee (2003) states that "in the context of ecological crisis and environmental deterioriation, teaching about environmental issues and the

preservation of the world's environment has become increasingly important across the globe" (p.187). Teachers are the key agents in developing students' environmental literacy (WCED, 1987). Although teachers are responsible in teaching environmental issues in schools, environmental educators have the responsibility to organize effective environmental education courses in undergraduate level. Pre-service teacher education has the top priority to improve teachers' instructional skills about environmental issues. Environmental educators are advised to improve the content of environmental education courses. Besides, environmental educators should feel responsibility to provide additional instructional materials to in-service teachers to help them in the instruction of environmental issues.

6.3 Recommendations for Further Researches

On the basis of the findings of the present study, there are some recommendations for further researches. First of all, the results presented in this study are valid only for the schools participated and are not generalized. A similar study can be conducted to urban and rural schools having students with different backgrounds. By this way, it will be possible to generalize the effects of eco-school applications on students' environmental literacy. It would be also interesting to replicate this study with students from different locations and cultures. Perhaps, this kind of research could be conducted internationally to look for similarities and variations. Additional studies may be conducted to investigate the effectiveness of eco-schools on primary school and high school students' environmental literacy. Although eco-schools are widespread there are not enough studies questioning eco-schools' effectiveness.

Another area for future study would be to conduct the same research by using other variables. A limited number of variables could be considered in the present study. It is worth to study investigating the effects of eco-schools on different variables other than environmental literacy such as environmental values, beliefs etc. Besides, gender and grade level seem to be effective on improving elementary school

students' environmental literacy through eco-schools. Further investigations of other factors that may influence the environmental literacy are required.

An additional area for further study would be to implement different instruments in similar studies to determine elementary school students' environmental literacy and their views about the environment. ELQ is strong and qualified enough to determine elementary school students' environmental literacy. Additionally, in drawings students' shared their views about the meanings that environment holds for them. However, these two instruments may not have been able to detect small-scale changes.

Increasing the time frame may be another focus point for future studies. The time frame for this study was not sufficient to study the long term retention of environmental literacy, and the extent of its continued impact on environmental attitudes and behaviors. While the initial results are favorable, there is no certainty that the acquired literacy will be retained. It is worth to conduct a longitudinal study and assess its effects.

Lastly, further investigation is necessary to integrate various student-centered teaching strategies such as 5E learning model, problem based learning, collobarative learning etc. accompanied with eco-school applications to enhance elementary school students' environmental literacy.

6.4 Conclusion

Environmental problems we experience are the indicators that resources on our planet are not being used effectively. Environmental education seems to be the most important way to solve environmental problems and to leave the future generations a healthy environment. According to Knapp (2000) "the ultimate goal of this medium (Environmental Education) is to produce an environmentally literate and responsible citizen, one who can make decisions that will help check many environmental problems that will arise in the 21st century" (p. 34). However, environmental education has not given the importance it deserves. If environmental

education seeks to save the world, then a reasonable emphasis should be given to attempts that aim to improve children's environmental literacy.

Overall, the results of the study present a very favorable scenario: eco-school applications improve elementary school students' environmental knowledge, attitudes, uses and concerns. With this study, it is proved that eco-school application foster elementary school students' environmental literacy. Eco-schools provide a learning environment both in and out school in which to explore what a sustainable lifestyle means. With eco-school application, students found rich learning settings in which they can participate environmental activities actively. Importance of active participation is emphasized by several researchers. Orr (1992) states that "Ecological literacy is becoming more difficult, I believe, not because there are fewer books about nature, but because there is less opportunity for direct experience of it" (p. 88). It is clear that simply providing more knowledge to people does not necessarily lead to an increase in their environmental literacy. This study addresses the way to educate environmentally literate children.

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APPENDIX A

ÇEVRE OKURYAZARLIĞI ÖLÇEĞİ

Sevgili Öğrenciler,
Bu anketin amacı çevre ile ilgili tutum, bilgi ve ilgilerinizi belirlemektir. Anketin tamamlanması yaklaşık 15–20 dakikanızı alacaktır. Bu anketten elde edilecek verilerin değerlendirilmesi aşamasında, anketin son bölümünde yer alan kişisel bilgiler kesinlikle gizli tutulacaktır. Ankete isminizi yazmanız **istenmemektedir.** Aşağıdaki soruları dikkatle okuyarak her bir soru için tek bir seçenek işaretleyiniz.

Yardımlarınız ve katkılarınız için teşekkür ederim.
Sibel ÖZSOY

1. Çevre sorunları ile ne kadar ilgilisiniz?

- ❑ Çok fazla
- ❑ Yeteri kadar
- ❑ Biraz
- ❑ Pek az
- ❑ Hiç

2. Aşağıdakilerden hangisi sizin görüşünüze en yakındır?

- ❑ Çevre, günümüzde insanların karşı karşıya olduğu en önemli 2 ya da 3 problemden biridir.
- ❑ Çevre önemli bir problemdir, ama daha önemli başka problemler de vardır.
- ❑ Çevre önemli bir problem değildir.
- ❑ Çevre bir problem değildir.

3. Çevre konuları ve problemleri ile ilgili, genel olarak, ne kadar bilginiz olduğunu düşünüyorsunuz?

- ❑ Çok fazla
- ❑ Yeteri kadar
- ❑ Biraz
- ❑ Hiç
- ❑ Fikrim yok

4. Çok çeşitli bitki ve hayvan türleri vardır ve bunlar çok farklı ortamlarda yaşamaktadır. Bu düşünceyi tanımlamak için kullanılan sözcük hangisidir?

- ❑ Çeşitlilik
- ❑ Biyolojik çeşitlilik
- ❑ Sosyo-ekonomik
- ❑ Evrim
- ❑ Bilmiyorum

5. Türkiye'de karbon monoksit hava kirliliği yaratan önemli bir kirleticidir. Aşağıdakilerden hangisi en önemli karbon monoksit kaynağıdır?

- ❑ Fabrikalar ve işyerleri
- ❑ İnsanların nefes alıp vermesi
- ❑ Motorlu araçlar
- ❑ Ağaçlar
- ❑ Bilmiyorum

6. Türkiye'de elektrik üretimi büyük ölçüde nasıl gerçekleşmektedir?

- ❑ Petrol, kömür ve odun yakılarak
- ❑ Nükleer santraller ile
- ❑ Güneş enerjisi ile
- ❑ Hidroelektrik santraller ile
- ❑ Bilmiyorum

7. Türkiye'de akarsu ve deniz kirliliğinin en temel nedeni nedir?

- ❑ Arıtılmamış, evsel, sanayi ve tarımsal atık sular
- ❑ Bahçe ve caddelerden akan sular
- ❑ Kumsal ve plajlardan atılan çöpler
- ❑ Şehir çöplerinin boşaltılması
- ❑ Bilmiyorum

8. Aşağıdakilerden hangisi yenilenebilir bir kaynaktır?

- ❑ Petrol
- ❑ Demir madeni
- ❑ Ağaçlar
- ❑ Kömür
- ❑ Bilmiyorum

9. Ozon, atmosferin üst katmanlarında koruyucu bir tabaka oluşturur. Ozon bizi aşağıdakilerden hangisinden korur?

- ❑ Asit yağmurları
- ❑ Küresel ısınma
- ❑ Sıcaklıktaki ani değişimler
- ❑ Zararlı, kansere neden olan güneş ışığı
- ❑ Bilmiyorum

10. Türkiye'de çöplerin büyük bir kısmı nereye atılır?

- ❑ Denizlere
- ❑ Yakma tesislerine
- ❑ Geri dönüşüm merkezlerine
- ❑ Çöp depolama alanlarına
- ❑ Bilmiyorum

11. Türkiye'de çevreyi korumaya yönelik kararlar alan resmi kurumun adı nedir?

- ❑ Çevre ve Orman Bakanlığı
- ❑ TEMA
- ❑ Tabiatı Koruma Vakfı
- ❑ Türkiye Çevre Eğitim Vakfı
- ❑ Bilmiyorum

12. Aşağıdaki evsel atıklardan hangisi zararlı atık olarak adlandırılabilir?

- ❑ Plastik ambalajlar
- ❑ Cam
- ❑ Piller
- ❑ Yemek artıkları
- ❑ Bilmiyorum

13. Hayvan türlerinin nesillerinin tükenmesinin en yaygın sebebi nedir?

- ❑ Pestisitler hayvanların ölmesine yol açmaktadır.
- ❑ Yaşam alanları insanlar tarafından yok edilmektedir.
- ❑ Avcılık çok artmıştır.
- ❑ İklim değişiklikleri hayvanları etkilemektedir.
- ❑ Bilmiyorum

14. Bilim adamları nükleer atıkların depolanması ile ilgili çalışmalarında henüz sonuca ulaşamamışlardır. Şu anda dünyada yaygın olan nükleer atık depolama yöntemi nedir?

- ❑ Nükleer yakıt olarak kullanılmaktadır.
- ❑ Başka ülkelere satılmaktadır.
- ❑ Çöp depolama alanlarında depo edilmektedir.
- ❑ Depolanmakta ve kontrol altında tutulmaktadır.
- ❑ Bilmiyorum

15. Aşağıdaki cümleler insan ve çevre ilişkisini yansıtmaktadır. Lütfen düşüncelerinizi her cümle için verilen seçeneklerden birini işaretleyerek belirtiniz.

	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Kesinlikle Katılıyorum**
Dünyanın insan yaşamını destekleme kapasitesini doldurmak üzereyiz.	❑	❑	❑	❑	❑
İnsanların doğaya müdahale etmesi genellikle felaketle sonuçlanır.	❑	❑	❑	❑	❑
Dünyada herkese yetecek miktarda doğal kaynak vardır, sorun bu kaynaklardan nasıl yararlanacağımızı öğrenmektir.	❑	❑	❑	❑	❑
Bitki ve hayvanlar da insanlar kadar var olma yaşama hakkına sahiptir.	❑	❑	❑	❑	❑
Doğanın dengesi, modern endüstrileşmiş toplumların etkileri ile rekabet edebilecek güçtedir.	❑	❑	❑	❑	❑
Bizi diğer canlılardan üstün kılan özel yeteneklerimize rağmen, hala doğa yasaları ile mücadele ediyoruz.	❑	❑	❑	❑	❑
İnsanların karşı karşıya kaldıkları "ekolojik kriz" olarak adlandırılan olaylar fazlasıyla abartılmaktadır.	❑	❑	❑	❑	❑
İnsan olmak doğanın geri kalan bölümüne hükmetmektir.	❑	❑	❑	❑	❑
İnsanlar doğayı kontrol edebilmek için doğayı anlamak gerektiğini sonunda öğrenecekler	❑	❑	❑	❑	❑
Eğer her şey bugünkü gibi devam ederse, yakında büyük bir ekolojik facia ile karşılaşacağız.	❑	❑	❑	❑	❑

16. Lütfen aşağıdaki her cümle için verilen seçeneklerden birini işaretleyiniz.

	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Kesinlikle Katılıyorum**
Soyu tükenmekte olan türler için özel alanlar ayrılmalıdır.	❑	❑	❑	❑	❑
Su kalitesi ile ilgili yasalar daha yaptırımcı olmalıdır.	❑	❑	❑	❑	❑
İnsanların et ihtiyaçlarının karşılandığı vahşi hayvanlar korunması gereken en önemli türlerdir.	❑	❑	❑	❑	❑
Zehirli yılanlar ve böcekler insanlar için tehdit oluşturduklarından öldürülmelidirler.	❑	❑	❑	❑	❑
Toprak sahiplerine sulak alanlarını tarımsal ve endüstriyel amaçlar için kullanmalarına izin verilmelidir.	❑	❑	❑	❑	❑
Herkesin çevre sorunlarının farkında olması çok önemlidir.	❑	❑	❑	❑	❑
Şahıslar sahip oldukları arazileri istedikleri şekilde kullanmakta serbest olmalıdır.	❑	❑	❑	❑	❑
Çevre sorunlarının çözümlenmesinde kişisel sorumluluklarım olduğunu düşünüyorum.	❑	❑	❑	❑	❑
Hükümet, vahşi hayatın korunması amacı ile özel mülkiyet alanlarının kullanımını denetlemelidir.	❑	❑	❑	❑	❑
İnsanlar, çevreye verdikleri her türlü zarardan sorumlu tutulmalıdır.	❑	❑	❑	❑	❑
Bitki ve hayvanların tümü çevrede önemli bir role sahiptir.	❑	❑	❑	❑	❑
Teknolojik değişimlerin çevre için yararları olduğu kadar zararları da vardır.	❑	❑	❑	❑	❑
Hükümet geri dönüşümün zorunlu olması yönünde yasalar hazırlamalı ve uygulamalıdır.	❑	❑	❑	❑	❑
Hava kirliliği ile ilgili yasalar yeteri kadar serttir.	❑	❑	❑	❑	❑

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
Çevre problemlerinin çözümünde bilim ve teknoloji çok önemlidir.	❑	❑	❑	❑	❑
İnsanların değer yargılarının değişmesi çevre problemlerinin çözümlenmesinde rol oynayacaktır.	❑	❑	❑	❑	❑
Toplu eylemler çevre problemlerinin çözümünde önemli bir yer tutar.	❑	❑	❑	❑	❑
Yaşam alışkanlıkları değişimler (tüketim gibi) çevre problemlerinin çözümlenmesinde önemli rol oynayacaktır.	❑	❑	❑	❑	❑

17. Aşağıda verilen çevre problemleri hakkında ne kadar kaygılanıyorsunuz? Lütfen her madde için verilen seçeneklerden birini işaretleyiniz.

	Hiç Kaygılanmıyorum	Çok Az Kaygılanıyorum	Kararsızım	Kaygılanıyorum	Çok Kaygılanıyorum
Duman kirliliği	❑	❑	❑	❑	❑
Ses kirliliği	❑	❑	❑	❑	❑
Otomobil emisyonları	❑	❑	❑	❑	❑
Endüstriyel kirlilik	❑	❑	❑	❑	❑
Zararlı atıklar	❑	❑	❑	❑	❑
Kalitesiz içme suyu	❑	❑	❑	❑	❑
Kapalı alanlarda oluşan hava kirliliği	❑	❑	❑	❑	❑
Ozon tabakasının delinmesi	❑	❑	❑	❑	❑
Küresel ısınma	❑	❑	❑	❑	❑

KİŞİSEL BİLGİLER

18. Cinsiyetiniz nedir?

- ❑ Kız
- ❑ Erkek

19. Yaşınız? _____

20. Sınıfınız _____

21. Aşağıdaki aktiviteleri bir yıl içinde hangi sıklıkta yaparsınız?

	Sık Sık	**Bazen**	**Ara Sıra**	**Hiçbir Zaman**
Kamp	❑	❑	❑	❑
Açık havada yürüyüş	❑	❑	❑	❑
Kuş gözleme	❑	❑	❑	❑
Balık tutma	❑	❑	❑	❑
Avcılık	❑	❑	❑	❑

22. Şimdiye kadar yaşadığınız bölge aşağıdakilerden hangisi ile tanımlanabilir?

- ❑ Kırsal alan, çiftlik
- ❑ Küçük kasaba (nüfusu 25 000 ile 100 000 kişi arasında)
- ❑ Büyük şehir (Nüfusu 100 000 kişiden fazla)

23. Anne ve babanızın çevre problemlerine ilgisi konusunda ne düşünüyorsunuz?

- ❑ Çok
- ❑ Yeteri kadar
- ❑ Çok değil
- ❑ Hiç
- ❑ Kararsızım

24. Anne ve babanız çevre korumacı davranışlar konusunda ne kadar aktiftir?

- ❑ Çok aktif
- ❑ Biraz aktif
- ❑ Aktif değil
- ❑ Kararsızım

25. Anne ve babanızın mezun olduğu okul hangisidir?

Anneniz	**Babanız**
❑ İlkokul	❑ İlkokul
❑ Ortaokul	❑ Ortaokul
❑ Lise	❑ Lise
❑ Meslek Lisesi	❑ Meslek Lisesi
❑ Üniversite	❑ Üniversite
❑ Lisansüstü	❑ Lisansüstü

APPENDIX B

ACTIVITY SHEET for DRAWING of ENVIRONMENT

"ÇEVRE"NİN RESMİNİ ÇİZELİM

Çevre denilince aklınıza gelenleri resmedebilir misiniz? Sizce "çevre"nin ne anlama geldiğini düşünün. Daha sonra aşağıdaki 1 numaralı kutucuğa "çevre"yi tanımlayan bir resim çizin. Çizdiğiniz resimde yer alan şekilleri isimlendirmeyi unutmayın. 2 numaralı kutucukta da çizdiğiniz resmi açıklayarak resminizin hangi açılardan çevreyi tanımladığını anlatın.

