FIFTH GRADE STUDENTS' ENVIRONMENTAL LITERACY AND THE FACTORS AFFECTING STUDENTS' ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

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Approval of the Graduate School of Social Sciences

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ABSTRACT

FIFTH GRADE STUDENTS' ENVIRONMENTAL LITERACY
AND
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RESPONSIBLE BEHAVIORS

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The purpose of the study was to assess 5th grade Turkish students' environmental literacy (EL) level by considering six EL components, and explore the factors predicting the environmentally responsible behaviors (ERB) of these students. The research design of the study was nation-wide survey. The sample of the survey consisted of 2412 fifth grade students selected from 78 elementary schools (26 private and 52 public) in 26 provinces across Turkey. Developed by the researcher, Elementary School Environmental Literacy Instrument (ESELI) including five parts and total 81 items was used as data collection instrument. To analyze quantitative data, descriptive statistics, ANOVA, multiple correlation and path analysis were conducted. The responses to open-ended question were subjected to content analysis.

The results of the study revealed that EL score of the students was found 149 (*SD*=26.19) suggesting moderate level of EL and 64.1% of the students (*n*=1545) had moderate level EL. The factors significantly affecting 5th grade students' ERB and the effect size of these factors were as follows; school type (partial η^2=.007), taking pre-school education (partial η^2=.002), mother education level (partial η^2=.007),

father education level (partial η^2=.012), residence (partial η^2=.008), experiences in the natural regions (partial η^2=.046), curiosity toward environmental information (partial η^2=.048), mother environmental concern (partial η^2=.023), father environmental concern (partial η^2=.031) and sibling environmental concern (partial η^2=.014). Furthermore, a combination of environmental knowledge, willingness to take environmental action, cognitive skills, and environmental attitude and environmental sensitivity explained 12% of the variance in ERB.

As a conclusion, the results of the presents study will shed light on the attempts on policy making and curriculum development regarding environmental education.

Keywords: Environmental literacy, environmentally responsible behavior, elementary school students, path analysis

ÖZ

5. SINIF ÖĞRENCİLERİNİN ÇEVRE OKURYAZARLIĞI VE BU ÖĞRENCİLERİN ÇEVREYE YÖNELİK SORUMLU DAVRANIŞLARINI ETKİLEYEN FAKTÖRLER

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Bu çalışmanın amacı, çevre okuryazarlığı boyutlarını dikkate alarak beşinci sınıf Türk öğrencilerinin çevre okuryazarlık düzeylerini belirlemek ve bu öğrencilerin çevreye yönelik sorumlu davranışlarını etkileyen faktörleri araştırmaktır. Bu araştırma ulusal bir tarama çalışmasıdır. Bu tarama çalışmasının örneklemini Türkiye'deki 26 ilden rasgele seçilen 78 ilköğretim okulunun 5. sınıfında öğrenim gören toplam 2412 öğrenci oluşturmaktadır. Araştırmacı tarafından geliştirilen, 5 bölüm ve toplam 81 maddeden oluşan İlköğretim Çevre Okuryazarlığı Aracı (İÇOYA) veri toplama aracı olarak kullanılmıştır. Nicel verilerin analizinde, betimsel istatistik, tek yönlü varyans analizi, çoklu korelasyon, ve path analizi kullanılmıştır. Açık uçlu sorudan elde edilen yanıtlar ise içerik analizine tabi tutulmuştur.

Araştırmadan elde edilen bulgular, öğrencilerin çevre okuryazarlık puanının 149 (*SD*=26.19) olduğunu göstermiştir. Bu sonuç öğrencilerin çevre okuryazarlıklarının orta düzeyde olduğu anlamına gelmektedir. Öğrencilerin %64.1 (*n*=1545) orta düzeyde çevre okuryazarlılığına sahiptir. 5. sınıf öğrencilerin çevreye yönelik sorumlu davranışlarını etkileyen faktörler ve etki değerleri söyledir; okul türü

(kısmi η^2 =.007), okul öncesi eğitimi alma (kısmi η^2 =.002), anne eğitim düzeyi (kısmi η^2 =.007), baba eğitim düzeyi (kısmi η^2 =.012), ikamet (kısmi η^2 =.008), doğa deneyimi (kısmi η^2 =.046), çevre bilgisine yönelik merak (kısmi η^2 =.048), annenin çevre kaygısı (kısmi η^2 =.023), babanın çevre kaygısı (kısmi η^2 =.031) ve kardeşlerin çevre kaygısı (kısmi η^2 =.014). Ayrıca, çevre bilgisi, çevre koruma davranışlarına katılmada gönüllük, bilişsel beceriler, çevreye yönelik tutum ve çevre duyarlılığı değişkenlerinin tümü birden çevreye yönelik sorumlu davranışlar değişkenindeki varyansın %12'sini yordamaktadır.

Sonuç olarak, bu çalışmada elde edilen bulguların çevre eğitimi ile ilgili politika geliştirme ve program geliştirme çalışmalarına ışık tutacağına inanılmaktadır.

Anahtar Kelimeler: Çevre okuryazarlığı, çevreye yönelik sorumlu davranışlar, ilköğretim öğrencileri, path analizi

To my father in my memory &

To my mother who always open a new door for me &

To my wife who shares the life with me

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CHAPTER I

INTRODUCTION

1.1. Background of the Study

Today, we as human beings have been confronted with several environmental problems because of global population explosion, growing demand for food, deforestation, and extinction of biological resources (Keating, 1993, as cited in Palmer, 1998), poverty and uncontrolled use of the world's resources (Smati, 2004). In addition to these environmental problems, as asserted by Doğan (1997), economic growth and industrialization has also accelerated the emergence of these problems. The underlying reasons behind these environmental problems are related to the lifestyles of human beings (Connell, Fien, Lee, Sykes & Yencken, 1999; Tung, Huang & Kawata, 2002). Recently, parallel to emergence of these problems, human started to be threatened by several environmental problems such as industrialization, use of non-environment friendly technologies and extensive concrete construction in urban areas in order to increase / improve their life quality. New industrialized countries, like Turkey, are facing rapid economic growth bringing in society's environmental problems including air, water, soil, and waste problems. A more threatening aspect is the unawareness of the influence of the human being on their environment. For a while, they have realized that the environmental problems around have started to influence their life pace. However, thereupon to these problems, human beings have continued to deplete environmental sources extensively without thinking of sustainability of the environment in which they live. The necessity of being aware of these problems and preventing the extensive use of environmental sources are manifest for protecting our environment and for sustainable future and quality life.

Although people seem to be indifferent for protecting environment and developing environmental literacy and responsible behavior for a long time, they might have opportunities to develop responsible behaviors toward environment, and gain understanding for sustainable future when they become knowledgeable about the environment through education (formal & non-formal & informal) and have positive attitudes. Education is an important and crucial way of making people aware of their environment and the problems human being may face. Education in general and environmental education in particular as a solution to the problem have played important role (Doğan, 1997). Environmental education grew out of movement in the early 1900s by taking students outdoor to experience nature (Disinger, 1983) directly rather than trying to build on classroom conceptual instruction. These outdoor experiences has increased students' interest/concern and helped them to develop positive behavior toward environment since then.

A review of substantial literature in the area of EE reveals that major outcome of EE is to develop environmentally literate people (Roth, 1992; Stapp, 1969). Further, the acquisition of environmentally responsible behavior is considered as the ultimate goal of EE (Hungerford & Peyton, 1977). It is a common sense that participation of people in environmental protection studies seems to be crucially important for preventing and solving environmental problems and issues for sustainable future. The importance of developing environmentally literate individuals as a major outcome of EE is apparent in the published definitions and frameworks (Disinger, 1983; Harvey, 1977; Hungerford & Volk, 1990; Schmeider, 1977; Simmons, 1995; Stapp et al., 1969), sets of goals and objectives (Hungerford, Peyton & Wilke, 1980; NAAEE, 1999; UNESCO, 1977, 1978; United Nations, 1992), reviews of the professional literature (Hart, 1981; Osbaldiston, 2004), and collections and reviews of research (Iozzi, 1981, 1984; Hart & Nolan, 1999; Hines, Hungerford, & Tomera, 1986/87; Marcinkowski & Mrazek, 1996; Rickinson, 2001; Volk & McBeth, 1997). Even though the term, environmental literacy, has long been used in the professional literature, no universal definition has been indicated. Some of the researchers relate EL with the cognitive terms (e.g. Daudi, 1999) whereas some others believe that it

should not be only related with cognitive terms, but also with affective and connative terms (Roth, 1992; Schneider, 1997; Staples, 1998). Harvey (1977) surveyed an extensive review of literature so as to conceptualize EE. He identified three levels of EE as environmentally literate person, environmentally competent person and environmentally dedicated person. Then, he defined environmentally literate person as the "one who possesses basic skills, understandings, and feelings for the man-environment relationship" (p.67). Early definition of Stapp et al. (1969), categories of EE proposed in the Tbilisi Declaration (UNESCO, 1978), Hart's identification of key characteristics of EE (Hart, 1981), the findings of Harvey's substantial review of EE structures (Harvey, 1977), Goals for Curriculum Development proposed and validated against the Tbilisi objectives by Hungerford et al. (1980), Roth's framework (Roth, 1992), the results of an analysis of 26 frameworks (Simmons, 1995), a framework developed by The Environmental Literacy Assessment Consortium (Wilke, 1995), and a meta analysis of research on ERB (Hines et al, 1986/87; Osbaldiston, 2004) provide substantial evidences that EL includes four main categories; (1) Knowledge, (2) Affect, (3) Skill, and (4) Behaviour (Hsu, 1997). Depending on these four categories, a recent and working model of the environmental literacy developed by Simmons (1995) includes following components; (1) affect, (2) ecological knowledge, (3) socio-politic knowledge, (4) knowledge of environmental issues, (5) cognitive skills, (6) additional determinants of environmentally responsible behaviour and (7) environmentally responsible behaviour.

Several research studies investigated individuals' EL status in different countries (e.g. South Korea, The USA, Taiwan, and Israel) and the predictors of ERB. However, total variance of ERB has not yet been totally explained. Investigation of these predictors is quite important for designing and/or re-designing EE curriculum both for formal education and for non-formal education process. Different models were previously proposed in order to explain the assumptions regarding the predictors of ERB. One of them is widely know as knowledge-attitude/awareness-behavior model (Ajzen & Fishbein, 1975; Hungerford & Volk, 1990; Ramsey &

Rickson, 1977). This model hypothesize that knowledge directly contributes to the development of positive environmental attitudes or awareness which turns into development of responsible environmental behaviour. Marcinkowski (1988) examined the number of research studies and found that increase in environmental knowledge may have a positive impact on attitudes toward the environment. With regard to the relationship between attitudes and behaviour, Makki et al. (2003) found significantly high correlation (r = .77, p<.01) whereas Hines et al. (1986/87) and Meinhold and Malkus (2005) found moderate relationship (r = .35, and r = .45, p<.001 respectively) between these two variables. Looking at the existing literature (e.g. Dresner & Gill, 1994; Karch, 2002; Korhonen & Lappalainen, 2004; Palmberg & Kuru, 2000; Yerkes & Harras, 1997), it was indicated that taking responsible action for environment was also highly influenced by environmental knowledge (specifically knowledge on action strategies). In addition to knowledge about environment, when the individuals know how to behave toward environment, they tend to develope action skills. Further, attitudes/interests and curiosity for the environment influence the motivation to take action and develop responsible behavior. In a model proposed by Dresner and Gill (1994), it is indicated that increased interests and curiosity about nature stimulate to learn about environmental issues, which turn into motivation to take environmentally responsible actions. As claimed by Hungerford and Volk (1990), knowledge either alone changes behavior directly or through a modification of attitudes. The findings of the study of Scott and Willits (1994) supported this claim that there is a significant relationship between attitudes and environmental responsible behavior.

In addition to the environmental knowledge, attitudes and curiosity (Cordano, 1998; Herremans & Reid, 2002; Hsu, 1997; Kaiser, Wölfing & Fuhrer, 1999; Karch, 2002), the meta-analysis carried out by Osbaldiston (2004) and Hines et al. (1986/87), and the review of twenty-one survey and correlational studies about environmental issues done by Van Liere and Dunlap (1980) point out that there are several backgrounds variables such as age, gender, SES, education level, motivation, culture, media (TV and press media), urban & suburban areas, and social class affecting the

environmental concern and the responsible environmental behavior(s). Among the variables mentioned above, it is interesting to notice that age is negatively correlated with environmental concern. One predominant finding mentioned in these studies is that when the ages of individuals get older, the individuals tend to show lower environmental concern. Other predominant findings are associated with income (residence), gender, and education level. The individuals settled down (or lived) in urban areas showed more responsible behavior than the ones living in rural areas. The research findings indicated that females showed more environmental responsible behaviors when compared to males. Furthermore, the findings revealed that education level was positively correlated with environmental concern. In other words, the higher the educational level the individuals have, the higher they show responsible behavior (Osbaldiston, 2004; Van Liere & Dunlap, 1980).

Sivek and Hungerford (1989/90) found that the most parsimonious predictors of ERB were environmental sensitivity, perceived knowledge of and skills in using environmental action strategies, and locus of control. Cottrell and Graefe (1997) found verbal commitment and perceived knowledge of ecology as significant predictors of ERB. Hsu and Roth (1998) reported most parsimonious set of predictors of ERB as perceived knowledge of environmental action strategies, intention to act, area of residence and perceived skill in using environmental action strategies.

In order to protect the environment in which we live and leave a sustainable environment for future generations, the individuals need to become more aware of influences of the problems on natural environment and on their life pace, and should develop environmentally responsible behavior so they can cope with the problems. Studying with these mentioned variables and their influences on the responsible behavior would support the literature and provide understanding about Turkish culture and students. In addition, it is believed that examining the influences of the other variables such as mother and father education level, pre-school, experience in the natural environment, types of schools, parent environmental concern that are not

sufficiently examined previously on environmental behavior would contribute to the science and related literature.

Turkish Education System has recently experienced a reform at primary level as well as secondary and university levels. The primary school curricula has been changed and re-designed in line with constructivist approach and new trends in the world. In addition to technology, society, and individual dimensions, the dimension of environment has been explicitly stated in the new curriculum (MEB, 2005). In line with the new changes in the curricula, investigating environmental responsible behavior, one of the chief aims of integrating this dimension into the curriculum, under the framework of this study would be expected to provide in-depth analysis of the environmental dimension of the curriculum. It is clearly understood from the literature that there are some background variables and individual experiences that probably influence the individuals' responsible behavior toward environment. Although the new curriculum have emphasized the dimension of environment and the concept of environmental education has been integrated into curriculum, it is still a standing problem to examine / determine to what extend the environmentally responsible behaviors are associated with probable parameters (e.g., age, school type, environmental knowledge) for elementary school students in Turkey. It is believed or expected that the findings of the study would contribute insights for further curriculum development and renewal or revision.

1.2. Purpose of the Study

The purpose of the present study was to assess 5th grade Turkish students' environmental literacy level by considering six EL components and to explore the factors that influence the environmentally responsible behaviors (ERB) of these students. Further, this study aimed at testing the proposed model indicating the relationship between ERB and other components of EL such as knowledge, cognitive skills and affect as they are called in Path Analysis. In other words, this study aimed to predict a structural model that best explained the relationship between ERB and

selected factors (variables). Furthermore, the effects of students' background variables (namely, gender, education level, types of school, residence, parent education level, SES and enrollment of pre-school) on their ERB were investigated. The following two questions and further 10 sub-questions guided and shaped the overall study.

