# INVESTIGATION OF ENVIRONMENTAL LITERACY OF SIXTH GRADES AT A PRIVATE SCHOOL

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# ABSTRACT

INVESTIGATION OF ENVIRONMENTAL LITERACY OF SIXTH GRADES AT A PRIVATE SCHOOL

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Purpose of this study was to investigate environmental literacy of 6th grade students at a private school. In detail of study it is also investigated that how mothers' educational background on environmental literacy dimensions (knowledge, attitude, use and concern) and besides, relationship between environmental background characteristics and environmental literacy dimensions. The study was carried out during the fall semester of the 2007-2008 academic year. The sample of study was chosen from an accessible population and consisted of 681 sixth grades students from a private school in Ankara. "Environmental Literacy Questionnaire" (ELQ) is used to collect data. The relationship among environmental literacy dimensions i.e., knowledge, attitude, use and concern was investigated by Means of zero order correlation. Effect of mothers' educational level on the environmental literacy of the students is analyzed by Multivariate Analysis of Variance (MANOVA).

Finally, canonical correlation is used in order to analyze relationship among environmental background of students, that is self-assessment about their interest in environmental problems (perception of interest), their views on the importance of environmental problems (perception of importance), their self evaluation of their environmental knowledge (perception of knowledge), their involvement in outdoor activities (activities), their perception of their parents' interest in environmental problems (parents' interest) and their perception of their parents' involvement in environmental activities (parents' involvement); and environmental literacy dimensions.

Results showed that majority of students (64%) received with mean of 8.2 questions out of 11 questions. Results also revealed that they have positive attitude, aware of importance between human and environment. Moreover, students have concerns about environmental problems. Results of means of zero order correlations indicated that between knowledge - use and attitude – concern are correlated positively, significantly but small. Moreover attitude-use and use –concern are correlated strong and medium in that order. Effect of mothers' educational level on EL, which is analyzed by Multivariate Analysis of Variance (MANOVA), indicated that dimensions of EL do not differentiate significantly by education level of mothers. By canonical correlation, it is found that parents' involvement in environmental activities positively related to environmental attitude, use and concern which stand for increase in parents' environmental involvement, increase in attitude, use and concern.

Keywords: Environmental Literacy, Environmental Education, Elementary Science and Technology Education, Elementary Science Curriculum

# ÖZ

## ÖZEL BİR OKULDA 6.SINIF ÖĞRENCİLERİNİN ÇEVRE OKURYAZARLIĞININ ARAŞTIRILMASI

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Bu çalışmanın amacı, özel bir okuldaki 6.sınıf öğrencilerinin çevre okuryazarlığını incelemektedir. Çalışmanın detayında annenin eğitim durumunun çevre okuryazarlığı üzerindeki etkisini ve öğrencilerin çevre ile ilgili altyapıları ile çevre okuryazarlığı boyutları arasındaki ilişki de yer almaktadır. Çalışma 2007-2008 öğretim yılı sonbahar döneminde uygulanmıştır. Örneklem, Ankara' da özel bir okuldan seçilmiş olup, 681 6.sınıf öğrencisini kapsamaktadır. Tüm örnekleme "Çevre okuryazarlığı anketi" uygulanmıştır. Pearson momentler çarpım korelasyonu analizi ile çevre okuryazarlığı boyutları (bilgi, tutum, kullanım, ilgi) arasındaki ilişki hesaplanmıştır. Annenin eğitim durumunun çevre okuryazarlığı üzerindeki etkisi ise tek yönlü MANOVA analizi ile hesaplanmıştır. Son olarak öğrencileri çevre okur yazarı yapabilecek etkenler (öğrencilerin çevreye yönelik ilgilerini algılama, çevre problemlerinin önemini algılama, çevre bilgilerini algılama, açık hava aktivitelerine katılım, ebeveynlerin çevre problemlerine ilgisini algılama, ebeveynlerin çevre aktivitelerine katılımın algılama) ile çevre okuryazarlığı boyutları arasındaki ilişki kanonik korelasyon ile hesaplanmıştır. Araştırma sonucunda öğrencilerin %64'nün

11 tane bilgi sorusundan ortalama 8.2 puan aldıkları bulunmuştur. Ayrıca öğrencilerin çevre karşı olumlu bir tutum sergiledikleri ve insan-çevre ilişkisinin öneminin farkında oldukları saptanmıştır. Pearson momentler çarpım korelasyonu sonucunda ise bilgi-kullanım; tutum-ilgi arasında pozitif, düşük düzeyde ve anlamlı bir ilişki bulunmuştur.

Ayrıca tutum-kullanım arasında yüksek; kullanım- ilgi arasında ise orta düzeyde bir ilişki bulunmuştur. Annenin eğitim seviyesinin çevre okuryazarlığı boyutları üzerinde ise anlamlı bir etkisi bulunamamıştır. Kanonik korelasyon sonucunda, ebeveynlerin çevre aktivitelerine katılımlarının, çevreye karşı tutum, kullanım ve ilgiyi olumlu etkilediği de bulgular arasındadır.

Anahtar Kelimeler: Çevre Okur-Yazarlığı, Çevre Eğitim, Ilköğretim Fen ve Teknoloji Eğitimi, Ilköğretim Fen ve Teknoloji Eğitimi Programı

*To my family…*

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# CHAPTER 1

## INTRODUCTION

The century left behind, which includes breakthroughs in science and technology, global changes in human history, urbanization, and industrialization, named as information and development century in history books. Another name given to the last century is "contradictions century", which implies contradictions as; discovery of moon, sheep cloning, development in genetics, nuclear and space research as well as increase in consumption, hunger and poverty, increased efficiency in agricultural production by so called "*green revolution*", erosion and desertification, never-ending increase in population rate and massive deaths, rights of human and other living organisms. The century left behind can also be named as, century of environmental awareness. Environment, as an interdisciplinary and multi-dimensional topic, has become a focus of political, philosophical, economical, cultural, social and ethical discussion and has privilege in national and international agenda as an important problem. In parallel to increase in scope and impact of environmental problems, political, economical, cultural, scientific and artistic interest has become greater than ever before.

It has also been pointed out that however that, environmental problems, being deep, complex and extensive, can not only be covered by one-dimensional, simple and short-term solutions. Being global and life threatening, environmental problems have made people to think about their attitudes and behaviors toward environment, their interaction with nature, and their responsibilities towards nature and have made them to define environmental morals, ecological culture and environmental consciousness. Thus, connection between education and environmental issues has been examined through teachers, schools, students and curriculum to bring up environment-sensitive and conscious individuals.

As a result, the need for environmental education, its significance, its function and effect has begun to be reviewed in the century left behind.

One of the purposes of environmental education is not dismay students about future, but makes them intensify (Erten, 2003).. If they are built up to be aware and take the responsibility of current and probable environmental problems, it would be easier to struggle with the problems and they become hopeful and confident for the future (Erten, 2003). Thus, the content and targets of environmental education have become significant at this point.

Children are an important audience for environmental education because they are tomorrow's leaders and resource users (Braus and Wood, 1993). Moreover, they may have influence on their parents and the people around. Members of staff at school have impact on awaken students' awareness and knowledge to develop attitude and actions toward environment. Women, as users of sources as well in all over world, should be one of audience of environmental education (Braus and Wood, 1993).

Environmental education content firstly was shaped by The Tbilisi Declaration. By Tbilisi Declaration, ideas of raising environmental literate individuals are discussed. However constituents of environmental literacy (EL) have been a question mark like in much other literacy. Environmental literacy includes according to definition of literacy in general; awareness and sensitivity, experiences and understanding, values and feel of concern and some skills about environmental issues and problems (Braus and Wood, 1993).

Goal of environmental education go in front of environmental literacy, in other word, they are synonymous with environmental literacy. Consequently, the ultimate goal of environmental literacy is acquiring life-sustaining, responsible environmental behaviors and skills as well. Knowledge and sensitivity to a problem are needed for taking suitable action. Knowledge of the problem is only part of the catalyst required; however, a student must also know what he or she can do to help.

What is more, provide students only with environmental awareness and knowledge are not adequate, instruction in and modeling of behavior is also needed in and out of the classroom (Moseley, 2000).

Content of environmental literacy is established to cover all the requirements for acquiring students with action skills. It draws upon six major areas: environmental sensitivity, knowledge, skills, attitude and values, personal investment and responsibility, and active involvement. Environmental sensitivity, attitudes and values are subsumed under the term "affects" and personal investment and responsibility and active involvement are subsumes under behavior, thus creating four strands: Knowledge, Skills, Affect and Behavior (Roth, 1992).

Value of environmental literacy will be comprehended by the time. It is certain that higher environmental knowledge will lead more conscious and beneficial environmental acts will consequent in better environmental conditions. As stated before environment is interdisciplinary concept that will affect many fields and different aspect of lives. For instance NEETF/Roper revealed that majority of public opinion is that environment and economics balance and affect each other. Culture and economic status, one the other hand, is another issue of enhanced environmental situation (Coyle, 2005). Furthermore, when issues of health and personal welfare are also connected with environmental issues, women are exceeding man in terms of concern about environment (Bord & O'Conner, 1997).

Many studies reveal female have more positive attitude toward environment or somewhat more supportive than male (Caiazza & Barret. 2003; Department of Environment and Conservation, 2006; Gezer et. al, 2006; Tuncer, 2005). Girls' education yields some of the highest returns of all development an investment, yielding both private and social benefits and additionally mothers' education is a significant variable affecting children's education attainment and opportunities (Worldbank, 2007).

For these supportive reasons, mothers' educational level is thought to have impact on students' knowledge, attitude, use or concern related to environment like in other fields of child's development.

Chu et.al (2007) also stated that "parents' education background affected all categories of environmental literacy and students whose parents had a university education showed higher level of environmental literacy" (p.12). Younger students also spend much time with parents, doing many activities such as reading, playing and studying (Chu, 2007). Thus students are expected to be affected by their parents' attitude, concern and use of environment. In another study it is also confirmed that parents who have concern for environment, can have influence on children environmental attitude strongly. In Turkish culture, there is a man dominated culture that means women education is not cared much, on the other hand, it is significant that women education has influence on developing students' environmental awareness (Tuncer, 2005).

There are many other variables affecting environmental literacy like in example of gender issue. For example, attitude will directly affected by environmental knowledge and it is its reflective. Many findings showed that more people know, more positive behavior they have (Coyle, 2005). In similar way, environmental literacy is affected by knowledge and attitude directly. Knowledge is, dimension of environmental literacy, and facilitate students' understanding how components of environment depend each other assembles values and their actions; what is more, increase in knowledge also motives students to take action (Palmberg & Kuru, 2000).

The century we are living can be recalled as a century of acquiring environmental literacy, if environmental education reaches the defined targets, that is to say, if environmental literacy becomes a major component for solutions to environmental challenges.

Therefore, research about environmental education and environmental literacy is an important tool both to investigate the current state of environmental literacy of individuals and to find means to develop it and also to find out the most convenient applications, instruments, and evaluation techniques to detect environmental literacy.

## 1.1. PURPOSE OF THE STUDY

The target of the current research is to investigate environmental literacy of $6^{th}$ grade students with and to find means to answer the questions to develop the environmental literacy. Therefore, in addition to investigating $6^{th}$ grades students' environmental literacy, this research aims to, find out the factors effecting environmental literacy, the relationship between these factors and environmental literacy and the relationship among the dimensions of environmental literacy. The possible factors that may affect environmental literacy have been defined as "background characteristics" and are, comprised of students' preference of outdoor activities, students' living area, students' parents' perceptions about environmental problems and parents' behavior towards environmental protection.

## 1.2. SIGNIFICANCE OF THE STUDY

Sustainability is the sum of social, economical and environmental development together. For example, it considers quality of life, on the other hand capacity of ecosystems within poor and disadvantaged conditions. It does not insist on development yet consider current situation and change according varying necessities (Unesco, 1997). Achievement of this addresses environmental education. Purpose of environmental education is bring up productive and responsible individuals' for future of planet and society, in other words; environmental literate citizens (Roth, 1992). Individuals' understanding and their experiences related their local conditions will contribute in improving environment (Hares et.al, 2006).

Individual's maturity about environment is probable with give them environmental literacy components. That's why acquisition of environmental literacy is prerequisite for better environment.

The most powerful approach to advance environmental conservation and a sustainable future is to ensure the next generation's environmental literacy. The children of today will one day be responsible for making decisions that will shape the future health of the environment. They need a sound environmental education as a foundation upon which to make those decisions to be prepared for such future responsibilities. Therefore, as also mentioned through the basic international documents like in Thessaloniki Conference (UNESCO, 1997), such education should aim teach students about sustainable development and its components. In addition, students should learn to make sustainable development valid for their lives.

Acquisition of such vision will help them to have skills and abilities to be informed, concerned and citizen active citizens for sustainability. Such an education will have role in democracy and peace as well. Any country in the world needs to include environmental education into their curriculum. Besides, as adults of the future they can lead their children to enroll in non-formal EE settings (Hsu, 2004).

Young children will face many difficulties in subsequent time. So it is necessary to help them in acquisition of knowledge and skills in order to overcome those difficulties. Many materials related to environmental education do not concentrate on developing knowledge but developing awareness of environmental problems. Many studies revealed that students need understanding rather than concern. As time pass, environmental problems will alter yet environmental literacy will be continued through life span (Salmon, 2000).

Individuals' understanding and their experiences related their local conditions will contribute in improving environment (Hares et.al, 2006). Individual's maturity about environment is probable with give them environmental literacy components. That's why acquisition of environmental literacy is prerequisite for better environment.

Environmental literacy, on the other hand, is the target of environmental education and helps develop and expand future generations' critical thinking skills, prepares them for citizenship, fosters their appreciation of the natural world. Targeted to find out 6th grade students' environmental literacy, the current study is a part of efforts in Turkey to establish an environmentally literate future generations. First of all, the content of this thesis may be inspiring for other Turkish researchers to get involve with the issue of environmental literacy. In addition, the instrument, used in this thesis, can be used as a starting point for other communities to develop their own measuring tool for environmental literacy. Moreover, the result of this study can promote awareness in Turkey and help the school managers and curriculum planners to investigate the means for developing the environmental literacy of the students. In the long run, on the other hand, the results and conclusions of this thesis are promising to add studies related to environmental literacy at all levels of education. Because, literacy is a never-ending process, like any form of education, environmental literacy must never stop, and it has to be promoted and encouraged at all levels and sectors.

The social and cultural factors are at the root of environmental problems so these factors should be considered for finding solutions (UNESCO, 1978). Turkey is developing country. Statue of environmental education is in its early stages so Turkey is deficient in studies and investigation relating individual's attitudes, concern, beliefs about environment. This will also lead development of curriculum relating the environment as soon as possible (Tuncer et.al, 2005). For such kind of effort, individuals' needs, knowledge, attitude and such variables should be detected and orient future attempts for welfare of environment.

## 1.3. ASSUMPTIONS

- All subjects of study were sincere in answering question of the measuring instrument.
- The survey administered under standard conditions.

## 1.4. LIMITATIONS OF STUDY

- The subjects of the study were limited to 681 $6^{th}$ grade students at private school.
- Validity of study is limited to reliability of instrument used in this study.
- Validity limited to the sincerity of responses given to the instrument questions.

## 1.5. THE MAIN PROBLEMS AND SUB-PROBLEMS:

### 1.5.1. The Main Problem

The purpose of this study was to investigate the environmental literacy of $6^{th}$ grade students at a private school.

### 1.5.2. The Sub-Problems

**Sub-Problems 1:**

What is the environmental literacy of $6^{th}$ grades students of private school?

**Sub-Problem 2:**

What is relationship among dimensions (knowledge, attitude, uses, concern) of environmental literacy?

**Sub-Problem 3:**

How does mother's educational background affect environmental literacy of 6th grade students?

**Sub-Problem 4:**

What is relationship among 6th grade students' background characteristics and environmental literacy?

# CHAPTER 2

# REVIEW OF LITERATURE

This chapter of the thesis is planned to present a review of literature about environmental education and environmental literacy and is comprised of 3 sections as: the state of the art of environmental education in international and national perspectives, research in environmental education and definitions and research about environmental literacy.