1. "Çevre"nin resmi:

2. Çevre kavramını tanımlayınız:

APPENDIX C

INTERVIEW QUESTIONS for TEACHERS

Değerli Hocam,
Okulunuzda bu dönem beraber yürüttüğümüz eko-okul uygulamasının etkililiğini değerlendirmek amacıyla sizinle bir görüşme yapmak istiyorum. Böylelikle yapılan uygulamanın olumlu ve olumsuz yönlerini ortaya çıkarmayı planlıyorum. Görüşmenin yaklaşık 20 dakika süreceğini düşünüyorum. İzin verirseniz görüşmeyi kaydetmek istiyorum. Bu şekilde hem zamanı daha iyi kullanabiliriz, hem de sorulara vereceğiniz yanıtların kaydını daha ayrıntılı tutma fırsatı elde edebilirim. Yaptığım tüm görüşmelerde verilen bilgiler sadece bu araştırmada kullanılacak ve kişisel bilgiler kesinlikle gizli tutulacaktır.

Çalışmama verdiğiniz destekten ötürü teşekkür ederim. Görüşmeye başlamadan önce bana sormak istediğiniz bir soru varsa cevaplamak isterim.

Cinsiyet:
Girdiği Ders:
Girdiği Sınıflar:
Okulda girdiği haftalık toplam ders sayısı:

6. Sınıflarda:
7. Sınıflarda:
8. Sınıflarda:

1. “Eko-okul” kelimesi size neleri çağrıştırıyor? “Eko-okul”u nasıl tanımlarsınız?
2. Okulunuzda yapılan eko-okul uygulaması hakkında ne düşünüyorsunuz? Bu uygulamanın okul, öğrenci, öğretmenler ve veliler için sizce olumlu ve olumsuz yanlarından bahseder misiniz?

3. Eko-okul uygulamaları okulunuzda ve öğrencilerinizde herhangi bir değişikliğe sebep oldu mu? Eğer değişiklik olduğunu düşünüyorsanız, ne tür değişikliklere sebep olduğunu açıklayabilir misiniz?
4. Okuldaki/sınıftaki öğrencilerinizin çevreye karşı davranışlarında geçmiş dönemlere göre bir farklılık gözlemlediniz mi? Ne tür farklılıklar gözlemlediniz?
5. Bir öğretmen olarak eko-okul uygulamaları çevre konularına olan ilginizi değiştirdi mi? Bundan sonraki dönemlerde derslerinizle çevre konularını ilişkilendirmeyi düşünür müsünüz? Neden?
6. Eko-okul uygulamasında yer almasını istediğiniz ama yapamadığınız etkinlikler var mı? Okulunuzda bu uygulamalar çerçevesinde değişmesini istediğiniz ama değiştiremeyeceğinizi düşündüğünüz şeyler var mı?
7. Dönem içerisinde yapılan etkinliklerin sizce eksik yanlarından bahseder misiniz?
8. Eko-okul uygulamasının gerçekleşmesi sırasında yaşadığınız zorluklardan bahseder misiniz?
9. Okullarda bu tür uygulamalar için engel teşkil edebilecek durumlar nelerdir?
10. Eko-okul uygulamasının daha iyi olabilmesi için önerileriniz nelerdir?
11. Önümüzdeki dönemlerde de bu tür uygulamaların içinde yer almak ister misiniz? Neden?
12. Eko-okul uygulaması ile ilgili eklemek istediğiniz şeyler var mı?

APPENDIX D

INTERVIEW QUESTIONS for STUDENTS

Sevgili ……..
Seninle bu dönem okulunda yapmış olduğumuz eko-okul etkinlikleri hakkında görüşme yapmak istiyorum. Böylelikle yapmış olduğumuz uygulamanın etkililiğini değerlendirme fırsatı bulacağım. . İzin verirseniz görüşmeyi kaydetmek istiyorum. Bu şekilde hem zamanı daha iyi kullanabiliriz, hem de sorulara vereceğiniz yanıtların kaydını daha ayrıntılı tutma fırsatı elde edebilirim. Görüşmenin yaklaşık 20 dakika süreceğini düşünüyorum. Çalışmama verdiğin destek için şimdiden teşekkür ederim. Görüşmeye başlamadan önce bana sormak istediğin bir soru var mı?

Cinsiyet:
Sınıf:
Yaş:

1. "Çevre" deyince aklına neler geliyor? Ülkemizde ve dünyada ne tür çevre sorunları yaşıyoruz? Bu sorunlar sence ne kadar önemli? Neden?
2. Sence 50 yıl sonra Türkiye'de yaşadığımız çevre sorunları bugüne göre daha mı az daha mı fazla olacak? Neden?
3. Bildiğin gibi bu dönem okulunuzda "eko-okul" projesi başlattık. "Eko-okul" u tanımlar mısın? Sence bir "eko-okul" nasıl olmalı? "Eko-okul"ların amacı ne olmalı?
4. Bu dönem yaptığımız eko-okul uygulamaları ile okulunda/sınıfında geçen dönemlere göre bir değişiklik fark ettin mi? Okulunda/sınıfında ne tür değişiklikler gözlemledin?

5. Bu dönem içerisinde arkadaşlarının çevreye karşı davranışlarında farklılıklar gözlemledin mi? Peki senin çevreye karşı davranışlarında değişiklikler oldu mu? Ne tür değişiklikler oldu?
6. Dönem içerisinde yaptığımız etkinliklerden hangilerine katıldın? Bu etkinliklerden hangisini daha çok sevdin? Neden?
7. Eko-okul uygulamalarında ne tür etkinlikler olsun istersin?
8. Önümüzdeki yıl okulunda bu uygulama devam etsin ister misin? Bu uygulamanın içinde aktif rol almak ister misin? Neden?
9. Eko-okullar ile ilgili eklemek istediğin başka şeyler var mı?

APPENDIX E

EKO-OKUL UYGULAMA DOSYASI

GÜNÜMÜZDE ÇEVRE EĞİTİMİ:

İnsanoğlu var olduğu günden bu yana çevresinde meydana gelen olaylardan etkilenmiş aynı zamanda da çeşitli faaliyetlerle çevresini etkilemiş, tahrip etmiştir. Günümüzde; hızlı nüfus artışı, küresel ısınma, doğal kaynakların bilinçsizce tüketimi, artan çevre kirliliği, sanayi ülkelerinde görülen tüketim artışı, canlı türlerinin yok olması, açlık ve susuzluk gibi problemler en önemli çevre sorunlarını oluşturmaktadır. 19. yüzyıla kadar insanoğlu çevre sorunlarını ve bu sorunların kendisini etkilediğinin farkına varamamış, doğal kaynakların sürekli ve tükenmez olduğunu düşünmüştür. Ancak bu tarihten itibaren çevre sorunları konuşulmaya ve tartışılmaya başlamıştır. 19. yüzyılın sonlarına doğru ise çevre, çevre sorunlarının anlaşılması ve önlenmesi, bireylerin yaşadıkları çevre hakkında bilgilendirilmesi ve bilinçlendirilmesinde eğitimin büyük rol oynadığı, eğitim sayesinde insanların çevre sorunlarına karşı daha bilinçli ve duyarlı bir yaklaşım sergiledikleri kabul edilmiştir.

İnsanoğlu çevreyle ilgili sorunlara neden olduğu gibi bu sorunları yine kendisi çözecektir. Çevre sorunlarının gittikçe arttığı günümüzde bu sorunlara çözüm bulunması, yeni sorunların oluşmaması için çevre okuryazarı olan, çevre sorunlarının farkında olan, bu sorunları çözmeye yönelik girişimlerde bulunabilen, doğal kaynakların tükenebileceğinin farkında olan ve kaynakları bu bilinçle kullanan bireylerin yetiştirilmesi gerekmektedir. Çevre ile ilgili bilgi, çevre bilinci, çevre problemleri ve bu problemlerin çözümleri düşünüldüğünde gerekli eğitimin sadece sınıflarda verilmesinin yetersiz olacağı aşikârdır. Bunun için günümüzde öğrenme-öğretmen süreci sınıfların dışına taşarak, okula, okul bahçesine kadar uzanmaya başlamış, çevre eğitimi okullardaki yaşamın bir parçası hâline gelmiştir.

EKO-OKULLAR PROGRAMI

Ülkemizde Türkiye Çevre ve Eğitimi Vakfı (TURÇEV, www.turcev.org.tr) ilköğretim okullarında çevre bilinci, çevre yönetimi ve sürdürülebilir kalkınma eğitimi vermek için "Eko-okullar Programı"nı yürütmekte, programa dâhil olan ve başarı ile yürüten okullar "yeşil bayrak" ile ödüllendirilmektedirler. Ülkemizde 2008 yılı itibariyle eko-okul programını yürütmekte olan 155 okul bulunmaktadır.

Planlanan bu çalışma ile …… Koleji'nde eko-okul çalışmasının başlaması, TURÇEV tarafından yürütülmekte olan eko-okul programında belirtilen sürecin takip edilerek gerekli sürenin geçmesinden sonar yeşil bayrak ödülü başvurusunun yapılması amaçlanmaktadır. Ayrıca bu uygulamanın amaçlandığı gibi öğrencilerin çevreye karşı tutumunda, çevre okuryazarlığında değişiklik yaratıp yaratmadığı da uygulanacak çeşitli ölçeklerle belirlenecektir. Böylelikle uygulamanın etkililiği de denenmiş olacaktır.

Eko-okul uygulamalarında çalışmayla ilgili herkesin katılımı büyük önem taşımaktadır. Çalışmanın başarı ile sonuçlanabilmesi okul müdürünün ve idarecilerin desteği, her branştan öğretmenin çalışmaya katılımı, eko-okul koordiantörü ve eko-tim öğretmenlerinin özverili çalışması, öğrencilerin çalışmanın her aşamasında aktif rol alması, çalışanların desteği ve velilerin de çalışmaya dâhil edilmesiyle mümkündür. Çalışmanın başarıya ulaşması bireysel çabayla değil tüm okulun katılımıyla mümkündür. Veliler uygulamadan haberdar edilmeli, velilerin uygulamanın çeşitli aşamalarına katılımı sağlanmalıdır. Dönem sonunda yapılan etkinlikler ve çalışmanın ayrıntıları yapılacak olan etkinliklerle velilerle ve yerel yöneticilerle paylaşılması uygun olacaktır.

EKO-OKUL KOORDİNATÖRÜNÜN VE EKO-TİM ÖĞRETMENLERİNİN GÖREVLERİ

Eko-okul koordinatörünün projedeki görevi, eko-timlerin çalışmalarını aksatmadan sağlamak, eko-tim çalışmalarını takip etmek, eko-timler arasındaki koordinasyonu sağlamak, ortaya çıkabilecek sorunlara çözüm yolları aramak, etkinliklerin ve raporların düzenli bir şekilde toplanmasını sağlamaktır. Proje sırasında yapılan her çalışma eko-okul koordinatörü ve eko-tim öğretmenleri

tarafından raporlanmalı, hazırlanacak raporlarda raporun amacı, hazırlanış tarihi, sonucu gibi başlıklara yer verilmelidir. **Eko-tim öğretmenleri** ise çalıştıklaır konu ile ilgili okulda bulunan eksikliklerin ve problemlerin belirlenmesini sağlamakla, eko-timde çalışan öğrencilerin çalışmada yapacakları işleri belirlemekle, öğrencilerin çalışmalar sırasında güvenliklerini korumak ve hijyen kurallarına gore çalışmalarını yürütmelerini sağlamakla, branş öğretmenlerinin çalıştıkları konu ile ilgili etkinlikleri sınıflarında yapmalarına destek olmakla, yapılan etkinliklere ait dokümanları toplayarak eko-okul koordinatörüne iletmekle yükümlüdürler. Branş öğretmenleri sınıflarında çalışma ile ilgili etkinlik planlarını varsa etkinlik kâğıtlarını eko-tim öğretmenleri ile paylaşmalı böylelikle bu etkinliklerin dosyalanmasına destek olmalıdırlar.

Dokümanın devamında sizlere eko-okul uygulamasının adımları, öneri bir çalışma planı, eko-timlerin çevresel incelemede kullanabilecekleri başlıklar, uygulama sırasında yapılabilecek etkinlikler ve müfredat çalışmalarına örnekler verilmiştir. Ayrıca eko-okul koordinatörleri tarafından TURÇEV'e dönem sonunda verilen çalışma raporlarındna örnekler, ülkemizde yeşil okula sahip okulların listesi de dokümanın devamında bulunmaktadır.

ÇALIŞMA ADIMLARI VE ÖNERİ ÇALIŞMA PLANI

ŞUBAT 2009	
Çalışmada Kullanılacak Ölçeklerin Ön-testinin Yapılması	
Tüm Okulun Proje Hakkında Bilgilendirilmesi:	Araştırmacı tarafından çevre eğitimi, eko-okullar ve çalışmada yapılacaklar hakkında idarecilere, öğretmenlere ve okul çalışanlarına bilgi verilmesi. Öğretmenler ve idarecilere konu ile ilgili hazırlanan dosyanın dağıtılması. Velilerin dönem boyunca uygulanacak çalışmadan haberdar edilmesi, desteğinin istenmesi. **Bu bilgilendirme sonunda öğretmenlerden öğrencilerini bilgilendirmeleri istenecektir. İdarecilerden de velileri bilgilendirmeleri istenecektir.**
Eko-Okul Komitesinin Kurulması:	Çevre konularındaki etkinlikleri organize etmek ve yönetmekle sorumlu eko-okul komitesinin kurulması. İdarecilerin, öğretmenlerin, öğrencilerin, personelin ve velilerin komiteye katılımının sağlanması. Koordinatör öğretmenin seçilmesi projede yer alacak alt başlıklar için eko-timlerin oluşturulması, her bir timden sorumlu öğretmenlerin belirlenmesi. Her bir eko-timin çalıştıkları alana yönelik eko-ilkelerini belirlemesi.
Projeyi Tanıtan ve yapılacakları anlatan Eko-Okul Bülten Panosunun Hazırlanması	Okulda yer alan duyuru panolarından birinin proje tanıtımı, proje ile ilgili etkinliklerin ve gelişmelerin bütün okula duyurulması için ayarlanması. Etkinliklerden çeşitli fotoğraflar, öğrencilerin proje sırasında elde ettiği ürünler bu panoda gösterilecektir.

MART 2009	
Çevresel inceleme:	Her bir eko-timin başlarındaki sorumlu öğretmenlerle birlikte okulda çalışma konularına yönelik inceleme yapması. Her bir konu başlığı için okulun durumunun belirlenmesi, ihtiyaçların ortaya çıkarılması. Eko-timlerin yapması gereken incelemeye örnek oluşturacak öneri niteliğindeki başlıklar EK-1'de verilmiştir. Sonuçların sorumlu öğretmenler tarafından raporlaştırılması ve eko-okul komitesinin yapacağı toplantıda paylaşılması.
Eylem Planı:	Eko–komitenin çevresel inceleme sonucu ortaya çıkan sonuçları değerlendirerek belirlenen önceliklere göre uygulanabilir, gerçekçi amaçlar ve bu amaçları gerçekleştirmek üzere tarihleri belirlemesi. Eylem planının raporlaştırılması. **Tarihleri belirlerken bu dönem içerisinde yapılacak uygulamaların yer almasına dikkat edilmelidir. Eylem planı hazırlanırken sınıf içerisinde yapılabilecekler de dikkate alınmalı, her bir branştan sınıf içerisinde yapılabilecek etkinlikler eylem planına eklenmelidir.**
Harekete Geçme: Müfredat Çalışması:	Eko-komite tarafından belirlenen eylem planında yer alan etkinliklerin yapılmaya başlanması. Atık, enerji, su, geri dönüşüm gibi konularda sınıf içinde yapılabilecek etkinliklerin uygulanması. Her bir eko-timin yapabileceği etkinlikler ve her bir branştan sınıflarda yapılabilecek etkinlikler öneri niteliğinde EK-2'de sunulmuştur. Uygulanan her bir etkinliğin ve eylem planında yapılan maddelerin raporlanması.