1.2.1. Problem Statements of the Study

1) What is the level of environmental literacy of fifth grade students across Turkey with regard to each of the following variables?

a. Environmental knowledge

b. Affect

1. Environmental attitudes
2. Environmental sensitivity
3. Willingness to take environmental action

c. Environmentally Responsible Behavior

1. Political action
2. Eco-management
3. Consumer and economic action
4. Individual and public persuasion

d. Cognitive skills

1. Problem identification and evaluation
2. Problem solving

2) What are the predictors of Environmentally Responsible Behavior (ERB) of fifth grade students?

Sub.1) Does 5th grade students' ERB differ according to gender?

Hyp.1) 5th grade female students demonstrate more ERB than 5th grade male students.

Sub.2) Does 5th grade students ERB differ according to school type?
Hyp.2) 5th grade students in private schools demonstrate more ERB than 5th grade students in public schools.

Sub.3) Does 5th grade students' ERB differ according to their participation in nursery school education?
Hyp.3) 5th grade students who attended nursery school education demonstrate more ERB than the ones who did not.

Sub.4) Does 5th grade students' ERB differ according to their parents' education level?
Hyp.4) 5th grade students whose parents received higher education demonstrate more ERB than the ones whose parents received lower education and no education.

Sub.5) Does 5th grade students' ERB differ according to their residence?
Hyp.5) 5th grade students in urban area demonstrate more ERB than the ones in rural area.

Sub.6) Does 5th grade students' ERB differ according to their SES / family income?
Hyp.6) 5th grade students with high SES / high family income demonstrate more ERB than the ones with low SES / low family income.

Sub.7) Is there any significant relationship between 5th grade students' experiences in natural environment and their ERB?
Hyp.7) The more the 5th grade students have experience in natural environment, the more they demonstrate ERB.

Sub.8) Is there any significant relationship between 5th grade students' curiosity about the environment and their ERB?

Hyp.8) The more the 5th grade students are curious about the environment, the more they demonstrate ERB.

Sub.9) Does 5th grade students' ERB differ according to their parents' environmental concern?
Hyp.9) 5th grade students coming from families holding environmental concern demonstrate more ERB than the ones from families holding no environmental concern.

Sub.10) What is the best fitting structural equation model representing the factors influencing fifth grade students' environmentally responsible behavior?

1.3. Significance of the Study

Human beings have recently been spending a great amount of resources of nature for increasing and improving life quality. This situation has started to threaten the environment where we live. Tung et al. (2002) asserted that today's environmental problems arose from the lifestyles of human being. As a result of these, public health has been endangered and ecological balance has been lost slowly. This threat has initiated a movement in school and educational system in order to consider environmental education. Therefore, environmental education has been recently strongly emphasized and has been taken into consideration when planning school curriculum by the developed and developing countries. Further, environmental education has been recently attracted much attention by most people such as children, teachers and parents, and by governments and organization (e.g. municipalities).

In Turkish Education System, there is no separate environmental education course and curriculum. The subjects related to environment take place in the science and technology education course, social studies course and life studies course as one or

two units. Since the environmental education is interdisciplinary in nature, it is meaningful to integrate environmental related issues and topics into different courses. As claimed by Howe and Disigner (1991), the development and acquisition of environmentally responsible behavior can be perceived as the chief aim of environmental education (as cited in Hsu, 1997). It is really needed to make the students understand the environmental problems and cause-effect relationship to take action for the environment and show responsible citizenry behaviors for the environment. So, one powerful way of raising awareness and developing responsible behavior of students in relation to environment is education. As it is clear from the research studies (e. g., Erten, 2002) that when the environmental education starts at early ages, these children later tends to demonstrate environmental responsible behaviors necessary for protecting and sustaining the environment. In today's contemporary society, it is crucial to take responsible action for preventing and solving environmental problems. Before integrating environmental related concepts into curriculum and developing environmental education program for formal and non-formal education, it would be practical and meaningful to investigate the factors that are likely to influence the development of children' environmentally responsible behavior.

The existing literature indicated that there are many research studies carried out to indicate the factors associated with environmentally responsible behavior abroad. However, research studies in this area are rarely observed in Turkey. Although the vital importance of environmentally responsible behavior is accepted in the field of environmental education, the researchers have not adequately emphasized on the studies in environmental education in Turkey. 53 research studies were gathered from the examination of Turkish literature that was related to environmental education focused upon k-8 grades. The analysis of these studies pointed out a little attention given to environmentally responsible behavior. It is believed that carrying out the present study in Turkey will initiate new research area on environmentally responsible behavior in environmental education. In addition, it is supposed that the

findings of the study will contribute insights to the experts working on the development and revision processes of school curricula.

1.4. Definition of the Terms

Environmental literacy: Hungerford and Peyton (1997) defined environmental literacy as a concept which is "reflected by human beings who have knowledge of and the ability to communicate the need for environmental action strategies, who have the ability to use those skills inherent in environmental action strategies, and who are willing to use action strategies in an effort to remediate environmental issues" (p.4). In the present study, 5th grade students' environmental literacy level was assessed by combining the scores of four main components of EL; Environmental knowledge, affect, cognitive skills and environmentally responsible behavior.

Environmental knowledge: Environmental knowledge refers to being knowledgeable about the ecology, natural history, environmental problems and issues, and socio-political-economic issues. In different way, Gambro and Switzky (1994) define environmental knowledge as having an ability to understand and evaluate the impact of society on the ecosystem. 5th grade students' knowledge on the environment was measured with the instrument "Test of Environmental Knowledge (TEK)" consisting of 19 multiple choice items with four alternatives and three T-F items.

Affective Disposition: In the present study, this broad concept consists of five sub-components as environmental attitude, environmental sensitivity, intention to act, locus of control and environmental responsibility. These all constructs emerging as a result of factor analysis were measured through the use of "The Affective Disposition toward the Environment Scale" consisting of 14 items on a four-point Likert type scale.

Environmental attitude: UNESCO (1977) defined environmental attitudes at Tbilisi Conference as helping social groups and individual acquire a set of value and feeling of concern for the environment and motivation for actively participating in environmental improvement and problems.

Environmental Sensitivity: Environmental sensitivity, an apathetic view of the environment (Hungerford et al., 2000), has long been equated with significant life experiences (Sward & Marcinkowski, 2001). Stapp (1974) referred to the environmental literacy with regard to exposure to, exploration of, appreciation of, respect for (Sward & Marcinkowski, 2001) and care about the environment (Hsu, 1997).

Intention to act: Intention to act has been interchangeably used with verbal commitment. Intention has been viewed "as the conative component of attitude and it has usually been assumed that this conative component is related to attitude's affective component. This conceptualization has led to the assumption of a strong relation between attitudes and intentions (Fishbein & Ajzen, 1975, p.289)."

Locus of Control: Locus of control can be identified as individual and group locus of control. Individual locus of control can be defined as "an individual's perception of whether a particular action will result in an anticipated reinforcement in acting (p.31)" (Ramsey, 1993). Individual locus of control can be further divided into two as internal locus of control and external locus of control. On the other hand, group locus of control can be defined as "an individual's perception of his and her effectiveness in bringing about change as a group member (p.32)" (Ramsey, 1993).

Environmental Responsibility: Environmental responsibility refers to human dimensions of responsibility (personal and others') (Hsu, 1997) toward in reference to the environment as a whole and/or in reference to only solutions of environmental problems (Hines et al., 1986/87). Personal responsibility is defined as personal obligation or sense of duty to implement actions (Boerschig & DeYoung, 1993) or

individuals' feelings of duty or obligation (Hines et al. 1986/87) or moral obligation to act (Schultz & Zelezny, 1998).

Cognitive skills: This concept can basically be defined as an ability to investigate environmental problems and issues and to suggest possible solutions for dealing with these problems and issues. Hungerford et al. (1996) identified fourteen steps of issue investigation and problem solving skills. Their identification of skills was later refined and lessened to ten steps by Lunsford (2000). 5th grade students' cognitive skills for identifying and solving environmental problems and issues were assessed with the instrument "Problem Identification and Problem Solving Skills Test" consisting of seven-step scientific process skill item and one open-ended item.

Environmentally responsible behavior: As defined by Sivek and Hungerford (1989/1990), "the behavior is considered environmentally responsible when the actions of an individual or group advocate the sustainable or diminished use of natural resources" (as cited in Vaske & Kobrin, 2001, p.16). Smith-Sebasto and D'Acasto mention about the categories of environmental action that are related to environmentally responsible behavior as civic action, educational action, financial action, legal action and physical action. Environmentally responsible behaviors of 5th graders were measured with the instrument "Children Responsible Environmental Behavior Scale (CREBS)" on a seven-point Likert type scale consisting of 26 items and four dimensions.

Environmental Curiosity: This concept refers to being eager to learn about the ecology, natural environment, environmental problems and issues, and socio-political-economic issues, and to explore natural environment. Curiosity of the 5th graders on obtaining environmental information was assessed with a single question including four levels.

SES (Socio Economic Status): Even though this concept refers to socio-economic level comprising several indexes (e.g. education level, income, residence…etc), the

income level of the parents of the participants is the only index considered for SES in the present study. SES, also called as income of the families in the present study, was grouped into three categories such as low SES, medium SES and high SES.

Experience in the Natural Environments: Experience in the natural environments refers to activities that individual are involved in their spare time in the natural region for recreation purposes (e.g. tracking, fishing, hunting, picnicking, canoeing…etc). This variable was measured with a single question including four levels (frequency of time spent in the natural regions).

Parent's Concern for the Environmental Pollutions: This variable measures whether parents (mother, father and siblings) have concerned about and worry for the environmental pollutions or not. It was measured with one single question with yes-no answers asking the students about their parents' concern on the environmental pollutions.

CHAPTER II

LITERATURE REVIEW

In this chapter, the existing research literature most relevant to the purposes of this study is summarized. First of all, historical roots of Environmental Education (EE) with regard to development of this area are presented by considering two main movements; education and environment. Then, cornerstone historical events regarding the development of EE in the World are presented with the support of conferences, declarations and seminars. Next, a timeline designed according to development and transitions of EE is illustrated. After mentioning development of EE in the world, development of this area in Turkey from 1923 until present is discussed. Based upon the interdisciplinary nature, incorporation of the concepts of environment into the curriculum development process is discussed from a historical perspective. However, newly developed primary school curricula are more focused in this part with regard to the integration of the concept of environment. Having mentioned the historical background of EE, conceptualization of EE is discussed by considering the early and recent definitions, goals, objectives, nature and scope of EE. After that, definitions, characteristics, components and sub-components of Environmental Literacy (EL) are discussed. Subsequently, Environmentally Responsible Behavior (ERB) is identified by integrating different perspectives and explanations done in advance. Based on the models, frameworks and the empirical studies, the determinants and predictors of environmentally responsible behavior are further presented. In the final section, national and local EL assessment studies performed in four different countries and research studies on ERB and its associated variables (such as categorical variables, environmental sensitivity…etc) are summarized are summarized. Also, a review of the selected K-8 EE research studies conducted in the context of Turkey is discussed. At the end, a general summary is provided based upon the review of the literature.

2.1. Historical Roots of EE

In order to conceptualize and draw a clear picture on EL, which is assumed to be one of the ultimate goals of EE, development of EE in the world and Turkey are summarized in this part. Furthermore, historical roots of EE, cornerstone historical events on EE in the World and particularly in Turkey are given, as well.

The development and emergence of EE in the professional literature were mainly influenced and contributed by two broad movements, which were educational movements and environmental movements. The primary *educational* movements that basically contributed to the area of EE and its development were nature study movement (initiated in 1891), outdoor education movement (started during 1920s) and conservation education movement (started during 1930s). At the same time, primary *environmental* movement that enhanced the area of EE were the preservation movement (1872-1908), the conservation movement (1908-1962) and the environmental quality movement (1962-1992), each of which are based on different philosophy (Marcinkowski, 2006).

The roots of the EE date back to 1891 when nature study appeared with Wilbur Jackman's Nature Study for the Common schools which defined the nature study movement (McCrea, 2006; Nash, 1976) and initiated a nature study movement taking the students outdoor to explore an indivisible environment (Disinger, 1983). The main focus of nature study movement was based on direct and first-hand observation and experiences out of doors that would develop an understanding and respect to the natural environment and make a learner become more interested in his environment (Stapp, 1974). A further ahead, during late 1920s, outdoor education movement was initiated with L. B. Sharpe and Julian Smith who believed the importance of taking the education methods outside the classroom (Swan, 1984). Sharpe saw the outside as a laboratory that helped the learner provide direct experience with the natural environment (Disinger, 1983). The education methods used for the execution of nature study and outdoor education revealed the several of factors that influenced the

achievement and that the classroom isolated. For example, direct experience in the natural environment through field trips can increase students' understanding of nature and natural processes (e.g. cause-effect relationship).

After that, International Union for the Conservation of Nature and Natural Resources (IUCN) at 1948 triggered the development of EE process. In the mid 1960s, the term, EE, appeared as a distinct field in the literature (Roth, 1992). For the first time, this term was used in National Conference in Environmental Education that was held in New Jersey in 1968 and one of the early users of this term was Clay Schoenfeld who was the editor of The Journal of Environmental Education (Swam, 1984). Definition attempts for the term, EE, were initiated in those years. As a last, but not least, sustainability movement was started in 1987 in order to provide balanced attention to environmental concerns with attention to social concerns (Marcinkowski, 2006).

2.2. Cornerstone Historical Events on EE in the World

Several conferences and steps on the topic of EE and its initial development were held in different countries; e.g. Kenya in 1968, Japan in 1969, and Finland in 1974 (Schmieder, 1977). Founded in 1948, The International Union for the Conservation of Nature and Natural Recourses (later called as The World Conservation Union) first formalized the term EE in 1970 at the meeting held in Nevada, USA (IUCN, 1970). During early 1970s, this term was raised and started to be discussed in the international area. In 1972, first international agreement on the issue of worldwide environmental degradation was expressed in The United Nations Conference on the Human Environment held in Stockholm in Sweden. This conference was the first conference laying down the foundations of environmental action at an international level (UNESCO, 2007) and calling for the provision of EE to address the environmental issues worldwide (McCrea, 2006). Recommendation 96 from this conference emphasized the importance of taking necessary steps to establish the International Environmental Education Programme (IEEP), interdisciplinary in nature, within- and out-of school, and comprising life long education (that is all level

of education) (United Nations, 1972). After taking this initial step for establishing international environmental education measures, several other international conferences (e.g. The Tbilisi Conference in 1977) and workshops (e.g. The Belgrade Workshop in 1975) were held and charters, reports and recommendations (e.g. *Earth Charter* in 2000, *Lüneburg Declaration* in 2001 and *Ubuntu Declaration* in 2002) were published.