## 2.1 ENVIRONMENTAL EDUCATION

### 2.1.1 STATE OF THE ART

How did environmental education come out? Roots of environmental education has premise on nature and conservation of natural resources (Ünal et al, 1999). The history of environmental education that was set out by McCrea (2006) begins with the well known novel titled Emile. In his novel titled Emile, Jean-Jacques Rousseau (1762) states an educational philosophy that place environment in the center of education and defines teachers as catalysts for students to learn about human development and their implications for teaching and education. At the end of early influences of environmental education, in about 1920s, ecology joined in scientific field. In 1930s conservation education is supported by many states and federal natural resource agencies and non-governmental organizations in the US. Afterwards many associations started to form and give support for the development of conservation education. Environmental education separated from other fields in mid 1960s originated from many different areas such as conservation education, nature education etc (Roth, 1992).

Yet it has focal point on relationship between natural and social system, human-nature harmony, technology and lifelong learning. National Environmental Policy Act in 1969 is accepted in the US with an aim to build up strategy in order to provide agreement between people and his environment, endorse them to protect environment, moreover provide understanding neighborhood.

The United Nations Conference on the Human Environment in Stockholm is organized in 1972, to motivate and lead everyone for the protection and improvement of environment (UN, 1972). The United Nations Educational, Scientific, and Cultural Organization (UNESCO) in cooperation with the United Nations Environment Program (UNEP) hold the Intergovernmental Conference on Environmental Education in Tbilisi in 1977. As declared in Tbilisi (UNESCO, 1977), environmental education should be a part of education with the intention of offering knowledge, understanding, values and skills for environmental problems. Besides non-formal education also should have impact on this task.

It is stated in the report submitted by National Environmental Education Advisory Council in 2005 for describing the state of environmental education in the United States that, environmental education was crucial and lead youth for environmental vocations. Since environmental education is a mean to provide understanding to protect environment, economical wealth and comfort through future.

In 1990s it has been found out that, providing knowledge and skills make individuals successful, productive and help them to develop responsibility toward their society and the environment. Therefore it has been evaluated that, only education help to reach contemporary levels with clean, healthy and productive environment which presents materials and energy need for human beings. Thus, schools are decided to discipline students for productivity and responsibility for society (Roth, 1992).As a result, environmental education is included in education process by means of developing programs.

But, it has also been discussed that, it can not be limited by only formal education system and should be considered as a lifelong process. That is to say, environmental education builds up in every individual's lives (UNESCO-UNEP, 1978).

The questions have been asked then: What is environmental education? What does it aspire? Although the answers have still been discussed, it was realized in 1990s that, all nations should be aware of results of environmental problems; international standards should be set out for environmental conservation and environmental education makes it possible by means of handling issues at risk and including knowledge, skill and attitudes. So, environmental education has an important role in environmental protection. It should be at all levels of education, giving knowledge, skills and values to all people to develop solutions for environmental problems. Similarly, it was also realized that, environmental awareness and knowledge can be built through mass media as a form of informal education.

As declared as a result of Tbilisi Conference (UNESCO-UNEP, 1977), environmental education makes people aware about economic, political and ecological interdependence universally. This is a necessity for solution to nationwide serious environmental problems. Environmental education is interdisciplinary since it considers environmental problems from viewpoint of ecology, sociology, cultural and other aspects. In order learners get skills, knowledge, values for problem solving, environmental education should contain recognizable environmental problems. Environmental education can be realized by different approaches as in, for and about the environment. By means of appropriate teaching method, environmental education becomes lifelong and advanced. Content and application for environmental education may wary among type of learner (young, adult or different occupational groups) for developing awareness.

Braus and Wood (1993) claimed that Environmental education is a process of acquisition of tools or skills to overcome and stop environmental problems with suppose of increasing quality of life. Through environmental education, people will gain knowledge, skills, motivate values and commitment to direct earth's resources in a sustainable ways and keep environment at steady.

Critical purpose of environmental education is to allow people intricacy of environment and encouraging nations for a vision of environmental-compatible actions through their development (UNESCO-UNDEP, 1977).

Principles of environmental education, on the other hand, are declared by Staniskis and Stasiskiene (2006) as, an interdisciplinary subject and considered and developed for local problems and solutions at first and then adapted by others.

Why environmental education is important? Earth's natural resources are being used by more than 5.3 million people via intentionally abusing or not. Deforestation, reducing energy sources, pollution, hazardous waste and disrupting fields are some examples for abuse of earth. As population increase, it becomes more difficult to meet people's needs.

As a result of destruction of environment, many negative consequences are inevitable such as extinction of species, ruin of vegetation, health problems. According to many experts, if this continues at the same rate, collapse of life will be observable. Thus, it can be inferred with no doubt that environmental education is important as being one of the valuable means to struggle with environmental problems and to build a sustainable future with conscious individuals.

### 2.1.2. RESEARCH RELATED TO ENVIRONMENTAL EDUCATION

The following section is a summary of research related to EE with chronological order. Although the research related to EE goes back to 1960's, this section of this thesis includes the work done after the year 2000.

In the year 2000, a mail survey was conducted in the Research Center of University of Maryland, USA, sponsored by the North American Association for Environmental Education (NAAEE) and the Environmental Literacy Council (ELC), about how environmental education is carried out in the classrooms. The questionnaires sent to random samples of K-12 teachers via mail and responses of 1505 teachers were evaluated as follows. The percentage of teachers that include environmental topics in their classrooms was found to be %61.2. According to the grade level, 83% of K-4 teachers, 58.7% of 5-8 teachers and 44.5% of 9-12 teachers were teaching environmental topics. Ninety percent of the teachers include recycling and waste management into their program and their sources were found to be textbooks, library and newspaper (79.1%, 75.9% and 17.9% respectively). Teachers of 5-8 graders found textbooks as the most relied source with percentage of 88.8. Most common method for environmental education among teachers were ranked as, discussion (90%), hands on activities/projects (over 90% for K-4 teachers) and problem solving (55%-61% for all grades). On the contrast, field trip was found to be less preferred teaching method for 9-12 grades teachers.

It was stated in the study that, teachers who included EE topics into their program explained the reason why doing so as because it encourages environmental protection activities among students. Ones who did not include EE into their program, on the other hand, explained the reason with the irrelevancy of the topics with the curriculum. As a result it was concluded that, students were offered an EE to an extent and this was realized by the integration of the topics to the other courses rather than developing a specific course.

In another research (Barraza & Cuaron, 2004) investigated the 7 to 9 age Mexican and English students' acquaintance and understanding of 10 environmental concepts. The authors'' purpose was to find out the effects of cultural and structural differences on environmental concepts formation. Majority of students of the study were middle-class yet overall sampling had variety socio-economic status. The study was carried out in 2 parts. Firstly students were asked if they were familiar with the selected 10 terms (habitat, pollution, recycling, global warming, deforestation, solar energy, endangered species, extinction, nuclear power station and ozone layer), which were included in the curriculum. Afterwards students were asked if they knew the meanings of the terms. They defined "familiarity" as hearing of environmental terms and "knowledge" as the understanding definition of terms. As a result 7.2 terms out 10 were found to be heard by students and 5.8 terms were found to be known in average. In addition, 16.2% of students were found to be heard al the terms and 4.4% of them knew the definition as well. When the authors compared Mexicans and English students they found that, English students' average was 6.9 terms whereas Mexicans students knew the meanings of 5.1 terms. Mexican students were found to be familiar with the terms such as, pollution, recycling, extinction, solar energy, endangered species and ozone layer. Most of the English students were found to be more familiar with the terms pollution; solar energy and nuclear power station. Moreover, level of understanding was found as lower than the level of familiarity.

For the source of environmental information; school, television and parents (equal percentages) were found as having the highest priority for Mexican students. English students, on the other hand, found as getting information via school and television. Nonetheless knowledge was expected to be higher, since selected terms were chosen from the curriculum. It was concluded from the results that, schools had influence on developing environmental knowledge and awareness for students. Therefore, schools should develop environmental policies so as to guide students to be more knowledgeable.

Shepardson (2005) investigated the effect of grade level and educational experience on students' ideas about environmental issues. He conducted a research with 81 students, consists of $7^{th}$, $8^{th}$, $9^{th}$ graders from general biology and $9^{th}$ graders from college preparatory. The students were from rural and agricultural community. Two environmental tasks were executed; firstly students drew a picture and explained it, secondly, students were shown photos and asked for an explanation whether it portrays an environment. Students' ideas were coded according to constructing pattern or theme. As a result all students were found to have a tendency to draw pictures related to natural environment such as forests or trees, lakes, streams, except $7^{th}$ grades, which drew human managed environment like building and homes. In addition, $9^{th}$ grades regarded human as a part of environment and college preparatory students evaluated environment supporting life with food, water, shelter and oxygen. $8^{th}$ grades, on the other hand, were mere group who showed human impact on the environment. In the photograph show task students' answers were consistent with ideas in the drawings. As a result, it was concluded by the authors that, environment was viewed from a limited perspective like a location for animal, human management on environment was ignored by majority of students whereas human were not seen as part of it. However, according to the authors, students described environment from point of view of ecology, whereas information filling this ecological view was empty, meaning students were not well informed about the dependence or relation between biotic or abiotic factors.

Kaplowitz and Levine (2005) examined environmental knowledge level of undergraduate, graduate and professional students of Michigan State University (MSU). MSU students' environmental knowledge was compared with 2000 national sample of Americans adults.

The authors applied a survey comprised of 12 environmental knowledge questions adopted from National Environmental Education and Training Foundation (NEETF) and Roper Starch Worldwide Survey of adult Americans.

The survey was scattered in 2 different ways as hard copy survey and web based survey. Approximately 20.000 MSU students were asked to answer the survey.

Moreover, a grading scale was set up as, 70% and greater right answer having a passing score, meaning adequate environmental knowledge (A,B, C) and 69% below right answers indicating inadequate levels (D, F) of environmental knowledge. In the survey, 1st question was set out to test participants' evaluation for their own level of knowledge about environmental issues and problems. Remaining 11 items had 5 choices from which only one was correct. As a results of the study, 98% of the respondents answered knowledge questions. MSU students were found to be good at questions about household hazardous waste and biodiversity whereas the questions answered wrongly were about electricity generation and non point source pollution. When MSU students' environmental knowledge was compared with that of the national sample it was found that, majority of students passed and majority of national sample failed the test. So the null hypothesis which says that there was no difference in environmental level between MSU students and American public was rejected with this finding. Despite the fact that, MSU students were inadequate in field of electricity generation, non point source pollution and nuclear waste; they were better than the national sample. Moreover, MSU students were fairly realistic about their level of knowledge which leads that students were able to judge themselves about environmental knowledge well again than national sample. Yet, students failed to know about landfills, primary method for disposal of garbage in U.S. in comparison with national sample. The differences among colleges of MSU were also tested in the study and Osteopathic Medicine, human medicine, agriculture and natural resources, veterinary medicine and natural science were found as having the highest scores. College of human ecology, on the other hand, had got the lowest score. Related to the academic level, it was found that as the academic level increases, environmental knowledge increase as well.

Another study related to EE was about testing hypothesis that, more a person knows about environment, more positive attitude is developed toward environment. The study was realized by DeChano (2006) in 4 countries, Chile, England, Switzerland and USA with students of approximately 17-19 years old. As stated in the study, there were no predominant pattern about the relationship was found in the literature.

The special features of the study can be stated as, the sample size was approximately 60 students with an age of 17-19, sampling was convenience sampling, using 1 class (except Switzerland), the language was English and research sites were arranged by collaboration with teachers. The instrument was comprised of 3 sections as; demographic data, environmental knowledge questions and attitude measurement questions. Environmental knowledge was made up of 4 parts as, human activity, atmosphere, biodiversity and ecosystem and water. Results of this study showed that Chile had least score on knowledge items whereas Switzerland and England had no difference yet more knowledgeable among other countries. A criterion of passing score was 75% correctness along with knowledge questions.

Global warming question was examined and noticed that students in Chile couldn't answer it but it greatly higher scored in England and Switzerland. Reasons were considered to be difference in energy consumption and curriculum context. Overall rating was under the criteria (75%). As a result, Switzerland was found as having the highest score, while Chile has the lowest overall. The reason for Chile getting the lowest score was attributed to the situation that, no mandatory environmental education was available and environmental concepts and issues were taught within other courses such as chemistry, biology and geography. By the way, they were good biodiversity and atmosphere topic most. Answers of questions related to pre-trip and post-trip activities' effect on residential environmental education were sought by the study realized by Sebasto and Cavern (2006). The study was conducted with 169 $7^{th}$ grade students from middle school. A residential environment education program was present in the field of a university, to which, many students and teachers participated. This program included subjects related with environmental science, humanities, outdoor pursuits and social sciences. Pilot study was performed and outcome of this try provided alteration for the application. Two activities were chosen to be integrated into the treatment; one before program and the one after program. There were 4 levels of treatment and there was a group of participants with no additional activity.

A pre-trip activity was realized before program and participants attended the program and then they received the post-trip activity. As a result, as a 4th level; both pre-trip and post-trip activities were applied. Children's' Environmental Response Inventory was used for evaluation. There were 3 subscales in the inventory as Environmental Adaptation, Environmental Trust and Pastoralism. Results indicated that the group only attended the program changed in environmental trust which means confidence and trust in all types of environment. Students, who attended pre-trip, did not show any change of attitude toward environment. Pastoralism, which is sympathy for spending time in non-human dominated areas, showed decrease in scores with attending trips. However for groups attending both pre-trip and post-trip activity, environmental adaptation score was higher, showing more respect for environment as well.

One can inferred as a result of the above summarized studies that, one of them states that majority of teachers contains environmental topics as they teach yet many times, environmental topics are taught as separate course. In general students have environmental education at some level. Schools have impact on environmental knowledge and awareness for students and should develop strategies aiming increase in environmental knowledge as well.

In another study, it is also found that understanding of concepts of environment is at lower level than being familiar to those concepts. At a study at university level, environmental knowledge is found to increase as academic level increase. Furthermore, through environmental activities, easily environmental adaptation and more respect is concluded in another study.

## 2.2. ENVIRONMENTAL LITERACY

One of the first researchers who set out "environmental literacy" was Roth (1969). Literacy can be verified by observable behavior, so does environmental literacy. In case of literacy, people should be able to reflect their knowledge and skills. Environmental literacy is range of stages of proficiency. More obviously, there are three levels of environmental literacy; nominal, functional and operational. Nominal environmental literate persons are familiar with basic environmental terms and definitions roughly. Besides, they have simple knowledge about human- nature interaction; they are aware, sensitive and respectful to nature and human impact.
Functional environmental literacy is defined as being more knowledgeable about ecological, economic, and geographic and some other aspects of environmental process and human impact. They have basic skills about identifying environmental issues and their background; higher order skills such as analyzing issues from different viewpoint, evaluating solutions, judging and behave according to personal values and the like. Moreover, they have concern for society and environment and change act according to selected lifestyle behaviors. Operationally literate people, on the other hand, are, additional to functional environmental literacy's knowledge, skills, attitude and values and actions; demonstrate evaluation of problems and issues on facts and personal values and skills for solutions. They feel responsible for environment as an individual and cooperatively. At this level, lifestyle of environmental literacy well established and they are habitually active about environment (Roth, 1992).

Roth (1992) also segregates forward steps to environmental literacy as awareness, concern, understanding and action levels gradually. Awareness is having opinion of human-nature interactions and consequences about an environmental issue. Concern includes perception of negative human-nature interactions and belief of change. Level of gaining of more detail information about human-nature interactions for present and future is understanding stage.

When people are in action stage, behaviors take place in order to change negative consequences of human-nature interactions. In brief, operational environmental literacy as mentioned above is combination of all components of beneath levels.

After the term appeared, an obvious question arises how environmental literate person will be known. Skills related to critical and creative thinking, seeking and organizing information, having doubtful approach and looking forward and planning. Moreover, they recognize environmental problems, think from different from different aspect of issue before acting and consider long term benefits rather than short term gains, keep on learning about environment, know relations among all living things and have tendency to convert values of culture according to human-environment interactions (Roth, 1992).

There are many definitions of environmental literacy in the literature and it would be significant to involve some definitions of environmental literacy here. For example, Clair (2003) asserts that environmental literacy is combination of knowledge and action moreover, many of skills needed to be literate. Moseley(2000), describes a person who is environmentally aware is not yet environmentally literate – nor is a person who possesses broad environmental understanding, who demonstrates environmental concern or who takes action on a single environmental issue. According to Morrone et.al, (2001), environmental literacy is to change values, attitudes, and skills into action. Values and attitudes are part of ecological psychology whereas ecological knowledge is in field of environmental education. Furthermore, students need to be specifically trained about environmental action, problem solving skills and this training need to be incorporated into the instructional practice of environmental education.