NİSAN 2009	
Harekete Geçme: Müfredat Çalışması:	Eko-komite tarafından belirlenen eylem planında yer alan etkinliklerin yapılmaya başlanması. Atık, enerji, su, geri dönüşüm gibi konularda sınıf içinde yapılabilecek etkinliklerin uygulanması. Her bir eko-timin yapabileceği etkinlikler ve her bir branştan sınıflarda yapılabilecek etkinlikler öneri niteliğinde EK-2'de sunulmuştur. Uygulanan her bir etkinliğin ve eylem planında yapılan maddelerin raporlanması.

MAYIS 2009	
Harekete Geçme: Müfredat Çalışması:	Eko-komite tarafından belirlenen eylem planında yer alan etkinliklerin yapılmaya başlanması. Atık, enerji, su, geri dönüşüm gibi konularda sınıf içinde yapılabilecek etkinliklerin uygulanması. Her bir eko-timin yapabileceği etkinlikler ve her bir branştan sınıflarda yapılabilecek etkinlikler öneri niteliğinde EK-2'de sunulmuştur. Uygulanan her bir etkinliğin ve eylem planında yapılan maddelerin raporlanması.
Gözlem ve Değerlendirme:	Eylem planında belirtilen maddelerin yapılıp yapılmadığının kontrolü. Dönem başından beri geçen sürenin değerlendirmesi.
Bilgilendirme ve Katılım:	Okulda yapılan uygulamanın sonuçlarından velilerin ve yerel yönetimin haberdar edilmesi. Yapılan çalışmalarla toplumun çevresel konularda duyarlı olmaya çağırılması.
Çalışmada Kullanılacak Ölçeklerin Son-testinin Yapılması	

EK-1

EKO-TİMLER TARAFINDAN ÇEVRESEL İNCELEMEDE KULLANILABİLECEK BAŞLIKLAR

Aşağıda eko-timlerin yapacakları çevresel incelemede kullanabilecekleri çeşitli başlıklar verilmiştir. Bu başlıklar tamamen öneri niteliğinde olup-eko-timler dilerlerse bu başlıkları aynen kullanabilir ya da başlıklara ekleme ve çıkarma yapabilirler.

Sağlıklı Yaşam Eko-Timi:

- Okul kantininde satılan yiyecek ve içeceklerin incelenmesi (Bunun için kantinde satılan yiyecek ve içecek çeşitleri listelenir ve sağlıklı yiyecek/içeceklerin oranı belirlenir.)
- Okulda tüketilen yiyecek ve içeceklerin ne kadarının yerel olduğunun belirlenmesi
- Kantinde satılan sıcak içeceklerin servis edildiği bardakların hangi malzemeden yapıldığının belirlenmesi (kâğıt, plastic, cam vb.)
- Öğle yemeğinde tüketilen yiyecek/içeceklerin incelenmesi (Aylık yemek listesinde yer alan yiyecek/içecekler listelenir, sağlıklı olup olmadığına karar verilir.)
- Okulda sigara içen personel ve öğretmenlerin sayısının belirlenmesi
- Okulda içme suyunun ne tür kaynaklardan sağlandığının belirlenmesi (damacana, kantinde satılan pet şişe vb.)
- Okulda yapılan fiziksel aktivitelerin ve bu aktivitelere ayrılan haftalık toplam sürenin belirlenmesi
- Okul ve sınıf içerisinde temiz havanın sağlanma yollarının ve kullanım sıklığının belirlenmesi
- Sınıflarda kullanılan tahta ve tebeşir çeşitlerinin belirlenmesi (kara tahta, tozsuz tebeşir, beyaz tahta, boarda marker, vb)
- Okul tuvaletlerinde (öğrenci ve personel tuvaletleri için ayrı ayrı) hijyeni sağlayacak sıcak su, tuvalet kâğıdı, çöp kovası, otomatik sabunluklar, fotoselli musluklar, vb. unsurların varlığının belirlenmesi)

- Okulun temizliği için kullanılan temizlik malzemelerinin belirlenmesi, bu malzemelerin çevreye zararlı olup olmadığının belirlenmesi.

Enerji Eko-Timi(Elektrik ve Isınma):

- Okulda enerji tüketimini takip eden, bundan sorumlu bir kişinin olup olmadığının belirlenmesi
- Okulda kullanılan enerji türlerinin ve kullanım alanlarının belirlenmesi (elektrik, doğalgaz, kömür, vb.)
- Okulda ısınmanın hangi yollarla sağlandığının belirlenmesi (Sınıflarda, bürolarda, koridorlarda varsa farklı ısınma yolları ayrıntılarıyla belirtilmelidir.)
- Elektrik ve doğalgaz sayaçlarının yerlerinin belirlenmesi
- Isı kaybını azaltmak için alınan önlemlerin belirlenmesi (camlar, pencereler, kapılarda alınan önlemleri içerebilir.)
- Okulun içinde ve dışında kendiliğinden kapanan kapıların sayılarının belirlenmesi
- Okulda (sınıf, koridor ve bürolar) ve okul bahçesinde aydınlatma için kullanılan ampul sayısının ve türlerinin belirlenmesi
- Okulda aydınlatmanın gereksiz kullanılıp kullanılmadığının belirlenmesi
- Okulda yenilenebilir enerji kaynaklarının kullanılıp kullanılmadığının belirlenmesi
- Okulda kullanılan elektrikli araçların sayısının, kullanım alanlarının ve kullanım sıklığının belirlenmesi
- Okulda aylara gore tüketilen elektrik miktarının belirlenmesi, 2008 Eylül ayından itibaren gelen elektrik faturalarında aylara gore tüketim maliyetinin ve miktarının belirlenmesi
- Okul içerisinde ve dışında varsa güneş ışığından daha fazla yararlanmak için kullanılan yöntemlerin belirlenmesi

Atık Miktarını Azaltma ve Geri Dönüşüm Eko-Timi:

- Okul içerisinde ve dışında çöp kovaları yerine yere atılan çöp miktarının belirlenmesi
- Okul içerisinde ve dışında bulunan çöp kovalarının adetlerinin ve yerlerinin ve ne kadar sıklıkta boşaltıldığının belirlenmesi

- Çöp kovası sayısının yeterli olup olmadığına karar verilmesi, ihtiyaç duyulan alanların belirlenmesi
- Kullanılan çöp kovalarının kullanım alanlarına uygunluğunun belirlenmesi (örn. Tuvaletlerde el değmeden açılan çöp kovalarının varlığı, okul bahçesinin dışında daha büyük ve rüzgârla devrilmeyen çöp kovalarının varlığı vb.)
- Okulda kullanılan kâğıt, toner, kalem gibi tüketim malzemelerinin aylık tüketim miktarının ve tüketiminin control altında olup olmadığının belirlenmesi
- Kullan-at türdeki malzemelerin geri dönüştürülmüş malzemelerden elde edilip edilmediğinin belirlemesi (örneğin kâğıt havlular, vb.)
- Tüketim malzemelerinin geri dönüştürülmüş malzemelerden elde edilip edilmediğinin belirlenmesi
- Okulda kullanılan malzemelerin geri dönüşüm için ayrılıp ayrılmadığının belirlenmesi (pil, kâğıt, plastik, cam, teneke, vb.)
- Yiyecek atıklarından compost yapılıp yapılmadığının belirlenmesi, yapılıyorsa atıkların yüzde kaçnının compost yapıldığının belirlenmesi
- Okuldaki tüketimi azaltmak için herhangi bir uygulamanın yapılıp yapılmadığının belirlenmesi

Su Eko-Timi:

- Okuldaki su sayaçlarının yerlerinin belirlenmesi
- Su tüketimini azaltmak için gerekli uyarı işaretlerinin bulunup bulunmadığının belirlenmesi.
- Okulda aylara gore tüketilen su miktarının belirlenmesi, 2008 Eylül ayından itibaren gelen su faturalarında aylara gore tüketim maliyetinin ve miktarının belirlenmesi
- Su tüketimini azaltmak için varsa alınan önlemlerin belirlenmesi
- Tuvaletlerde kullanılan rezervuar türlerinin belirlenmesi
- Muslukların kullanılmadığı zamanlarda açık bırakılıp bırakılmadığının belirlenmesi
- Damlatan muslukların olup olmadığının belirlenmesi

- Okulda su kullanan araçların ve kullanım sıklığının belirlenmesi (çamaşır makinesi, bulaşık makinesi, vb.)
- Okulda su tüketimini arttırdığı düşünülen etkinliklerin ve yapılma sıklığının belirlenmesi

Okul Binası ve Bahçesi Eko-Timi:

- Okul bahçesinde bulunan alanların (yeşil alan, spor sahası, oyun alanı vb.) tarifinin yapılması, kullanım amaçlarının ve yüzölçümlerinin belirlenmesi
- Yeşil alanlarda bulunan bitki çeşitlerinin ve miktarının belirlenmesi
- Okulda varsa akvaryum, kuş yuvası, gölcük gibi hayvanlara yaşam alanı sağlayan alanların belirlenmesi
- Bahçede kullanılan böcek ilaçlarının ve bitkilerde kullanılan ilaçların, kullanım sıklığının ve miktarının belirlenmesi
- Bahçe atıklarının ayrı bir alanda toplanıp toplanmadığının belirlenmesi
- Beden eğitimi dersi dışında okul bahçesinde yapılan derslerin ve ne sıklıkta bahçede ders yapıldığının belirlenmesi
- Okul sınırları içerisinde yaşayan hayvanların belirlenmesi
- Okul binasının dış çeperinde ve iç çeperinde kullanılan boyanın türünün belirlenmesi

EK-2
ÇEVRE İNCELEMESİNDEN SONRA YAPILABİLECEK ETKİNLİKLER VE MÜFREDAT ÇALIŞMALARI

Bu başlık altında her bir eko-timin çevre incelemesini tamamlamasından sonar okulda belirlediği problemleri ve eksiklikleri gidermeye yönelik yapabileceği etkinliklere ve müfredat çalışmalarına örnekler verilmiştir. Bu bölüm çevre incelemesi sonucu çıkabilecek muhtemel eksiklikler düşünülerek oluşturulmuştur. Çevre incelemesi sonucu farklı eksiklikler ve problemler çıkabileceği düşünüldüğünde, eko-timlerin uygulamaya koyacağı etkinlikler burada belirlilenlerden farklılıklar gösterebilir. Bu bölüm tamamen öneri niteliğinde olup, eko-timlere fakir vermek amacıyla hazırlanmıştır. Eko-timler dilerlerse burada belirtilen etkinlik önerilerini aynen kullanabilir ya da farklı etkinlikler yapabilirler. Değişik müfredat çalışmalarının eklenmesi tavsiye edilmektedir.

Sağlıklı Yaşam Eko-Timi:

- Okul kantininde fast-food (hamburger, patates kızartması, tost vb.) tarzı yiyeceklerin yerine daha sağlıklı gıdaların satılması yönünde bir çalışmanın başlatılması (Bunun için kantin idarecisiyle görüşülebilir, alternatif seçenekler –meyve, salata, kepek ekmeği ile yapılmış peynirli, domatesli sandviçler vb.- sunulabilir.)
- Okul kantininde satılan gazlı içeceklerin (gazlı içecekler) yerine sağlıklı içeceklerin (ayran, süt vb.) tüketiminin desteklenmesi (sağlıklı içecekler öğrencilerin daha rahat göreceği, ulaşacağı yerlere konabilir, bu tür içeceklerin sayısı arttırılabilir.)
- Kantinde ve yemekhanede eğer kullanılıyorsa plastic bardak ve tabakların yerine kâğıt veya cam olanların kullanılması. Kâğıt bardakların kullanıldıktan sonar geri dönüşüm kutusuna atılması. Bunun için yemekhanede ve kantinde birer adet geri dönüşüm kutusunun ya da bu amaç için hazırlanmış birer çöp kovasının hazırlanması
- Okulda mümkünse damacana ve sebiller kullanarak öğrencilerin her an temiz içme suyuna ulaşmasının sağlanması (pet şişe tüketimini azaltacağı gibi öğrencilerin musluk suyu içmemeleri de sağlanacaktır.)

- Sınıf içerisinde temiz havanın sağlanabilmesi için teneffüslerde sınıfın boşaltılarak havalandırılması
- Mümkünse tozsuz, tebeşirlerin, beyaz tahtanın kullanılması
- Okul tuvaletlerinde özellikle öğrenci tuvaletlerinde tuvalet kâğıdı, sabun, çöp kovası gibi hijyeni sağlayacak unsurların devamlılığının sağlanması.
- Okulda kullanılan temizlik maddelerinin çevreye zarar vermeyenlerden seçilmesi.

Müfredat Çalışmaları:

- Fen bilgisi derslerinde okul bahçesinde yeşil bir alanda küçük bir sera oluşturarak öğrenciler burada yetiştirilmesi kolay meyve ve sebzeleri üretebilirler, üretilen bu sebze ve meyveler (marul, domates, salatalık, biber, taze soğan, nane vs.) okul kantininde ve yemekhanesinde kullanılabilir. Benzer bir uygulama sınıflarda da yürütülebilir, saksı içerisinde bazı meyve ve sebzeler yetiştirilebilir.
- Fen bilgisi dersinde sigaranın sağlığa zararları ile ilgili posterler hazırlanabilir, deneyler yapılabilir, yapılacak olan bir gösteriyle öğrencilerin öğretmenlerini bilgilendirmeleri sağlanabilir.
- Her branşta, yapılan derslerde öğrencilerin fiziksel aktivitelerini arttırıcı etkinliklere (drama, tiyatro, eğitsel oyun) yer verilebilir.
- Çeşitli branşlarda sağlıklı yaşamı ve hayatımızda hijyeni nasıl sağlayabileceğimiz konularında çalışmalar yapılabilir (örneğin resim dersinde sağlıklı beslenen ve beslenmeyen insanları konu olan resim çalışmaları yapılabilir.)