In 1975, the International Environmental Education Programme (IEEP) was established. This was perceived as the co-operative activity between United Nations Educational, Scientific and Cultural Organization (UNESCO) and United Nations Environmental Programme (UNEP) (Sato, 2006). UNESCO (1984) historically examined the activities of IEEP. In the period of 1975-1983, there main tendencies were observed in the activities of IEEP, called as three phases. In the *first phase* of IEEP covering the dates 1975-77, more attention was paid to the development of global EE awareness. Falling into this phase, The Belgrade Workshop in 1975 and The Tbilisi Intergovernmental Conference in 1977 were two most important events, in which goals, aims, objectives and guiding principles were identified.

Following up to these international events, the regional meeting on EE were further realized in the USA, Latin America, Africa, The Arab States, Asia, and Europe between 1976 and 1977. In 1975, The Belgrade Workshop was realized in the former capital city of Yugoslavia to provide framework for the EE, originate recommendations for development of EE worldwide and to ensure a commitment for each representative to convene for adapting the recommendations of Belgrade to regional needs (Stapp, 1979). This conference brought together 20 national representatives who were EE experts from different region of the world. In the Belgrade Charter, as an outcome of the workshop, the goal and objectives of the EE were stated (UNESCO, 1975). Together with the "state of the art" papers, tentative guidelines and recommendations would be used as working papers for the regional seminars (Stapp, 1975). The term EE was elaborated in the Intergovernmental

Conference held in Tbilisi in Georgia in 1977. Over 265 delegates, 65 representatives and other observers from approximately 70 countries, 8 organizations of the UN system, 3 other intergovernmental organizations and 20 international NGOs participated in the conference (Stapp, 1979; UNESCO, 1978). During the conference 41 recommendations were made to better define EE and incorporate it into government policy.

In the *second phase* including the dates 1978 – 1980, emphasis was placed on the conceptual and methodological development of EE. During these years, series of studies regarding different pedagogical aspects of EE were performed for the purpose of incorporating an environmental dimension into the general educational practices. In 1980, an international seminar on interdisciplinary EE at primary and secondary levels was held in Budapest, Hungary by the help of IEEP. In the *third phase* (1981-1983), the greater attention was devoted to the development of content, methods and materials for EE practices and training activities. Same as the second phase, for the sake of content, method and material development, several projects and studies were undertaken to incorporate the environmental dimension into educational practices. Some of those projects were about interdisciplinary approaches in EE, problem-solving approaches in EE, integration of an environmental dimension into social studies at school and so on. In this period, the governments realized the need for upgrading of their own environmental programs to effectively incorporate EE into their own educational policy and plans.

Ten years after The Intergovernmental Conference held in Tbilisi, UNESCO and UNEP cooperatively organized the Intergovernmental Congress on Environmental Education and Training held in Moscow in 1987 (UNESCO, 1987). The Congress document focused more on the needs and priorities for developing EE and training, and provided an international strategy including 42 international action for EE and training for 1990s (UNESCO-UNEP, 1988). Provided in the document, this was a strategy for the nations to prepare their own national action strategies for EE and

training for 1990s. IEEP, later on, seemed to shift its attention on the educational activities for EE (Sato, 2006).

In the same year as Moscow Congress, in order to create a '*global agenda for change*' (p. ix), World Commission on Environment and Development (WCED) published a report for re-examining the critical environment and development problems on the planet. This report was called as "Our Common Future", or The Bruntland Report. The proposals formulated in the report were within the principle of Environmentally Sustainable Development (ESD) (Bruntland, 1987). In the report, a common endeavor and new forms of behavior at all level are called for. As a follow-up to the World Conservation Strategy report, emphasizing the importance of conserving nature and natural resources for future, IUCN, UNEP and WWF jointly published "Caring for the Earth: A Strategy for Sustainable Living" in 1991 (IUCN, UNEP & WWF, 1991). The publication, basically targeting to policy-makers and decision makers, stressed on the importance of EE for sustainable development. The report was mainly based upon the re-thinking on conservation and development. A series of continuous discussions on the theme of Environment and Sustainable development started to be evolving the reports, such as World Conservation Strategy in 1980, Our Common Future in 1987 and Caring for the Earth: A Strategy for Sustainable Living in 1991, and declarations, such as The Talloires Declaration in 1990, The Halifax Declaration in 1991, The Kyoto Declaration in 1993, and Swansea Declaration in 1993.

Another important conference organized by the United Nations was "*The Earth Summit*" held in Rio de Janerio, Brazil in 1992. This was two decades after the first global environmental conference in Stockholm. As a consequence, five major instruments were signed by the leaders (participants) which were (1) The Rio Declaration (a statement of principles); (2) Agenda 21 (a framework for activity into the 21st century addressing the combined issues of environment protections and fair and equitable development for all, and includes the creation of a new Commission for Sustainable Development); (3) A Framework Convention on Climate Change; (4)

A Framework Convention on Biological Diversity; and (5) A Statement of Principles on Forests (United Nations, 1992). The fundamental principles and the program for action for realizing and achieving sustainable development emerged from the Rio Conference. As clear in the Rio declaration, human beings are an important concern and at the center of sustainable development. Chapter 36, based on *Education, Awareness and Training*, in Agenda 21 is a comprehensive attempt for action dedicated toward establishing Education for Sustainability. This chapter was designed in line with the principles presented in Tbilisi Conference in 1977 and Tbilisi Conference Report published in 1978. This chapter emphasizes:

> Education is critical for achieving environmental and ethical awareness, values and attitudes, skills, and behavior consistent with sustainable development and for effective public participation in decision making. Both formal and non-formal educations are indispensable to changing peoples' attitudes so that they have the capacity to assess and address their sustainable development concerns (p. 264) (United Nations, 1992).

Since Rio, UNESCO has then started to accelerate the reforms attempts on sustainable development (UNESCO, 2002). The main focuses of UNESCO in these attempts is basically on education for sustainable development, raising public awareness, and promoting more investment in education. The importance of education for sustainable development was stressed at major UN conferences of the 1990s, such as those on environment and development in Rio, 1992; human rights in Vienna, 1993; population and development in Cairo, 1994; small island developing states in Barbados, 1994; social development in Copenhagen, 1995; women in Beijing, 1995; food security in Rome, 1996; and human settlement-habitat in in Istanbul, 1996 (UNESCO, 2002; UNESCO, 1997b). These major conferences of UN between 1992 and 1997 have developed, enriched and reinforced the vision of education and public awareness, and thus the understanding of "education for sustainability". Sustainable development is grounded in four independent systems; biophysical, economic, social and political concerns.

Five years after Rio (1992) and twenty years after Tbilisi (1977), the other conference that was dedicated to refining the concept and message of education for sustainable development was held in Thessaloniki, Greece in 1997 by UNESCO (Knapp, 1997). This conference was organized to emphasize the roles of education and public awareness as well as to mobilize and enhance the action at international, national and local levels (UNESCO, 1997c). The conference brought together 600 people acting as mobilizer and facilitator such as the representative of The UN system, governments, NGOs, experts, and other major interested parties. This conference was basically about the reorientation of education to the sustainable development. With respect to this aim, it was stated in the declaration:

> The reorientation of education as a whole towards sustainability involves all levels of formal, non-formal and informal education in all countries. The concept of sustainability encompasses not only environment but also poverty, population, health, food security, democracy, human rights and peace. Sustainability is, in the Final analysis, a moral and ethical imperative in which cultural diversity and traditional knowledge need to be respected (p.2) (UNESCO, 1997a).

Third decade after the Stockholm Conference on the Human Environment, and ten years after Rio Declaration, milestone conference that an agenda for sustainable development were set, on Environment and Development, United Nations organized its third major conference, The World Summit for Sustainable Development (WSSD). This conference, also called as Johannesburg Summit, was held in Johannesburg, South Africa in 2002 (Sato, 2006). Tens of thousands of people participated in the conference in which five major target areas were discussed and some commitments were taken; (1) water and sanitation, (2) energy, (3) health and environment, (4) agriculture, and (5) biodiversity and ecosystem management – this was called as “WEHAB” (EETAP, 2002).

Growing concern on education for sustainable development has been also observed in other international and national conferences and meetings. Those movements on education for sustainable development have resulted in international implementation

of this issue and, in 2002, United Nations General Assembly proclaimed the Decade of Education for Sustainable Development (UNDESD) for the period 2005-2014 (UNESCO, 2005).

Dedication of a decade emphasizes the importance of education for achieving the sustainable development; that is, education is an important and essential way of realizing the sustainable development. As asserted in UNDESD International Implementation Scheme, the roots of Education for Sustainable development (ESD) are grounded in two main concern of United Nations (UN) such as (1) Quality basic education and (2) Environmental education for sustainable development (UNESCO, 2005). Within the framework of EE for Sustainable development, historical changes are observed from EE to EPD and to ESD (Sato, 2006).

2.3. Historical Development of EE in Turkey

The modern-day Republic of Turkey (Turkey, or TR) was founded in 1923. The Turkish Education system, which had been administered by a number of national agencies, was unified within the Ministry of National Education in 1924 under the Act of Unification. Progressive curriculum development studies began shortly after that date (Demirel, 2004) to modernize the educational system and to make the society be aware of the benefits and contributions of being a republic (Gözütok, 2003). Ayas, Çepni, and Akdeniz, (1993) indicated that educational reform efforts in Turkey between 1923-60 were characterized by three trends: (1) innovations in education tended to be dominated by foreign advisers such as Dewey and Buyse; (2) their recommendations were mainly theoretical rather than practical; and (3) agricultural education became part of school curricula for economic development reasons.

In the same year as this Act of Unification, John Dewey, one of the proponents of experiential leaning and progressive philosophy (Ornstein & Hunkins, 1988), was invited to Turkey to examine the educational system and provide some suggestions

to enhance curricula in Turkey (Turan, 2000). Based on his recommendations, national curricula were redesigned to place greater emphasis on experiential learning. Topics and courses pertaining to the Natural Studies (*Tabiat Bilgisi*) and Agriculture (*Tarım*) were introduced into the primary and secondary school curriculum. New courses on Natural Studies (*Tabiat Tetkiki*), Agriculture (*Ziraat*) and Health (*Hıfzıshha*) were added to the primary school (1-5) curriculum. In addition, science-related topics were integrated into Life Studies (*Hayat Bilgisi*), Natural Studies (*Tabiat Bilgisi*), and Agriculture (*Tarım ve İş*) in 1926 and again in 1936. Further, a course on Family Awareness (*Aile Bilgisi*) was introduced into the primary school curricula in 1948 (Kaptan, 1999), and it too included science topics.

Dewey's recommendations also influenced the improvement of village schools and the curriculum for these schools (Köy Okulları) (Akyüz, 1999), which included environmentally related principles (Çağlar, 1999). The main purpose of village schools was to grow up the students according to the conditions and needs of villages (Gözütok, 2003). The courses in these schools were parallel to the ones in urban areas. However, additional courses such as Life Studies, Natural Studies, and Agriculture were added to these school curricula to link the course content to village life. In the 1940s, topics on agriculture were highly emphasized in village schools and incorporated into the curriculum for these schools.

Similarly, Dewey's recommendations influenced the establishment of village institutes (Köy Enstituleri) in 1940 (Dündar, 2002). In the 1940s, teacher candidates in teacher schools (öğretmen okulları) and in the newer village institutes were prepared to teach agriculture (Tekışık, 2004). Practice gardens were created at these schools and institutes, and guide books were published. These institutes placed great emphasis on the theory and practice of agriculture, and provided teacher candidates with greater opportunities for outdoor and natural experiences. While these institutes were commonly viewed as making important contributions to the Turkish Education system (Dündar, 2002) and may have foreshadowed EE, they were closed

permanently in 1954 for what are widely believed to be ideological reasons (Türkoğlu, 2000).

During the 5th National Education Convention (*5.ci Milli Eğitim Surası*) held in 1953, decisions were made to place greater emphasis on solving students' health-related problems, notably those pertaining to nourishing / diet problems and to managing students' class hours and resting hours (Özalp & Ataünal, 1983). In the 6th National Education Convention held in 1957, decisions were made to pay greater attention to Public Education (Halk Egitimi), and History and Appreciation of Nature (Tarih ve Tabit Sevgisi) (Özalp & Ataünal, 1983).

The national curriculum for primary schools (*ilk okul*, 1-5 grade level) developed in 1962, piloted over 1962-1967, and disseminated in 1968 (Cicioglu, 1983) reflected a pragmatist and humanistic philosophy. One of the reform strategies that emerged from these attempts was to improve the primary school curriculum, and combine and reorganize the existing courses into new ones. For example, during this period, courses from the 1948 primary school curriculum on natural studies, agriculture, and family awareness were combined into a new course on Science and Natural Studies (Fen ve Tabiat Bilgisi) (Kaptan, 1999; Varış, 1983). In addition, earlier courses on geography, history, and civics education were combined into the course on Country and Society Studies (*Toplum ve Ulke Incelemeleri*) (Varış, 1983).

As happened in many other parts of the world during the 1960s, the Turkish government began to pay serious attention to the study and prevention of environmental problems. For example, for the first time, the term environment (*çevre*) was spelled out in the 1961 Turkish Constitution in the article 49: "*everyone's physical and mental health should be protected"* (Özdemir, 2003). About a decade later, the Turkish government approved the first policy pertaining to environmental rights and protection as part of Third Five Year Development Plan, which covered the years between 1973 and 1977 (Hotinli, 2002). In 1978, the Prime Ministry Undersecretariat for Environment was founded for coordinating

environmentally related national and international activities, and was later replaced by the Ministry of Environment in 1991 (Okumuş, 2002). Policy developments such as these often had a corresponding influence on national curricula (Kaya, 1984). While these new environmental policies did not seem to have any direct influence on national curricula prior to 1980, they do appear to have contributed to a political climate in which EE could later develop and receive governmental support.

The environmental policies from the 1960s and 1970s were reaffirmed and expanded in the 1980s. In specific, the Republic of Turkey's 1982 Constitution, which is still in effect today, gave increased attention to the topic of the environment. This is reflected in 1982 Constitution's Article 56 which states "*every one has right to live in a healthy and balanced environment. Protection of environmental health, prevention of environmental pollutions, and development of the environment are the state's and every citizen's duty …"* (Budak, 2002). Further, in light of Article 56, a number of environment laws were enacted in 1983. According to the OECD Environmental Performance Reviews for Turkey, she had been confronting the challenges of ensuring that economic growth is associated with environment and social progress; e.g., *sustainable development*. However, due to rapid growth in energy, industry, transportation, and tourism during the 1990s, Turkey has experienced increasing environmental pressures. As a result, several new institutional and legislative reforms have been put into practice (OECD, 1999).

The environmental policies alluded to above appear to have had a more direct influence on the development of EE in Turkey. For example, due to the growing attention to environmental problems and issues in the 1982 Constitution and environmental laws that followed from it, courses pertaining to the environment started to appear in school curricula (Doğan, 1997; Özdemir, 2003). In addition, during the 1990s, several national projects focused on "education for the environment" at the primary level were initiated. One prominent example was the agreement for a primary level EE project signed by MONE in cooperation with UNESCO in 1990, which led to the preparation of a handbook for primary school

teachers (Erol & Tuncer, 1992). Governmental support for EE took a major step forward in 1994, when the Seventh Five Year Development Plan Environment Commission completed and published its report, emphasizing the importance of the environment and EE. This growing attention to EE led to initial dissertation studies of EE in middle schools, including studies of the effects of a water conservation unit integrated into the 6th grade science curriculum (Arkış & Doğan, 1992), a soil conservation unit integrated into the 6th grade science curriculum (Doğan & Doğan, 1993), and an air conservation unit integrated into the 8th grade curriculum (Tican & Doğan, 1996). Finally, the Turkish Environmental Education Foundation (TURCEV), a non-governmental organization, was founded in 1993. Since then, this organization has coordinated Turkish participation in international environmental education programs such as the 'Eco-School' and 'Young Reporters for the Environment' programs.