In the scope of environmental studies in University of Georgia, an environmental literacy committee has been created and in 1992, this committee proposes some items to be evaluated for environmental literate individuals (Environmental Literacy Committee *as cited in* Moody et al, 2005, pp. 1–2)

1. *Basic scientific principles that govern natural systems, using these to understand the limits and major factors associated with the earth's capacity to sustain life;*
2. *Linkages among all living things and their dependency on each other as well as the physical environment;*
3. *Consequences of human activity on local, regional, and global natural systems;*
4. *Impact of changes within natural systems of life, health, and welfare;*
5. *Cultural, economic, and political forces—both past and present—that affect environmental attitudes and decision making; and*
6. *Role of ethics and morality in individual and group decision making related to the environment.*

Although, the concept of "environmental literacy" introduced in an article by Roth in 1969 (Roth, 1992), it is a new term for Turkey. Front to current multifaceted and difficult environmental problems, government alone is not adequate, therefore; dealing with this intricacy issues, well-informed and environmental literate persons are needed (National Environmental Education Advisory Council, 2005).

Environmental literacy is the desired outcome of environmental education programs (National Environmental Education Advisory Council, 2005, p. 10). Idea of environmental literacy and its relation with environmental education and sustainability is a debate contained by environmental education (Gayford, 2002).

According to experts, there are 3 level of learning in environmental education as namely awareness, personal conduct knowledge and environmental literacy. At the first level, individuals are familiar with environmental subjects or have heard about them mainly via public media. Secondly, ach person behaves for environmental improvements such as saving sources, waste management etc yet without complete knowledge. Finally, they become environmental literate.

That means gradually having information, completely understand subject with principles and skills for analysis and apply what is known.

The need to be environmental literate can be explained by means of an increase in world population. People need more environmental knowledge about the resources and their use.
In many media tools, people may not associate environment and economy but many researches reveal that they may accompany each (NEETF, 2005). The best way to increase environmental literacy is to absorb it to whole education system (NEETF, 2002).

According to Marcinkowski (1990, *as cited in* Roth, 1992); environmental literacy contains awareness and sensitivity, respectful attitude and additionally concern toward environment. Understanding and using many skills to assess many environmental problems in line with personal values are included as well. Besides individually or cooperatively solutions and knowledge and skills and active involvement at all levels about remediation and solution of environmental problems are within environmental literacy.

Roth (1992) utters similar to in other any literacy an observable behavior should be to demonstrate knowledge and skills any subject, in environmental literacy presents series of proficiency of understanding, skills and actions.

According to Gayford (2002), environmental literacy aims acquisition of every individual to understand their world in order to contribute their personal development to meet their needs and society to make it more sustainable as well. Environmental literacy adds peoples' knowledge, learning and their choices. By means of environmental literacy, different viewpoints are acquired with conscious and awareness for better society. Environmental literacy is a need to examine and understand environmental problems in detail.

Environmental literacy:

- *has a significant scientific component, since most environmental problems require this dimension in order that citizens can fully appreciate the issue. It should help to*
- *encourage an understanding of interactions between human populations and natural resource systems;*
- *requires understanding which is organized according to major unifying principles;*
- *enables students to appreciate the difference between opinion and scientific information based on evidence;*
- *involves the development of the ability to discover new knowledge and the ability to use available knowledge to solve problems;*
- *concerns the development of attitudes, approaches, ethics, skills and related knowledge and concepts which are necessary to cope with a rapidly changing environment and which are useful in problem solving and decision making in daily life;*
- *is an aspect of education for all."* (Gayford, 2002, p.106)

As members of society, everyone should be environmental literate. It is important not only know world but also reinforce people be responsible for development of society. Furthermore, it leads people for sustainable standard of living (Gayford, 2002).

Thus, in line with the related literature, we can define EL as sum of knowledge, attitude, use and concern regarding environmental issues. Environmental literacy should be considered as a must for every citizen.
Future will illustrate a pessimistic framework unless environmental literacy is aimed in every field of education. Next generations should be accountable to understand human-environment interaction and its consequences.

By environmental education, it is possible to convert knowledge, values, attitudes and concern into action for better environmental conditions.

As declared in many studies, level of environmental literacy will lead people to establish environmental quality which is directly related with human life. For this reason, implementation of environmental education has a huge impact on level of environmental literacy. In process of improvement of quality of environment, environmental literacy should be main goal of education in all levels.

### 2.2.1. RESEARCH RELATED TO ENVIRONMENTAL LITERACY

After presenting the theory of environmental literacy, this section of the thesis includes the research related to environmental literacy.

Gayford (2002) made a research on the secondary teachers' thoughts about environmental literacy in England. The methods used in this study are, participatory appraisal methods, participatory action research and cooperative enquiry. Researcher had the role of facilitator in the study as to ensure that participators share their knowledge and experiences about topic. Participants are comprised of 17 science teachers from 4 schools and teaching students of age between 14 -16 with different science backgrounds. Meetings are organized in small groups (5-6 people) to ensure an efficient work. They concentrated on the issue of science teachers' contribution to education for environmental literacy. They agreed on some concerns like science curriculum load, sustainable development topics not being in their expertise, imprecise sustainable education content and issues regarding sustainable development are controversial. Participants were dispensed some readings about environmental education with intention to define some ideas on their mind. Teachers also agreed on some items about science as; contribution of science to environmental literacy, changeability, uncertainty and limitations of science.

The role of science education for environmental literacy was considered as a sequence of some skills, namely; knowing terminology, acquisition of new information and evaluation according to evidence, analysis and assimilation of information into existing information and synthesizing and judging.
Teachers also made conclusions about methodologies used in science classes as; using newspaper stories, presenting some contradictory ideas of scientists about environmental issues, role play, using web to find out different views and information, allowing students to express their ideas, use of pictures and story writing, critical evaluation of materials. At the end, it was confirmed that science educators can have great contribution to sustainable development.

In another study realized by Nair, Jones and White (2002), effects of a course were investigated for developing and teaching environmental literacy at undergraduate level. The course aim was described as to develop informed decision making skills for environmental issues. The study illustrates the course content and assessment of effectiveness of environmental literacy. At the beginning of study, basic core of knowledge areas were identified in order to make environment understandable without disciplinary expertise. In addition to knowledge areas, 3 requirements were also identified as system approach, building on initial environmental knowledge and applying knowledge- analysis, synthesis and evaluation. By system approach it was meant to think about the interactions. By building on initial environmental knowledge it was meant to gain knowledge and terminology and apply them as decision making. Applying knowledge requirement was explained as students' ability to use high levels of skills such as analysis, synthesis and evaluation during decision making scenarios. Furthermore, environmental literacy curriculum consisted of modules and each module was made of topics. There were also resources and exercises for each topic. Projects were also included to facilitate environmental decision making skills and homework, tests, portfolios were used for assessment. As a conclusion, students became skilled in problem solving and self-directed in decision making.

Moody et.al (2005) studied to set up a research, service and instruction about environment to create environmental literacy requirement (ELR) in the University of Georgia (UGA). In sum of close past of UGA about environmental literacy, 1989; interdisciplinary discussions of current issues lectures about were created. 1990; a task force on environmental studies, having 3 directives of proposing curriculum to make graduates environmental literate (EL), review of university organization to increase emphasis on environmental issues and decide add on environmental issues activities funs.

A report called "Toward an Environmentally Responsible University of Georgia for the Twenty First Century" having 2 goals; having UGA students environmental literacy experiences and every departments' students having interdisciplinary environment course related with their field.

1991; vice president establish environmental literacy committee to examine the feasibility of implementation of task force addressing the 6 criteria.

1992; this committee reported environmental literacy operational definitions.

Vice president created an EL board which review, coordinate and recommend approval of individual unit literacy plan for satisfying ELR. The first college to approve this plan was College of Arts and Science.

1993; plan was approved for other colleges.

1995; subcommittee is charged with reviewing ELR which focus on number of course hours to meet ELR. This committee also reduces 6 criteria to 2; related with natural system and how human affect natural system. ELR is evaluated with the 3 students' studies.

One of them is a graduate paper about a certificate program in ELR start up period, the other one is about ELR on this middle operation period and last one is after reduction of ELR. These three evaluations are formal and informal questionnaires and surveys of students and faculty completing and teaching the ELR. In sum up, environmental responsibilities and goals are not adequately defined. By means of ELR, there is significant increase in students' awareness of the environment. However it is taken out from 3$^{rd}$ study that 43% of students are not aware of the ELR.

In consequences, both students and faculty support the ELR. However, lack of coordinator and commonly agreed upon definitions and goals, this ELR program couldn't be settled down. Environment and human affect on environment is not understood well and this limits people's health, productivity and sustainability of nature preservation.

Another study was constructed on the basic Orr (1992)'s definition of ecological literacy by Mancl et.al (1999). In this study data collection was realized by telephone survey. The study was composed of 504 adults and the questionnaire was composed of 32 questions related to 8 principles of ecology. Results showed that Ohio adults understand biogeography, earth as biosphere, ecological energetic and carrying capacity mostly, whereas they have difficulty in understanding ecological succession, biotic interaction and importance of diversity subjects. The comparison of the results with those of the study of National Environmental Education and Training Foundation (NEETF), on the other hand, resulted that two of three Americans were not good at pollution knowledge, yet Ohio Adults showed that they are good at ecological principles.
It was emphasized as the outstanding result that, Ohio adults were insufficient in principles of materials cycle, implied as nitrogen, phosphorous and hydrologic cycles and bioaccumulation. By the absence of this knowledge, Ohio adults were unable to understand applications regarding nutrient management, water conservation and toxic chemical disposal.

Another study was constructed by Goldman, Yavetz and Pe'er (2006) on the base of integration of environmental education in pre- service programs to foster a sustainable society. In this study, teachers were regarded as having key role for future generations and environmental literacy level was characterized by a longitudinal research of environmental education in academic teacher training programs. As stated by the authors, environmental literacy has 3 variables as knowledge, attitude and reported behavior.

The questionnaire for this study was developed by Goldman et.al (2006) and included 4 sections as, demographic and background information, environmental behavior, attitude variables and knowledge. The study was realized in 2003 academic year. Number of students participated the study was 765 and they were from three major teacher training colleges of Israel. The average age of the participants was 24 and 90% of all female and Jewish. Approximately 86 % of the students were from environment major, and the rest were from environmentally related subjects. Results of this study showed that television was the major source of information yet internet was minor. The most frequent behavior category was resource conserving actions with personal financial benefit nevertheless environmental activism was the least one. In case of relationship among environmental behavior, attitude and knowledge; there was high correlation between attitude and behavior. Moreover, there was low correlation between knowledge and two other variables (attitude and behavior). Overall scores of environmental knowledge of students were very low. Additionally higher commitment level leads less behavior carried out. The pre service teacher group of the study was they characterized as they had low level of environmental literacy since limited knowledge about ecological concepts and environmental issues. By reflection of environmental behavior, they were evaluated as quite committed to environment. Results may lead how a better environmental education program can be developed for teacher training programs since teachers have key role for sustainable society.

In 2006, Chu and Lee realized a study as aimed to investigate Korean students' environmental literacy development according to their grades and relationship between areas of environmental literacy variables as affecting their environmental literacy. The result of this study was promising to be used to set up a curriculum for environmental education. The study was realized with students from 3$^{rd}$ grade with an age range of 8-9, 7$^{th}$ grade with an age range of 12-13 and 10$^{th}$ grade with an age range of 15-16. The instrument used was the one titled, Environmental Literacy of Korean's Students (ELIKS).

Environmental literacy was investigated under 4 different scales, environmental knowledge, environmental attitude, environmental skills and environmental behavior. Results of the data collected from 300 students showed that environmental behavior and attitude was correlated significantly and environmental knowledge and environmental skills' as well. On the other hand, environmental behavior and environmental skills and environmental knowledge and environmental behavior were not correlated significantly. Furthermore, environmental attitude and knowledge; environmental attitude and skills were found as moderately correlated scales of environmental literacy. Attitude toward environment had 4 sub-scales as for example, environmental sensitivity and concern for environmental nature. As a result of the study it was found that, 3rd grade students had more positive attitude than 7th grade and 10th grade students. Tenth grade students; on the other hand, was found to have the highest environmental sensitivity. Environmental behavior component of the questionnaire of the study had comprised of 16 items as for example, active participation, eco management, responsible environmental spending. Outcome of study was that, 3rd year students have had greater eco management skills. The parameters investigated in the demographic part of the instrument are students' gender, parents' educational background, pre experience environmental education, source of their students' environmental information and science related items. Science related items included science achievement in school and favorite subject. Students' parental background at young ages found to be important (Chu, 2006) as well as pre experience in environmental education. Third grade students' environmental understanding was derived from outdoor learning. Newspapers and magazines, family and field trip were found as effective in developing environmental understanding. In summary, gender and parental background were found as important factors that influence students' knowledge, skill, attitude and behavior yet as students become older, their impact decrease. It was also found that, science related variables, understanding science, science achievement and role of science and technology affect environmental literacy dimensions; they are important in effecting behavior and attitude in young ages whereas knowledge and skill dimensions are added in older ages.

Chu et.al (2006) claimed that among all dimensions of environmental literacy, attitude; as an actual responsible environmental behavior, was important for this research. They also added that environmental behavior is very difficult to develop as students get older. Therefore, environmental education should be designed with effective teaching materials and strategies and students should be encouraged to involve in environmental programs actively. The author also stated the necessity of including environment concept in disciplines for attitude and skill development.

A research in America by NEETF (2004) revealed that people have, in general, knowledge about environmental topics yet real comprehension that means detailed information; is missing about environmental topics. In any of age, income, education level; people are not good at having detailed information about environmental issues and cause-effect relationships even for basic concepts. This illustrates that 32% of them have basic awareness about environmental topics. Incorrect and old environmental myths have impact on all citizens. Considering knowledge, 12% of them have passed score on basic quiz about awareness of energy topics.

Some of the beneficial actions of people and relationship between their beliefs, knowledge with these actions are examined by the 2000 NEETF/Roper Report Card. The study revealed that people have environment-friendly behaviours everyday and carrying out frequently. These are turn off lights and electrical appliances when not in use mostly. However reason for this action is not understood with a little attribution to environment. Thus, recycling, conservation of water in their homes and yards and decreasing household garbage are other regular activities that people perform (NEETF, 2004).

One can inferred as a result of the above summarized studies that, in case of developing environmental literacy has some constraints such as curriculum load, teachers' competency and like. Science education has great contribution to acquisition of sustainable development education. Effect of course, about developing environmental literacy, is has on students' problem solving and decision making skills.

At elementary level, students are found to have more positive attitude toward environment. Additionally, students' background and gender are found be significant aspect in developing environmental knowledge.

## 2.3. ENVIRONMENTAL EDUCATION PRACTICE AND RESEARCH IN TURKEY

Ministry of Environment and Forestry of Turkish Republic defined EE as, to inform, awake, gain positive and permanent behavior development and involve them actively in problem solving about environment all part of society about environment (MoEF, 2008). It should be a kind of education that providing active involvement, response to unfavorable things and comprehension of the fact that personal and social profits are not separate. Environmental education should not only inform and build responsibility feeling but also influence people's behavior (MoEF, 2008).

Almost certainly, the main problem of 21st century is environment and environmental issues. This problem is being increased day by day as the natural balance is being destroyed in Turkey. Irregular urbanization, disposal of garbage around, fritter of natural resources away and lack of education accelerates process of decay (Morgil et al). Indispensable interaction between human and environment is gaining new dimensions needs to be examined with new approaches not only at national level but also international level.

As stated in the 56$^{th}$ law of Turkish Constitution, "Everyone has right to live in healthy and stable environment. Developing environment quality, conserving environmental health and preventing environmental pollution is duty of government and citizens".

Main problem in Turkey is to inform made people aware of the reasons and results of environmental problems, as well as individual responsibilities. Individuals without consciousness can not create sensitive future generations. As stated by the Environment Law, 2872, environmental protection and development is responsibility of both government and citizens (MoEF. 2008).

Turkey continues progress as a candidate for European Union by systematizing economical and social life. Similar in many fields, it is being carried on adjustments and innovations in environmental education (Alım, 2006). A protocol about cooperation related to subjects of environmental education has been signed between Ministry of Environment and Ministry of Education in 1999 in order to make environmental education more systematic starting from pre school till secondary level.