Enerji Eko-Timi: (Elektrik ve Isınma)

- Elektrik ve doğal gaz sayaçlarının her hafta öğrenciler tarafından okunması ve harcanan enerji miktarının kaydedilmesi, bu verilerin grafiğe dökülmesi.
- Farklı ısınma yolları kullanılıyorsa (elektrik sobalarının kullanımı gibi) daha ekonomik yolların kullanılması yönünde harekete geçilmesi
- Isı kaybını azaltmak için önlemlerin alınması

- Mümkünse özellikle okul giriş kapılarının kendiliğinden kapanmasının sağlanması ya da giriş çıkışlarda kapıların kapatılması için uyarı levhalarının öğrenciler tarafından hazırlanarak uygun yerlere asılması
- Okul içindeki aydınlatma ve ampullerin enerji tasarruflu olanlarla değiştirilmesi
- Gereksiz elektrik kullanımının engellenmesi bunun için uyarı levhalarının asılması
- Okulda kullanılan elektrikli araçların kullanım sıklığının azaltılması, araçların kullanılmadığı zamanlarda düğmesinden kapatılması
- Okul içerisinde ve dışında varsa güneş ışığından daha fazla yararlanmak için belirlenen yöntemlerin uygulanması

Müfredat Çalışmaları:

- Fizik ya da fen bilgisi derslerinde elektrik tüketiminden, harcanan elektrik miktarının hesaplanmasından bahsedilebilir.
- Öğrencilerin evlerinde kullandıkları elektrikli aletleri, bu aletlerin kullanım sıklıklarını belirlemeleri istenebilir.
- Öğrencilerin evlerinde enerji tüketimini azaltmak için aldıkları önlemleri anne ve babalarından öğrenmeleri istenebilir (röportaj yapmaları istenebilir, anket hazırlayarak anne ve babalarına doldurtmaları istenebilir)
- Sınıfta enerji tüketimine karşın alınabilecek önlemler tartışılarak bu önlemlerin uygulanması sağlanabilir
- Öğrencilere yenilenebilir enerji kaynakları tanıtılarak uygulamada aktif olarak kullanılamasa bile bir rüzgâr tribününün ya da bir güneş panelinin çalışma prensibi açıklanabilir, örnek modeller oluşturulabilir

Atık Miktarını Azaltma ve Geri Dönüşüm Eko-Timi:

- Okul içerisinde ve dışında mevcut çöp kovalarının yetersiz kaldığı alanlara yeni çöp kovalarının eklenmesi
- Kullanım alanlarına uygun olmayan çöp kovalarının uygun olanlarla değiştirilmesi

- Kullanılan kâğıt, toner gibi malzemelerinin aylık tüketim miktarının azaltılması. Alınan bilgisayar çıktılarının toner tasarruflu alınması, kullanılan kâğıtların arka yüzlerinin de kullanılması
- Kullan-at malzemelerinin ve tüketim malzemelerinin mümkünse geri dönüştürülmüş olanlardan tercih edilmesi
- Atık pil kutularının okulun değişik yerlerine yerleştirilmesi, başlatılacak bir kampanya ile öğrencilerin evlerinde ve okulda kullandıkları pilleri bu kutuda toplamaları
- Kâğıt, plastik, cam, teneke gibi geri dönüştürülebilir malzemelerin geri dönüşüm kutularına atılmasının sağlanması
- Okuldaki tüketimi azaltmak için çeşitli önlemlerin alınması

Müfredat Çalışmaları:

- Öğrenciler kâğıt geri dönüşümüyle ilgili etkinlikler yapabilir, elde ettikleri ikinci ürünü resim dersinde resim yapmakta kullanabilirler.
- Sınıfta kullanılmak üzere küçük bir geri dönüşüm kutusu hazırlanabilir, geri dönüştürülebilir atıkların ilk önce sınıf içerisinde kullanılması sağlanabilir.
- Her bir sınıfın geri dönüşüme sağladığı katkı hesaplanabilir
- Geri dönüşüm için kullanılan semboller öğrencilere tanıtılabilir çeşitli tüketim malzemelerinin ambalajları bu semboller açısından incelenebilir.
- Katı atık merkezine gezi düzenlenebilir
- Öğrencilerin geri dönüşüme attıkları malzemelerin hangi işlemlerden geçtiği anlatılabilir.
- Pil toplama kutularında biriken piller, şehir içerisinde bulunan toplama noktasına öğrencilerle birlikte götürülebilir.
- Yiyecek atıklarından kompost yapılabilir, elde edilen kompost bahçede ya da sınıfta yetiştirilen bitkileri beslemek için kullanılabilir.
- Okul bahçesinde ve içerisinde yere atılan çöpler düzenlenecek bir etkinlikle öğrenciler tarafından hijyen kuralları içerisinde toplanabilir.
- "Bilinçli tüketici" kavramı tartışılabilir, bilinçli tüketicinin yapması gereken davranışlar listelenebilir.

- Organik ve organik olmayan birkaç atık toprağa gömülerek 1 gün, 3 gün, 1 hafta, 1 ay ve 3 ay sonraki değişimlerine bakılabilir.
- Wall-E filmi öğrencilerle birlikte izlenebilir.

Su Eko-Timi:

- Su sayaçlarının her hafta öğrenciler tarafından okunması ve harcanan su miktarının kaydedilmesi, bu verilerin grafiğe dökülmesi.
- Su tüketimini azaltmak için gerekli uyarı işaretlerinin konulması
- Okulda aylara göre tüketilen su miktarının belirlenmesi, Eylül ayından itibaren gelen su faturalarında aylara göre tüketim maliyetinin ve miktarının belirlenmesi
- Tuvaletlerde kullanılan sifonlardaki su tüketimini azaltmaya yönelik önlemlerin alınması
- Muslukların kullanılmadığı zamanlarda kapatılmasının sağlanması
- Damlatan muslukların tamir edilmesi
- Okulda su kullanan araçların kullanım sıklığının azaltılması
- Okulda su tüketimini arttırdığı düşünülen etkinliklere alternatiflerin oluşturulması
- Yağmur suyunun toplanarak bahçedeki bitkileri sulamak için kullanılması

Müfredat Çalışmaları:

- Suyun yaşamımız için önemi ve suyun olmaması durumunda hayatımızda nelerin değişeceği tartışılabilir.
- Gazete ve dergilerden kuraklıkla ilgili son günlerde çıkan haberler toplanarak incelenebilir.
- Susuzluğun sonuçları resmedilebilir.
- Al Gore'un "Inconvenient Truth" filmi öğrencilerle izlenebilir.
- Yağmur suyunu toplamak için bir düzenek hazırlanabilir, toplanan su sınıf içerisinde ve bahçede bulunan bitkileri sulamak için kullanılabilir.

Okul Binası ve Bahçesi Eko-Timi:

- Okul binası dışında ve içerisinde (Sınıflarda, koridorlarda) yetiştirilen bitki sayısının arttırılması
- Öğrencilerin sosyal ilişkilerini güçlendirebilecek ortak olanların arttırılması
- Hayvanlara yaşama alanları oluşturulması (okul bahçesinde bir gölcük, kuş yuvaları, akvaryumlar)
- Bahçede kullanılan böcek ilaçlarının ve bitkilerde kullanılan ilaçlarının, kullanım sıklığının ve miktarının azaltılması, doğaya en az zarar veren ilaçların kullanılması
- Bahçe atıklarının ayrı bir alanda toplanması
- Okul binasının dış çeperinde ve iç duvarlarında boyama yapılacaksa çevre dostu boyaların seçilmesi

Müfredat Çalışmaları:

- Dönem içerisinde çeşitli zamanlarda derslerin okul bahçesinde yapılabilir. Dersin tamamında olmasa bile okul bahçesi yapılacak etkinliklerde sık sık kullanılabilir.
- Öğrencilerin evlerinde yetiştirdikleri bitki ve bakmakla sorumlu oldukları hayvanlar hakkında bilgi toplanabilir.
- Evde yetiştirilen bitki ve hayvanlar için ne tür bir yaşam alanı sağladıkları konuşulabilir.
- Mümkünse sınıfta bir hayvan için yaşam alanı oluşturulabilir.
- Öğrenciler seçtikleri bir hayvanın yaşamı için gereken koşulları araştırabilirler.

YUKARIDA BELİRTİLEN ETKİNLİKLER DIŞINDA AMACA UYGUN HER TÜRLÜ ETKİNLİK ÇALIŞMAYA EKLENEBİLİR. KAVRAM HARİTALARI, V DİYAGRAMLARI, DENEYLER, MODELLER, BEYİN FIRTINALARI, DRAMALAR, EĞİTSEL OYUNLAR, VB. ETKİNLİK TASARIMINDA KULLANILABİLİR.

APPENDIX F

OFFICIAL PERMISSION FROM LOCAL EDUCATION AUTHORITIES

T.C
AKSARAY VALİLİĞİ
İl Millî Eğitim Müdürlüğü

Sayı :B.08.4.MEM.4.68.00.06-666/445 05932 25 MART 2009
Konu :Araştırma

AKSARAY ÜNİVERSİTESİ REKTÖRLÜĞÜNE
(Personel Daire Başkanlığı)

İlgi :a) 28/02/2007 tarih ve B.08.0.EGD.0.33.05.311.311/1084 sayılı Makam onayı ile yürürlüğe giren "Millî Eğitim Bakanlığına Bağlı Okul Ve Kurumlarda Yapılacak Araştırma Ve Araştırma Desteğine Yönelik İzin Ve Uygulama Yönergesi"
b) Aksaray Üniversitesi Rektörlüğü Personel Daire Başkanlığı'nın 04/03/2009 tarih ve B.30.2.ASÜ.0.71-440/547-441-546 sayılı yazısı.

İlgi (b) yazı ile Üniversitenizin Eğitim Fakültesi İlköğretim Bölümü Fen Bilgisi Eğitimi Anabilim Dalı Öğretim Elemanı Araştırma görevlisi Sibel ÖZSOY'un **"Sürdürülebilir Kalkınma için bir Eko-okul Uygulaması"** konulu çalışmasını İlimiz [redacted] İlköğretim Okulu ve [redacted] Koleji 6 - 8. sınıf öğrenci ve öğretmenlerine yönelik uygulanılması istenilmektedir.

Yapılması istenilen anket çalışmalarına ilişkin formlar İlgi (a) yönerge hükümleri doğrultusunda Müdürlüğümüz Araştırma Değerlendirme Komisyonu tarafından incelenmiş olup, söz konusu araştırmanın yapılmasına ilişkin Valilik Makamının 24/03/2009 tarih ve B.08.4.MEM.4.68.00.03-666/430-05788 sayılı oluru ekte gönderilmiştir.

Bilgilerinizi ve araştırma sonunda ilgi (a) yönergenin 5. maddesinin (o) bendi gereği EK-1 formu ve araştırmanın iki örneğinin CD'ye kayıtlı olarak gönderilmesini rica ederim.

Taceddin ÖZEREN
Vali a.
Vali Yardımcısı

EKLER :
EK-1. Olur (1 Adet)
EK-2. Form (1 Adet)

T.C. MİLLİ EĞİTİM BAKANLIĞI
İl Millî Eğitim Müdürlüğü Sofular Mahallesi
Hasas Caddesi No:1 68100 AKSARAY
Tel : 0 382 213 68 40, 212 00 12, 212 64 94
Faks : 0 382 213 68 14
aksaraymem@meb.gov.tr | http://aksaray.meb.gov.tr

APPENDIX G

GÖNÜLLÜ KATILIM FORMU

Bu çalışmanın amacı, yapılacak olan eko-okul uygulamalarının öğrencilerin çevre ile ilgili tutum, bilgi ve ilgilerine etkisini araştırmaktır. Bu amaçla, çalışmada yer alan ölçekleri doldurmanız 30–40 dakikanızı alacaktır. Bu çalışmaya katılımınız **gönüllü** olmanıza bağlı olup, çalışmanın sonuçlandırılabilmesi açısından çok değerlidir. Araştırma, Orta Doğu Teknik Üniversitesi Eğitim Fakültesi'nde Sibel Özsoy tarafından yürütülmekte olan doktora çalışması kapsamında yapılmaktadır.

Bu çalışmadan elde edilecek verilerin değerlendirilmesi aşamasında, ankette yer alan kişisel bilgiler kesinlikle gizli tutulacaktır. Ankete isminizi yazmanız **istenmemektedir.** Verdiğiniz kişisel bilgiler anketin kapsamında yanıt verilen sorularla kesinlikle ilişkilendirilmeyecektir.

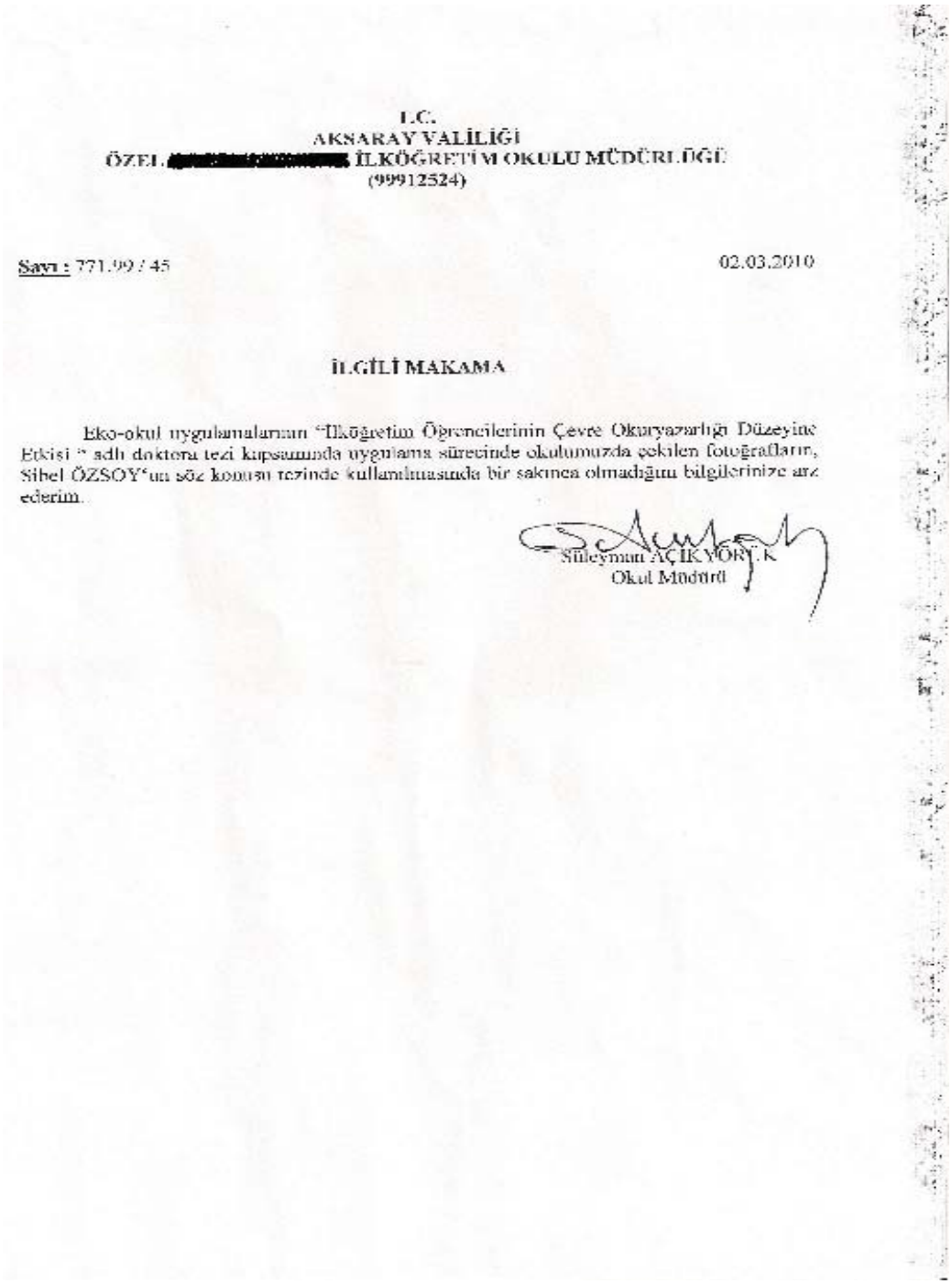
Bu çalışma ile ilgili her türlü sorunuz için Sibel Özsoy'u …….. numaralı telefondan arayabilir, ozsoy.sibel@gmail.com adresine sorularınızı e-posta ile iletebilirsiniz.

Eğer bu çalışmaya gönüllü olarak katkıda bulunmayı kabul ediyorsanız lütfen sonraki bölümlerde yer alan soruları yanıtlamaya geçiniz ve lütfen her soru için bir seçenek işaretleyiniz.

Yardımlarınız ve katkılarınız için teşekkür ederim.