Looking at curricula developed up to the present, it is readily apparent that the topics and subjects are integrated in different courses by taking into account the interdisciplinary nature of the environmental education. However, these concepts were not sufficiently incorporated in the natural studies, agriculture, and life sciences until 1960s. In line with the trends and developments in the USA and Europe, topics pertaining to environmental education were started to be highly introduced into school curricula. For example, primary school science curricula that paid much greater emphases on environmental related concepts/topics were developed in 1992, 2000 and 2004, respectively. Topics associated with the universe, living organisms and life, bio-diversity, matter, energy, and the relationship between human and environment were included in the primary school science curriculum in 1992. Since behaviorist approach was dominant within this curriculum, the curriculum developed in 2000 was intended to be more student-centered (Ünsal, 2004). The primary school science curriculum initiated in 2000 aimed to increase students' environmental knowledge and consciousness. Topics that emphasized the environment and humans' interaction with the nature were included in the primary school science curriculum. At first glance, this seems to be an extension of many

topics of 1992 primary school science curriculum. However, since the 2000 curriculum did not satisfy the needs of modern society, the Turkish Education System has been undergoing reforms at the primary and secondary level since 2004 (TTKB, 2004). These reforms have been part of the adaptation process associated with Turkey's joining the European Union, and reflect the incorporation of constructivist approaches to the school curricula. This new primary school curriculum (grades 1-5) has placed greater emphasis on the environment, which is accepted now as one of the broad dimensions in Science and Technology Education Course. This 2004 curriculum goes further and aims at developing students' attitudes, skills, and behaviors as well as knowledge for developing scientific literacy of the students. Furthermore, topics related to the environment have been introduced into in Life Studies (1st, 2nd and 3rd grade), Social Studies (4th and 7th grade) and some other interdisciplinary courses (e.g., Health Education, Citizenship and Human Rights Education, and Special Education). The new curricula for the elementary level (1st to 5th) was piloted in 2004 and disseminated to all schools in 2005, while the curricula for middle level has been piloted and disseminated gradually (e.g., with one new grade level added each year). Similar developments have also been undertaken for pre-school education (3-6 years old-children). 2002 pre-school education curriculum including several environmental-related topics and objectives (Buhan, 2006) were up-dated in 2005-2006 academic year as a result of reform attempts in primary education.

With the intent of improving environmental literacy among the students, almost each school establish an environment and/or nature club, and student are left free to select to be part of this club and be involved in the club activities (e.g. planting, cleaning school garden, recycling…etc). Also, the schools celebrate some special days and weeks such as animal protection day (November 4th), energy possession/saving week (second week of the January), the forest week (March, 21st -26th), the tourism week (April, 15th – 22nd) and environment day (Jun, 5th). Furthermore, funded by MONE, and Ministry of Environment and Forestry, schools conduct environmentally related competitions among the students to help them better understand the environment and

develop environmental literacy (e.g., competitions involving pictures, projects, posters, stories and poems).

2.4. Conceptual Framework of EE

In the professional literature on the area of EE, it is apparent that the definition of EE is still evolving. There is no single definition of EE observed in the literature, because of the encompassing nature of EE (Schmieder, 1977). Looking at the historical roots of EE, three main educational movements which are nature study, conservation education and outdoor education provided a base for developing the EE. An early succinct definition of the environmental education appeared in a graduate seminar in the Department of Resource Conservation and Planning of The University of Michigan under the leadership of William B. Stapp (Disinger, 1983). Stapp et al. (1969) realized that recent movement which was conservation education was oriented to basic resources, but not to community environment and its associated problems. He emphasized the importance and necessities of educating people for their relationship with the total environment. He and his colleagues defined that

> EE is aimed at producing a citizenry that is knowledgeable concerning to bio-physical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (Stapp et al., 1969, p 31).

To them, major objectives of EE were to promote the people to develop and/or acquire (Stapp et al., 1969)

> (1) a clear understanding that man is an inseparable part of a system, consisting of man, culture, the biophysical environment, and that man has the ability to alter the interrelationship of this system,
> (2) a broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society,
> (3) a fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and their responsibilities of citizens and government to work toward their solution and

> (4) attitudes of concern for quality of the biophysical environment which will motivate citizens to participate in biophysical environmental problem-solving (p 31)

The understanding of Stapp and his colleagues further referred that human-kind can not be separated from the natural setting and can not be thought as a separate part of the environment. The problems in the environment came out as a result of functions of human-kind that directly influence themselves. For living in healthy environment and sustaining the biophysical environment, people should be aware of their influences, responsibilities and commitments toward the natural environment and thus, should take necessary actions. Knowledge of the environmental problems, awareness of possible solutions and motivation to take necessary action were identified as three statements of objectives. They believed that the major objectives of EE are to help people acquire the understanding of biophysical environment and its role in the society, the understanding of their interdependence on the system including people, culture and biophysical environment, the understanding of their citizenship responsibilities toward solving the environmental problems and of concerns that would motivate people to act. The definition done by Stapp and his colleagues was further revised and modified by R. Roth in 1970. In the Roth's (1970) definition, four major areas of concern were observed; biophysical, socio-cultural, environmental management and change. In the same year, Schoenfeld (1969) tried to answer to whether "it (EE) is simply conventional conservation education in a new bottle (p. 1)" or not. He realized that EE is more comprehensive than conservation education (CE) and more concerned with the relationship between man and his surrounding as a whole. Also, he indicated that EE is more man-centered and puts more emphasize on the study of man; "man affects the environment and affected by his environment (p. 2)". Tanner (1974b) later discussed and supported Schoenfeld's claims by comparing CE with EE.

Later, parallel to Stapp and et al.' (1969) definition of EE, Rillo (1974) mentioned about the objective of EE as the growing individuals who are motivated to use of the environment and natural resources rationally to get highest quality of life for all. He

believed that biophysical world including the natural environment (bio-sphere) and the man-made environment (psycho-sphere) should be understood by the individuals. He further discussed about the inclusion of the biological, social, economic, cultural, ethical and aesthetic components of environment into the EE content. The same as Stapp and his colleagues' understanding, it is observed in Rillo's definition and view that human being can not be thought to be separate from the natural environment, but to be interrelated with the environment including natural and cultural life. Similarly, Tanner (1974a) asserted that the focus of EE should be on Spaceship Earth concept, and man-man, man-society and man-earth relationship should be dealt with by EE. He further claimed that some of the writers defined EE with regard to content whereas others with regard to methodology.

A need for and development of EE addressing to environmental issues & problems in the world were discussed in Recommendation 96 of Stockholm Conference on the Human Environment in 1972 (United Nations, 1972). In the conference a need for creating people who are aware of environmental crisis and, at the same time, able to overcome those crisis by focusing intelligently on the means were also pointed out. However, the definition, goals, characteristics and guiding principles were not explicitly mentioned in this conference.

Another broad definition of EE was proposed by the International Union for the Conversation and Nature and Natural Resources (IUCN, 1972). This organization defined EE as

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

Following to Stockholm Conference on the Human Environment, one of the early milestones that contributed to the area of EE was International Workshop on Environmental Education held in Belgrade in 1975. This workshop produced

tentative framework for EE and over 100 recommendations (Stapp, 1978; Stapp, 1975; UNESCO-UNEP, 1975). Within the tentative framework of EE produced, the goal and objectives of the EE were stated (UNESCO, 1975). According to Charter, produced in Belgrade Workshop, the general goal of EE was;

> …to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually, and collectively toward solutions of current problems and prevention of new ones (UNESCO, 1975, p.3).

The objectives of EE taking place in this global framework were based upon six levels such as awareness, knowledge, attitude, skills, evaluation ability and participation. Those objectives of EE stated in the charter were:

> *Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.*
> *Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.*
> *Attitude: to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.*
> *Skills: to help individuals and social groups acquire the skills for solving environmental problems.*
> *Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological, political, economic, social, esthetic and educational factors.*
> *Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems* (UNESCO, 1975, p.3).

Schmieder (1977) indicated the importance of EE for promoting and sustaining world-wide dialogue which would stress ecological principles and go far beyond ideological and political borders. He identified the goal of EE as

> …developing a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward the solution of current problems and the prevention of new ones (p.27).

Two years after Belgrade Workshop, the term EE was more elaborated in the first Intergovernmental Conference on Environmental Education held in Tbilisi in Georgia in 1977, also known as Tbilisi Declaration. Aims, goals and objectives of EE were identified by the participants of the conference. As a result of the basic aim of EE was proposed:

> …to succeed in making individuals and communalities understand the complex nature of the natural and built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects, and acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and the management of the quality of the environment (UNESCO, 1978, p.25).

The conference also endorsed the goals, objectives and guiding principles for EE. The goals stated in the conference final report were

> (1) to foster clear awareness of, and concern about, economic, social, political and ecological, interdependence in urban and rural areas;
> (2) to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
> (3) to create new patterns of behavior of individuals, groups and society as a whole towards the environment (UNESCO, 1978, p.26).

The objectives were set by adapting from the early definition of Stapp et al. and from the objectives identified in Belgrade in 1975. The categories of the objectives were as follows;

> Awareness: to help social groups and individuals acquire an awareness of sensitivity to the total environment and its allied problems

> Knowledge: to help social groups and individuals gain variety of experience in, and acquire a basic understanding of the environment and its associate problems
> Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection
> Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems
> Participation: to provide social groups and individuals with and opportunity to be actively involved at all levels of in working toward resolution of environmental problems (UNESCO, 1978, p. 26-27).

One of the objective areas which was stated in Belgrade but not in the Tbilisi Conference was "*evaluation ability*". The other areas are similar and overlapping.

As well as aim, goals and objectives, the participants of Tbilisi Conference also identified several guiding principles [it is called as recommendations in Tbilisi Report] that were proven and validated in further years by Hungerford et al. (1980) and Hart (1981). In Tbilisi Report Recommendation (UNESCO, 1977), EE was considered "*interdisciplinary subject*" and "*an approach to education as a whole, rather than a subject".* So, EE can be used to improve all subjects in the curriculum (Fien & Corrcoran, 1996). In order to conceptualize EE and identify the key characteristics of EE, Hart (1981) conducted a broad review of EE related documents published within the dates between 1968 and 1978 by using historical research design. He identified 25 key characteristics for EE, so called as common themes emerged from the documents; such as, interdisciplinary, multilevel, global views, concepts, process development, problem solving, values clarifying, system thinking, first-hand experiences and activities, environmental issue oriented, present and future orientation, active participation, individual learning, team approach to teaching/learning, new productive student-centered relationships, community oriented, field studies (urban and natural environments), communication networking, coordination and cooperation, flexible administrative organizational patterns, reform of educational processes and systems, curriculum development base, curriculum evaluation base, research base and teacher education.

Furthermore, Hungerford, et al. (1980, p.43) refined the goals and objectives of EE and proposed a super ordinate goal for EE as

> aiding citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment.

Hungerford and his colleagues further discussed the more specific a set of intermediate and sub-goals for helping EE program developers and practitioners. Four levels of sub-goals were presented in their paper for curriculum development for EE, namely (1) Ecological Foundation Level, (2) Conceptual Awareness level – Issues and Values, (3) Investigation and Evaluation Level and (4) Environmental Action Skills Level – Training and Application.

Stapp et al. (1969) definition of EE, and goals, objectives and definitions of EE done in the Belgrade Charter and Tbilisi Declaration were the early attempts to develop the area of EE. Recent definitions of EE are all based upon these initial attempts. In the report published by the North American Association for Environmental Education (NAAEE) (2001), EE is defined as a comprehensive process that develop an environmentally literate people and that help people understand the environment where they live, their place in it and related issues. Further, Environmental Protection Agency (EPA) (1998) defines the EE as

> ...the interdisciplinary process of developing a citizenry that is knowledgeable about the total environment its nature and built aspects and has the capacity and commitment to insure environmental quality by engaging in inquiry, problem solving, decision-making and action (EPA, 1998, p.1).

One can understand from EPA's definition that EE is very important area to develop people who are knowledgeable on environment, sensitive toward environment, and have desirable behavior for environment. Furthermore, UNESCO-UNEP (1991, as cited in Makki, Abd-el-Khalick, & Boujaoude, 2003) declared that EE is important

and crucially needed for preparing environmentally literate students who will play active role for protecting the environment and taking environment friendly behavior. It is clear that one of the essential aims of the EE is to cultivate every learner who has responsible attitudes toward environment (Palmer, 1998).

One of the most recent definitions has been done by the National Environmental Education Advisory Council of the U.S. EPA. This Council defines EE as

> …the interdisciplinary process of developing a citizenry that is knowledgeable about the total environment in its natural and built aspects and has the capacity and commitment to insure environmental quality by engaging in inquiry, problem solving, decision-making and action (Landers, Naylon, & Annette, 2002, p.5).

It is apparent in the early and recent definitions that EE is still evolving, and new trends and attempts in this area play a great role to develop this broad and complex term. It is defined that EE is a way of learning regarding as human relations with the environment. In this regard, Doğan (1997) asserts that EE has aims in relation to both cognitive and affective domains. Whereas aims in cognitive domain enable individuals to be more environmentally literate, aims in affective domain comprise values and attitude toward environment and environmental problems. In addition to these aspects of learning, some aims of EE are more related to a psychomotor aspect (domain). These types of aims or objectives enable the individuals to take responsible action toward protecting the environment.

The fundamental characteristics of EE were proposed in Tbilisi in 1978. According to the document published after this conference, Palmer (1998) stated that EE;

- is a life long process,
- is interdisciplinary and holistic in nature and application,
- is an approach the education as a whole, rather than a subject,
- concerns the inter-relationship interconnectedness between human and natural system,
- views the environment in its entirety including social, political, economics, technological, moral, aesthetic, and spiritual aspects,

- recognizes that energy and material sources both present and limit possibility,
- encourages participation in the learning experiences
- emphasizes active responsibility,
- uses a broad range of teaching and learning techniques, with stress on practical activities and first hand experience,
- is concerned with local to global dimensions, and past/present/future dimensions,
- should be enhanced and supported by the organization and structure of the learning situation and institution as a whole,
- encourages the development of sensitivity, awareness, understanding, critical thinking, and problem solving skills,
- encourages the clarification of values and the development of values sensitive the environment,
- is concerned with building an environmental ethic (p.10-11).

As a conclusion, EE is an interdisciplinary, holistic and life-long in nature (Palmer, 1998; Schmieder, 1977) which helps the individuals develop awareness of, knowledge and attitudes regarding the natural environment, acquire skills and motivation to act as an active citizenship so as to resolve environmental problems and issues, and finally develop active involvement in preventing environmental problems and protecting and improving the environment (Hsu, 1997). As clearly inferred in the professional literature and in the definitions of EE, the ultimate aim of EE is to develop environmentally literate people and thus, responsible environmental behaviors of individuals (Hungerford & Volk, 1984, 1990).