In the scope of this protocol, environmental education applications have been started in order to develop environmental conscious of preschool and elementary level students, vocational schools, environmental education to increase environmental conscious of teachers and students, obligation to "Environment" subject once in a week at level of secondary with appropriate curriculum approved by Ministry of Education, in service training is supported. In addition, a meeting about description of pilot study of environmental education was realized in 2003 (MoEF. 2008). As a result, demand of increase in quality and level of education was stated in every level as importance. It has been declared that there is dynamism in population structure characteristics of family, social texture, consuming comprehension, human rights, in politics and in science and technology. With these expectations, in 2004-2005 academic year new curriculum was integrated gradually to 1 to $5^{th}$ grades elementary level by Turkish Board of Education (Turkey Ministry of Education, Turkish Board of Education, 2005). Curriculum is renewed on the base of constructivist approach and having vision of every elementary student is science literate person. This alteration can also be evaluated as important progression in environmental education (Alım, 2006).

The objectives for the revised curriculum included interactions between society and environment, apart from objectives assigned for subjects; related nature of science and technology, relationship between science and technology (Table 1). These are tagged as "Science-Technology-Society–Environment" (STSE) objectives. Some examples of STSE objectives are listed below:

- Notices natural and artificial environments.
- Knows how human and society affect environment.
- Knows necessity of protection and development of natural resources.
- Understands recycle of waste for preserving environment and the issue of waste (technological waste) management.
- Notices and understands technology impact on environment.
- Understands and describes the use of technological products and systems in order to protect natural resources.

*Table 1: Units and Subjects in 4th and 5th Grade New Science and Technology Curriculum related to Environment*

| Grade | Unit | Subjects having environmental objectives |
|---|---|---|
| 4th | Let' s Know matter | Use of natural resources |
| | Light and Sound | Light pollution<br>Noise Pollution |
| | Out planet Earth | Soil and Erosion |
| | Let's know and wander livings' world | Living areas and human impact |
| | Electricity in our Life | Battery use |
| 5th | Let's know and wander livings' world | Human impact on environment |

Environmental education is an essential research area in Turkey. Many studies are conducted at different levels of education.

A study was conducted by Gezer et.al (2006) among 3 types of high school in order to determine and compare environmental attitudes. Schools were located in a town and are different in type as, High School, Anatolian High School and Vocational High School. Students were $9^{th}$ grades. The instrument used in the study was designed with 5 Likert Type by Ozkan (2001). Survey was answered by 33 students of which 54.1% female and 45.9% male. It was found that High School students' attitude is more positive compared with Anatolian High School and Vocational High School students'.

Therefore, although Anatolian High Schools accept student according to their Secondary High School Entrance Exam and thus they are expected to have get higher scores for attitude, the results reflect that students' environmental attitude may not be related with the type of school, but other parameters. Overall attitude of students of the study was described as positive. Participants live in a town which imply that majority of them grow up in families dealing with agricultural activities, showed positive attitude toward environment. In general female students were found as having more positive attitude than male students. This result of the study was confirmed by similar studies and such a result was found to be positive by the authors as assuming every female student as a mother-candidate. As a result of the study, the authors concluded that, environment as an interdisciplinary field, catalyses performance of general objectives of education; parents should take care of children's environmental education since attitudes develop at early ages; teachers should try instructing with methods of observation, inquiry and discovery in outdoor.

In their study, Naim and Uzun (2007) investigated the effects of a course titled "Man and Environment" and voluntary work through environmental organizations on the students' environmental ideas, behavior and knowledge scores. The study was conducted with 1013 high school students, of which 509 are female and 504 are male. During the application, 10.6% of these students attended "Man and Environment" course and 5.9% of them participated voluntary environmental organizations. The data were collected with 3 instruments, which are survey, environmental attitude instrument and environmental knowledge instrument. As a result, students who attended "Man and Environment" course gained more environmental knowledge and positive attitude yet not significantly different in terms of environmental ideas. Besides, no development was observed for the students related to their attitude and knowledge average who involved actively in environmental organizations.

Another study is conducted among students of School of Health (Nursing, midwifery, and health servant), Health Service Vocational School (Medical Secretary, Documentation) and Faculty of Medicine by Özmen, Çetinkaya and Nehir (2005). The number of students participated in this study are 410. Two instruments were used; survey including 24 questions and Environmental Attitude Instrument including 21 items. Environmental Attitude instrument has 4 sub-dimensions as population increase, energy conservation, environmental problems and nuclear energy. Ratio of participation is slightly low (56.2%). High majority of students (91%) did not attend any environmental education course before university education. Approximately half of the students (48%) interested in the environmental issues; 84.9% of them did not take part in any environmental activity and 96.8% of students are not member of any environmental organization.

Environmental Attitude scores of the students of Medicine and School of Health were found to be higher than the third sample. The attitude score was also high for the students who live in cities. Greater part of participants (92%) stated that environmental education was necessary at elementary level.The results of the study implied that, such studies launch activities with environmental education and supports behavioral changes.

Another study was carried out Ozdemir et al, (2004) to determine environmental awareness and sensibility of first and last year medical school students. This sampling was considered as important as reflecting the people working in the health service. The sample consisted of 301 medicine students. The variables defined in the study were, gender, students' living conditions, parents' education, attendance to environmental course and etc. Results of the study showed that students perceive air pollution, waste disposal and deforestation as the most important environmental issues relatively. 17.9% of them were found as familiar about these issues yet they did not take any action about problems. In terms of gender, female participants also found to be more well-informed with respect to males. Besides younger students (blow age of 21) are more sensitive towards environment. Interestingly, no difference was found between grades (first and last year students).

Furthermore, students who live in dormitories are more knowledgeable compared to the ones living at home. To sum up, doctor candidates were not seem as neither having an environmental interest nor well educated about it, although they were expected to conscious graduates about global and local environmental problems and environment impact on health and protection.

Another remarkable study was conducted by Erten (2003) about conscious of 5$^{th}$ grade students related to waste reduction. The purpose of this study was stated as to determine the knowledge, attitude and behavior of the students toward environment and the relationship among these variables. Reason of selecting waste as the topic was stated as waste being a problem which occupies in every field and affects human directly. Sample of the study was comprised of 230 students from 7 classes of Eco-school (schools having curriculum of developing environmental conscious). Gender was divided approximately partially. A survey was used for the assessment of knowledge, attitude and caring behaviors towards environment. Before the survey performed, a lesson plan was prepared about waste and it consisted of theoretical information as well as applications. Lesson plans included art, open ended questions, practice, discussion, games, field trip etc. in it.

Results were divided into 3 parts as, evaluation of art study, evaluation of survey results conducted before lesson and after lesson and finally a general evaluation. Art study results showed that 90% of students drew pessimistic pictures about environment. The questions in the pre and post survey included the followings:

"Do you read news about environmental problems in the newspapers?"

"Do you prefer to be taught about environment in lessons?"

"Is it rational to collect garbage separately?"

Results indicated that, despite the fact that students know that garbage is big problem, they do not convert knowledge to action. Many students think that educational tools should environment-friendly nevertheless there was inconsistency between their attitude and behavior. After implementing environment course for 2 months, the students agreed the importance of learning about separating wastes, being environment-friendly and sharing the information with family and friends.

As a result, it was declared that, an environment course impacts students' conscious and interests toward environment.

Moreover, a study realized by Sungurtekin (2001) is about using music and a project based learning for environmental education. The study was realized in Bursa and comprised of 10 primary schools and 4 preschools. A field trip to a dumping area was realized during the study in order students to know the neighborhood and recognize environmental issues better. Afterwards, presentations and workshops were realized related to recycling by preschool students. Moreover, beautification of gardens and classroom environments activity competition was realized among schools. The applications also included a presentation titled "Environmental Education via Music" for teachers in range of program of "Creative Drama and Design with Disposed Materials". As a result, it was suggested that, composing music and field trips are valid methods to facilitate environmental conscious among primary school students.

Tuncer, Tekkaya and Sungur (2006) conducted a research among pre-service teachers, examining their beliefs about sustainable development. Participants of the study comprised of 334 students, 104 of them being enrolled in an environmental course. A 25 items Environmental Attitude Questionnaire was used to detect the students' beliefs about sustainable development. The results indicated that, pre-service teachers are conscious about concept of sustainability. Furthermore they accept environmental problems in front of economic growth and take action respectively.

Girls found to have higher scores than boys relating to sustainable development. Attending an environmental course was found to be effectiveness on awareness of sustainable development.

# CHAPTER 3

# METHOD

This chapter presents information about the sample, sampling technique, variables, instrument, data collection and methods for data analysis.

## 3.1. Sampling

All sixth grades students in Turkey were the target population in this study. However since the data collection from this population is extremely difficult, all sixth grades students in one private school in Ankara were identified as accessible population. The school is located in Ankara, the capital city of Turkey. It is a private school and most of the students have high socio-economic status. The population being sampled in this study is comprised of all $6^{th}$ grade students of a private school in Ankara, which constituted as 681 students.

This private school has the greatest elementary school campus in Turkey. Students have privilege to learn much environmental concepts. Moreover they play outdoor games in lunch and break times. Sampling is chosen from private school. Private schools include another trait which is high parental education level; is another determinant (Tuncer et.al, 2005). So as expected, majority of parents of students also are at high education level and economical status which offers students many benefits of having different hobbies and social activities.

## 3.2. Instrument

The questionnaire used in this study was called as the Environmental Literacy Test (ELT). The questionnaire was adopted from Kaplowitz and Levine (2005) and translated into Turkish by Tuncer, Tekkaya, Sungur, Çakıroğlu and Ertepınar (2008, in review).

The self-completed written instrument was originally developed in English and subsequently translated, adapted, and evaluated in Turkish.

The Turkish version of the questionnaire was peer-reviewed before implementation by three experts in the field of science education and one expert in environmental science. Some revisions were made to the questionnaire based on this peer-review. The revised Turkish version of the questionnaire was pilot tested. The internal consistency of the knowledge, attitudes, uses, and concerns dimensions were found to be 0.88, 0.64, 0.80, 0.88, using Cronbach alpha respectively.

The questionnaire was designed to assess students' environmental literacy in four parts , with each of these dimensions to be measured by a distinct set of questions- knowledge (11items), attitudes (7 items), uses (19 items), and concerns (8 items) about the environment. Each item is responded to on a 5-point Likert- type scales with different alternative answers according to each dimension. An English language version of the instrument is available at: http:// www.neefusa.org. Table 1 contains a description of each dimension and a sample item for each scale.

*Table 2: Description of Environmental Literacy Items in Questionnaire*

| ELQ Dimensions Name | Number of Items | Target of Item | Sample Item |
|---|---|---|---|
| Knowledge | 11 | Students' knowledge about current environmental issues | There are many different kinds of animals and plants, and they live in many different types of environments. What is the word used to describe this idea? |
| Attitude | 10 | Students' feelings and values about environment | We are approaching the limit of the number of people the earth can support. |
| Use | 19 | Students' responsibility toward environment | Special areas should be set aside for endangered species. |
| Concern | 9 | Students' sensitivity toward environmental problems | Smoke pollution |

Questionnaire starts with items related with students' self assessment about their environmental concern and knowledge. There are 3 items and each item provides an evaluation of themselves about environmental problems, environment as a problem and well-informed about environment.

As stated before, knowledge part has 11 multiple- choice items. Each item has "I don't know" choice. Knowledge items aims to assess students' environmental knowledge on some basic issues such as diversity, air pollution, electricity generation.

Attitude part includes 10 items. Students' answer on a 5-point Likert-type scale from "I strongly agree" to "I strongly disagree". Students' feelings and values about environmental issues are targeted in this part.

Use part includes 19 items. Students' answer on a 5-point Likert-type scale from "I strongly agree" to "I strongly disagree". Students' ideas about use of environmental services and their responsibilities are evaluated.

In concern part there are 9 environmental problems names are given for each items and students are expected to range them according to 5-point Likert-type scale with alternatives to "very concerned" to "not at all concerned".

### 3.3. Data Collection

In this study, all sixth grades students were included from a private school in Ankara. Instrument was applied with guidance of class teachers. The study was carried out at beginning of fall semester of the 2007-2008 academic years.

Students were advised to complete the questionnaires in its entirety, not to discuss their responses with others, to be as sincere as possible. Students are also reminded that their answers will be kept confidentially.

### 3.4. Analysis of Data

MS Excel and Statistical Package for Social Sciences (SPSS) were used for statistical analysis. The data obtained in this study were analyzed in two parts. In the first part, descriptive statistics and in the second part, inferential statistics were used.

#### 3.4.1. Descriptive Statistics

For self-assessment, knowledge, attitude, use and concern, demographic items; frequency and percentage values are calculated. Moreover for dimension of environmental literacy, knowledge, attitude, use and concern; mean and standard deviations are also calculated. Bar graphs for self assessment items and pie charts for knowledge items are preferred in order to display responses evidently.

#### 3.4.2. Inferential Statistics

Relationship among environmental literacy dimensions, that is knowledge, attitude, use and concern; means of zero order correlation is analyzed.

Multivariate Analysis of Variance (MANOVA) is used to analyze the effect of mothers' educational level on the environmental literacy of the students.

Relationship among environmental background of students, that is self-assessment about their interest in environmental problems (perception of interest), their views on the importance of environmental problems (perception of importance), their self evaluation of their environmental knowledge (perception of knowledge), their involvement in outdoor activities (activities), their perception of their parents' interest in environmental problems (parents' interest) and their perception of their parents' involvement in environmental activities (parents' involvement); and environmental literacy dimensions is analyzed by canonical correlation.

### 3.5. Variables

Dependent variables for Multivariate Analysis of Variance MANOVA, are dimensions of environmental literacy; environmental knowledge, environmental attitude, environmental concern and environmental use. In this analyze; independent variables determined as mother's educational background.

In Canonical correlation analysis, independent variables are environmental background of students, that is self-assessment about their interest in environmental problems (perception of interest), their views on the importance of environmental problems (perception of importance), their self evaluation of their environmental knowledge (perception of knowledge), their involvement in outdoor activities (activities), their perception of their parents' interest in environmental problems (parents' interest) and their perception of their parents' involvement in environmental activities (parents' involvement). Scale of instrument that was administered is dependent variable that is in this study, students' environmental literacy is the variable that can be affected by independent variable stated above. There are 4 dimensions that constitute as dependent variables in environmental literacy. These are students' knowledge, students' attitude, students' concern and students' view about environmental use.

# CHAPTER 4

# RESULTS

## 4.1. INTRODUCTION

This chapter of the thesis is comprised of 2 parts as results of descriptive and inferential statistics. In the first part, frequency distributions for each dimension of the ELT are evaluated and independent variables are presented, in the second part relationship between independent variables and environmental literacy has been set up.

### 4.1.1 Students' Self Assessment about Their Environmental Concern and Knowledge

In the beginning of the survey, students are asked 3 questions to make them evaluate themselves as far as their environmental knowledge is concerned. Related items and frequency distributions are presented below.

*Item 1:*

How concerned are you personally about environmental problems?

- A great deal
- A fair amount
- Somewhat
- Not very much
- Not at all

Results revealed that 58% of students, more than half of majority, are not very much concerned about environmental problems as presented in Figure 1 below.

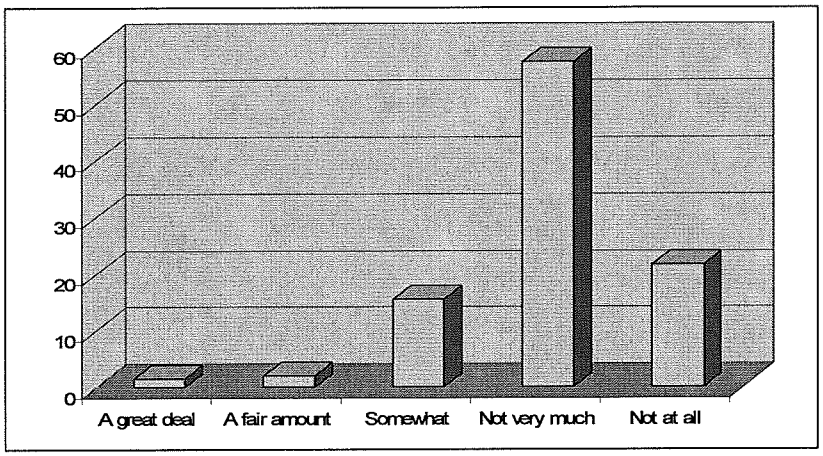


*Figure 1: Students' self evaluation about their environmental concern*

*Item 2:*

Item 2 was associated with students' perception of environment as a problem.