APPENDIX H

OFFICIAL PERMISSION TO USE PHOTOGRAPHS TAKEN DURING THE STUDY



T.C.
AKSARAY VALİLİĞİ
ÖZEL [redacted] İLKÖĞRETİM OKULU MÜDÜRLÜĞÜ
(99912524)

Sayı : 771.99 / 45 02.03.2010

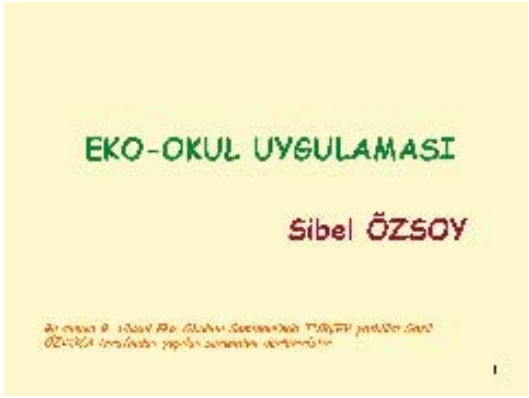
İLGİLİ MAKAMA

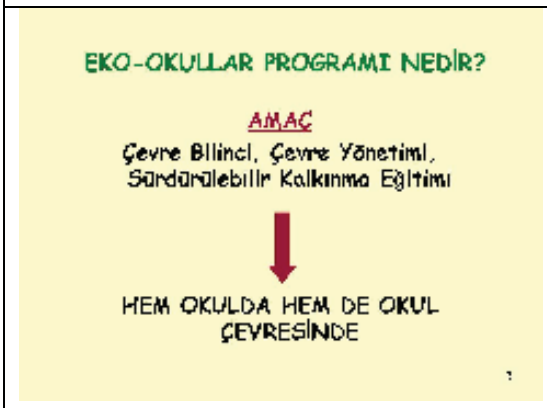
Eko-okul uygulamalarının "İlköğretim Öğrencilerinin Çevre Okuryazarlığı Düzeyine Etkisi " adlı doktora tezi kapsamında uygulama sürecinde okulumuzda çekilen fotoğrafların, Sibel ÖZSOY'un söz konusu tezinde kullanılmasında bir sakınca olmadığını bilgilerinize arz ederim.

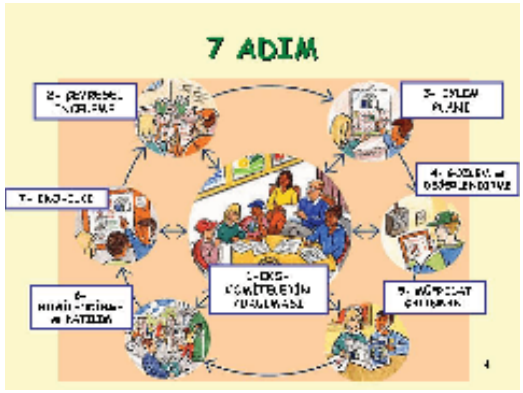
Süleyman AÇIKYÜREK
Okul Müdürü

APPENDIX I

PRESENTATION OF THE PROJECT







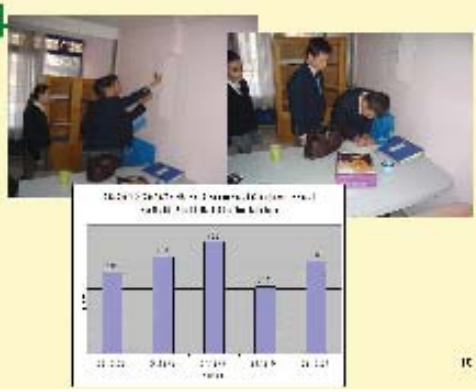
2 **Çevresel İnceleme:** Okul içi ve çevresinde bir inceleme gezisi yapılarak yerinden çevre sorunları belirlenir.

3 **Eylem Planının Hazırlanması:** Çevresel incelemeye sonucu ortaya çıkan sorunların giderilebilmesi için okul içinde ve dışında yapılması gerekenler planlanır. Bu planda her bir ay içerisinde farklı disiplin alanında yerine getirilebilecek etkinlikler belirtilir.

AYLAR	ETKİNLİKLER	UYGULAMA

4 **Gözlem ve Değerlendirme:** Okulda belirlenen eylem planının öğrenciler tarafından başarılı bir şekilde uygulanmasını sağlar. Aynı zamanda, okulda verilen çevre eğitiminin sürekli bir güvencesidir.

4



5 **Mufredat Çalışması:** Çevreye ilişkin konuların derslerde yer aldığından bütünlük sağlanmasının sağlanmasıdır. Önemli bir nokta ise çevre eğitiminin tüm derslerde verilmesinin gerekliliğidir.

6 **Bilgilendirme ve Katılım:** Yapılan etkinliklerin okul içerisinde ve dışında duyurulması gerekmektedir. Okul içerisinde filmlerde yer almayan diğer öğrencilerin, okul dışında ise velilerin, yerel yönetimlerin diğer kurum ve kuruluşların bilgilendirilmesi ve çalışmaya katılımı sağlanmaktadır.

6

7 Eko-ilkenin Belirlenmesi: Eko-Okul'un öğrencilerin ve çalışanların istenip uygulayacağı ve çevre yararına olan faaliyetleri açıklayan, tarif eden bir eylem dizinidir.

YEŞİL BAYRAK ÖDÜLÜ

Eko-Okullar Programını başarılı bir şekilde uygulayan okullara verilen uluslararası düzeyde tanınan ve saygınlığı olan bir eko-etikettir.

YEŞİL BAYRAK ÖDÜLÜ DEĞERLENDİRME

1. Yeşil Bayrak Başvuru Dosyalarının incelenmesi
2. Okulların yerinde incelenmesi

9. EKO-OKULLAR SEMİNERİ 20-22 ŞUBAT 2009 AKÇAKOCA

9. EKO-OKULLAR SEMİNERİ 20-22 ŞUBAT 2009 AKÇAKOCA

APPENDIX J

ATIK MİKTARINI AZALTMA ve GERİ DÖNÜŞÜM EKO-TİMİ EYLEM PLANI

Okul Adı: …… Koleji

Konu: Atık Miktarını Azaltma ve Geri Dönüşüm

Hedef	**Eylem**	**Tarih**	**Sorumluluk Sahibi**	**Sonuç**
Okulda ve okul çevresinde yaşanan çevre sorunlarının belirlenmesi	Çevre sorunlarını belirlemek için sınıflar, kantin, yemekhane, tuvaletler, spor salonu gezilerek incelenecek. Belirlenen sorunlar öğrenciler tarafından not alınacak.	MART	Eko-tim öğretmeni ve eko-tim öğrencileri	Eylem hedeflenen sürede tamamlandı. Öğrenciler problemli bölgelerdeki değişimi daha sonra gözlemleyebilmek için fotoğraf çektiler.
Okul binasında ve bahçesinde çöp toplama etkinliklerinin düzenlenmesi	Okulda yere atılan çöp miktarını azaltmak, bu konuda öğrencilerin duyarlılık kazanmasını sağlamak için öğrencilerle yere atılan çöpler toplanacak.	Tüm Dönem	Tüm Sınıflar	Eylem dönem boyunca her hafta (Sınavların yoğun olduğu haftalar dışında) ikişer sınıf olmak üzere yapıldı.
Okulun değişik yerlerindeki çöp kovalarının yeterliliğinin belirlenmesi	Okul bahçesinde, sınıflarda ve tuvaletlerde bulunan çöp kovalarının sayıları ve büyüklükleri incelenecek	MART	Eko-tim öğretmeni ve eko-tim öğrencileri	Öğrencilerle birlikte eylem tamamlandı. Eksik olan bölgelere çöp kovaları ilave edildi.

Hedef	**Eylem**	**Tarih**	**Sorumluluk Sahibi**	**Sonuç**
Geri dönüştürülebilir atıkların toplanması	Okulda, geri dönüştürülebilir malzemeler okul çapında düzenlenecek bir kampanya ile toplanacak	Tüm Dönem	Tüm Sınıflar	Dönem başından itibaren geri dönüştürülebilir malzemeler okulun daposunda toplandı. Daha sonra her sınıf kendine ait malzemeleri satarak, sınıfları için çeşitli malzemeler aldılar.
Atık Pillerin Toplanması	TAP'la iletişime geçilecek, pillerin toplanması için özel kutular istenecek. Okul çapında düzenlenecek bir kampanya ile piller toplanacak.	Tüm Dönem	Eko-tim öğretmeni ve eko-tim öğrencileri Tüm Sınıflar	Eko-tim TAP'tan pillerin toplanması için gerekli kutuları istedi. Kampanya tüm okula duyuruldu ve atık piller bu kutularda toplanmaya başladı.
Eko-okul panosunun hazırlanması	Eko-timin yaptığı çalışmalar eko-okul panosunda duyurulacak	MART	Eko-tim öğretmeni ve eko-tim öğrencileri	Diğer eko-timlerle birlikte bir pano oluşturuldu. Eko-tim öğrencileri çalışmalarını bu panoda arkadaşlarına duyurdu.
Kompostlama yapılması	Okul bahçesinde organik maddelerin kompostlanması	NİSAN	Eko-tim öğretmeni ve eko-tim öğrencileri	Bu eylem okul bahçesinde uygun yer ayrılamaması sebebiyle yapılamadı.

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Developing Turkish Ecological Footprint Questionnaire- Collobaration with Global Network Footprint

TÜRKÇE ÖZET

GİRİŞ

İnsanoğlu var olduğu günden bu yana çevresinde meydana gelmiş olaylardan etkilenmiş aynı zamanda da çeşitli faaliyetlerle çevresini etkilemiş, tahrip etmiştir. 19. yüzyıla kadar insanoğlu çevre sorunlarını ve bu sorunların kendisini nasıl etkilediğinin farkına varamamış, doğal kaynakların sürekli ve tükenmez olduğunu düşünmüştür (Doğan, 1988). Ancak bu tarihten itibaren çevre sorunları konuşulmaya ve tartışılmaya başlamıştır. Çevre sorunları ilk defa 1972 yılında Stockholm'de düzenlenen konferansta gündeme gelmiş ve o günden bugüne dünya gündemini meşgul etmiştir. 1987 yılında ise 'sürdürülebilir kalkınma' terimi ortaya atılmış, terim "bugünkü nesillerin ihtiyaçlarını, gelecek nesillerin kendi ihtiyaçlarını karşılayabilmelerini tehlikeye sokmaksızın karşılayabilme" (Brundtland, 1987, p.43) olarak tanımlanmıştır. 19. yüzyılın sonlarına doğru ise çevre, çevre sorunlarının anlaşılması ve önlenmesi, bireylerin yaşadıkları çevre hakkında bilgilendirilmesi ve bilinçlendirilmesinde eğitimin büyük rol oynadığı, eğitim sayesinde insanların çevre sorunlarına karşı daha bilinçli ve duyarlı bir yaklaşım sergiledikleri kabul edilmiştir (Flogaiti, 2006). 'Sürdürülebilir kalkınma için eğitim' ilk olarak, 1992 yılında Rio Konferansı'nın ardından Gündem 21 dökümanının 36. bölümünde ele alınmış, bu dökümanda sürdürülebilir kalkınma için eğitimin önemi vurgulanmıştır.

Sürdürülebilir kalkınma için eğitimin en önemli amacı çevre okuryazarı bireyler yetiştirmektir. Bu amaç için tüm eğitim kurumları çevre ile ilgili bilgi, tutum, davranış ve değerleri gelişmiş, insanların davranışları ile çevresel problemler arasında bağlantı kurabilen, gelecek nesillerin gereksinimlerini gözeten bireyler yetiştirmeyi amaçlamalıdır. Sürdürülebilir kalkınmanın sağlanabilmesi, çevre okuryazarı bireylerin yetiştirebilmesi için derslerde çevre konularıyla ilgili

bilgilerin öğrencilere verilmesi yeterli değildir. Yeni yetişen neslin sürdürülebilir yaşamı bir hayat felsefesi haline getirebilmesi için okul yaşantısı bir örnek olmalı, sürdürülebilir kalkınma her anlamda okullarda uygulanmalıdır. Çevre okuryazarı bireylerin nasıl yetiştirilebileceği, gelecek nesillerimizi yetiştirdiğimiz okullarımızda sürdürülebilir bir hayatın nasıl uygulanabileceği sorularını cevaplamak da çevre eğitimi üzerine çalışmalar yürüten araştırmacılara düşmektedir.

Günümüzde, hızlı nüfus artışı, küresel ısınma, doğal kaynakların bilinçsizce tüketimi, artan çevre kirliliği, sanayi ülkelerinde görülen tüketim artışı, canlı türlerinin yok olması, açlık ve susuzluk gibi problemler en önemli çevre sorunlarını oluşturmaktadır (Brown, 1991; Goodland, 1996; Linden, 1997; MacNeill, Winsemius & Yakushiki, 1991; Redclift, 1984). Çevre sorunlarının gittikçe arttığı günümüzde bu sorunlara çözüm bulunması, yeni sorunların oluşmaması için çevre okuryazarı olan, çevre sorunlarının farkında olan, bu sorunları çözmeye yönelik girişimlerde bulunabilen, doğal kaynakların tükenebileceğinin farkında olan ve kaynakları bu bilinçle kullanan bireylerin yetiştirilmesi gerekmektedir. Çevre ile ilgili bilgi, çevre bilinci, çevre problemleri ve bu problemlerin çözümleri düşünüldüğünde gerekli eğitimin sadece sınıflarda verilmesinin yetersiz olacağı aşikardır. Bu ihtiyacı gidermek amacı ile eko-okul uygulamaları ülkemizde ve dünyada uygulanmaktadır. Ülkemizde Türkiye Çevre ve Eğitimi Vakfı ilköğretim okullarında çevre bilinci, çevre yönetimi ve sürdürülebilir kalkınma eğitimi vermek için "Eko-okullar Programı" nı yürütmekte programa dâhil olan ve başarı ile yürüten okullar "yeşil bayrak" ile ödüllendirilmektedirler. Ülkemizde 2008 yılı itibariyle eko-okul programını yürütmekte olan 155 okul bulunmaktadır. Ülkemizde ve dünyada sürdürülebilir okullara yönelik birçok uygulama bulunmakla birlikte bu uygulamalar birbirinden farklılıklar göstermekte ve benzer uygulamaların etkililiğine yönelik yapılmış çalışma sayısı oldukça azdır. Bu eksiklik dikkate alındığında bu çalışmanın amacı eko-okul uygulamalarının ilköğretim öğrencilerinin çevre okuryazarlığı düzeyine etkisini incelemektir. Çalışmada ayrıca, eko-okul uygulamalarının ilköğretim öğrencilerinin çevre hakkındaki görüşlerine etkisi de araştırılmıştır.

YÖNTEM

Çalışma Grubu

Bu araştırmanın çalışma grubunu iki özel ilköğretim okulunun altıncı, yedinci ve sekizinci sınıflarında öğrenim görmekte olan toplam 316 öğrenci oluşturmaktadır. Çalışmanın deney grubunda 156 öğrenci (84 erkek ve 72 kız), kontrol grubunda ise 160 öğrenci (92 erkek ve 68 kız) bulunmaktadır. Örneklemin cinsiyete ve sınıf düzeyine göre dağılımı Tablo 1'de ayrıntılı olarak gösterilmiştir.

Tablo 1 *Örneklemin Cinsiyete ve Sınıf Düzeyine Göre Dağılımı*

	Deney Grubu		Kontrol Grubu		Toplam
	Erkek	Kız	Erkek	Kız	
6. sınıf	40	30	28	19	117
7.sınıf	27	18	38	35	118
8. sınıf	17	24	26	14	81
Toplam	84	72	92	68	316

Ölçme Araçları

Araştırmada, ilköğretim öğrencilerinin çevre okuryazarlığı düzeylerini belirlemek için Kaplowitz ve Levine (2005) tarafından geliştirilen, Tuncer, Tekkaya, Sungur, Çakıroğlu ve Ertepınar (2009) tarafından Türkçe'ye adapte edilen 'Çevre Okuryazarlığı Ölçeği' kullanılmıştır. Çevre Okuryazarlığı Ölçeği, bilgi, tutum, kullanım ve kaygı alt boyutlarından oluşmaktadır. Tuncer v.d. (2009) Türkçe'ye adapte edilen ölçeğin güvenilirliğini her bir alt boyut için sırasıyla .88, .64, .80, .88 olarak raporlamıştır. Bu çalışmada ise ölçeğin her bir alt boyutu için Cronbach's alpha değerleri .78, .60, .86 ve .90 olarak bulunmuştur.