2.5. Conceptual Framework of Environmental Literacy (EL)

It is apparent in the professional EE literature that major outcome of EE is perceived as development of "*environmentally literate citizenry*". This outcome is either explicitly or implicitly observed in published definitions and frameworks (Disinger, 1983; Disinger & Roth, 1992; Harvey, 1977; Hungerford & Volk, 1990; Roth, 1992; Schmeider, 1977; Simmons, 1995; Stapp et al., 1969), sets of goals and objectives (Hungerford, et al., 1980; NAAEE, 1999; United Nations, 1992; UNESCO, 1977, 1978), reviews of the professional literature (Hart, 1981; Osbaldiston, 2004), and

collections and reviews of research (Erdoğan & Marcinkowski, 2007; Hart & Nolan, 1999; Hines, Hungerford & Tomera, 1986/87; Iozzi, 1981, 1984; Marcinkowski & Mrazek, 1996; Rickinson, 2001; Volk & McBeth, 1997).

The term, EL, has been used for about five decades in the professional EE literature. However, there is no exact definition of it (Disinger & Roth, 1992) even though it is a subject of many research studies, numerous researchers (e.g., Hungerford, McBeth, Volk and Marcinkowski) and organizations (e.g., NAAEE and EPA) have written about EL.

Harvey (1977) conducted an extensive review of literature in order to conceptualize EE. He concluded that structure of EE includes four basic parts; the generic structure of EE (including three sub-parts – philosophy, precept, and expected outcomes), the specifics of substantive structure, a super-ordinate goal and a base. He indicated that the expected outcome of EE referred in his substantive review of literature is "*developing environmentally literate citizenry*" or "*environmental literacy*" (p.67). Harvey added two more categories for expected outcomes. According to the results of his substantial review, the levels of expected outcomes of EE are to develop; (1) environmentally literate person, (2) environmentally competent person, and (3) environmentally dedicated person. Figure 1.1 summarizes his completed substantive structure of EE. He defined environmentally literate person as "*one who possesses basic skills, understandings, and feelings for the man-environment relationship* (p.67)". This was one of the early attempts to conceptualize EE and define the EL.

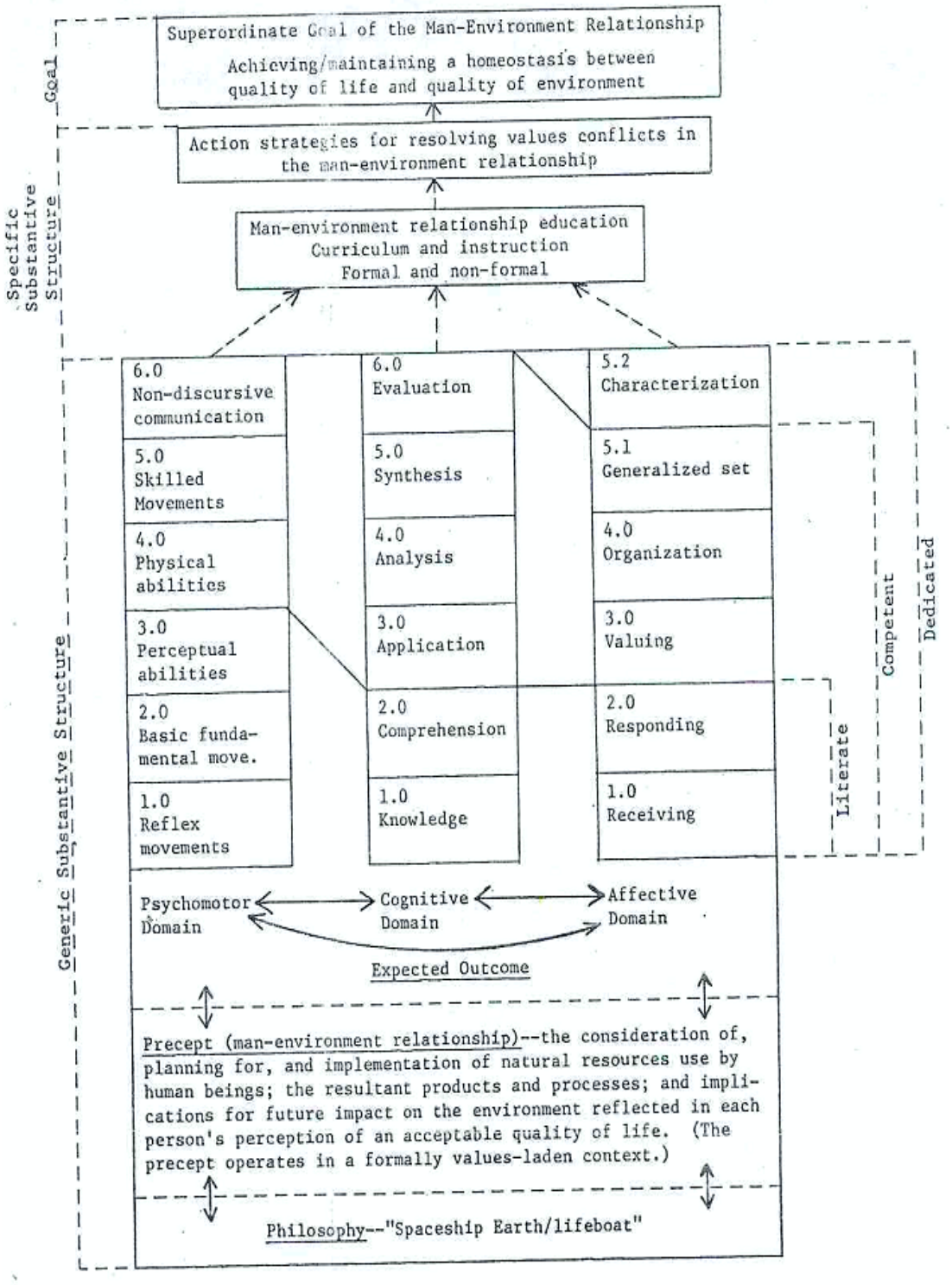

Figure 2.1. The Completed Substantive Structure of "Environmental Education" (Harvey, 1977, p.69)

It is clear that there is no available universal definition of EL. Various researchers defined EL by considering their own context and their research findings. Rockcastle (1989) defined EL as understanding of the interaction between humans and their natural environment in terms of living things and non-living things. This definition of EL seems to be parallel with the definition of EE done by Stapp et al. 1969.

Daudi (1999) relates EL with the cognitive term which basically refers to having an ability to write and read about EL, or environmental knowledge at broad scale. However, Coppola (1999) indicates that even though literacy is defined in only cognitive terms, EL can not be bounded with cognitive terms only. It should be defined

> in both cognitive terms with knowledge as a necessary precondition of thoughtful behavior and action and in conative terms with behavioral change following directly from knowledge and skills (p.40).

Schneider (1997) also indicated "*environmental literacy is not simply being well versed in the knowledge and methods of related environmental disciplines* (p. 457)". Stables (1998) argued that knowledge is one of the important components of EL, not the only predictors of being environmentally literate. Furthermore, Roth (1992) believed that EL is beyond the certain cognitive skills and the basic definition of literacy – ability to read and write. He claimed that

> Environmental literacy builds on an ecological paradigm. Environmental literacy is the capacity to perceive and interpret the relative health of environmental systems and to take appropriate action to maintain, restore, or improve the health of those systems (p. 17).

Roth further elaborated that EL draws on four major strands – *Knowledge, Skills, Affect* (environmental sensitivity, attitudes and values) and *Behavior* (personal investment and responsibility, and active involvement). To him, EL includes particular ways of thinking, acting and valuing. Roth identified three levels or degrees of environmental literacy – (1) Nominal, (2) Functional, and (3) Operational.

> (1) Nominal environmental literacy specifies a person able to recognize many of the basic terms used in communicating about the environment and able to provide rough, if unsophisticated, working definition of their meaning (p. 28).
>
> (2) Functional environmental literacy indicates a person with a broader knowledge and understanding of the nature and interactions between human social systems and other natural systems (p.29).
>
> (3) Operational environmental literacy indicates a person who has moved beyond functional literacy both the breath and depth of understanding and skills, and routinely evaluates the impacts and consequences of actions; gathering and synthesizing pertinent information, choosing among alternatives, and advocating action positions and taking actions that work to sustain or enhance a healthy environment (p. 32).

Bogan and Kromrey (1996) defined EL as "*knowing ecology, being attitudinally predisposed to the environment, valuing responsible environmental behaviors, participating in responsible environmental behaviors and knowing political action strategies* (p.1)". Roth (1992) believed that EL demands understandings, skills, attitudes and habits of minds that would empower long-term action for sustainable future. He further claimed that EL must be defined in terms of observable behavior, which is later called as responsible environmental behavior (REB) or environmentally responsible behavior (ERB). Theoretical literature analyzed by Morrone, Mancl and Carr (2001) revealed that EL involves more than only knowledge on the environment, but it also involves values, attitudes, skills and action. Parallel to this claim, Goldman, Yavetz and Pe'er (2006) identified environmentally literate person as "*possessing the values, attitudes, and skills that enable knowledge to be converted into action* (p.5)". They further claimed that the variables fostering EL can contribute to ERB. Likewise, Sivek (1987; as cited in Hsu, 1997) equated EL with environmental action, environmental behavior or citizen action while Sia (1984; as cited in Hsu, 1997) believed that ERB and EL are synonymous. However, Buetthe and Smallwood (1987) conducted a research with teachers, and equated their environmental knowledge and attitudes with EL. Hungerford and Peyton (1976, as cited in Hungerford & Peyton, 1977) proposed that

> EL is, in part, reflected by human beings who have knowledge of and the ability to communicate the need for environmental action strategies, who have the ability to use those skills inherent in environmental action strategies, and who are willing to use action strategies in an effort to remediate environmental issues (p. 4).

Furthermore, Marcinkowski (1991) recognized that EL involves;

> (a) awareness and sensitivity toward the environment,
> (b) an attitude of respect for the natural environment and of concern for the nature and magnitude of human impacts on it,
> (c) a knowledge and understanding of how natural system work, as well as of how social systems interface with natural systems,
> (d) an understanding of various environmentally-related problems and issues (local, regional national, international and global),
> (e) the skills required to analyze, synthesize, and evaluate information about environmental problems/issues using primary and secondary sources, and to evaluate a select problem/issue on the basis of evidence and personal values,
> (f) a sense of personal investment, responsibility for, motivation to work individually and collectively toward the resolution of environmental problems/issues,
> (g) a knowledge of strategies available for use in remediating environmental problems/issues,
> (h) the skills required to develop, implement and evaluate single strategies and composite plans for remediating environmental problems/issues, and
> (i) active involvement at all levels in working toward the resolution of environmental problems/issues (As cited in Simmons, 1995, p.17)

Roth (1992) identified two continuum of EL from *inability* to *sophisticated* competency, and describes the continuum of EL as "*a continuum of competencies* (p.8)". He further discusses about tree levels of EL as nominal literacy, functional literacy and operational literacy. Harvey (1977) identified three types of people falling into this continuum. The continuum he described starts with environmentally literate person, moves with environmentally competent person and ends with environmentally dedicated person. Stables (1998) suggested three types of environmental literacy to be included into curriculum; (1) functional, (2) cultural, and (3) critical. Stables (1998) relates these types of EL with Hungerford et al. (1980)'s goals for EE curriculum. Functional EL is related to knowledge on ecological concepts and similar to Goal Level I – Ecological Foundation Level.

Cultural EL is more related to why society values the environment and similar to Goal Level II – Conceptual Awareness Level. Critical EL is more related to helping students develop appropriate citizen action based on using functional and cultural EL. This is similar to combination of Goal Level III – Investigation and Evaluation Level and Goal Level IV – Environmental Action Skills Level.

The Environmental Literacy Assessment Consortium consisting of EE scholars (H. Hungerford, T. Volk, R. Wilke, R. Champeau, T. Marcinkowski, B. Bluhm and R. McKeown-Ice) designed EL framework based upon historical definitions, research and evaluation literature, and learning outcomes in EE (Simmons, 1995; Wilke, 1995). Their framework of EL includes following dimensions;

(1) *Cognitive dimensions* (knowledge and skills)
   a. knowledge of ecological and socio-political foundations,
   b. knowledge of and ability to identify, analyze, investigate and evaluate environmental problems and issues,
   c. knowledge of and ability to apply environmental action strategies seeking to influence outcomes on environmental problems and issues,
   d. ability to develop and evaluate an appropriate action plan for the resolution of environmental problems and issues.

(2) *Affective dimensions*
   a. recognition of the importance of environmental quality and the existence of environmental problems and issues,
   b. emphatic, appreciative and caring attitude toward the environment,
   c. willingness to work toward the prevention and/or remediation of environmental problems and issues

(3) *Additional determinants of environmentally responsible behavior*
   a. belief in their ability, both individually and collectively, to influence outcomes of environmental problems and issues
   b. assumption of personal responsibility for personal actions that influence the environment

(4) *Personal and/or group involvement in environmentally responsible behaviors*
   a. eco-management
   b. economic/consumer action
   c. persuasion
   d. political action
   e. legal action

In short, early definition of Stapp et al. (1969), categories of EE proposed in the Tbilisi Declaration (UNESCO, 1978), Hart's identification of key characteristics of EE (Hart, 1981), the findings of Harvey's substantial review of EE structures (Harvey, 1977), Goals for Curriculum Development proposed and validated against the Tbilisi objectives by Hungerford et al. (1980), Roth's framework (Roth, 1992), the results of an analysis of 26 frameworks (Simmons, 1995), a framework developed by The Environmental Literacy Assessment Consortium (Wilke, 1995), and a meta analysis of research on ERB (Hines et al, 1986/87; Osbaldiston, 2004) provides substantial evidences that EL includes four main categories; (1) Knowledge, (2) Affect, (3) Skill, and (4) Behavior (Hsu, 1997).

Over time, an increasing number of professionals in the field have recognized that single or multi-sentence definitions and finite sets of goals and objectives, as useful as they have been, are limited in breadth and depth (scope), as well as the extent to which they can be adapted to accommodate external influences on the field (e.g., emergent needs such as sustainability and climate change) and internal developments within the field (e.g., findings from reviews of research). These and other sources, and this line of thinking, have contributed to the development of broader, evolving lists of environmental literacy components (e.g., Roth, 1992; Simmons, 1995; Wilke, 1995). In response to the opening question, each of these frameworks posit that environmental literacy encompasses at least five clusters of learning outcomes within several common learning domains: (Cognitive) Knowledge and Skills; (Affective) Affective Dispositions and Determinants of Behavior; (Psychomotor or Conative) Environmentally Responsible Behavior. In general, Environmental Education (EE) and the more recent Education for Sustainability (EFS) have been identified as means or tools for developing environmental literacy (Sato, 2006; Stapp et al, 1969; Roth, 1992; United Nations, 1992).