Which <u>one</u> of the following comes closest to your view?

- o The environment is one of the 2 or 3 most important problems that people currently face.
- o The environment is an important problem, but there are other more important problems.
- o The environment is not an important problem.
- o The environment is not a problem.

Majority of the students (74.3%) do not regard environment even as a problem. Only 1.8% of participants have a view that environment is one of the important problems. 1, 5 % of them, on the other hand, stated that there are other more important problems and 20.3% do not consider environment as a significant problem (Figure 2).

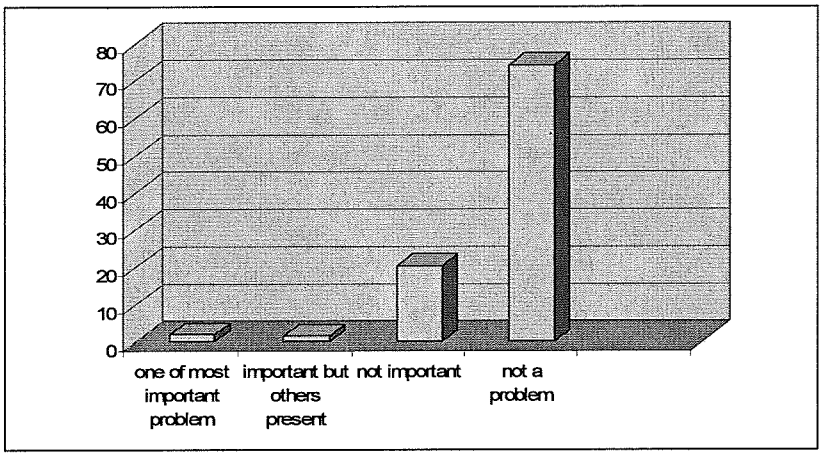


*Figure 2: Students' self evaluation about environment as problem.*

*Item 3:*

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

- A lot
- A fair amount
- Only a little
- Practically nothing
- Don't know

As shown in the Figure 3 below; 64.2% of students stated that they are not familiar with environmental issues and problems. Whereas, 1.5% of students stated that they know a lot and 0.7% of students stated that they know a fair amount about environmental issues and problems.

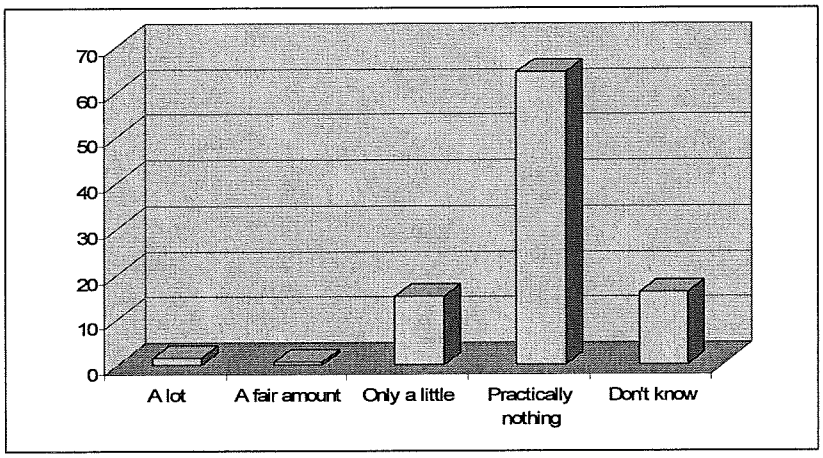


*Figure 3: Students' self evaluation of their environmental knowledge.*

## 4.2. STUDENTS' ENVIRONMENTAL BACKGROUND

What is referred by environmental background is, students' preference of outdoor activities, students' living area, students' parents' perceptions about environmental problems and parents' behavior towards environmental protection. Each item is specified and displayed in tables below.

### 4.2.1. Outdoor Activities

Students' preference of outdoor activities is presented in Table 3 by means of frequencies. The item (item no: 21) in the ELQ for outdoor activities is:
About how often, in a typical year, do you engage in each of the following activities?

- Camping
- Hiking
- Bird watching
- Fishing
- Hunting

*Table 3: Students' preference of outdoor activities*

| | Usually | | Sometimes | | Seldom | | Never | |
|---|---|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % | Number | % |
| Camping | 346 | 50.8 | 172 | 25.3 | 79 | 11.6 | 33 | 4.8 |
| Hiking | 27 | 4.0 | 200 | 29.4 | 218 | 32.0 | 205 | 30.1 |
| Bird watching | 258 | 37.9 | 206 | 30.2 | 106 | 15.6 | 50 | 7.3 |
| Fishing | 320 | 47.0 | 154 | 22.6 | 101 | 14.8 | 45 | 6.6 |
| Hunting | 561 | 82.4 | 33 | 4.8 | 12 | 1.8 | 12 | 1.8 |

As the results show majority of students prefer hunting (82.4%) where as hiking (4%) is the least preferred outdoor activity of all.

### 4.2.2. Students' Living area

Students' area of living is presented in the table below and the related item (item no: 22) in the ELQ is:

In what type of area did you spend most of your childhood?

- Rural, farm
- Small town
- Metropolitan area

*Table 4: Students' living area*

| | Number | % |
|---|---|---|
| Rural, farm | 15 | 2.2 |
| Small Town | 26 | 3.8 |
| Metropolitan Area | 605 | 88.8 |

As it is displayed in the table greater part (88.8%) of the participants lives in big city.

### 4.2.3. Parents' perceptions about environmental problems

Students were asked about their parents' perceptions about environmental problems. The results are presented in the Table 5 and the related item (item no: 23) in the ELQ is:

How concerned do you think your parents are about environmental problems?

- A great deal
- A fair amount
- Not very much
- Not at all
- Unsure

*Table 5: Students' idea about their parent's concern about environmental problems*

| | Number | % |
|---|---|---|
| A great deal | 11 | 1.6 |
| A fair amount | 49 | 7.2 |
| Not very much | 41 | 6 |
| Not at all | 303 | 44.5 |
| Unsure | 246 | 36.1 |

As the results displayed most (44.5%) of the students think that their parents are not concerned at all about environment and 36.1% of students are not sure about parents' perceptions about environmental problems.

### 4.2.4. Students' idea about their parents' behavior towards environmental protection

Students were asked about their parents' behavior towards environmental protection by means of the below in the ELQ (item no 24):

How active are you parents in promoting environmentally friendly behavior?

- Very active
- Somewhat active
- Not active at all
- Unsure

*Table 6: Students' idea about their parents' behavior towards environmental protection*

| | Number | % |
|---|---|---|
| Very active | 269 | 39.5 |
| Somewhat active | 279 | 41 |
| Not active at all | 25 | 3.7 |
| Unsure | 62 | 9.1 |

As shown in the above tables, as stated by the students' only 39.5% of parents are very active in environmental protection actions.

## 4.3. STUDENTS' ENVIRONMENTAL LITERACY

Environmental literacy is described blend of knowledge in science and ecology, concepts, facts, processes and values with environmental action (Hernandez, 2005). In the environmental literacy questionnaire of this study there are 4 dimensions of environmental literacy. These are knowledge, attitude, use and concern. Results of descriptive analyses for each item will be presented above.

### 4.3.1. Environmental Knowledge

Environmental knowledge is evaluated by the sum of correct answers in all 11 items. As presented in the Table 7, the aggregate number of correct responses for each student was 'graded' or categorized as evidencing acceptable or unacceptable levels of environmental knowledge in line with previous studies (Kaplowitz & Levine 2005; NEETF & Roper, 2005).

*Table 7: NEETF and Roper Starch Worldwide national survey grading scale*

| Letter Grade | Number of Questions Answered Correctly | Percentage Score | Passing or Unacceptable |
|---|---|---|---|
| A | 10 or more | 90%-100% | Pass |
| B | 9 | 80%- 89% | Pass |
| C | 8 | 70%- 79% | Pass |
| D | 7 | 60%- 69% | Unacceptable |
| F | 6 or fewer | 50% or less | Unacceptable |

*Source: Kaplowitz and Levine 2005 (147, table 1).*

According to results, more than half of the students (%64) in this study received a passing grade, evidenced acceptable levels of environmental knowledge, based on the NEETF and Roper Starch grading scale.

Majority of students (81. 9%) answered 11$^{th}$ item correctly, which is about hazardous household garbage and the least answered (18.8%) question was about source of electricity generation in Turkey.
The items and frequencies of the responses will be presented in the below sections of the study.

#### 4.3.1.1. Definition of Biodiversity

The first item of the environmental knowledge dimension was:
"There are many different kinds of animals and plants, and they live in many different types of environments. What is the word used to describe this idea?"
Approximately 67% of 656 students answered this item correctly. But 24 % of the students stated that they don't know the answer.

*Table 8: Students' answers for Definition of Biodiversity*

| Item # 4 – Environmental knowledge | number | % |
|---|---|---|
| Multiplicity | 32 | 4,9 |
| Biodiversity (correct answer) | 439 | 66,9 |
| Socio-economics | 9 | 1,4 |
| Evolution | 18 | 2,7 |
| Don't know | 158 | 24,1 |
| Total | 656 | 100 |

#### 4.3.1.2. Carbon monoxide as a source of motor vehicles

The purpose of the second environmental knowledge item is to test students' knowledge about the source of carbon monoxide. The related item in the ELQ was (item no: 5):

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

The results for this item revealed that 70.5% of the students know the basic source of CO as factories and businesses. Only 20% of them answered the item as motor vehicles.

*Table 9: Students' answers for CO as a source of motor vehicles*

| Item # 5 – Environmental knowledge | number | % |
|---|---|---|
| Factories and businesses | 480 | 72,3 |
| People breathing | 7 | 1,1 |
| Motor vehicles (correct answer) | 134 | 20,2 |
| Trees | 10 | 1,5 |
| Don't know | 33 | 5,0 |
| Total | 664 | 100 |

#### 4.3.1.3. Electricity generation in Turkey

The third environmental knowledge item in the ELQ was about electricity generation in Turkey and the related item was (item no: 6):

How the most electricity in Turkey is generated?

As the frequencies displayed (Table 10), 45.3% of the students answered the item correctly as, electricity is generated by hydro electric power plants, however 18.8% of the students answered the item as by burning oil, coal and wood, 11.9 % stated that electricity is generated with nuclear power in Turkey and 18.9 of the students declared that they do not know how electricity is generated in Turkey.

*Table 10: Students' answers for electricity generation in Turkey*

| Item # 6 Environmental knowledge | number | % |
|---|---|---|
| By burning oil, coal and wood | 123 | 18,8 |
| With nuclear power | 78 | 11,9 |
| Through solar energy | 34 | 5,2 |
| By hydro electric power plants (Correct answer) | 297 | 45,3 |
| Don't know | 124 | 18,9 |
| Total | 656 | 100 |

#### 4.3.1.4. Most common cause of pollution in the surface waters in Turkey

The fourth environmental knowledge item was about the reason of pollution in the surface waters. The related item (item no: 7) in the ELQ was:

"What is the most common cause of pollution of streams, rivers in Turkey?"

As the frequencies displayed (Table 11), 56.9% of the students know the major reason for surface water pollution in Turkey as waste dumped by cities. The percentage of the students answered the item correctly as, "untreated wastewaters from domestic, industrial and agricultural sources "were 33.3.

*Table 11: Students' answers for major cause of pollution surface waters in Turkey*

| Item # 7 Environmental knowledge | number | % |
|---|---|---|
| Untreated wastewaters from domestic, industrial and agricultural sources (correct answer) | 218 | 33,3 |
| Surface water running off yards, city streets | 5 | 0,8 |
| Trash washed into ocean from beaches | 45 | 6,9 |
| Waste dumped by cities | 372 | 56,9 |
| Don't know | 14 | 2,1 |
| Total | 654 | 100 |

#### 4.3.1.5. Renewable resources

The purpose of the 5th item in the environmental knowledge dimension of the ELQ was to test students' knowledge about renewable resources. The related item was (item no: 8):

Which of the following is a renewable resource?

The answers given by the students are presented as frequencies in the Table 12.

As displayed in the table, more than half of students (57.3%) know that trees are renewable resource. Nonetheless, 25.7% of them answered the item as do not know.

*Table 12: Students' answers for renewable resources*

| Item # 8 Environmental knowledge | number | % |
|---|---|---|
| Oil | 19 | 2,9 |
| Iron ore | 61 | 9,4 |
| Trees (Correct answer) | 372 | 57,3 |
| Coal | 30 | 4,6 |
| Don't know | 167 | 25,7 |
| Total | 649 | 100 |

#### 4.3.1.6. Ozone as a protective layer

The 9th item of the environmental knowledge dimension was about the role of ozone layer. More than half of the students (60.7%) know that ozone layer protects us from harmful, cancer causing sunlight (Table 13). The related item was (item no: 9): Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from?

*Table 13: Students' answers for ozone as a protective layer*

| Item # 9 Environmental knowledge | number | % |
|---|---|---|
| Acid rain | 82 | 12,5 |
| Global warming | 77 | 11,7 |
| Sudden changes in temperature | 31 | 4,7 |
| Harmful, cancer causing sunlight ( Correct answer) | 398 | 60,7 |
| Don't know | 68 | 10,4 |
| Total | 656 | 100 |

#### 4.3.1.7. Garbage in Turkey

The item related to garbage in Turkey was responded correctly by some 26.7% of students as it ends up in the landfills. Whereas, 23.2% and 23.7% of students answered as oceans and recycling respectively (Table 14). The related item (item no: 10) was:

Where does most of the garbage in the Turkey end up?

*Table 14: Students' answers for garbage end up in Turkey*

| Item # 10 Environmental knowledge | number | % |
|---|---|---|
| Seas | 153 | 23,2 |
| Incinerators | 77 | 11,7 |
| Recycling centers | 156 | 23,7 |
| Landfills (correct answer) | 176 | 26,7 |
| Don't know | 97 | 14,7 |
| Total | 659 | 100 |

### 4.3.1.8. Primary governmental authority for environmental protection in Turkey

Students are asked about the responsible governmental authority for environmental protection in Turkey. Fifty five percent of the students answered the question as Ministry of Environment and Forestry. However 29.3% of them know it as TEMA (Turkish Foundation for combating Soil Erosion, for Reforestation and Protection of Natural Habitats).

TEMA is most known civil society organization so students may assume that as a governmental authority (Table 15).

The related item (item no: 11) was:

What is the name of the primary federal agency that works to protect the environment in Turkey?

*Table 15: Students' answers for primary federal agency that works to protect the environment in Turkey*

| Item # 11 Environmental knowledge | number | % |
|---|---|---|
| Ministry Environment and Forestration (Correct Answer) TEMA | 394 | 55,0 |
| Nature Protection Agency | 194 | 29,3 |
| Turkish Environmental Education Agency | 51 | 7,7 |
| Don't know | 12 | 1,8 |
| Total | 41 | 6,2 |
| | 662 | 100 |

#### 4.3.1.8. Hazardous Household Waste

In the 12th item, students are asked about the most hazardous household wastes. Almost 82% of the students, which have the greatest majority of all questions; gave the correct answer that is batteries are the most hazardous waste.

The related item was (item no: 12):

Which of the following household wastes is considered a hazardous waste?

*Table 16: Students' answers for hazardous waste in household wastes*

| Item # 12 Environmental knowledge | number | % |
|---|---|---|
| Plastic Packaging | 64 | 9,6 |
| Glass | 11 | 1,6 |
| Batteries ( correct answer) | 548 | 81,9 |
| Spoiled food | 13 | 1,9 |
| Don't know | 33 | 4,9 |
| Total | 669 | 100 |

#### 4.3.1.9. Reason of extinction of animal species

Another item of the environmental knowledge part is about reason of extinction of animal species. Almost 15 % of the students responded the question as too much hunting and climate change, yet both of them are incorrect.

Whereas, 60.4% of the students considered human affect as a reason for extinction of the animal species (Table 17).

The related item (item no: 13) was:

What is the most common reason that an animal species becomes extinct?