Öğrencilerin çevre hakkındaki görüşleri ise çiz-ve-anlat tekniği ile belirlenmiştir (Brackett-Milburn, 1999; Shepardson, 2005). Çalışmaya katılan ilköğretim öğrencilerinden uygulama öncesinde ve sonrasında çevre ile ilgili görüşlerini yansıtan çizimler yapmaları ve çizimlerini açıklamaları istenmiştir.

Uygulama

Araştırma, öntest-sontest kontrol gruplu deneysel desen modeline göre tasarlanmıştır. Deney grubunda eko-okul uygulamaları yapılmış, kontrol grubunda ise mevcut eğitim öğretim faaliyetleri sürdürülmüştür.

Deney Grubu Uygulamaları: Deney grubunda ön-testlerin uygulanmasından sonra 7 adımdan oluşan eko-okul uygulamalarına başlanmıştır. Bu adımlara ait uygulamaların ayrıntıları şöyledir:

1. Eko-okul Komitesinin Kurulması: Çalışmaya başlamadan önce araştırmacı eko-okul uygulamalarının yapılacağı okulun öğretmenleri ve idarecileri ile bir toplantı yapmış, bu toplantıda çalışmanın nasıl yürütüleceğine dair açıklamalarda bulunmuştur. Ayrıca uygulama sırasında öğretmen ve idarecilere yardımcı olması amacıyla araştırmacı tarafından hazırlanan el kitabı tüm katılımcılara dağıtılmıştır. Bu toplantıda, çalışmada yer alacak beş eko-time önderlik edecek öğretmenler ve eko-okul koordinatörü öğretmenler tarafından seçilmiştir. Öğretmen ve idarecilerle yapılan bu toplantıdan sonra çalışma tüm okula duyurulmuş, çalışmada aktif olarak çalışmak isteyen öğrenciler eko-timler altında toplanmaya başlamıştır. Her bir timde 10-15 öğrenci yer almaktadır. Eko-timlerin oluşturulmasından sonra timler kendi aralarında yaptıkları toplantılarla dönem boyunca yapacakları çalışmaların ayrıntılarını belirlemeye başlamışlardır.

2. Çevresel İncelemenin Yürütülmesi: Her bir eko-timde (Sağlıklı Yaşam, Enerji, Atık Miktarını Azaltma ve Geri Dönüşüm, Su, Okul Binası ve Bahçesi) yer alan öğrenciler eko-tim öğretmenlerinin yardımı ile okullarında konuları ile ilgili eksiklikleri belirlemek için çevresel inceleme yürütmüşlerdir. Çevresel incelemenin daha verimli geçmesi için eko-timlere önderlik eden öğretmenler inceleme

öncesinde birçok soru hazırlamışlardır. Eko-timler, lider öğretmenlerinin hazırladıkları bu sorulara çevresel inceleme sırasında cevap aramışlardır. Her bir çevresel inceleme 3 ile 5 gün arasında tamamlanmış ve yaklaşık 4-5 saat sürmüştür.

3. Eylem Planının Hazırlanması: Çevresel incelemeden sonra eko-timler belirledikleri sorunları çözebilmek için bir dönem boyunca sürecek bir eylem planı hazırlamışlardır. Bu eylem planı için eko-tim öğrencileri çevresel inceleme sırasında ortaya çıkan sorunları değerlendirmiş, sorunlar için bir öncelik sırası belirlemiş ve bu sorunları çözmek için kendilerine bir eylem planı hazırlamışlardır. Eko-tim öğrencileri hazırladıkları eylem planından ve yapacakları diğer çalışmalardan tüm okulu bilgilendirebilmek için bir eko-okul panosu hazırlamıştır. Eylem planının hazırlanmasından sonra öğrenciler planlarında yer alan maddeleri gerçekleştirebilmek için harekete geçmişlerdir.

4. Gözlem ve Değerlendirme: Eylem planının uygulamaya konulmasının üzerinden bir süre geçtikten sonra eko-timler yaptıkları çalışmaların planlarına uygun gidip gitmediğini belirlemek için toplantılar yaparak çalışmalarını değerlendirmişlerdir. Bu sayede, uygulamanın plana uygunluğu kontrol altında tutulmuş olup planda çeşitli değişiklikler yapılmıştır. Ayrıca eko-tim öğrencileri yaptıkları çalışmaların bir değişikliğe sebep olup olmadığını belirlemek için gözlemlerde bulunmuşlardır. Yapılan çalışmaların etkililiğini belirlemek için çalışma öncesinde ve çalışma sonrasında fotoğraflar çekilmiştir.

5. Müfredat Çalışması: Bu aşamada atık, enerji, su, geri dönüşüm gibi konularda sınıf içinde yapılabilecek etkinliklerin uygulanmasına başlanmıştır. Böylelikle, tüm okuldaki öğrencilerin çevreyle ilgili etkinliklerde aktif rol alması sağlanmıştır. Müfredat çalışmaları sırasında sadece fen bilgisi öğretmenlerinin değil diğer öğretmenlerin de derslerinde çevre ile ilgili etkinliklere yer vermesi sağlanmıştır.

6. Bilgilendirme ve Katılım: Bu aşama tüm okulun eko-okul uygulamalarına katılması amaçlanmıştır. Sadece eko-timde çalışan öğrencilerin değil, diğer öğrencilerin de çalışmada yer almasını sağlamak için okul bahçesinde ve şehirde

ağaç dikme, okul çapında geri dönüşüm malzemesi toplama gibi değişik etkinlikler yürütülmüştür.

7. Eko-kodun Üretilmesi: Bu aşamada eko-timde yer alan öğrenciler dönem boyunca yaptıkları çalışmaları özetleyen birer slogan bulmuşlar ve bu sloganlarını eko-okul panosunda diğer öğrencilere de duyurmuşlardır.

Kontrol Grubu Uygulamaları: Kontrol grubunda çalışma süresince, yürütülen eğitim-öğretim faaliyetlerinde herhangi bir düzenleme yapılmamıştır. Kontrol grubunda genellikle dersler düz anlatım ve soru-cevap yöntemi ile yürütülmüştür. Dönem boyunca, kontrol grubu öğretmenleri öncelikle işleyecekleri konuları öğrencilerine anlatmış daha sonra konu ile ilgili çoktan seçmeli soru çözmüşlerdir. Bu sayede, kontrol grubu öğretmenleri öğrencilerinin SBS sınavına hazır olduklarından emin olmuşlardır. Kontrol grubunda, müfredatta yer alan çevre ile ilgili konular dışında, çevre konularına vurgu yapılmamıştır. Tüm dersler sınıfta tamamlanmış, öğrenciler herhangi bir etkinliğin planlanmasında rol almamıştır. Fen öğretmenleri SBS sınavında az sayıda soru çıktığından ve öğrencilerin çok zorlanmadığını düşündüklerinden çevre ile ilgili konular üzerinde fazla vakit harcamamışlardır.

BULGULAR

Çevre Okuryazarlığı Ölçeği'nden elde edilen veriler, betimsel; yüzde analizi ve çıkarımsal istatistik; ilişkisiz örneklemlerde t-testi, tek faktörlü covaryans analizi yöntemleri ile analiz edilmiştir. Öğrencilerin çevre ile ilgili çizimleri ise içerik analizi yöntemi ile analiz edilmiştir.

Çalışma Grubunun Demografik Özellikleri

Çalışma grubunda yer alan öğrencilerin, cinsiyetleri, sınıf düzeyleri, anne ve baba öğrenim durumları Çevre Okuryazarlığı Ölçeğinde sorulan demografik sorularla belirlenmiştir. Belirtilen değişkenler göz önüne alındığında çalışma grubunun özellikleri Tablo 2' de belirtilmiştir.

Tablo 2 *Katılımcıların Demografik Özellikleri*

Demografik Özellikler	**Deney Grubu**		**Kontrol Grubu**	
	f	*P*	*f*	*P*
Cinsiyet				
Erkek	84	53.8	92	57.5
Kız	72	46.2	68	42.5
Sınıf Düzeyi				
6. Sınıf	70	44.9	47	29.4
7. Sınıf	45	28.8	73	45.6
8. Sınıf	41	26.3	40	25
Anne Eğitim Düzeyi				
İlköğretim	6	3.8	33	20.6
Ortaöğretim	13	8.3	18	11.3
Lise	60	38.5	30	18.8
Meslek Lisesi	3	1.9	6	3.8
Üniversite	66	42.3	66	41.3
Lisansüstü	7	4.5	7	4.4
Belirtilmemiş	1	.6	0	0
Baba Eğitim Düzeyi				
İlköğretim	6	3.8	12	7.5
Ortaöğretim	11	7.1	15	9.4
Lise	45	28.8	25	15.6
Meslek Lisesi	5	3.2	3	1.9
Üniversite	69	44.2	84	52.5
Lisansüstü	19	12.2	21	13.1
Belirtilmemiş	1	.6	0	0

Çevre Okuryazarlığı Ölçeği öğrencilerin çevre ile ilgili bilgi ve kaygılarının özdeğerlendirmesini yapabilecekleri sorular içermektedir. Bu sorulardan ilkinde öğrencilerden çevre ile ilgili kaygı düzeylerini değerlendirmeleri istenmektedir. Sonuçlar, deney grubunda, 6. sınıf öğrencilerinden %48.6'sının, 7. sınıf

öğrencilerinden %46.7'sinin, 8. sınıf öğrencilerinden %41.5'inin, çevre ile ilgili kaygı düzeylerini 'yeteri kadar' olarak değerlendirdiğini göstermektedir. Deney grubu öğrencilerinin çevre sorunlarına karşı kaygı düzeylerine ilişkin özdeğerlendirmeleri Tablo 3'de ayrıntılarıyla gösterilmektedir.

Table 3 *Deney Grubu Öğrencilerinin Çevre Sorunlarına Karşı Kaygı Düzeylerine İlişkin Özdeğerlendirmeleri*

Seçenekler	6. Sınıf		7. Sınıf		8. Sınıf		Toplam	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Çok fazla	12	17.1	8	17.8	6	14.6	26	16.7
Yeteri kadar	34	48.6	21	46.7	17	41.5	72	46.2
Biraz	20	28.6	14	31.1	16	39.0	50	32.1
Pek az	3	4.3	0	0	2	4.9	5	3.2
Hiç	1	1.4	2	4.4	0	0	3	1.9

Kontrol grubu öğrencilerinin özdeğerlendirmelerinde de benzer sonuçlar elde edilmiştir. Altıncı sınıf kontrol grubu öğrencilerinin %53.2'si, 7. sınıf öğrencilerinin %53.4'ü, 8. sınıf öğrencilerinin %40'ı, toplam kontrol grubu öğrencilerinin %50'si çevre sorunlarına karşı kaygı düzeylerini 'yeteri kadar' olarak değerlendirmiştir. Kontrol grubu öğrencilerinin çevre sorunlarına ilişkin kaygı düzeylerine ilişkin özdeğerlendirmeleri Tablo 4'te verilmiştir.

Table 4 *Kontrol Grubu Öğrencilerinin Çevre Sorunlarına Karşı Kaygı Düzeylerine İlişkin Özdeğerlendirmeleri*

Seçenekler	6. Sınıf		7. Sınıf		8. Sınıf		Toplam	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Çok fazla	6	12.8	10	13.7	4	10	20	12.5
Yeteri kadar	25	53.2	39	53.4	16	40	80	50
Biraz	12	25.5	22	30.1	16	40	50	31.3
Pek az	1	2.1	1	1.4	2	5	4	2.5
Hiç	3	6.4	1	1.4	2	5	6	3.8

Çevre Okuryazarlığı Ölçeğinde öğrencilerden ayrıca çevre konularındaki bilgilerini de değerlendirmeleri istenmektedir. Deney grubu öğrencilerinin büyük bir çoğunluğu, 6. sınıf öğrencilerinin %62.9'u, 7. sınıf öğrencilerinin %66.7'si ve 8. sınıf öğrencilerinin %63.4'ü, çevre konularındaki bilgilerini 'yeteri kadar' olarak değerlendirmiştir. Deney grubu öğrencilerinin çevre konularındaki bilgilerine yönelik özdeğerlendirmeleri Tablo 5'te gösterilmiştir.

Table 5 *Deney Grubu Öğrencilerinin Çevre Konularındaki Bilgilerine Yönelik Özdeğerlendirmeleri*

Seçenekler	6. Sınıf		7. Sınıf		8. Sınıf		Toplam	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Çok fazla	7	10	6	13.2	5	12.2	18	11.5
Yeteri kadar	44	62.9	30	66.7	26	63.4	100	64.1
Biraz	16	22.9	5	11.1	10	24.4	31	19.9
Hiç	2	2.9	1	2.2	0	0	32	1.9
Fikrim Yok	1	1.4	3	6.7	0	0	4	2.6

Benzer sonuçlar kontrol grubunda da elde edilmiştir. Kontrol grubu öğrencilerinin büyük bir çoğunluğu, 6. sınıf öğrencilerinin %53.2'si, 7. sınıf öğrencilerin %63'ü, 8. sınıf öğrencilerinin %60'ı, çevre konusundaki bilgilerini 'yeteri kadar' olarak değerlendirmiştir.

Table 6 *Kontro*l *Grubu Öğrencilerinin Çevre Konularındaki Bilgilerine Yönelik Özdeğerlendirmeleri*

Seçenekler	6th Grade		7th Grade		8th Grade		Total	
	f	*P*	*f*	*P*	*f*	*P*	*f*	*P*
Çok fazla	10	21.3	10	13.7	4	10	24	15
Yeteri kadar	25	53.2	46	63	24	60	95	59.4
Biraz	10	21.3	16	21.9	6	15	32	20
Hiç	1	2.1	0	0	0	0	1	.6
Fikrim yok	1	2.1	1	1.4	6	15	8	5

Deney ve Kontrol Grubu Öğrencilerinin Çevre Bilgisi Alt Boyutuna Verdikleri Yanıtların Nicel Analizleri

Öğrencilerin çevre konularındaki bilgileri Çevre Okuryazarlığı Ölçeğinde bulunan 11 soru ile değerlendirilmiştir. Bilgi sorularını doğru yanıtlayan öğrencilerin yüzdeleri Tablo 7'de gösterilmiştir.

Tablo 7 *Çevre Bilgisi Sorularını Doğru Yanıtlayan Öğrencilerin Yüzdeleri*

Çevre Bilgisi Maddeleri	Doğru Yanıt (*P*) DG		Doğru Yanıt (*P*) KG	
	Ön-test	Son-test	Ön-test	Son-test
B-1 Biyoçeşitlilik, farklı ortamlarda yaşayan çeşitli bitki ve hayvanları tanımlamak için kullanılır.	51.9	55.8	57.5	50
B-2 Motorlu araçlar Türkiye'de en önemli karbon monoksit kaynağıdır.	21.2	55.8	13.8	20
B-3 Türkiye'de elektrik üretimi büyük ölçüde hidrolektrik santraller ile gerçekleşir.	41.7	67.9	33.1	20.6
B-4 Türkiye'de akarsu ve deniz kirliliğinin en temel nedeni, arıtılmamış evsel, sanayi ve tarımsal atık sulardır.	65.4	75.6	63.8	53.1
B-5 Ağaçlar yenilenebilir kaynaklardır.	47.4	75	53.1	40
B-6 Ozon tabakası, bizi zararlı güneş ışıklarından korur.	40.4	47.4	45.6	31.3
B-7 Türkiye'de çöplerin büyük bir kısmı çöp depolama alanlarına atılır.	38.5	58.3	23.8	28.1
B-8 Çevre ve Orman BakanlığıTürkiye'de çevreyi korumaya yönelik kararlar alan resmi kurumdur.	59.6	66	52.5	54.8
B-9 Piller zararlı evsel atıklardır.	62.8	84.6	63.8	45
B-10 Hayvan türlerinin nesillerinin tükenmesinin en yaygın sebebi yaşam alanlarının insanlar tarafından yok edilmesidir.	63.5	67.9	58.8	59
B-11 Nükleer atıklar depolanmakta ve kontrol altında tutulmaktadır.	19.9	53.8	15	39.4

Tablo 7 incelendiğinde deney grubunda her bir bilgi sorusunu doğru yanıtlayan öğrenci yüzdesinin arttığı gözlemlenirken, kontrol grubunda bu durum gözlenememektedir. Kontrol grubunda bulunan öğrencilerin bazı çevre bilgisi sorularına verdiği son-test yanıtlarında artış gözlenirken, B2, B7, B8, B10 ve B11,

diğer bilgi sorularına verilen son-test yanıtlarında düşüş gözlenmektedir, B1, B3, B4, B5, B6 ve B9.