2.5.1. Components and Sub-Components of EL

The recent and working model of the environmental literacy was developed by Simmons (1995) under the North American Association for Environmental Education (NAAEE) Guidelines for Excellence Project. She synthesized 26 EE frameworks. That working model of environmental literacy consisted of seven components: affect, ecological knowledge, socio-economic knowledge, knowledge of environmental issues, skills, additional determinants of environmentally responsible behavior, and environmentally responsible behavior. This framework was used in its entirety by Volk and McBeth (1997) in their effort to generate a research-based picture of the status of environmental literacy in the U.S., and in part by researchers undertaking national assessments of environmental literacy in South Korea (Lee et al., 2003), Israel (Negev et al., 2006), and the U.S. (McBeth, 2006). These components were described by Simmons (1995) as following:

> *Affect* refers to factors within individuals which allow them to reflect on the environmental problems/issues at the interpersonal level and to act on them if they judge the issue/problem warrants action
>
> *Ecological knowledge* refers to the knowledge of major ecological concepts. Ecological knowledge also refers to a knowledge and understanding of how natural system work, as well as knowledge and understanding of how natural system interface with social system.
>
> *Socio-Political knowledge* includes an understanding of the relationship between beliefs, political systems, and environmental values of various cultures. Socio-political knowledge also includes an understanding of how human cultural activities (e.g. religious, economic, political, social and other) influence the environment from an ecological perspective. Also included within this category is knowledge related to citizen participation in issue resolution.
>
> *Knowledge of environmental issues* includes an understanding of environmental problems/issues caused as a result of human interaction with the environment. Also included within this category is knowledge related to alternative solutions to issues.
>
> *Cognitive skills* are those abilities required to analyze, synthesize and evaluate information about environmental problems/issues and to evaluate a select

> problem/issue on the basis of evidence and personal values. This category also includes those abilities necessary for selecting appropriate action strategies, and for creating, evaluating and implementing an action plan
>
> *Additional determinants of environmentally responsible behavior* include locus of control and the assumption of personal responsibility.
>
> *Environmentally responsible behaviors* include active and considered participation aimed at solving problems and resolving issues. Categories of environmentally responsible actions are persuasion, economic and consumer action, eco-management, political action and legal action. (Volk & McBeth, 1997, pp. 8-9)

Although the concept of environmental literacy (EL) has been investigated in the various parts of the world over the past three decades, this concept has only recently begun to be explored in any depth within the Turkish EE community and literature (Erdoğan & Marcinkowski, 2007).

Furthermore, these dimensions were divided into more specific components reported by Simmons (1995) and Volk and McBeth (1997), and later used for determining the correlation between standards and an environmental literacy framework done in Melbourne, Florida (Babulski, Gannett, Myers, Peppel and Williams, 1999). Although Babulski et al. (1999) used 36 components in their analysis, four additional components (Erdoğan & Marcinkowski, 2007) were added to these sub-components.

In order to classify and analyze the studies, the components and topics associated with these components were reviewed and refined using of four texts on ecology and environmental science (Cunningham, & Saigo, 2001; Enger, & Smith, 2002; Miller, 1998; Raven, & Berg, 2001). Thus, forty-one sub-components are grouped into six major components of EL with regard to their relevance. Table 2.1 illustrates these subcomponents and corresponding components and categories.

Table 2.1
Categories, Components and Sub-components of EL

Categories	*Components*	*Sub-components*
COGNITIVE	Knowledge of Natural History and Ecology	Species and Population
		Environments and Habitats
		Communities and Interaction
		Abiotic Factors and Matter Cycles
		Ecosystem and Biomes
		Natural and Social System
		Physical and Biological History
	Knowledge of Environmental Problems and Issues	Risk, Toxicology and health*
		Bio-Physical Problems
		Causes of Problems
		Socio-Political Issues
		Causes of Issues
		Effects of Problems and Issues
		Natural Disaster*
		Alternatives Solutions and Actions
	Socio-Political-Economic Knowledge	Cultural Values and Activities
		Economic Values and Activities
		Societal and Social System
		Governmental and Political System
		Geographic Pattern
		Citizenship Participation
	Skills	Problems and Issue Investigation Skills
		Issue Analysis Skills
		Variable and Research Question Skills
		Data Collection Skills
		Data Analysis Skills
		Action Skills
AFFECTIVE	Affect and Determinants of Behavior**	Intention to Learn / Eagerness to Learn / Curiosity*
		Environmental Appreciation and Sensitivity
		Environmental Attitudes***
		Environmental Values***
		Ethical and Moral Reasoning
		Efficacy / Locus of Control
		Personal Responsibility
		Willingness/Motivation/Intention to Act
ACTION	Responsible of Environmental Behavior	Conservation and Eco-management
		Consumer and Economic Action
		Interpersonal and Public Persuasion
		Governmental and Political Action
		Legal Action and Law Enforcement
		Other forms of Citizen Action

* These sub-components were never used in the analysis before. They emerged from the literature review and the topics in the books examined by the researcher

** Affect and additional determinants of ERB were combined as one category, because of their similar nature.

*** In the early categorization of Babulski et al. (1999), attitude and values had been combined. However, they were separated and a new sub-component name was given to each of them in the later categorization of Erdoğan and Marcinkowski (2007).

2.6. Conceptual Framework of Environmentally Responsible Behavior (ERB)

Changes in behaviors were discussed and given emphasis as a goal of EE in Tbilisi conference (UNESCO, 1978). In the conference, the governments agreed that one of the goals of EE is to "*create new patterns of behavior of individuals, groups, and society as a whole towards the environment* (p.26)". In line with the efforts dedicated to develop the area of EE in Tbilisi, as proposed and accepted by many scholars, the ultimate goal of EE is acquisition of environmentally responsible behaviors (ERB) and to develop environmentally responsible and active citizens (Childress & Wert, 1976; Culen, 2001; Hungerford et al., 1980; Hungerford & Volk, 1984; Hungerford & Volk, 1990; Leeming, Dwyer, Porter & Cobern, 1193; Roth, 1970, 1992; Stapp et al, 1969). Based upon the objectives proposed in Tbilisi Conference, Hungerford and Volk (1990) defined environmentally responsible citizens as the ones who have

> (1) an awareness and sensitivity to the total environment and its allied problems [and/or issues], (2) a basic understanding of the environment and its allied problems [and/or issues], (3) feeling of concern for the environment and motivation for actively participating in environmental improvement and protection, (4) skills for identifying and solving environmental problems [and/or issues], and (5) active involvement at all levels in working toward resolution of environmental problems [and/or issues] (p. 9).

Early studies and traditional understanding / thinking supported linear relationship among knowledge, attitude and action variables for behavioral change process (Culen, 2001) and proposed knowledge-attitude/awareness-behavior model (Ramsey & Rickson, 1977). According to traditional thinking, the more knowledge people have about the environment, the more they tend to engage in responsible behaviors toward protecting the environment and dealing with environmental problems. It was postulated in the model that increased knowledge on the environment will lead to developing environmental awareness or attitudes which will turn into responsible environmental behavior (Ramsey & Rickson, 1977). Hungerford and Volk (1990) show this linear relationship in their model as in Figure 2.2.

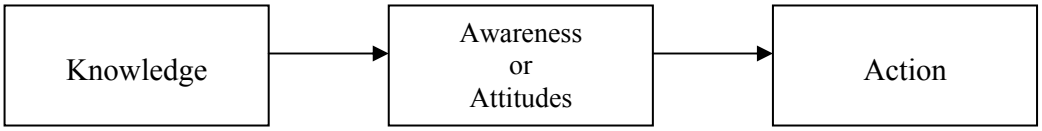

Figure 2.2 Behavioral Change System (Source: Hungerford and Volk, 1990, p.9)

This linear relationship might only show three assumptions pertaining to the knowledge – behavior, knowledge – attitudes / awareness, and attitudes – behavior relationships and not provide adequate evidences about direction of the relationship and the effects of possible background variables and other cognitive and affective factors contributing to ERB. However, it is obvious that human behavior is not a single construct predicted by limited number of variables (Fishbein & Ajzen, 1995). Hines et al. (1986/87) performed a meta-analysis with 128 empirical studies to assess the variables strongly associated with ERB. Their analysis resulted in several factors contributing to ERB. Fifteen separate variables were analyzed in accordance with their association with ERB. They categorized the variables emerged from their meta-analysis of 128 studies; (1) Cognitive variables, (2) Psycho-social variables, (3) demographic variables, and (4) a category of experimental studies comprised of behavioral intervention approaches and classroom strategies aimed at encouraging REB. Hines et al. (1886/87) further developed a model of responsible environmental behavior based upon their findings of meta-analysis study. Figure 2.3 displays their model of REB.

Their analysis and model proposed accordingly indicates following inferences;

> An individual who expresses an intention to take action will be more likely to engage in the action than will an individual who expresses no such intention. …it appears that intention to act is merely an artifact of a number of other variables acting in combination (e.g. cognitive knowledge, cognitive skills and personality factors) (p. 6).

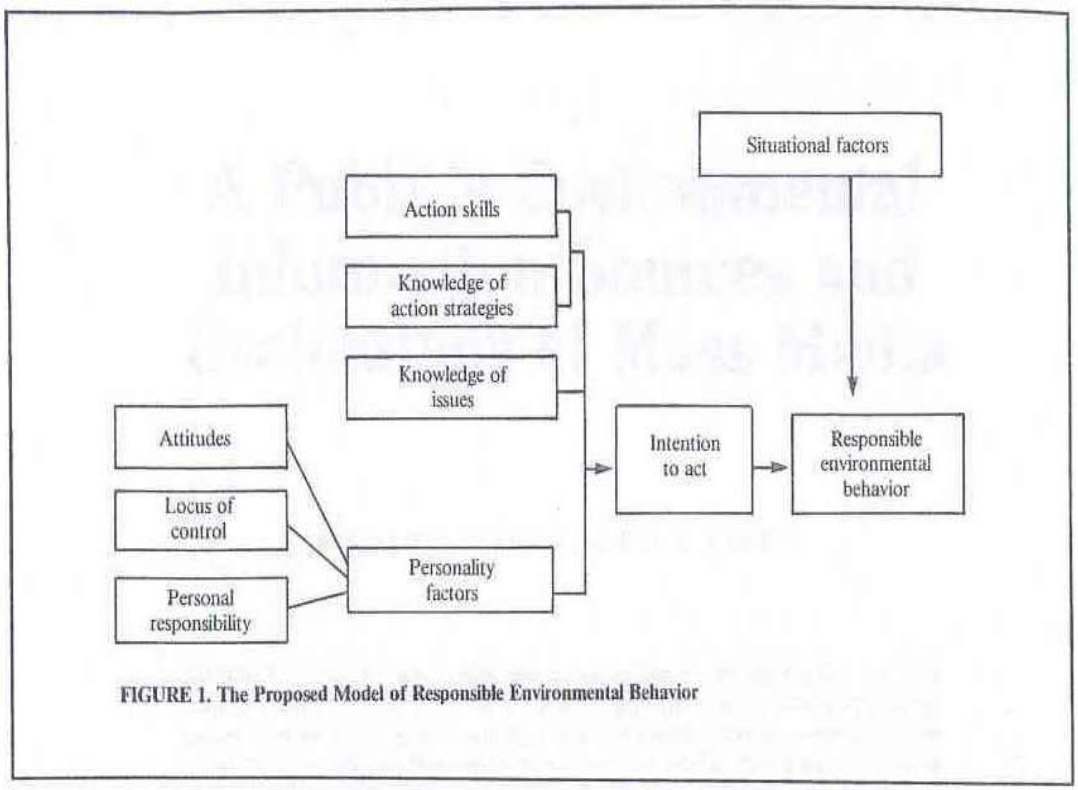

Figure 2.3. The Proposed Model of Responsible Environmental Behavior (Hines et al, 1986/87, p. 7)

> …knowledge of the problem appears to be a prerequisite to action (p.6)
>
> …it appears that skill in the application of action strategies to issues, combined with the appropriate knowledge, endow individuals with the abilities to take action (p.7)
>
> …an individual with an internal locus of control, positive attitudes toward the environment and toward taking action, and with a sense of obligation toward the environment will likely develop a desire to take action (p.7). Situational factors, such as economic constrains, social pressures and opportunities to choose different actions may … serve to either counteract or to strengthen the variables in the model (p.7)

Several other models on investigating the determinants of ERB have been developed subsequent to Hines et al.'s model. For example, Hungerford and Volk (1990) developed their own model based upon previously proposed models. They identified three categories of variables contributing to behavior; (1) Entry-level variables, (2)

ownership variables, and (3) empowerment variables. Their model of behavioral flow chart is displayed in Figure 2.4

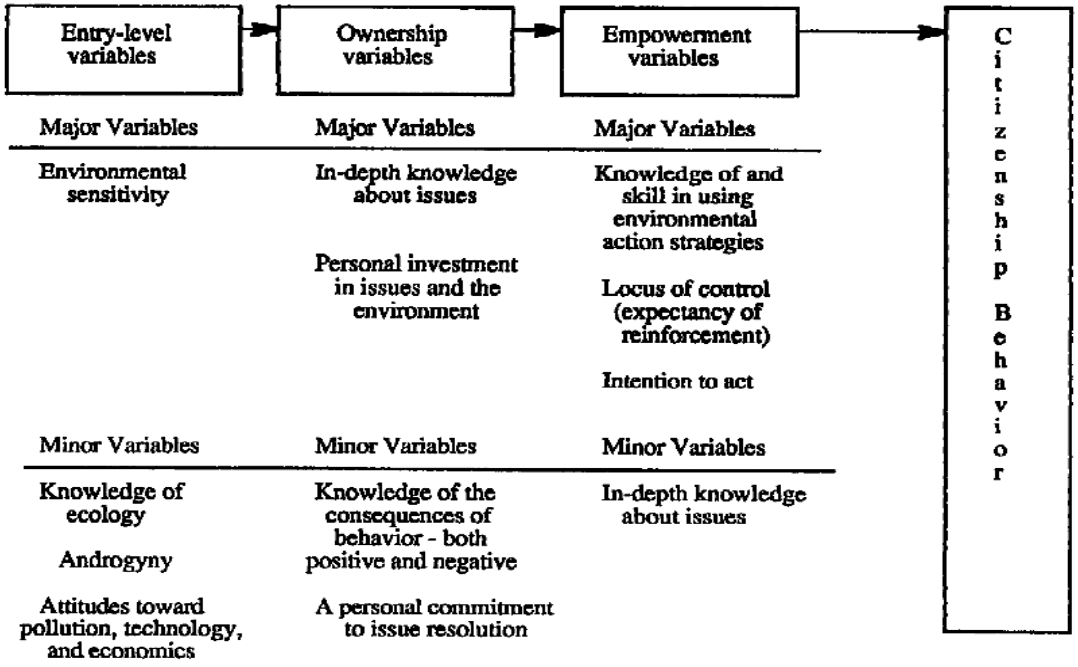

Figure 2.4 Behavioral Flow Chart: Major and Minor Variables Involved in Environmental Citizenship Behavior

Entry level variables seem to be predictors and includes prerequisite variables (environmental sensitivity, androgyny, knowledge of ecology and attitudes toward pollution/technology/economics) enhancing decision making process of people. Ownership variables which make environmental issues personal include two main variables; in-depth knowledge (understanding) of issues and personal investment. Empowerment variables enable human being to feel that they have ability to make changes and help resolve the environmental problems and issues. Empowerment variables include perceived skill in using environmental action strategies, knowledge of environmental action strategies, locus of control and intention to act.