*Table 17: Students' answers for extinction of animal species*

| Item # 13 Environmental knowledge | number | % |
|---|---|---|
| Pesticides are killing them | 19 | 2,8 |
| Their habitats are being destroyed | 404 | 60,4 |
| by humans (Correct answer) | 99 | 14,8 |
| There is too much hunting | 99 | 14,8 |
| There are climate changes that | 48 | 7,2 |
| affect them | 669 | 100 |
| Don't know | | |
| Total | | |

#### 4.3.1.10. Nuclear waste

The last item is about storage of nuclear waste. Students' answers show honesty here. Considerable majority of students (52.3%) do not know about disposing of nuclear waste.

The Item (item no: 14) is:

Scientists have not determined the best solution for disposing of nuclear waste. In the Turkey what do we do with it now?

*Table 18: Students' answers for accumulation of nuclear waste*

| Item # 14 Environmental knowledge | number | % |
|---|---|---|
| Use it as nuclear fuel | 132 | 20,0 |
| Sell it to other countries | 13 | 2,0 |
| Dump it in landfills | 40 | 6,1 |
| Store and monitor the waste (Correct answer) | 130 | 19,7 |
| Don't know | 346 | 52,3 |
| Total | 661 | 100 |

As a result, students' environmental knowledge is summarized in the Table 19 below.

*Table 19: Correct answers Environmental Knowledge*

| Item number | Item topic | % correct response |
|---|---|---|
| 4 | Definition of biodiversity | 66,9 |
| 5 | Motor vehicles as the largest contributor of carbon monoxide | 20,2 |
| 6 | Electricity generation in Turkey by hydroelectric power plants | 45.3 |
| 7 | Untreated wastewaters from domestic, industrial and agricultural sources | 33,3 |
| 8 | Trees are renewable resources | 57,3 |
| 9 | Role of ozone as a protective layer from cancer- causing sunlight | 60,7 |
| 10 | Most garbage in Turkey ends up in solid waste storage areas | 26,7 |
| 11 | Primary governmental agency for environmental protection in Turkey is the Ministry of Environment and Forestry | 55,0 |
| 12 | Batteries are household hazardous waste | 81,9 |
| 13 | Human activities of habitat is the major reason for animal extinction | 60,4 |
| 14 | The common method for storing nuclear waste throughout the world is storing and monitoring | 19,7 |

To sum up, students are slightly over the acceptable range of environmental knowledge as defined by NEETF (2005). 81.9% of students answer correctly question about hazardous waste (item no: 12). Students also are knowledgeable about definition of biodiversity, ozone layer and reason of animal extinction as well (66. 9, 60. 7 and 60. 4 respectively). In general, majority of students (50.8%) do not know answer of question related with nuclear waste (item no: 14). Table 20 also illustrates that 64.2% of students had adequate score which equals to more than 8 correct items.

*Table 20: Respondents' aggregate scores for set of environmental knowledge items*

| Number of questions answered correctly | Score percentage range | Percent of respondents per score | Aggregate percentage of respondents | Adequacy of score |
|---|---|---|---|---|
| 10 or more | 90%-100% | 31.5% | 31.5 | Adequate |
| 9 | 80%-89% | 17.8% | 49.3% | Adequate |
| 8 | 70%-79% | 14.9% | 64.2% | Adequate |
| 7 | 60%-69% | 12.7% | 76.9% | Inadequate |
| 6 or fewer | 59% or less | 23.1% | 100% | Inadequate |

### 4.3.2. ENVIRONMENTAL ATTITUDE

As described in the former sections, the second dimension of environmental literacy is environmental attitude.

According to the results of this section (Table 21), and when "strongly agree" and "agree" choices are evaluated together, the item upon which most of the students (91. 4%) were agreed is the one about plants' and animals' right to exist. The other item that most of the students (84.8%) were agreed upon was about facing a major ecological catastrophe if things continue on their present course. The items that students responded with least agreement, on the other hand, were the ones related to choose between environment and industry. For example, only 31.3% of the students were agreed on the item stating that, "The balance of nature is strong enough to cope with the impacts of modern industrial nations." having highest unsure score over students. Additionally, the idea of exaggerating "ecological crisis" item is one of high scores of unsure.

Similarly, according to 37% of the students think that "Humans will eventually learn enough about how nature works to be able to control it".

*Table 21: Percentage of respondent agreement with environmental attitude statements*

| | Strongly agree | Agree | Unsure | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| We are approaching the limit of the number of people the earth can support. | 30 | 33,2 | 24,4 | 5,3 | 4,3 |
| When humans interfere with nature it often produces disastrous consequences. | 36,9 | 30,4 | 15,9 | 10,3 | 4,1 |
| The earth has plenty of natural resources if we just learn how to develop them. | 40,1 | 27 | 13,5 | 9,7 | 6,6 |
| Plants and animals have as much right as humans to exist. | 80,8 | 10,6 | 4,4 | 1,2 | 0,9 |
| The balance of nature is strong enough to cope with the impacts of modern industrial nations. | 13,7 | 17,6 | 36,3 | 17 | 10,6 |
| Despite our special abilities humans are still subjects to the laws of nature. | 23,8 | 33,3 | 24,1 | 7,5 | 7,6 |
| The so-called 'ecological crisis' facing humankind has been greatly exaggerated. | 22,5 | 19,2 | 31,7 | 13,8 | 9,3 |
| Humans were meant to rule over the rest of nature. | 22,9 | 28 | 23,8 | 11,7 | 8,7 |
| Humans will eventually learn enough about how nature works to be able to control it. | 13,1 | 23,9 | 27,6 | 17,9 | 14,4 |
| If things continue on their present course, we will soon experience a major ecological catastrophe. | 62,6 | 22,2 | 6,8 | 1,6 | 3,8 |
| AVARAGE PERCENTAGES OF ITEMS | 34,64 | 24,54 | 20,85 | 9,6 | 7,03 |

**This item is reversed.*

### 4.3.3. ENVIRONMENTAL USE

Environmental use is the third dimension of environmental literacy and targets to measure their views on environmental uses and service.

Table 22 presents respondents' agreement with the environmental uses and services. There are 19 statements comprised in this dimensions. These items were adapted from the ones used by NEEFT and Roper (2005) for the study titled "Environmental Literacy in America". When the "strongly agree" and "agree" choices were evaluated together, the highest agreement were obtained for the items like, "Special areas should be set aside for endangered species" (89.3%); "It is important that everyone be aware of environmental problems" (85.9%) and "All plants and animals play an important role in the environment" (83.5%). Whereas the lowest agreement has been detected for the ones like, "Individuals should be allowed to use private land as they see fit" (17.9%); "Poisonous snakes and insects that pose a threat to people should be killed" (19.9) and "Air pollution laws are already strict enough" (20%).
Students also are not sure about whether cultural changes will be very important in solving environmental problems (34.8%) and wild animals that provide meat for people are the most important species to protect (25. 8%). Another high scored unsure item is "changes in people's values will help solve environmental problems" (25.7 %).

*Table 22: Percentage of respondent agreement with environmental use statements*

| Items | Strongly agree | Agree | Unsure | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| Special areas should be set aside for endangered species. | 70,9 | 18,4 | 4,6 | 2,1 | 1 |
| Laws regarding water quality should be stricter. | 52,3 | 29,2 | 13,2 | 1,5 | 1 |
| Wild animals that provide meat for people are the most important species to protect. | 25,1 | 29,1 | 25,8 | 10,3 | 5,9 |
| Poisonous snakes and insects that pose a threat to people should be killed. | 11,7 | 8,2 | 14,2 | 23,5 | 38,3 |
| Landowners should be allowed to drain wetlands for agricultural or industrial uses. | 18,5 | 21,6 | 24,7 | 12,5 | 17,6 |
| It is important that everyone be aware of environmental problems. | 72,1 | 13,8 | 6,0 | 2,2 | 1,9 |
| Individuals should be allowed to use private land as they see fit. | 10,9 | 7,0 | 15,0 | 25,0 | 37,7 |
| I feel personally responsible for helping to solve environmental problems. | 50,1 | 27,8 | 11,2 | 3,5 | 1,9 |
| Government should regulate the use of private land to protect wildlife habitat. | 48,6 | 27,0 | 14,8 | 1,6 | 1,9 |
| People should be held responsible for any damages they cause to the environment. | 45,5 | 28,8 | 13,8 | 3,1 | 3,5 |
| All plants and animals play an important role in the environment. | 67,3 | 16,2 | 8,2 | 1,2 | 1,2 |
| Technological changes often do as much harm to the environment as they do good for the environment. | 54,0 | 25,6 | 9,7 | 2,6 | 2,6 |
| Government should pass laws to make recycling mandatory. | 46,4 | 25,4 | 16,7 | 2,8 | 2,2 |
| Air pollution laws are already strict enough. | 10,3 | 9,7 | 24,5 | 28,0 | 21,6 |
| Science and technology will be very important in solving our environmental problems. | 29,5 | 29,7 | 24,4 | 6,6 | 4,1 |
| Cultural changes will be very important in solving environmental problems. | 20,1 | 20,4 | 34,8 | 10,7 | 6,8 |
| Changes in people's values will help solve environmental problems. | 30,5 | 30,1 | 25,7 | 3,5 | 2,9 |
| Collective action (i.e. movements) is central to solving environmental problems. | 32,7 | 31,1 | 21,4 | 4,0 | 3,7 |
| Lifestyle changes (i.e., consumption) will help solve environmental problems. | 36,1 | 26,7 | 22,2 | 4,3 | 3,2 |
| Average percentage of items | 38,55 | 22,41 | 60,96 | 17,41 | 7,84 |

### 4.3.4. ENVIRONMENTAL CONCERN

As was presented in the Table 23, the students of this study are mostly concerned about global warming (74.6%), and water pollution (63.1). The third issue students are concerned with is ozone depletion (55.4 %). The issue that students are not concerned at all is noise pollution (26.9 %). Industrial pollution and hazardous waste are items about which students are not sure much (7. 9% and 7. 6% in that order).

*Table 23: Students' environmental concern*

| Items | Very concerned | Somewhat concerned | A little concerned | Not at all concerned | Unsure |
|---|---|---|---|---|---|
| Smoke pollution. | 44,9 | 36 | 7,6 | 2,3 | 2,2 |
| Noise pollution. | 26,9 | 37,6 | 16 | 9 | 3,8 |
| Automobile emissions. | 63,1 | 21,3 | 5,3 | 2,1 | 1,3 |
| Industrial pollution. | 35,1 | 27 | 13,7 | 8,8 | 7,9 |
| Hazardous wastes. | 29,7 | 28,8 | 17 | 8,8 | 7,6 |
| Poor drinking-water quality. | 50,8 | 20,3 | 10,9 | 6,3 | 3,8 |
| Indoor air pollution. | 39,9 | 28,6 | 12,2 | 7,3 | 4 |
| Ozone Depletion. | 55,4 | 21,4 | 7,5 | 5,1 | 2,8 |
| Global warming. | 74,6 | 11,5 | 2,3 | 2,1 | 2,2 |
| Average percentage of items | 46,71 | 25,83 | 3,95 | 10,27 | 5,75 |

## 4.4. INFERENTIAL STATISTICS

### 4.4.1. ASSUMPTIONS FOR ZERO ORDER CORRELATION

#### 1. Normality and Outliers

In zero order correlation scores on each variable should be normally distributed. In order to check normality Q-Q plots, to check outliers' histograms and box plot were examined. Result showed us that none of those assumptions were violated.

#### 2. Linearity and Homoscedasticity

Linearity assumption refers to the presence of a straight-line relationship between each pair of variables. Homoscedasticity assumption refers scores for variable X should be similar at all variable Y. To assess both linearity and homoscedasticity scatter plots were examined. Scatter plots showed us that none of these assumptions were violated.

Relationships among the dimensions of the ELQ (knowledge, attitudes, uses, and concerns) have been analyzed by means of zero order correlations.
The assumptions tested before the analysis, were comprised of normality, linearity and homoscedasticity. None of the assumptions were violated. In order to confirm the assumptions, scatter plots and histograms are also checked. Table 28 below shows correlations among knowledge, attitudes, uses, and concerns

### 4.4.2. RELATIONSHIPS AMONG KNOWLEDGE, ATTITUDES, USES AND CONCERN

*Table 24: Relationships between ELQ dimensions*

| | Knowledge | Attitude | Use | Concern |
|---|---|---|---|---|
| **Knowledge** | 1.000 | -,012 | ,111** | ,065 |
| **Attitude** | -,012 | 1,000 | ,477** | ,264** |
| **Use** | ,111** | ,477** | 1,000 | ,347** |
| **Concern** | ,065 | ,264** | ,347** | 1,000 |

** *Correlation is significant at the 0.01 level*

As presented in the Table 24 there is positive, significant but small correlation between knowledge and use ($r =. 11$, $p <.01$).

The coefficient of determination ($r^2= .012$) shows that knowledge of the students helps to explain 1 % of their variance in their views about environmental uses and service. However knowledge variable has no significant correlation with attitude and concern.

Positive, middle strong (medium) and significant correlation was found between attitude and use ($r = .48$, $p < .01$). The coefficient of determination ($r^2= .230$) shows that attitudes of the students help to explain 23 % of the variance in their views on environmental uses and service. This is the strongest correlation found among the dimensions of the ELQ; meaning that the students with positive attitude towards environmental issues have positive views on environmental uses and service. In other words the more students have positive attitudes towards environmental issues the more they have positive views on environmental use and service.

In addition, positive, small and significant correlation was found between attitude and concern ($r = .26$ $p < .01$). The coefficient of determination ($r^2 = .067$) shows that attitudes of the students help to explain 7 % of the variance of their concern about environmental problems. Attitude has no significant correlation with knowledge.

Moreover, positive, medium and significant correlation was found between use and concern ($r = .35$ $\mathbf{p} < .01$). The coefficient of determination ($r^2 = .120$) shows that students' concern about environmental problems helps to explain 12 % of the variance of their views on environmental use and service. This means that students concerning about environmental problems have more positive views on environmental use and service.

Therefore, as a result of the correlation analysis, relationships found among the four dimensions of environmental literacy included in the questionnaire can be considered as small except for the relationship between the variables attitude-use and use-concern.

### 4.4.3. ASSUMPTIONS FOR MANOVA

#### 1. Sample Size

In MANOVA sample size is important to get away with violations of some of the other assumptions such as normality and linearity. In order to calculate MANOVA there must be more cases in each cell than we have dependent variables. In this study number of case is four and in each cell there are many more than required number of cases. So this assumption was not ignored.

## 2. Normality and Outliers

MANOVA requires both univariate and multivariate normality. There are different ways to assess univariate normality such as obtaining skewness and kurtosis values, calculating Kolmogrov Simirnov or checking graphs etc. In this study Q-Q plots were examined to assess normality. Each variable was examined individually and Q-Q plots showed us that all the variables disturbed normally. So univariate normality was tested. Since each variable assessed individually in terms of univariate normality we can assume that multivariate normality can be achieved. Moreover in order to define both multivariate outliers and assess multivariate normality Mahalanobis distances was calculated. So maximum Mahalanobis distances value was compared with critical value and variables whose Mahalanobis value is higher than the critic value were defined as extreme outlier and omitted.

## 3. Linearity

Linearity assumption refers to the presence of a straight-line relationship between each pair of variables. In this study linearity was tested with scatter plots separately in terms of males and females for dependent variables. Scatter plots showed us that this assumption was not violated.

## 4. Multicollinearity and singularity

MANOVA requires moderately correlation among dependent variables. This is called multicollinearity assumption.
Correlations were checked in order to assess multicollinearity no correlation higher than .80 was found. So this assumption was not violated.

**5. Homogeneity of variance-covariance matrices.**

Test of this assumption is generated in MANOVA output. Box M test of Equality of Covariance matrices test was used to assess this assumption. Result of this test showed us that Homogeneity of variance-covariance matrices assumption was not violated [$F_{(20\text{-}271848)} = 0{,}829$ $p > 0, 05$].

## 4.4.4. EFFECT OF MOTHERS' EDUCATION LEVEL ON ENVIRONMENTAL LITERACY

The effect of mothers' educational level on the environmental literacy of the students has been analyzed by means of Multivariate Analysis of Variance (MANOVA). Before the analysis assumptions about normality, linearity, multicollinearity, singularity and homogeneity of variance-covariance matrices were tested. No assumption was violated however; in order to provide multivariate normality some extreme outliers were omitted.