Deney grubu öğrencilerinin çevre bilgisi sorularına verdiği ön-test ve son-test sonuçları incelendiğinde yüzde olarak en büyük değişikliğin B2, B3, B5, B9 ve B11 sorularında gerçekleştiği görülmektedir. B2 sorusunda öğrencilere en önemli karbon monoksit kaynağı sorulmuştur. Bu soruya ön-testte deney grubu öğrencilerinin %21.2'si doğru cevap vermişken son-testte öğrencilerin %55.8'si doğru cevaplamıştır. Üçüncü bilgi sorusu Türkiye'de elektrik üretiminin büyük ölçüde nasıl gerçekleştiği ile ilgilidir. Bu soruya doğru yanıt veren öğrencilerin yüzdesinde ön-test ile son-test arasında %26.2'lik bir artış gözlenmiştir. Çevre bilgisi sorularındaki en büyük değişim B5'te gerçekleşmektedir. Ön-testte bu soruyu doğru yanıtlayan öğrencilerin yüzdesi 47.4 iken, son testte bu soruyu deney grubu öğrencilerinin %75'i doğru yanıtlamıştır. B9 sorusu en tehlikeli evsel atık hakkındayken son-testte deney grubu öğrencilerinin %84.6'sı bu soruyu doğru yanıtladığı görülmüştür. Diğer çevre bilgisi sorularında da deney grubunda doğru yanıtlayan öğrenci yüzdesinde artışlar gözlenmiştir.

Kontrol grubu öğrencilerinin çevre bilgisi sorularına verdiği yanıtlar incelendiğinde öğrencilerin son-test yanıtlarının sadece birkaç bilgi sorusunda arttığı gözlenmiştir; B2, B7, B8, B10 ve B11. Bu sorular arasında en çok artış B11'de görülmüştür. Ön-testte kontrol grubu öğrencilerinin %15'i bu soruyu doğru yanıtlamışken son-testte öğrencilerin %39.4'ünün bu soruya doğru yanıt verdiği gözlenmiştir. Kontrol grubunda çevre bilgisi sorularına verilen yanıtlarda artışlar gözlemlenirken bazı sorularda da ciddi düşüşlerin olduğu gözlenmiştir. En dramatik düşüş B9'da meydana gelmiştir. En tehlikeli evsel atığın sorulduğu bu soruya kontrol grubu öğrencilerinin %63.8'i ön-testte doğru yanıt vermişken son-testte doğru yanıtlayan öğrenci yüzdesi %45'e düşmüştür.

Deney ve Kontrol Grubu Öğrencilerinin Çevreye Karşı Tutum Alt Boyutuna Verdikleri Yanıtların Nicel Analizleri

Çevreye karşı tutum, Çevre Okuryazarlığı Ölçeği'nin ikinci alt boyutunu oluşturmaktadır. Bu bölüm Likert tipi sorulardan oluşmaktadır. Verilerin yorumlanmasını kolaylaştırmak için 'tamamen katılıyorum' ile 'katılıyorum' ve 'katılmıyorum' ile 'hiç katılmıyorum' seçeneklerine verilen yanıtlar birleştirilmiştir. Tablo 8'de deney ve kontrol grubu öğrencilerinin bu alt boyuttaki sorulara verdikleri yanıtların yüzdeleri gösterilmektedir.

Tablo 8 incelendiğinde uygulama sonrasında deney grubu öğrencilerinin çevreye karşı tutum ile ilgili ifadelere katılımlarının, T6 ifadesi dışında, arttığı gözlemlenmektedir. Kontrol grubunda ise farklı bir durum ortaya çıkmaktadır. Sonuçlar incelendiğinde T5 ve T7 ifadeleri dışında son-testlerde artış gözlenmemiştir.

Deney ve Kontrol Grubu Öğrencilerinin Çevresel Kullanım Alt Boyutuna Verdikleri Yanıtların Nicel Analizleri

Çevresel kullanım, Çevre Okuryazarlığı Ölçeği'nin üçüncü alt boyutudur. Tablo 9'da deney ve kontrol grubu öğrencilerinin bu alt boyuttaki ifadelere katılım durumları gösterilmektedir.

Çevresel kullanım alt boyutuna verilen yanıtlar incelendiğinde deney grubu öğrencilerinin olumlu ifadelere son-testlerde daha çok katıldıkları gözlenmiştir. En çarpıcı artışlar ÇK9, ÇK15, ÇK16, ÇK17, ÇK18 ve ÇK19'da gerçekleşmiştir. Bu sonuçlara paralel olarak son-testte deney grubu öğrencilerinden daha azının olumsuz ifadelere katıldıkları gözlenmiştir. Olumsuz ifadelerde de en çarpıcı sonuçlar ÇK4, ÇK5, ÇK7 ve ÇK14'te gerçekleşmiştir. Kontrol grubu öğrencilerinde ise son-testte olumlu ifadelerden sadece ÇK6 ve ÇK17'e katılımda artış gözlemlenmiştir. Olumsuz ifadelerde ise sadece ÇK3, ÇK4 ve ÇK5 için kontrol grubu öğrencilerinin daha azının katıldığı gözlenmiştir.

Tablo 8 *Deney ve Kontrol Grubu Öğrencilerinin Çevreye Karşı Tutum Alt Boyutuna Verdikleri Yanıtların Yüzdeleri*

Environmental Attitude Statements	Katılıyorum				Kararsızım				Katılmıyorum			
	DG		KG		DG		KG		DG		KG	
	Ön	Son	Ön	Son	Ön	Son	Ön	Son	Ön	Son	Ön	Son
T1-Dünyanın insan yaşamını destekleme kapasitesini doldurmak üzereyiz.	35.9	65.3	35	26.9	42.9	12.8	38.8	34.4	21.2	21.8	26.3	38.8
T2-İnsanların doğaya müdahale etmesi genellikle felaketle sonuçlanır.	52.6	78.2	49.4	44.4	24.4	15.4	21.3	15	23.1	6.4	29.4	40.6
T3-Dünyada herkese yetecek miktarda doğal kaynak vardır, sorun bu kaynaklardan nasıl yararlanacağımızı öğrenmektir.*	19.9	14.7	26.3	30	15.4	16.7	15.6	24.4	64.8	68.6	58.1	45.7
T4-Bitki ve hayvanlar da insanlar kadar varolma yaşama hakkına sahiptir.	74.4	86.6	75	53.2	13.5	7.1	8.1	8.1	12.2	6.4	16.9	38.8
T5-Doğanın dengesi, modern endüstrileşmiş toplumların etkileri ile rekabet edebilecek güçtedir.*	27.6	16	21.9	26.3	41	13.5	36.3	22.5	31.4	70.5	41.9	51.3
T6-Bizi diğer canlılardan üstün kılan özel yeteneklerimize rağmen, hala doğa yasaları ile mücadele ediyoruz.	62.8	56.4	43.8	29.4	15.4	19.2	25.6	35.6	21.8	24.4	30.6	35
T7-İnsanların karşı karşıya kaldıkları 'Ekolojik kriz' olarak adlandırılan olaylar fazlasıyla abartılmaktadır.*	51.9	17.3	48.8	42.6	25.6	10.9	25	25	22.4	71.8	26.3	42.5
T8-İnsan olmak doğanın geri kalan bölümüne hükmetmektir.*	22.5	25	20.6	22.5	21.8	11.5	34.4	33.8	55.8	63.5	45	43.8
T9-İnsanlar doğayı kontrol edebilmek için doğayı anlama gerektiğini sonunda öğrenecekler.*	12.8	17.3	20.6	31.9	18.6	11.5	18.1	20.6	68.6	71.2	61.3	47.6
T10-Eğer her şey bugünkü gibi devam ederse, yakında büyük bir ekolojik facia ile karşılaşacağız.	72.4	76.3	65.6	48.2	15.4	14.7	23.1	22.5	12.2	9	34.4	29.4

***** Bu sorulara verilen yanıtlar analiz sırasında ters kodlanmıştır.

Tablo 9 *Deney ve Kontrol Grubu Öğrencilerinin Çevresel Kullanım Alt Boyutuna Verdikleri Yanıtların Yüzdeleri*

Çevresel Kullanım İfadeleri	Katılıyorum				Kararsızım				Katılmıyorum			
	DG		KG		DG		DG		KG		DG	
	Ön	Son	Ön	Ön	Son	Ön	Ön	Son	Ön	Ön	Son	Ön
ÇK1- Soyu tükenmekte olan türler için özel alanlar ayrılmalıdır.	77.6	86.5	65.6	43.1	12.8	5.8	11.9	16.3	9.6	7.7	22.5	40.6
ÇK2- Su kalitesi ile ilgili yasalar daha yaptırımcı olmalıdır.	72.5	83.3	60.7	40.6	20.5	12.2	24.4	26.3	7.1	4.5	15	33.1
ÇK3- İnsanların et ihtiyaçlarının karşılandığı vahşi hayvanlar korunması gereken en önemli türlerdir.	42.9	73.8	37.5	28.7	38.5	8.3	38.1	36.9	18.6	17.9	24.4	34.4
ÇK4- Zehirli yılanlar ve böcekler insanlar için tehdit oluşturdukları için öldürülmelidirler.	63	18.6	59.4	23.7	21.8	19.2	20	25	15.4	62.2	20.6	51.3
ÇK5- Toprak sahiplerine sulak alanlarını tarımsal ve endüstriyel amaçlar için kullanmalarına izin verilmelidir.	38.5	38.5	38.8	38.1	37.8	12.8	30	26.3	23.7	48.7	31.3	35.6
ÇK6- Herkesin çevre sorunlarının farkında olması çok önemlidir.	77.6	85.9	58.1	70	15.4	3.8	18.1	18.1	7.1	10.3	23.8	11.9
ÇK7- Şahıslar sahip oldukları arazileri istedikleri şekilde kullanmakta serbest olmalıdır.	14.7	24.4	21.3	50	30.8	12.2	18.1	24.4	54.5	63.4	60.6	25.6
ÇK8- Çevre sorunlarının çözümlenmesinde kişisel sorumluluklarım olduğunu düşünüyorum.	68.6	83.9	56.9	38.1	16	9	23.1	19.4	15.4	7.1	20	42.5
ÇK9- Hükümet, vahşi hayatın korunması amacı ile özel mülkiyet alanlarının kullanımını denetlemelidir.	60.9	80.1	46.2	41.2	28.2	14.1	33.8	22.5	10.9	5.8	20	36.3
ÇK10- İnsanlar çevreye verdikleri her türlü zarardan sorumlu tutulmalıdır.	64.7	75.7	55	36.2	20.5	11.5	23.1	31.3	14.7	12.8	21.9	32.5

***** Bu sorulara verilen yanıtlar analiz sırasında ters kodlanmıştır.

Tablo 9 (Devamı) D*eney ve Kontrol Grubu Öğrencilerinin Çevresel Kullanım Alt Boyutuna Verdikleri Yanıtların Yüzdeleri*

Çevresel Kullanım İfadeleri	Katılıyorum				Kararsızım				Katılmıyorum			
	DG		KG		DG		DG		KG		DG	
	Ön	Son	Ön	Ön	Son	Ön	Ön	Son	Ön	Ön	Son	Ön
ÇK11- Bitki ve hayvanların tümü çevrede önemli bir role sahiptir.	76.9	75.0	61.3	56.9	16	12.2	24.4	20.6	7.1	12.8	14.4	22.5
ÇK12- Teknolojik değişimlerin çevre için yararları olduğu kadar zararları da vardır.	75	79.4	58.8	47.5	16.7	13.5	21.9	24.4	8.3	7.1	19.4	28.1
ÇK13- Hükümet geri dönüşümün zorunlu olması yönünde yasalar hazırlamalı ve uygulamalıdır.	66.7	75.7	57.5	47.4	21.8	16	28.1	23.8	11.5	8.3	14.4	28.8
ÇK14- Hava kirliliği ile ilgili yasalar yeteri kadar serttir.	12.8	21.2	22.5	47.5	29.5	4.5	29.4	25	57.7	74.3	48.1	27.5
ÇK15- Çevre problemlerinin çözümünde bilim ve teknoloji çok önemlidir.	53.8	81.4	48.8	38.7	29.5	10.9	34.4	28.8	16.7	7.7	16.9	32.5
ÇK16- Çevre problemlerinin çözümünde kültürel farklılıklar çok önemlidir.	55.4	78.2	41.9	35.6	32.1	10.9	40.6	37.5	9.6	10.9	17.5	26.9
ÇK17- İnsanların değer yargılarının değişmesi çevre problemlerinin çözülmesinde rol oynayacaktır.	50	78.2	45.2	60.5	34.8	10.9	36.8	14.5	15.2	10.9	18	25
ÇK18- Toplu eylemler çevre problemlerinin çözümünde önemli bir yer tutar.	56.4	77	40.6	29.3	23.7	17.9	35	28.8	19.9	5.1	24.4	41.9
ÇK19- Yaşam alışkanlıklarındaki değişiklikler (tüketim gibi) çevre problemlerinin çözümlenmesinde önemli rol oynayacaktır.	60.9	80.1	50.6	34.4	28.2	12.8	31.3	30	10.9	7.1	18.1	35.6

***** Bu sorulara verilen yanıtlar analiz sırasında ters kodlanmıştır.

Deney ve Kontrol Grubu Öğrencilerinin Çevre Problemlerine karşı Kaygı Alt Boyutuna Verdikleri Yanıtların Nicel Analizleri

Çevre problemlerine karşı kaygı alt boyutu Çevre Okuryazarlığı Ölçeği'nin dördüncü alt boyutunu oluşturmaktadır. Bu alt boyutta katılımcılardan çeşitli çevre problemlerine karşı kaygı düzeylerini paylaşmaları istenmektedir. Tablo 10'da katılımcıların bu alt boyuta verdikleri yanıtlar gösterilmiştir.

Sonuçlar deney grubu öğrencilerinin 'duman kirliliği', 'otomobil emisyonları', 'endüstriyel kirlilik', 'zararlı atıklar', 'kalitesiz içme suyu', 'ozon tabakasının delinmesi' ve 'küresel ısınma' konularında kaygı düzeylerinin arttığını göstermiştir. Deney grubu öğrencilerinin kaygı düzeylerinde en büyük artış 'küresel ısınma' konusunda gerçekleşmiştir. Ön-testlerde deney grubu öğrencilerinin %56.5' i, son-testte öğrencilerin %73.1' i bu konu hakkında kaygılandıklarını belirtmişlerdir. Belirtilen çevre konularında deney grubu öğrencilerinin kaygı düzeylerindeki artışların yanı sıra az da olsa 'ses kirliliği' ve 'kapalı alanlarda oluşan hava kirliliği' konularında azalmalar da görülmüştür.

Sonuçlar ayrıca 'zararlı atıklar' ve 'ozon tabakasının delinmesi' konularında kontrol grubu öğrencilerinin kaygı düzeylerinin arttığını göstermiştir. Ön-testte kontrol grubu öğrencilerinin %48.7'si, son-testte %63.4'ü 'zararlı atıklar' konusunda kaygılandıklarını belirtmiştir. Ayrıca ön-testte kontrol grubu öğrencilerinin %48.7'si, son-testte ise % 62.8'i 'ozon tabakasının delinmesi' konusunda kaygılandıklarını belirtmiştir. Diğer çevre konularında; ' duman kirliliği', 'ses kirliliği', 'otomobil emisyonları', 'endüstriyel kirlilik', 'kalitesiz içme suyu', 'kapalı alanlarda oluşan hava kirliliği ve 'küresel ısınma', son-testlerde kontrol grubu öğrencilerinin kaygı düzeylerinin azaldığı görülmüştür.