ERB has been classified into different sub-categories and/or components in the existing literature. Hungerford and Peyton (1976, as cited in Smith-Sebasto, 1992) identified six categories of ERB as

> (1) *Persuasion*; a verbal effort to motivate someone to take positive environmental action as a function of modified values, (e.g. letter writing, debate).
> (2) *Consumerism*; an economic threat aimed at modification in business or industry (e.g. boycotting and discriminating use of goods).
> (3) *Political action*; an effort aimed at persuading an electorate, legislators, or government agencies to conform the values held by the person or persons who initiated the action (e.g. lobbying, voting).
> (4) *Legal action*; any legal/judicial action aimed at some aspect of environmental law enforcement – or, a legal restraint preceding some environmental behavior perceived as undesirable (e.g. injunctions)
> (5) *Eco-management*; any physical action aimed at maintaining or improving natural systems (e.g., reforestation, urban landscaping).
> (6) *Interaction*; any combination of two or more of the above components (Ramsey, Hungerford & Tomera, 1981, p.24).

Champeau (1982, as cited in Hsu, 1997) modified one of these categories; consumerism to economic action. His definition of economic action referred to actions with regard to response to and economic threat, consumptions habits, and monetary contribution. Most recently, based on the previous categorizations, ERB are further divided into five different, but related, categories (Simmons, 1995; Wilke, 1995; Hsu, 1997; McBeth & Volk, 1997). The category of "interaction" does not take place in the recent categorization.

> (1) *Eco-management*: It is also called as physical action. It refers to those environmental actions in which people work directly with the natural world to help prevent or resolve environmental issues.
> (2) *Consumer/Economic Action*: It refers to those environmental actions in which people use monetary support or financial pressure to help prevent or resolve environmental issues.
> (3) *Persuasion*: It refers to those environmental actions in which individuals or groups appeal to others help prevent or resolve environmental issues.
> (4) *Political action*: It refers to those environmental actions in which people use political means to help prevent or resolve environmental issues.

(5) *Legal action*: It refers to those environmental actions in which people use to support or enforce existing laws which are designed to help prevent or resolve environmental issues.

2.6.1. Predictors of ERB

Even though developing ERB has long been recognized as the ultimate goal of EE, the adequate emphasis has not been given to research on ERB (Sia, Hungerford & Tomera, 1985/86). Linke (1981) claimed in this sense that knowledge on the factors which contribute to acquisition of ERB was very limited. However, new efforts and research studies have started to develop the vision of this area and number of the research studies on ERB increased substantially after 1980s. Several factors have been studied to investigate their association with the acquisition of ERB for many years. Several attempts were observed to identify the predictors of ERB. Hines et al. (1987) analyzed the substantial ERB research in order to explore the possible predictors. They proposed a model which illustrates the predictors of ERB. According to the model and analyses of the research studies, main variables that predict ERB are personality variables, cognitive variables, and situational variables. Further, based upon the meta-analysis of experimental studies, they proposed four groups of variables that affect behavior. Similarly, Hornik et al. (1995) meta-analyzed research studies investigating merely consumer recycling. They also suggested four groups of variables which contribute to ERB. These groups are intrinsic incentives, extrinsic incentives, internal facilitator and external facilitator. Previous meta-analysis studies (Dwyer et al., 1993; Hines, et al., 1886/87; Hornik, et al., 1995; Osbaldiston, 2004) and empirical studies (Barr, 2007; Cottrell & Graefe, 1997; Hsu, 1997; Manzo & Weinstein, 1990; McKenzie-Mohr, et al., 1995) and models proposed (Hines, et al., 1886/87; Sivek & Hungerford, 1989/90; Hungerford & Volk, 1990) revealed four main categories of variables which predict ERB. These categories are; (1) Personality factors (perception of moral responsibility, environmental concern, environmental sensitivity, locus of control, environmental attitudes, environmental responsibility and verbal commitment, values…etc) (2) Cognitive factors (knowledge and skills), (3) Demographic factors (age, gender,

income, residence, parent education level,…etc), and (4) External factors (external influences, pressure groups, opportunities to choose different action…etc).

2.7. Research Studies on EL and ERB Abroad

In this part, research studies on EL in national level and local level are firstly summarized. After that, research studies on ERB and selected variables in the world are discussed under eight main categories emerged as a result of literature review. Then, individuals' sources of knowledge on the environment and nature are presented. At the end, the research studies on the components of EL undertaken in the context of Turkey are summarized.

2.7.1. Research on EL Assessment

The survey of the existing literature abroad pointed out that the research studies pertaining to any dimensions of the environmental literacy are substantial. However, it is interesting to state that many of the studies were about the determination of the students' environmental knowledge. Number of the studies that focused upon the affect, skills and responsible behavior are not very much. Only three national environmental literacy assessment studies which aim to portray environmental literacy level of target group at national level were found in the related literature. Each of these national assessments was conducted in the USA (McBeth, 2006), South Korea (Shin et al., 2005), and Israel (Negev, et al., 2006). In addition to these national large-scale studies, two regional EL studies were conducted in Israel (Goldman, Yavetz & Pe'er, 2006) and Taiwan (Hsu, 1997). In this part, three national EL assessment and two local EL assessment studies are summarized.

American National EL Assessment study (McBeth, 2006; Marcinkowski, Meyers, Simmons, Hungerford, Volk, & McBeth, 2007; McBeth, Volk, Meyers, Marcinkowski, Hungerford, & Simmons, 2007) was conducted with 1042 6^{th} and 962 8^{th} grade middle school students selected randomly from 51 counties across the

United States. The Middle School Environmental Literacy Instrument (MSELI) developed by Bluhm, Hungerford, McBeth and Volk (1995) was used for data collection. MSELI included seven parts each pertaining to environmental knowledge, verbal commitment, environmental sensitivity, environmental feeling, issue identification skills, issue analysis skills, action planning skills and behavior. The reliability estimates of each part ranged from .717 to .847. They calculated composite EL score of the students (participants) by combining four components of EL. They reported that students' average score from each section of MSELI fell in moderate level. The highest score were obtained in environmental knowledge (*M*=40.34, Range=0-60), slightly lower score in environmental affect (*M*=39.40, Range=12-60) and behavior (*M*=36.84, Range=12-60) and lowest score in cognitive skills (*M*=25.56, Range=0-60). After compiling the four components of EL scores, the possible composite EL score was calculated 240 (Range=24-240). They divided this score into three levels such as low (24-96), moderate (97-168) and high (169-240). EL composite score of 6th graders was found 143.99 and of 8th graders was found 140.19 reflecting moderate level EL for both groups of students.

Korean National EL Assessment Study (Chu et al., 2006; Chu, Lee, Ko, Shin, Lee, Min, & Kang, 2007; Shin et al., 2005) was conducted with 969 3rd grade (8-9 years-old), 987 7th grade (12-13 years-old) and 1047 10th grade (15-16 years-old) students within Seoul and Kyunggin-do area in Korea. Researchers used The Environmental Literacy Instrument for Korean Students (ELIKS) designed based upon Simmon (1995)'s framework of EL was used as data collection instrument. ELIKS consists of items in four different scales; environmental knowledge, environmental attitudes, skills and behaviors. Knowledge and skill scales included multiple-choice items whereas attitude and behavior scales consist of a four point Likert type items. The reliability of each section in ELIKS ranged from .46 to .81. The researchers used descriptive and correlational analyses over the data through the use of SPSS. Their findings revealed that environmental attitude was closely associated with ERB. However, the correlation between behavior and knowledge was relatively low. The acquisition of environmental knowledge was much related to proper environmental

skills. Female students in 3rd grade indicated significantly higher environmental knowledge, skills, attitudes and ERB. Gender, experience of EE program in schools, science achievement, and parent education background were appeared to play a role in shaping/improving students' EL. However, their effects decrease when students become older.

Israeli National Environmental Literacy Assessment (Negev, et al., 2006) was conducted with 7635 6th and 12th grade students in 182 schools in spring 2006. The sample covered 5% of all schools in Israel. They developed their own instrument based upon previous three instruments; The Middle School Environmental Literacy Instrument (MSELI) developed by Bluhm, Hungerford, McBeth and Volk (1995), The Secondary School Environmental Literacy Instrument (SSELI) developed by Marcinkowski and Rehrig (1995) and Teachers-College-Student Instrument developed by Goldman et al. (2006). The survey included four section; (1) Environmental background information and environmental behavior, (2) Awareness, attitudes, and willingness to act, (3) Knowledge and its sources, and (4) Open-ended questions addressing to cognitive skills. For the grade 6th and 12th respectively, Cronbach's alphas were .63 and .74 for the knowledge scale, .78 and .82 for the attitude scale, and .72 and .80 for the behavioral scale. The researchers used JMP Software (version 6) for data analysis. Their survey study pointed out that compared to 12th graders, 6th grade students had less environmental knowledge, but higher environmental attitudes and ERB. They reported significant correlation between attitudes and behavior (r =. 44), and attitudes and knowledge (r = .29), but no significant correlation between knowledge and behavior (r = .01) was found. Students who enjoyed being in nature with someone scored higher in knowledge, attitudes and behavior dimensions. Natural experiences seemed to be closely associated with higher score in all dimensions. Furthermore, background (religion, residence, SES, and achievement) factors had certain influence on the dimensions of EL. In addition to above nationwide studies, the reached literature revealed two local studies, each in Israel and Taiwan.

Goldman et al., (2006) conducted EL assessment with 765 incoming students in three teacher training colleges in Israel. They were inspired from the previous studies while developing their own instrument/questionnaire. In their paper, they only considered two part of their assessment; behavior and background variables. In the study, ERB was categorized into seven dimensions based upon factor analysis. AS indicated in the study, these dimensions reflect the levels of environmental commitment. Though the use of SPSS, they calculated mean, *SD* and percentages through descriptive statistics and run reliability analysis, factor analysis, Pearson's and Spearman correlation, t-test and ANOVA through inferential Statistics. They reported that "*students demonstrated limited performance of behaviors that require a high level of commitment and hence reflect a high level of EL* (p.18)". The findings also indicated that even though participants' awareness of importance of ERB, they did not turn this awareness into action. Furthermore, all of the background variables (mothers' education, ethnicity – Jewish and Arab, hometown environment – urban and rural, and disciplinary interest) of the participants differed at least one level of REB. Arab students showed significantly higher behaviors in the categories which reflect high level of environmental commitment. Students whose mothers had high level of education showed significantly higher behavior related to recycling. Students who grew up in urban areas seemed to be less active in most of the ERB categories than students in rural areas did.

Hsu (1997) studied with 236 secondary school teachers in Taiwan to assess their EL level and to determine the effects of nine selected variables on participants' ERB. He designed the assessment study using the definition of Roth (1992) and considering the variables emerged from the previous studies/analyses (Hines et al., 1986/87; Hungerford & Volk, 1990; Marcinkowski & Rehring, 1995). Hsu developed her own nine pages instrument including ten sub-scales. In the study, a stepwise regression method was used to investigate the effects of selected EL variables on responsible behavior. The findings revealed that knowledge of and skills in using environmental action, and intention to act were found to be three powerful predictors of ERB. Further, she also found that intention to act was best predicted by perceived skill in

using environmental action strategies, environmental responsibility and locus of control (Hsu & Roth, 1999). Area of residence (rural-urban) differed with regard to parsimonious predictors of ERB. For example, for urban teachers, the best predictors of ERB were found to be; intention to act, skill, major source of information and membership in environmental organization. For rural teachers, the best predictors of ERB were; perceived knowledge of environmental action strategies, intention to act and perceived knowledge of environmental problems and issues (Hsu & Roth, 1998).

2.7.2. Research on ERB and Its Predictors

Following predictors are selected among the variables in the behavioral models (Hines et al. 1986/87; Hungerford & Volk, 1990), frameworks proposed (Simmons, 1995; Marcinkowski & Rehring, 1995; Volk & McBeth, 1997) and EL assessment studies (Goldman et al. 2006; Hsu, 1997; McBeth, 2006; Negev, et al., 2006; Shin et al., 2005). These variables are background (categorical) variables (e.g. age, gender, income, residence and parent education level), environmental knowledge, cognitive skills, environmental attitudes, verbal commitments, environmental sensitivity, locus of control, environmental responsibility, and environmental curiosity.

2.7.2.1. Background Variables

Background (categorical and demographic) variables have been commonly investigated predictors in ERB literature. The review of the literature revealed the following variables as the most commonly investigated predictors of ERB; Age, gender, income, residence and parent education level.

ERB was observed to be significantly correlated with *age* (Barr, 2007; Bogner & Wiseman, 1997; Hines et al, 1986/87; Negev et al., 2006; Poortinga, et al., 2004; Shin et al., 2005), *gender* (Barr, 2007; Bogner & Wilhelm, 1996; Chu et al., 2006; Eisler et al., 2003; Hines et al, 1986/987; Huang & Yore, 2003; Meinhold & Malkus, 2005; Oweini & Houri, 2006; Theodori & Luloff, 2002), *income* (Hines et al,

1986/987; Negev et al., 2006; Poortinga et al., 2004; Theodori & Luloff, 2002), and *parent education level* (Chu et al., 2006; Goldman et al., 2006). A meta-analysis of Hines et al. (1986/87) revealed average correlation between environment behavior and age (r = -.151, SD = .200), gender (r = .075, SD = .084) and income (r = .162, SD = .084). Their results suggested that younger female individual with high income more likely engage in responsible environmental behavior than did older male individuals with low income. Despite few exceptional findings (Oweini & Houri, 1999; Theodori & Luloff, 2002), it has been observed as common results in the selected research studies that younger people, females, people with higher income and high education level reported more ERB than the older people, males, people with low income and low education level did. For example, Theodori and Luloff (2002) found that males significantly more likely stop buying a product causing environmental problems than females did. Also, in the study of Oweini and Houri (1999), males reported higher actual behavior than the females did. A national EL assessment performed in Israel with 6th and 12th graders showed that students with low SES have better behavior.

Environmental knowledge seemed to be significantly correlated with *age* (Arcury & Christianson, 1993; Kellert, 1985; Negev et al., 2006; Shin et al., 2005; Tikka, Kuitunen & Tynys, 2000), *gender* (Arcury & Christianson, 1993; Chu et al., 2006; Eisler et al., 2003; Gambro & Switzky, 1992; Gifford et al. 1982/83; Kellert, 1985; Meinhold & Malkus, 2005; Lyons & Breakwell, 1994; Tikka et al., 2000; Zimmerman, 1996), *income* (Gambro & Switzky, 1992; Arcury & Christianson, 1993; Negev et al., 2006), *parent education level* (Shin et al., 2005; Chu et al., 2006) and *residence* (Arcury & Christianson, 1993; Kellert, 1985). Students with higher grade and older people expressed higher environmental knowledge than the low graders and young people did. The effect of age on environmental knowledge is statistically significant and magnitude of this effect is high. Students in higher grades (e.g. Kellert, 1985; Shin et al., 2005) and older children (e.g. Tikka et al., 2000) seemed to have more environmental knowledge than the ones in lower grades and younger ones did. It is commonly observed in the selected studies that statistically

significant difference in the level of self-reported environmental knowledge between male and females are obtained in favor of males. For example, Gifford et al. (1982/83) investigated this relationship and found that males had more environmental knowledge (r = .31, p<.001) than females. Furthermore, Eisler et al. (2003) conducted a research with 1317 people in varied age groups from six different countries. Their research also showed that male participants had higher environmental knowledge than female ones did. Income has been another variable influencing the variance in environmental knowledge. People with high SES showed higher environmental knowledge than ones with low SES. A National EL assessment in Korea with about 3000 students in various grades (Chu et al., 2006; Shin et al., 2005) revealed that father and mother education background significantly contributed to their children's environmental knowledge. Children whose parents obtained college education showed higher environmental knowledge than those whose parents obtained higher school or technical education degree. The other important predictor of environmental knowledge is residence of the people. It is apparent in the selected studies that people living in the urban areas seemed to be more knowledgeable on the environment than the ones in the rural areas. However, Kellert (1985) reported that rural children showed more knowledge on wild animals compared to the ones in the large cities.