MANOVA results shows that there is no significant difference between the mean scores of students on dependent variables according to education level of their mothers [Wilks Lambda [ Wilks Lambda($\Lambda$)= ,981 $F(8, 1228) = 1{,}454$, $p >$ ,01].

This means that mean scores of students, whose mothers had master degree, bachelor degree or below degrees (up to 12 years of education), do not differentiate significantly in terms of knowledge, attitude, use and concern subscales of the questionnaire.

In other words students' environmental knowledge, attitudes towards environmental issues, concern about environmental issues and views on environmental uses and service do not differentiate significantly according to education level of their mothers.

### 4.4.5. ASSUMPTIONS FOR CANONICAL CORRELATION

#### 1. Sample Size

In canonical correlation sample size is important to get away with violations of some of the other assumptions such as normality and linearity. Canonical correlation requires approximately 15-20 cases per variables. In this study there are ten variables and (20*10) =200 participants are need to get reliable results from canonical correlation. Fortunately in this study there many more cases than required number. So this assumption was not violated.

#### 2. Normality and Outliers

Canonical correlation requires multivariate normality. Since there is not a direct test for multivariate normality, we generally test each variable individually and assume that they are multivariate normal if they are individually normal. So each variable was tested individually-Q plots showed us that each variable both in set one and set two disturbed normally. Furthermore in order to define both multivariate outliers and assess multivariate normality Mahalanobis distances was calculated.

So maximum Mahalanobis distances value was compared with critical value and variables whose Mahalanobis value is higher than the critical value were defined as extreme outlier and omitted. To assess univariate outliers' histograms and box plot was examined and extreme outliers were omitted.

### 3. Linearity and Homoscedasticity

Linearity assumption refers to the presence of a straight-line relationship between each pair of variables. Homoscedasticity assumption refers scores for variable X should be similar at all
Variable Y. To assess both linearity and homoscedasticity scatter plots were examined. Scatter plots showed us that none of these assumptions was violated.

### 4. Multicollinearity and singularity

Canonical correlation requires moderately correlation among dependent variables. This is called multicollinearity assumption. Correlations were checked for each set (set one and set two) in order to assess multicollinearity and no correlation higher than .80 was found. So those assumptions were not violated.

## 4.4.6. RELATIONSHIP BETWEEN STUDENTS' ENVIRONMENTAL BACKGROUND AND ENVIRONMENTAL LITERACY

Canonical correlation analysis was used to examine the relationship, if any, between the background characteristics of students and the set of environmental literacy variables in the questionnaire.

Student characteristics that were examined included their self-assessment of their interest in environmental problems (perception of interest), their views on the importance of environmental problems (perception of importance), their self evaluation of their environmental knowledge (perception of knowledge), their involvement in outdoor activities (activities), their perception of their parents' interest in environmental problems (parents' interest) and their perception of their parents' involvement in environmental activities (parents' involvement).

The results of the canonical correlation analysis showed that the first canonical correlation was ,41 (with 17 % overlapping variance;) indicating significant relationships between the two sets of variables [Wilks Lambda(L) = 0,802 $x^2_{(24)}$ =142,160 p< ,01]. Since second, third and forth canonical correlations are not significant; they were ignored and not interpreted. [Wilks Lambda(L) = 0,962 $x^2_{(15)}$ =25,271 p> ,01], [Wilks Lambda(L) = 0,986 $x^2_{(8)}$ =8,990 p> ,01], [Wilks Lambda(L) = 0,999 $x^2_{(3)}$ =,457 p> ,01].

Using a cut-off correlation of 0.30 (Tabachnick & Fidell, 1996), students' perception of interest, perception of importance, perception of knowledge outdoor activities and Parents' involvement in environmental activities were highly correlated with the first canonical variate. The first canonical variate is positively associated with environmental interest, environmental importance, self assessment of environmental knowledge and outdoor activities. On the other hand it is negatively related to parents' interest in environmental issues and parents' involvement in environmental activities. The first canonical variate is negatively related to all variables of environmental literacy dimensions.

The first pair of canonical variates indicates that parents' involvement in environmental activities is positively related to environmental attitude, environmental use and environmental concern.

This means that as parents' involvement in environmental activities increases, their children's environmental use, concern and attitude increase. In other words students whose parents are involving environmental activities have positive attitude towards environmental issues and positive views on environmental use.
On the other hand students whose parents are involving environmental activities are concerning environmental problems. As the first canonical correlation is significant the other canonical correlations were ignored and not interpreted.

The reported percent of variance values that the first canonical variate pair accounts for 28 % of the variance of students' characteristic variables and 35 % of the variance from the environmental literacy dimensions of the questionnaire.
The redundancy values reveal that proportion of variance of "student background characteristics" explained by canonical variate of "environmental literacy dimensions" is .05.

This means that canonical variate of "environmental literacy dimensions" explains 5 % of the variance in "student background characteristics". On the other hand proportion of variance of "environmental literacy dimensions" explained by canonical variate of "student background characteristics" is .06. This means that canonical variate of "student background characteristics" explains 6 % of the variance in "environmental literacy dimensions".

### 4.4.7. SUMMARY OF RESULTS:

To sum up, over half of students (58%), do not much concerned about environmental problems. 74.3% of students do not see environment as problem and 64.2% of students feel practically nothing about environmental issues and problems. 82.4% students prefer hunting whereas hiking is least preferred (4%) outdoor activity. 8.8% of students live in big city. 44.5% of students' parents are not concerned at all about environment and only 39.1% of students' parents are very active in environmental protection action.

In inferential part of analyses, first of all 4 dimensions of environmental literacy, knowledge, attitude, use and concern are examined by each item. Results showed that majority of students (64%) received a passing grade with mean of 8.2 questions out of 11 questions. Questions related with batteries as hazardous waste and definition of biodiversity are answered correctly with highest proportion among other questions. On the other hand, majority of students could not answer questions related with nuclear waste and largest contributor of carbon monoxide. Results also showed that majority of students (91.4%) think that plants and animals have as much right as humans to exist and 84.8% of them also think that if continue on their present course, we will soon experience a major ecological catastrophe.

In environmental use part, the mean is higher than average, which stands for students are aware of importance ($\mu$=70.7) of interaction between human and environment. 89.3% of students agree with item special areas should be set aside for endangered species and 85.9% of them think important that everyone be aware of environmental problems.

In the third part which is environmental concern, overall mean is higher than average of lowest and highest score which means students have concerns about environmental problems.

They are mostly concern about global warming, water pollution and ozone depletion while they are not much concerned about noise pollution. Students are also not sure about industrial pollution and hazardous waste much.

Relationship among ELQ dimensions (knowledge, attitude, use and concern) is analyzed by means of zero order correlations. Results indicated that between knowledge - use and attitude – concern are correlated positively, significantly but small. Moreover attitude-use and use –concern are correlated strong and medium in that order. Multivariate Analysis of Variance (MANOVA) is conducted in order to effect of mothers' educational level on EL. However dimensions of EL do not differentiate significantly by education level of mothers.

Relationship among students' environmental background and environmental literacy is analyzed by canonical correlation. Environmental background variables consist of self perception of interest, importance, knowledge, involvement in outdoor activities and parents' interest and parents' involvement in environmental activities. As stated before knowledge, attitude, use and concern compose EL set of variables. Parents' involvement in environmental activities positively related to environmental attitude, use and concern which stand for increase in parents' environmental involvement, increase in attitude, use and concern.

# CHAPTER 5

# DISCUSSION

The main goal of this study was to investigate environmental literacy of students and its dimensions as well. Mothers' effect on environmental literacy of students, additionally; relationship among students' environmental background and environmental literacy is also studied. This chapter consists of seven sections. The first section is summary of study, second one is about conclusion and following is discussion of study. Internal and external validity of study is given in the forth and fifth sections. Finally, implications of the study and recommendations for further studies are presented.

## 5.1. DISCUSSION

The data obtained by Environmental Literacy Questionnaire (ELQ) showed that over half of students (58%), do not much concerned about environmental problems. 74.3% of students do not see environment as problem and 64.2% of students feel practically nothing about environmental issues and problems. This may be due to inefficiency of curriculum context since students are not informed about environmental facts. Students may not perceive it as a problem so as a conclusion, not even feel anything. In addition, 44.5% of students' parents are not concerned at all about environment and only 39.1% of students' parents are very active in environmental protection action according to students. This is not surprising result due to inadequacy of media resources, previous educational background would not have been competent for parents.

Environmental literacy seems to start with an assumption that individuals begin with a competent level of knowledge. However, the results of this study reveal that a majority of the students possess the knowledge necessary to be considered environmentally literate according to NEETF/ Roper Report Card (2005).

As far as environmental knowledge dimension is concerned, students are slightly over the acceptable range. 81.9% of students answer correctly question about hazardous waste (item no: 12). Students also are knowledgeable about definition of biodiversity, ozone layer and reason of animal extinction as well (66. 9, 60. 7 and 60. 4 respectively). These are expected results since a campaign was started by the term about informing students how batteries are hazardous at overall school. This probably is a reason of this high score about battery question. In 4$^{th}$ grade Science and Technology curriculum, there are also objectives on the subject of battery use and how battery wastes danger human and environmental health. Moreover biodiversity is included in 5$^{th}$ grade Science and Technology curriculum and according to teachers' feedback; students are really interested in these topics. Item related to, ozone layer protective feature from sunlight also took place in new many times and they may be well-informed. They also probably related ozone layer with global warming, which is also popular and students are familiar with that concept. Dove (as cited in Pekel et.al, 2007) states students, age of 11-13, perceive ozone layer as a major cause of global warming. It is consistent with the result that reveals that majority of students also concern about global warming. On the other hand, 50.8% of students do not know answer of item related with nuclear waste. Concept of "nuclear" is possibly an alien term for their age group. In Turkey, nuclear related subjects are not come to agenda and students do not see or hear much about it from media or other information source much. According to Piaget, between ages 7-11 are Concrete Operational Stage in children cognitive developmental stages. In this item, majority of students most likely consider term "nuclear" as discrete. They do not know "nuclear" or "nuclear waste" either. Another low-scored item is about carbon monoxide source of air pollution. Students are clued-up about air pollution through 4$^{th}$ and 5$^{th}$ grade Science and Technology curriculum objectives.

For example there some objectives inside unit "Out planet Earth", stated "search and present precautions for air, soil and water pollution" yet they possibly do not know carbon monoxide gas as a source of air pollution.

Air and gas subjects may be abstract for them. Science education and science related variables have also affect on environmental literacy (Chu & Lee, 2006).

In addition to their levels of environmental knowledge, respondents expressed positive attitudes toward environment as well as high level of concern about environmental problems. Also according to Prokop and Tunnicliffe (2008), environmental knowledge consequences indicate more positive pro-environmental attitude; so it also results in pro-environmental behavior (Iozzi, 1989). Students in general have positive attitude towards environment. The item, which majority of students strongly agrees that, plant and animals have as much as humans to exist. This result is predictable among all items in attitude part since child at age of 11 roughly equals to sampling age group, present privilege for adventure and excited stories (Yavuzer, 1993). Many of their adventure and stories include animals and plants so students are likely to be aware of importance of animal and plant existence. Moreover at elementary level, students are found to have positive attitude toward environment similarly in study of Chu and Lee (2006).

Moreover, it is obtained one of the studies that the size and location of one's hometown might shape attitudes toward environment. The most attitudes were found among students coming from the metropolitan area where population levels are the densest. People, living in those crowded, urbanized areas, are more aware of environmental problems and develop positive attitude toward environment (Tikka et.al 2000). Majority of the participants of (88.8%) lives in metropolitan area which also address positive environmental attitude for this study.

Another item "if things continue on their present course, we will soon experience a major ecological catastrophe" has very high score. This shows they are aware and sensitive to environmental problems. This age children are very easily influenced of social situations (Yavuzer, 1993). Furthermore, according to Coyle (2005), media is main source of environmental information. Students probably might know about natural disaster that gives them pessimistic view about future of nature.

Students are being taught of how environment is polluted, water is used up and decrease in trees as soon as they start to school. As time goes by, they acquired negative vision about environment's potential.

Most students are not sure about the item says; the balance of nature is strong enough to cope with the impacts of modern industrial nations. First of all, students in all probability did not understand "balance of nature" concept. Secondly, term "industry" and so does "modern industrial nation" become unfamiliar concepts for them.

As stated before, in Concrete Operational Stage, children can reason logically as working with concrete present materials yet, have difficulty in situations or problems with elements not concretely present (Strommen et al, 1977). In brief, due lack of understanding, majority of students could not state any idea on this item. Lastly; some of the studies done for different age of students are found be positive attitude toward environment (Aslan et.al, 2008; Özmen et.al, 2005). Actually personal feelings and values are determinant of attitude with addition of factual knowledge (Tikka et.al, 2000) so students are probably added

In "environmental use" part, students' awareness of the importance of interaction between humans and the environment is high. Similarly in "attitude" part, majority of students agree, item related with animal; that special areas should be set aside for endangered species. In $4^{th}$ and $5^{th}$ grade curriculum, there are objectives related with, each living organism has adapted own living area and how human impact harm their lives. They are familiar with subjects how environment is modified by human, endangered species around and some of the environmental problems nearby as well. Score on similar item, all plants and animals play an important role in the environment, likewise high. In a study by Myers et.al (2004) that children, ages of 4-14, are found to have concrete ecological connections among animals. Addition, ages 7-11 years could predict conservation needs of animal. In the same study, it is also concluded that children could construct ideas about ecology from their concrete understanding of and caring about, animals and their needs.

In this study, students at this school mostly spend time outside school lunch times and breaks and majority of them involve in outdoor activities at weekends. According to Irmeli et.al, (2000), various outdoor activities can stimulate environmental education so pupil may learn and experience much and develop strategies for protection.

Consistency among items is owing to subject on 5th grade curriculum; food chain constructed between living organisms and when a circle breaks off in that chain, possible results also learnt in scope this unit. Students are aware that presence pf animals' and plants' mean a lot for environment, in short.

Sensitivity of this age group also illustrated by means of their agreement on item about everyone should be aware of environmental problems. Students do not agree much about poisonous snakes and insects that pose a threat to people should be killed. In 5th grade curriculum, presence of every animal and plant ecosystem is beneficial and having role is taught. This point in curriculum may be effective in this result. Furthermore students do not agree much about air pollution laws is already strict enough. In general, air pollution is one of the most mentioned environmental issues at primary level. Students probably focus on air pollution and do not agree that some precautions are taken.

There are also some items that students are not sure much. For example, most of them are not sure that cultural changes will be very important in solving environmental problems. In this item "culture" concept is abstract for them and they may not know how such a change could be important for solutions. In another item students are not sure whether wild animals that provide meat for people are important or not. Here, being wild and providing meat is contradiction for them. As before, they pointed out significance of protection of animal yet, providing meat is a need for them.

Third highest score about their uncertain item is effect of changes in people's values in finding solution for problems. Similarly, students could not comprehend "value" which is again an abstract term for them.

Students mostly concern about global warming. Global warming is very recognizable since it is hot topic in Turkey. Water pollution comes next. In Ankara, where school takes place, there is serious water problem. Quality and amount of water is always discussed. Students also worry about ozone depletion; they probably assume it is connected with global warming. Industrial pollution and hazardous waste are students are not sure much. As stated before most of the students live in crowded are in this study and according to results of Tikka et.al (2000); It is also found those students who live in crowded area, are more concerned about environment when compared to others (Tikka et.al, 2000).

Relationship among knowledge-attitude-use-concern is as predictable result. Relationship between attitude and use is positive, middle strong, significant. As expected, students having positive attitude, obviously they have more positive view on use and service. Similarly relationship between use and concern is found to be positive, medium, and significant.

As students have concern about environmental problems, they noticeably more positive views on use and service. It is found that students' age of 11-12 mainly focuses on concrete environmental problems such as littering and they have tendency to worry easily even though they do not understand much (Palmberg& Kuru, 2000). This verifies this finding, more they concern, more they are sensitive in use of environment.

In studies of Goldman et.al (2006), there is high correlation between knowledge and attitude and Chu and Lee (2006), attitude and knowledge also found to be moderately correlated. In the same study, knowledge and skills, additionally behavior and attitude are also significantly correlated.

Like other dimensions' among relations, relationship between attitude and concern is found positive, small, and significant. This is also expected since when students have positive attitude; that means they also may have worries about environment.