Tablo 10 *Deney ve Kontrol Grubu Öğrencilerinin Çevre Problemlerine karşı Kaygı Alt Boyutuna Verdikleri Yanıtların Yüzdeleri*

	İlgili				**Kararsız**				**İlgisiz**			
	DG		**KG**		**DG**		**KG**		**DG**		**KG**	
	Ön	Son	Ön	Son	Ön	Son	Ön	Son	Ön	Son	Ön	Son
K1- Duman Kirliliği	58.3	69.9	73.3	50	10.9	9.6	11.2	24.3	30.8	20.5	15.5	25.7
K2- Ses Kirliliği	66.1	60.3	60	46.8	12.1	9	11.4	17.5	21.8	30.7	28.6	35.7
K3- Otomobil Emisyonları	52	58.3	55.8	45	15.4	5.8	19.9	21.9	32.6	35.9	24.3	33.1
K4- Endüstriyel Kirlilik	63.5	64.1	59.6	51.3	7.7	12.2	14.3	18.1	28.8	23.7	26.1	30.6
K5- Zararlı Atıklar	63.5	75	48.7	63.4	14.1	7.7	21.9	6.8	22.4	17.3	29.4	29.8
K6- Kalitesiz İçme Suyu	66.1	75	64.5	52.4	15.9	7.1	5.6	16.9	18	17.9	29.9	30.7
K7- Kapalı Alanlarda Oluşan Hava Kirliliği	71.7	67.9	71.4	54.9	7.1	10.9	8.1	14.4	21.2	21.2	20.5	30.7
K8- Ozon Tabakasının Delinmesi	74.4	80.1	50.6	62.8	6.4	2.6	10.6	4.3	19.2	17,3	38.8	32.9
K9- Küresel Isınma	56.5	73.1	69.6	59.3	18	5.1	3.7	8.8	25.5	21.8	26.7	31.9

Çıkarımsal İstatistikler:

Deney ve kontrol grubu öğrencilerinin arasında çevre okuryazarlığının dört boyutunda istatistiksel olarak anlamlı farklılıklar olup olmadığını incelemek için çıkarımsal istatistikler yapılmıştır. Bu analizler yapılmadan önce analizlerin varsayımları test edilmiş ve yapılacak olan istatiksel analizlere bu varsayımların test sonuçlarına göre karar verilmiştir. Dört alt boyutta deney ve kontrol grubu arasında anlamlı farklılıklar olup olmadığı her bir ilgili başlıkta ayrıntılı olarak anlatılmıştır.

Deney ve Kontrol Grubu Öğrencilerinin Çevre Bilgisi Alt Boyutuna Verdikleri Yanıtların Analizi

Deney ve kontrol grubu öğrencilerinin çevre bilgisi sorularına verdikleri yanıtlar arasında istatistiksel bir farklılık olup olmadığını belirlemek için ilişkisiz örneklemler için t-testi uygulanmıştır. Sonuçlar 6. sınıf deney grubu ve kontrol grubu öğrencilerinin çevre bilgisi sorularına verdikleri yanıtlar arasında istatistiksel fark olduğunu göstermektedir ($t_{(115)} = 7.059$, $p = .000$). Sonuçlarda ayrıca etki değeri yüksek bulunmuştur ($\eta^2 = .30$). Sonuçlar ayrıca deney grubu öğrencilerinin bu alt boyuta verdikleri doğru yanıtların ortalamalarının ($M = 6.585$, $SD = 2.095$), kontrol grubu öğrencilerininkinden yüksek olduğunu ($M = 3.638$, $SD = 2.381$) göstermiştir.

Yedinci sınıflar için yapılan ilişkisiz örneklemler için t-testi sonuçları orta düzeyde etki değeri ile ($\eta^2 = .07$) deney ve kontrol grubu öğrencilerinin çevre bilgisi alt-boyuna verdiği yanıtlar arasında istatistiksel olarak anlamlı farklılıklar olduğunu göstermiştir. Deney grubu öğrencileri ($M = 5.577$, $SD = 2.544$) bu alt boyutta kontrol grubu öğrencilerinden ($M = 4.205$, $SD = 2.088$) daha yüksek ortalamalar elde etmiştir.

Benzer bir durum 8. sınıf öğrencileri içinde geçerlidir. Yapılan analizler sonucunda deney grubu öğrencilerinin çevre bilgisi alt boyutuna verdikleri yanıtlar ile kontrol grubu öğrencilerinin bu alt boyuta verdikleri yanıtlar arasında yüksek etki değeri ile ($\eta^2 = .53$), istatistiksel olarak anlamlı farklılıklar olduğunu göstermiştir ($t_{(79)} = 9.443$, $p = .000$). Eko-okul öğrencilerinin ($M = 7.853$, $SD = 1.236$) kontrol grubu

öğrencilerine göre (M = 4.100, SD = 2.216) daha yüksek puanlar elde ettiği görülmüştür.

Deney ve Kontrol Grubu Öğrencilerinin Çevreye Karşı Tutum Alt Boyutuna Verdikleri Yanıtların Analizi

Deney ve kontrol grubu öğrencilerinin çevreye karşı tutum ifadelerine verdikleri yanıtlar arasında anlamlı farklılık olup olmadığını bulmak için çevreye karşı tutum ön-test skorlarının kovariate olarak atandığı tek faktörlü kovaryans analizi (ANCOVA) yürütülmüştür. ANCOVA sonuçc8ları 6. sınıf deney ve kontrol grubu öğrencilerinin çevreye karşı tutum alt boyutuna verdikleri yanıtlar arasında yüksek etki değeri ile (partial η^2= .107), deney grubu lehine, istatistiksel olarak anlamlı farklılıklar olduğunu göstermiştir (F(1,114) = 13.597, p = .000).

Yedinci sınıf öğrencileri için yürütülen ANCOVA analizlerinde de deney grubu öğrencilerinin lehine istatistiksel olarak anlamlı farklılıklar bulunmuştur (F(1,115) = 34.023, p = .344).

Sekizinci sınıf deney ve kontrol grubu öğrencileri arasında istatistiksel olarak anlamlı bir farklılık olup olmadığını belirlemek için ilişkisiz örneklemler için t-testi yürütülmüştür. Bu analizlerin sonucunda gruplar arasında yüksek etki değeri ile (η^2 = .45) anlamlı farklılıklar olduğu ($t_{(79)}$ = 9.443, p = .000), uygulamadan sonra deney grubu öğrencilerinin (M = 36.585, SD = 3.701) kontrol grubu öğrencilerine göre (M = 26.700, SD = 6.801) daha yüksek tutum puanları elde ettiği görülmüştür.

Deney ve Kontrol Grubu Öğrencilerinin Çevresel Kullanım Alt Boyutuna Verdikleri Yanıtların Analizi

Deney ve kontrol grubu öğrencileri arasında çevresel kullanım alt boyutunda anlamlı farklılıklar olup olmadığını belirlemek için her bir sınıf düzeyinde ayrı ayrı tek faktörlü kovaryans analizi (ANCOVA) yürütülmüştür.

Yapılan ANCOVA sonuçları 6. sınıf deney ve kontrol grubu arasında istatistiksel olarak anlamlı farklılıklar olmadığını göstermektedir (F(1,114) = 46.195, p = .288).

Yedinci sınıf öğrencileri için yürütülen analizler ise uygulama grupları arasında orta düzeyde etki değeri ile deney grubu lehine istatistiksel olarak anlamlı farklılıklar olduğunu ortaya koymuştur ($F(1,115) = 10.325$, $p = .002$).

Analizler ayrıca sekizinci sınıf deney ve kontrol grupları arasında çevresel kullanım alt boyutuna verilen yanıtlarda büyük etki değeri ile ($\eta^2 = .578$) deney grubu lehine, istatistiksel olarak anlamlı farklılıklar olduğunu ortaya koymuştur ($F(1,78) = 106.934$, $p = .000$).

Deney ve Kontrol Grubu Öğrencilerinin Çevre Sorunları ile İlgili Kaygı Alt Boyutuna Verdikleri Yanıtların Analizi

Altıncı sınıf öğrencilerinin çevre sorunlarına duydukları kaygı arasında istatistiksel olarak anlamlı farklılıklar olup olmadığını belirlemek için ilişkisiz örneklemlerde t-testi yapılmıştır. Bu testin sonuçları eko-okula devam eden öğrencileri ve kontrol grubu öğrencileri arasında küçük etki değeri ($\eta^2 = .04$) ile birlikte istatistiksel farklılıklar ($t(115) = 2.189$, $p = .031$) olduğunu ortaya çıkarmıştır. Sonuçlara göre eko-okul öğrencilerinin kaygı düzeylerinin ($M = 32.257$, $SD = 9.690$) kontrol grubu öğrencilerinin kaygı düzeylerinden ($M = 27.914$, $SD = 11.648$) daha yüksek olduğu söylenebilir.

Yedinci sınıf deney ve kontrol grupları arasındaki farklılığı belirlemek için ANCOVA yapılmış, analizlerin sonuçları iki grup arasında çevre sorunlarına karşı kaygı alt boyutunda istatistiksel olarak anlamlı farklılıklar olmadığını ($F(1,115) = 2.308$, $p = .131$) göstermiştir.

Sekizinci sınıf öğrencilerinin kaygı düzeylerini karşılaştırmak için ilişkisiz örneklemlerde t-testi yapılmış, analizlerin sonucunda deney grubu ve kontrol grubu öğrencilerinin çevre sorunlarına duydukları kaygı düzeyleri arasında yüksek etki değeri ($\eta^2 = .31$) ile birlikte istatistiksel olarak anlamlı farklılıklar ($t(79) = 6.026$, $p = .000$) olduğu görülmüştür. Deney grubu öğrencilerinin kaygı düzeyleri ($M =$

38.170, *SD* = 5.444) kontrol grubu öğrencilerinin kaygı düzeylerinden (*M* = 29.275, *SD* =7.632) daha fazladır.

Çevre Çizimlerinin Analizi:

Çalışmaya katılan öğrencilerin çevre hakkındaki çizimleri içerik analizi yöntemleri (Ball & Smith, 1992; Banks, 2001) kullanılarak analiz edilmiştir. Bunun için öncelikle bir kodlama taksonomisi geliştirilmiş analiz sırasında ortaya çıkan kodlar ve kategorilere göre resimler analiz edilmiştir.

Uygulama öncesi çizimlerin analizinde 59 kod bulunmuştur. Öğrenciler resimlerinde çoğunlukla bitki, insan, hayvan, ev, fabrika, dağ, ırmak gibi ögelere yer vermişlerdir. Uygulama sonrası çizimlerin analizinde 13 kod daha bulunmuştur. Tüm yeni kodlar deney grubu çizimlerinde ortaya çıkmıştır. Bu kodlar arasında ahtapot, denizyıldızı, ördek, panda, penguen gibi canlılar bulunmaktadır. Ön ve son çizimler incelendiğinde en sık çizilen ögenin ağaç olduğu görülmüştür. Ön-çizimlerde deney grubun öğrencilerinin %90.1'i, kontrol grubu öğrencilerinin %83.9'u çizimlerinde ağaca yer vermiştir. Son-çizimlerde ise deney grubu öğrencilerinin %65.4'ü, kontrol grubu öğrencilerinin ise %75.0'ı çizimlerinde ağaca yer vermiştir.

Öğrencilerin temiz, kirli ve hem temiz hem kirli çevre çizmeleri içerik analizinden elde edilen en önemli bulgudur. Bu üç ortam, analiz sırasında katergorileri oluşturmuş, analiz edilen her çizim bu üç kategori altında toplanmıştır.

Temiz Çevre Üzerine Yoğunlaşan Görüşler:

Bu kategoriyi oluşturan çizimlerde öğrenciler çevreyi temiz ve güzel ortamlar olarak göstermektedirler. Bu çizimler genellikle ağaçlar, çimen, çiçek, tek katlı evler, dağlar, göl ve nehirleri içerir. Bazı çizimlerde ise kuş, tavşan ve balık gibi hayvanlar bulunmaktadır. Öğrenciler temiz çevrede insanlara da yer vermişlerdir. Bu çizimlerde yer alan insan figürleri genellikle parkta oynayan ya da temiz bir çevrede duran çocuklardan oluşmaktadır. Bu kategoride yer alan çizimlerde öğrenciler genellikle ağaç, ev, güneş, insane figürlerine gülen yüzler çizmektedir.

Ayrıca bu çizimlerde kirliliğe neden olan herhangi bir çizime rastlanmamaktadır. Evlerde nadiren baca bulunmakta, arabaların egzozu çoğu zaman çizilmemektedir.

Uygulamadan once, deney grubunun 46.1'i, control grubunun ise %58.1'i temiz çevre çizmiştir. Uygulamadan sonra ise, deney grubunda öğrencilerin %35.9'u temiz çevre çizerken, control grubundaki öğrencilerin 71.9'unun temiz çevre çizdiği görülmüştür.

Kirli Çevre Üzerine Yoğunlaşan Görüşler:

Bu kategori altında yer alan çizimlerde öğrenciler genellikle hava kirliliği, su kirliliği, çölleşme gibi çeşitli çevre problemlerine yer vermişlerdir. Bu kategoriye ait çizimlerde genellikle fabrikalar, çok katlı apartmanların bacalarından ve arabaların egzoslarından havaya karışan duman, toprak, deniz ve nehirleri kirlemiş olan endüstriyel atıklar bulunmaktadır. Öğrenciler kirli çevre üzerine yoğunlaşan çizimlerinde yer alan ögelere üzgün, ağlayan yüz ifadeleri çizmişlerdir.

Uygulama öncesinde deney grubu ve control grubu öğrencilerinin %43.4'ü kirli çevre çizerken, uygulama sonrasında deney grubu öğrencilerinin %54.5'i, control grubu öğrencilerinin ise %28.1'i çizimlerinde kirli çevreye yer vermişlerdir.

Hem Kirli Hem Temiz Çevre Üzerine Yoğunlaşan Görüşler:

Üçüncü kategori altında yer alan çizimlerde çalışmaya katılan ilköğretim öğrencileri hem temiz hem kirli çevreyi gösteren ögelere yer vermişlerdir. Bu çizimlerde öğrenciler sayfayı ikiye ayırarak, sayfanın bir kısmında temiz diğer kısmında ise kirli çevreyi resmetmişlerdir. Bu tür çizimler diğer iki kategoride yer alan çizimlerin sahip oldukları özellikleri kapsamaktadır.

Diğer iki kategoriye göre, bu kategori altında yer alan çizimlerin sayısı daha azdır. Uygulamadan once deney grubu öğrencilerinin %10.6'sı, control grubu öğrencilerinin %3.8'i bu kategori altında yer alan çizimler yapmışlardır. Uygulamadan sonra ise deney grubu öğrencilerinin %3.8'i bu çizimleri yaparken, kontrol grubu öğrencileri bu kategori altında yer alacak bir çizim yapmamışlardır.

SONUÇ

Çevre okuryazarlığının dört boyutunda; bilgi, tutum, kullanım ve kaygı, yapılan analizler incelendiğinde eko-okul uygulanan okulda öğrenim gören öğrencilerin çevre okuryazarlığı düzeylerinin kontrol grubu öğrencilerine göre daha yüksek olduğu yargısına varılabilir. Bu sonuca göre eko-okul uygulamalarının çevre okuryazarlığını geliştirmek için etkili uygulamalar olduğu söylenebilir. Bu sonuca dayanarak ilköğretim düzeyinde çevre okuryazarlığını geliştirmek için eko-okul uygulamalarının yaygınlaştırılması önerilmektedir.

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