Mothers' education degree did not significantly differ in terms of knowledge, attitude, use and concern. However in some studies differently, parental education background is found to have effect on students' environmental literacy (Chu et.al, 2007).

Students' one of environmental background dimension is parents' involvement in environmental activities and as such activities increase, students' knowledge, attitude, use and concern also increase. This is also expected result since students may have influenced and take model of their parents; this may be increase their environmental literacy. For children's education, parents have an absolute important role (Sanchez, 2004). Family and filed trip are also found to be effective in environmental understanding (Chu & Lee, 2006). Similarly, students' environmental literacy is found to be affected by parents' attitude, use and concern. This is more valid in younger students. Because, they spend much more time with parents, doing many activities such as reading, playing and studying when compare to older students. Students prefer being with friends as getting older (Chu, 2007).

## 5.2. CONCLUSION

Rapid increase in population, industrialization and civilization, nuclear attempts, agricultural chemistry and many other reasons form base for environmental problems and at the end, polluted air, water and soil threatened all living organisms on earth.

Such pessimistic framework brings education in agenda and environmental education become current issue of recent days in many international conferences and documents.

As a result, environmental education is seen as an important tool to solve many problems in conjunction with economical and social fields. One of the important developments in case of handling environmental problems, concept of sustainable development has come into effect with Rio Earth Summit. Conclusions derived from this meeting were assembled as "Agenda 21" which attributed countries many responsibilities about education for environment and sustainable development. These principles mention human-environment interaction, use of natural resources, and importance of growing next generations for better future.

Moreover, today's children will be responsible for tomorrow's environment and their education is crucial at this point. By means of such an education, knowledgeable, aware, positive attitude and responsible citizenry is anticipated as well; which actually constitute environmental literate individuals. There are many advantages of environmental education like increase students' achievement and contribute their character education and their career. Environmental education also leads responsible environmental behavior (NEETF, 2005).

nvironmental education continues as long as human existing in nature and confine experiences, knowledge, attitude, interest and concern inside and aims behavioral change at the end. Environmentally educated people is not a need in laboratories and research institutes rather they are needed in every field of life and attending at all levels (UNESCO; 1997).

Environmental literacy, being in target of environmental education, individual's savings since the birth similarly. On the basis of Roth's definition (1992), environmental literacy is development degrees which are awareness, concern, understanding and action.

Environmental literate person is not only aware only knowledgeable, highly concern or taking action itself; that is combination of all components in the action taken.

As stated above, importance of environmental education and determining how its target, environmental literacy, is implemented is evident. Once more to mention that purpose of study is dig out of this significance.

Through this study, students' environmental literacy dimensions, effect of mothers' educational level and students' environmental background characteristics are investigated In the scope this study, 6$^{th}$ grade students are quiet knowledgeable and concerned, additionally having positive attitude and sensitive about use of environmental services. Additionally, effect of mothers' education level on environmental literacy characteristics is also investigated yet not a significant difference is found.
On the other hand, parents' involvement in environmental activities also found positively related with students' environmental literacy dimensions.

As a conclusion, the results of the current study recommend that environmental background characteristics can be increased in variety. Reasons of acquisition of environmental literacy of this age children may be due to play outdoor games and media resources. Environmental background characteristics sections of the Environmental Literacy Questionnaire, therefore, may be modified according to students' field of interest, outdoor activities and probable factors that may contribute their environmental literacy like frequency of watching TV, kind of TV programs. Results draw a positive framework for this sample. This may be due to type of school since survey was conducted in a private school in Ankara.

In the conditions of Turkey, with respect to many schools, students at this school are provided with many advantages like located in a huge campus area, opportunity to

spend time in natural area that enables them to be in direct interaction with environment and some living organisms.

Thus, the results found in this study according to both the degree of literacy and that for the relations of EL with the background characteristics may differ for other schools in Turkey. Therefore, the similar research is needed to be conducted in several different characteristic schools to get the whole picture of EL.

Briefly, environmental literacy is significant determinant of quality of life and healthy environment in national and international perspectives. Investigating such competency will lead all members of society and governmental bodies as well, to develop strategies to offer sustainable future. Actions should be taken even starting from at early ages to all levels of education. Curriculum, main component of education, is recommended to allocate more quotas for environmental literacy components.

## 5.3. IMPLICATIONS

Evaluation of acquisition of environmental literacy and additionally is needed. Different methods are needed for environmental education (Coyle, 2004). Enlighten with previous studies, the following suggestions can be offered according to the findings:

Although a number of formal and non-formal agencies, including films and television, environmental youth organizations and a variety of projects conducted by local, national and international organizations, the main contributors to environmental education are the teachers (Lee & Williams, 2001). So, teachers have responsibility of evaluating results of this study. For example, teachers must also consider the students wrong answers as well as their correct answers in knowledge

part of survey. Despite the fact that wrong answered questions may explain where students do not have knowledge much yet this also gives clues about students' alternative conceptions of those items.

With increase in knowledge will end with increase in attitude (DiEnno and Hilton, 2005). In spite the fact that result revealed that students are quite knowledgeable in some environmental concepts, more activities and efforts needed to achieve better scores, which will lead more positive, concerned and sensitive majority. Since in this instrument, students are accepted as unknowledgeable about that item either choosing "I do not know" choice or choosing wrong answer. This distinction should be detected. Teachers should notice differentiation between misconception and lack of knowledge.

Environmental science education must encourage more interdisciplinary and comprehensive view of environment that includes human elements (Shepardson, 2007, p.343). By means of this, students would not allocate human aside from "environment" concept. Students should be aware of themselves and how their values, skills and behaviors affect environment. This is possible with teachers and their encouraging activities for students.

Curriculum developers should consider all part of survey in environmental topic while designing textbooks or other disciplines' curriculum consequently. For example, the most common unknown items should be taken in consideration from knowledge part of survey. Teaching materials and extracurricular activities would be useful for teachers and students (Ko & Lee, 2003). Nevertheless environmental education materials are mostly focused on developing awareness rather than building knowledge (Salmon, 2000). Acquisition of environmental information at schools is directly from textbooks rather than experiences (Chu et.al, 2007). Environmental education at schools would be better if shifted toward a more student centered, including activities and daily practice.

## 5.4. RECOMMENDATIONS FOR FURTHER RESEARCH

This is a fact that environmental education and environmental literacy field needs more research and collection at many levels including doctoral dissertations, thesis etc (Coyle, 2004).

On the basis of findings, there are several recommendations offered by this study. They can be listed as below:

- For the further research, sample size could be increased so as to obtain more accurate results.
- This study examined students of one of the private school in Ankara. Future study could examine environmental literacy, other variable's effect on environmental literacy and how these variables and environmental literacy relates in public school.
- A study could be conducted in order to examine all elementary students' environmental literacy for better evaluation of environmental education.
- A study could be conducted with the same survey, additionally open ended questions for understand students ideas related to environment.
- A pre-test and post test could be conducted to compare students environmental literacy through a semester how students environmental literacy changes with disciplines.
- Same grade level could be compared with different students from different school. By means of this study, environmental literacy dependents could also be investigated.
- In this study, mothers' educational level is not found to be effective on students' environmental literacy. However parents should be component of environmental education programs since children's environmental literacy

level is shaped by their parents' behaviors and thoughts about environment (Chu et.al, 2007). One of main concerns for development of environmental literacy should be about parents' education.

- Some of parts of Environmental Literacy Questionnaire could be modified in order to serve sampling at level of elementary since attendant are at concrete operational stage, some of terms may be discrete for them.

- Background characteristics also could be varied since for such a sample, there are more other variables that can influence on acquisition of environmental literacy. Majority of children at this age play outside. Such an activity may also be determinant to influence acquirement of environmental literacy.

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# APPENDICES

## Appendix A. Environmental Literacy Questionnaire

## EĞİTİM VE ARAŞTIRMA İÇİN ÇEVRE OKUR YAZARLIĞI ANKETİ

Bu anketin amacı öğrencilerin çevre ile ilgili tutum, bilgi ve ilgilerini değerlendirmektir. Anketin tamamlanması yaklaşık 15-20 dakikanızı alacaktır. Bu çalışmaya katkılarınız **gönüllü** olmanıza bağlı olup, çalışmanın sonuçlandırılabilmesi açısından çok değerlidir.

Bu anketten elde edilecek verilerin değerlendirilmesi aşamasında, anketin son bölümünde yer alan kişisel bilgiler kesinlikle gizli tutulacaktır. İsim ve diğer özel bilgiler anketin kapsamında yanıt verilen sorularla kesinlikle bağlantılandırılmayacaktır. Özel bilgilerinizin gizli tutulması konusunda gereken titizliğin gösterileceği kesinlikle garanti edilmektedir.

Bu çalışma ile ya da sizin katkılarınız ile ilgili sorularınız için Gaye Tuncer'i 210 4065 no'lu telefondan arayabilirsiniz.

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 ederiz.

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
- ☐ yeteri kadar
- ☐ biraz
- ☐ hiçbirşey
- ☐ 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 gerçekleştirilmektedir?
   - ☐ Petrol, kömür ve odun yakılarak
   - ☐ Nükleer santrallar ile
   - ☐ Güneş enerjisi ile
   - ☐ Hidro elektrik santraller ile
   - ☐ Bilmiyorum

7. Türkiye'deki akarsu ve deniz kirliliğinin en temel nedeni nedir?
   - ☐ Arıtılmamış evsel, sanayi ve tarımsal atıksular
   - ☐ 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?
   - ☐ Denizler
   - ☐ Yakma tesisleri
   - ☐ Geri dönüşüm merkezleri
   - ☐ Çöp depolama alanları
   - ☐ 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 tümceler insan ve çevre ilişkisini yansıtmaktadır. Lütfen düşüncelerinizi her tümce için verilen seçeneklerden birini işaretleyerek belirtiniz.

| | | **kesinlikle katılmıyorum** | **katılmıyorum** | **kararsızım** | **katılıyorum** | **kesinlikle katılıyorum** |
|---|---|---|---|---|---|---|
| a. | Dünyanın insan yaşamını destekleme kapasitesini doldurmak üzereyiz. | | | | | |
| b. | İnsanların doğaya müdahale etmesi genellikle felaketle sonuçlanır. | | | | | |
| c. | Dünyada herkese yetecek miktarda doğal kaynak vardır, sorun bu kaynaklardan nasıl yararlanacağımızı öğrenmektir. | | | | | |
| d. | Bitki ve hayvanlar da insanlar kadar varolmayaşama hakkına sahiptir. | | | | | |
| e. | Doğanın dengesi, modern endüstrileşmiş toplumların | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | etkileri ile rekabet edebilecek güçtedir. | | | | | |
| f. | Bizi diğer canlılardan üstün kılan özel yeteneklerimize rağmen, hala doğa yasaları ile mücadele ediyoruz. | | | | | |
| g. | İnsanların karşıkarşıya kaldıkları 'Ekolojik kriz' olarak adlandırılan olaylar fazlasıyla abartılmaktadır. | | | | | |
| h. | İnsan olmak doğanın geri kalan bölümüne hükmetmektir. | | | | | |
| i. | İnsanlar doğayı kontrol edebilmek için doğayı anlama gerektiğini sonunda öğrenecekler | | | | | |
| j. | Eğer herşey bugünkü gibi devam ederse, yakında büyük bir ekolojik facia ile karşılaşacağız. | | | | | |

16. Lütfen aşağıda verilen her tümce için verilen seçeneklerden birini işaretleyiniz.

| | | kesinlikle katılmıyorum | katılmıyorum | kararsızım | katılıyorum | kesinlikle katılıyorum |
|---|---|---|---|---|---|---|
| a. | Soyu tükenmekte olan türler için özel alanlar ayrılmalıdır. | | | | | |
| b. | Su kalitesi ile ilgili yasalar daha yaptırımcı olmalıdır. | | | | | |
| c. | İnsanların et ihtiyaçlarının karşılandığı vahşi hayvanlar korunması gereken en önemli türlerdir. | | | | | |
| d. | Zehirli yılanlar ve böcekler insanlar için tehdit oluşturdukları için öldürülmelidirler. | | | | | |
| e. | Toprak sahiplerine sulak alanlarını tarımsal ve endüstriyel amaçlar için kullanmalarına izin vermelidir. | | | | | |
| f. | Herkesin çevre sorunlarının farkında olması çok | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | önemlidir. | | | | | |
| g. | Şahıslar sahip oldukları arazileri istedikleri şekilde kullanmakta serbest olmalıdır. | | | | | |
| h. | Çevre sorunlarının çözümlenmesinde kişisel sorumluluklarım olduğunu düşünüyorum. | | | | | |
| i. | Hükümet, vahşi hayatın korunması amacı ile özel mülkiyet alanlarının kullanımını denetlemelidir. | | | | | |
| j. | İnsanlar çevreye verdikleri hertürlü zarardan sorumlu tutulmalıdır. | | | | | |
| k. | Bitki ve hayvanların tümü çevrede önemli bir role sahiptir. | | | | | |
| l. | Teknolojik değişimlerin çevre için yararları olduğu kadar zararları da vardır. | | | | | |
| m. | Hükümet geri dönüşümün zorunlu olması yönünde yasalar hazırlamalı ve uygulamalıdır. | | | | | |
| n. | Hava kirliliği ile ilgili yasalar yeteri kadar serttir. | | | | | |
| o. | Çevre problemlerinin çözümünde bilim ve teknoloji çok önemlidir. | | | | | |
| p. | Çevre problemlerinin çözümünde kültürel farklılıklar çok önemlidir. | | | | | |
| r. | İnsanların değer yargılarının değişmesi çevre problemlerinin çözümlenmesinde rol oynayacaktır. | | | | | |
| s. | Toplu eylemler çevre problemlerinin çözümünde önemli bir yer tutar. | | | | | |
| t. | Yaşam alışkanlıklarındaki değişimler (tüketim gibi) çevre problemlerinin çözümlenmesinde önemli rol oynayacaktır. | | | | | |

17. Aşağıda verilen çevre problemleri ile, genel olarak, ne kadar ilgilisiniz? Lütfen her madde için verilen seçeneklerden birini işaretleyiniz

| | | ilgisiz | çok az ilgili | karar sızım | biraz ilgili | ok ilgili |
|---|---|---|---|---|---|---|
| a. | Duman kirliliği. | | | | | |
| b. | Ses kirliliği. | | | | | |
| c. | Otomobil emisyonları. | | | | | |
| d. | Endüstriyel kirlilik. | | | | | |
| e. | Zararlı atıklar. | | | | | |
| f. | Kalitesiz içme suyu. | | | | | |
| g. | Kapalı alanlarda oluşan hava kirliliği. | | | | | |
| h. | Ozon tabakasının delinmesi | | | | | |
| i. | Küresel ısınma. | | | | | |

## KİŞİSEL BİLGİLER

Yukarıdaki ankete verdiğiniz yanıtları daha kapsamlı değerlendirebilmek için size bir kaç kişisel soru sormak istiyoruz. Bu bölümde vereceğiniz yanıtların gizli tutulacağını lütfen unutmayınız.

18. Cinsiyetiniz nedir?
- ☐ Erkek
- ☐ Kadın

19. Hangi yılda doğdunuz? **19**__

20.Şu anda kaçıncı sınıftasınız?

- ☐ 6. sınıf
- ☐ 7.sınıf
- ☐ 8.sınıf
- ☐ 9.sınıf

21. Aşağıdaki aktiviteleri bir yıl içinde hangi sıklıkta yaparsınız?

| | sıklıkla | bazen | ara sıra | hiçbir zaman |
|---|---|---|---|---|
| a. Kamp | | | | |
| b. Açık havada yürüyüş | | | | |
| c. Kuş gözleme | | | | |
| d. Balık tutma | | | | |
| e. Avcılık | | | | |

22. Şimdiye dek 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 eğitim seviyesi hangi düzeydedir?

| ***Anneniz*** | ***Babanız*** |
|---|---|
| İlkokul □ | □ İlkokul |
| Ortaokul □ | □ Ortaokul |
| Lise □ | □ Lise |
| Meslek Lisesi □ | □ Meslek Lisesi |
| Üniversite □ | □ Üniversite |
| Yüksek Lisans □ | □ Yüksek Lisans |
| Doktora □ | □ Doktora |
| □ | □ |

Katkılarınız için teşekkür ederiz!

Bizimle paylaşmak istediğimiz bir düşünceniz varsa, lütfen aşağıdaki boşluğu kullanınız.