Affect (e.g. environmental attitudes, concern…etc) was observed to be significantly correlated with *age* (Arcury & Christianson, 1993; Fransson & Gärling, 1999; Kellert, 1985; Lyons & Breakwell, 1994; Negev et al., 2006; Shin et al., 2005; Van Liere & Dunlap, 1980), *gender* (Bogner & Wilhelm, 1996; Chu et al., 2006; Chan, 1996; Eagles & Demara, 1999; Eisler et al., 2003; Fransson & Gärling, 1999; Gifford et al. 1982/83; Huang & Yore, 2003; Kellert, 1985; Meinhold & Malkus, 2005; Milfont & Duckitt, 2004; Oweini & Houri, 2006; Shin et al., 2005; Tikka et al., 2000), *income* (Lyons & Breakwell, 1994; Negev et al., 2006), *parent education level* (Chu et al., 2006) and *residence* (Bogner & Wiseman, 1997; Fransson & Gärling, 1999; Kellert, 1985). Younger people seemed to show more concern, sensitivity, attitudes and willingness to act for the environment than older ones.

Bogner and Wiseman (1997) conducted a survey study with the group of student who represented 11-16 years of pupils in rural, sub-urban and urban residence of Bavaria. Their research indicated that the younger the pupils were, the more they were sensitive toward the nature and the more they were willing to take action for resolving environmental problems. Females showed more environmental attitudes (e.g. Gifford et al., 1982/83; Huang & Yore, 2003), environmental concern (e.g. Chan, 1996; Fransson & Gärling, 1999; Huang & Yore, 2003; Milfont & Duckitt, 2004) and willingness to take part in protection of the environment than the males. For example, Gifford et al. (1982/83) reported that female students expressed greater affect about the environment ($r = .20$, $p < .05$) and reported more verbal commitment ($r = .20$, $p = .05$) than male students. Eisler et al. (2003) conducted a research with 1317 people in various age from six countries. Their research showed that female participants showed higher motivation for ecological thinking and behavior. Eagles and Demare (1999)'s study showed that girls scored significantly higher moralistic scores than boys, but this was not observed in students' ecologist scores. Kellert (1985) found that girls developed higher moralistic concern toward the animals than boys. Tikka et al. (2000)'s study with 464 student showed that men had more negative attitudes toward the environment. Income has been also observed to have an impact on affect. People with high SES showed more environmental concern than the ones with low SES. Lyons and Breakwell (1994)'s study revealed that the middle and upper classes showed more concerned about the environment than the lower classes. In the survey study of Bogner and Wiseman (1997) with 2400 pupils in rural, sub-urban and urban residence of Bavaria, the results revealed that rural pupils scored negative and differed significantly from both urban and sub-urban pupils with regard to verbal commitment to protect environment. Further, the results showed that rural pupils' actual environmentally responsible behaviors were more positive than their verbally expressed commitment. People who lived in urban areas tended to have higher environmental concern than those in rural areas (Fransson and Gärling, 1999). Kellert (1985) found that rural children showed more knowledge on and interest in animals compared to the ones in the large cities. A Korean National EL Assessment Study with about 3000 3rd, 7th and 10th graders indicated that parent education level

directly correlated with students' environmental attitudes (Chu et al., 2006; Shin et al., 2005). Students with high parent education level showed more environmental attitudes than the ones with low parent education level. On the other hand, a few studies indicated different results from the ones mentioned above. The study of Oweini and Houri (2006) revealed that males expressed higher willingness to act than the females did.

2.7.2.2. Environmental Knowledge

The review of the existing literature reveals that knowledge of the environment entails both individual's knowledge on ecological behavior and factual knowledge (e.g. knowledge on ecological concepts, knowledge of environmental problems and issues) (Hines et al., 1986/87). Environmental knowledge and its different forms have long been investigated in several research studies in the area of EE. Environmental knowledge has been observed to be one of the predictors which explain the variance in responsible behavior (Armstrong & Impara, 1991; Gillett, et al., 1991; Hungerford & Volk, 1994; Korhoren & Lappalinen, 2004; Sivek & Hungerford, 1989) and observed to be associated with ERB (Cottrell & Allan, 1997; Hines, et al., 1986/87; Hsu & Roth, 1998, 1999; Kaiser, Wölfing, et al., 1999; Kuhlemeier, et al., 1999; Sia et al., 1985/86; Hornik & Cherian, 1995).

Sia et al., (1985/86) reported very strong correlation between perceived knowledge of environmental action strategies and environmental behavior ($r = .55$, $p < .05$, $n = 171$). Subsequently, meta-analysis of seventeen research studies (Hines et al, 1986/87) revealed a correlation between knowledge and environmental behavior ($r = .299$, $SD = .195$), indicating that individuals who had a greater knowledge on environmental issues and/or how to take action tended to show more responsible environmental behaviors than the ones who did not posses this knowledge. Hornik and Cherian (1995) examined 67 empirical studies regarding recycling behaviors. Their analysis indicated that knowledge of recycling was observed to be strongest predictors of recycling behavior ($r = .541$) and 87 % of the correlations regarding

these two variables were found statistically significant. Cottrell and Allan (1997) examined the predictors of general responsible environmental behaviors. Their multiple regression analysis revealed that 21.8 % of the variance in responsible behavior could be explained by verbal commitment (β = .386) and perceived knowledge of ecology (β = .238). In their two studies in which structural models were proposed, Kaiser, Wölfing, et al. (1999) observed significant correlation between knowledge and general environmental behavior ($r_{\text{study-1}}$ = .360 and $r_{\text{study-2}}$ = .290 for Swiss sample, and $r_{\text{study-1}}$ = .216 and $r_{\text{study-2}}$ = .253 for US sample). In the study of Hsu and Roth (1998) with 226 teachers, significant positive correlation was observed between responsible behavior and teachers' perceived knowledge of environmental action strategies (r = .46, p < .05), perceived knowledge of environmental problems and issues (r = .34, p < .05), and perceived knowledge of ecology and environmental sciences (r = .27, p < .05). Hsu and Roth (1999) reported significant correlations between responsible behavior and teachers' perceived knowledge of environmental action strategies (r = .53, p < .05, n = 157), perceived knowledge of environmental problems and issues (r = .39, p < .05, n = 157), and perceived knowledge of ecology and environmental sciences (r = .32, p < .05, n = 157). Kuhlemeier et al. (1999) also reported significant positive correlation between environmental knowledge and ERB of Dutch students (r = .20, p < .05, n = 206). Marcinkowski (2001) reviewed three dissertations studies (Marcinkowski's study, Sia's study and Sivek's study) with regard to predictors of ERB. He reported knowledge of action strategies as the strongest single predictors of ERB for his sample. Knowledge also contributed to behavior in other two studies, but their percentage was relatively low. Knowledge of action strategies alone explained nearly 40 % of the variance in ERB scores in Marcinkowsk's study (n = 119, members of environmental organizations). In Sivek's study (n = 281, members of environmental organizations), knowledge of action strategies seemed to explain 34 % of the variance in ERB scores.

2.7.2.3. Cognitive Skills

Hungerford et al. (1996) identified fourteen steps of issue investigation and problem solving skills. Their identification of skills was later refined and lessened to ten steps by Lunsford (2000). Skills in using environmental action strategies have been observed to be one of important predictors of REB (Hines et al. 1986/87; Hsu & Roth, 1998, 1999; Hungerford & Volk, 1990; Marcinkowski, 2001). Skill in using action strategy was observed to be strongest predictor of ERB in the dissertation studies of Sia and Sivek whereas knowledge of action was the strongest predictor of ERB in Marcinkowski's study (Marcinkowski, 2001). In addition, Hines et al. (1986/87), Hungerford and Volk (1990) indicated that skill in using environmental action strategies seemed to be stronger than the knowledge variable. It is apparent in the model of Hungerford and Volk (1990) that skill variable is dependent of knowledge variable and both are suspected to operate synergistically, but not separately.

Several experimental studies (Culen & Volk, 2000; Hsu, 2004; Ramsey, 1981; Ramsey & Hungerford, 1989; Ramsey, 1993) revealed that an instruction in issue investigation and action skill training could result in positive and significant increase in overt environmental behavior of students. In their quasi-experimental study with 8^{th} graders, Ramsey et al. (1981) found that students who were trained in citizen action skills were observed to demonstrate more REB than the ones who received either environmental awareness instruction or content-oriented text instruction. Ramsey and Hungerford (1989) conducted another experiment in order to investigate the effects of Issue Investigation and Action Training (IIAT) on 7^{th} grade students' overt behavior. Their experiment revealed that students who received IIAT demonstrated stronger beliefs about their knowledge of and skill in using issue resolution strategies. Similar study was later conducted with 8^{th} graders (Ramsey, 1993), 7^{th} and 8^{th} graders (Culen & Volk, 2000), and college students (Hsu, 2004). The studies reported parallel findings in that the students who received a course / training emphasized issue investigation and action training tended to show more

REB and more perceived knowledge of and skills in using environmental action strategies.

Sia et al. (1985/86) found quite high correlation between perceived skill in using environmental action strategies and environmental action of 171 member of environmental organizations in the USA (r = .59, p < .05). The regression analysis, they performed to investigate the most parsimonious set of variables which predicted REB, revealed that perceived skill in using environmental action strategies alone explained 34.54 % of total variance of REB. Similarly, Hsu and Roth (1998) and Hsu (1999) conducted a research with Taiwanese secondary teachers. Stepwise regression was performed in both studies in order to investigate the most parsimonious set of predictors of ERB. A high correlation was observed between perceived skill in using environmental action strategies and ERB (r = .46, p < .05, n = 157, and r = .45, p < .05, n = 226 respectively). Perceived skill in using environmental action strategies explained 2.05 % (Hsu, 1999) and 8.4 % (Hsu & Roth, 1998) of the variance of ERB respectively.

2.7.2.4. Environmental Attitudes

Environmental attitude is a psychological construct and refers to a set of values and beliefs dealing with the individuals' feelings, pros or cons, favorable or unfavorable, in terms of particular aspects of the environment and/or objects associated with the environment (Hines et al., 1986/87). Even though several research studies have been conducted to investigate the relationship between attitudes and behavior (ERB), Adams (2003) claims by considering substantial researches that "*attitudes do not necessarily influence or lead to overt behavioral changes*" (p.15). On the other hand, Newhouse (1990) and later Chan (1996) claimed that attitude has been considered as one of the most important predictors of ERB.

The review of research studies in the literature reveals that the relationship/correlation between environmental attitude and ERB seemed to be high

(Chan, 1996; Makki et al., 2003; Meinhold & Malkus, 2005) or moderate (Hines et al., 1986/87; Balderjhan, 1988; Kuhlemeier, et al., 1999; Thapa, 1988; Scott & Willits, 1994) or weak (Sia et al., 1985/86; Grob, 1995), or were never observed (Evans, Brauchle, Haq, Stecker, Wong & Shapiro, 2007).

Chan (1996) studied with 992 students from Hong Kong and investigated the correlation between attitudes and intention to act (which is one of the best predictors of ERB) of these students. Chan found significant, positive and high correlation among environmental attitudes and the different types of behavioral intentions (paper recycling, using less tissue, and overall behavioral intention). All the correlations ranged from .37 to .46 ($p < .0001$). Makki et al., (2003) reported significant and high correlation between Lebanon secondary students' environmental attitudes and environmental behavior ($r = .77$, $p < .01$, $n = 660$). Meinhold and Malkus (2005) observed high correlation between pro-environmental attitudes and environmental behaviors adults in West coast of the USA ($r = .45$, $p < .001$, $n = 848$). Meta analysis of 51 empirical studies investigating the relationship between attitudes and ERB which resulted in a corrected correlation coefficient of .35. This moderate correlation indicates the existence of relationship between environmental attitude and ERB (Hines, et al., 1986/87) suggesting that individuals who had more positive attitudes tended to show more ERB than the ones who had less positive environmental attitudes. In the structural equation model proposed to examine the relationship among several demographic variables, personality variables, attitudinal variables and consumers actions, Balderjhan (1988) reported that attitude toward ecologically consciousness issues was associated with the public acts of consumers regarding environmental issues ($r = .36$, $p < .05$, $n = 791$). In the study of Kuhlemeier et al. (1999) with 206 Dutch secondary school students, the correlation between environmental attitude and ERB was observed to be moderate ($r = .36$, $p < .05$). Scott and Willits (1994) observed modest level relationship between levels of attitude and level of behavior; such as between balance of nature and consumer behavior ($r = .21$, $p < .001$) and political behavior ($r = .19$, $p < .001$), between humans-with-nature and consumer behavior ($r = .18$, $p < .001$), and political

behavior (r = .11, p < .001). Sia et al., (1986/87) found weak correlation between environmental behavior and attitude toward pollution (r = -.26, p < .05, n = 171) and further no correlation between environmental behavior and attitude toward technology (r = -.08, p > .05, n = 171). Grob (1995) proposed a structural model of 12 sub-components of environmental attitudes and behavior. He observed significant correlation of six sub-components with reported environmental behaviors; recognition of environmental problems (r = .39, p < .01), affective reactions (r = .36, p < .01), disturbance because of real-ideal discrepancies (r = .22, p < .01), post-materialistic values (r = .33, p < .01), openness to new ideas (r = .39, p < .01) and belief in science and technology (r = -.16, p < .01). Evans et al., (2007) investigated 100 young children's environmental attitudes and behavior. They found no correlation between attitudes and behaviors (r = .01, p > .05) of young children. However, this correlation was significant for their parents (r = .50, p < .05).

Kaiser, Ranney, et al. (1999) and Kaiser, Wölfing et al. (1999) confirmed three measures as factors of environmental attitudes. They believed that environmental knowledge, environmental values and ecological behavior intention were main components of theory of planned behavior and encompasses most commonly used attitude approaches. They tested attitude-behavior relationship by incorporating these measures into structural equation models. In the first structural model, environmental knowledge and environmental values explained 40% of the variance of ecological behavior intentions which, in turn, predicted 75% of the variance of ecological behavior (Kaiser, Wölfing et al., 1999). In the second structural model, environmental knowledge, environmental values and responsibility feelings together predicted 45% of the variance of ecological behavior intention which explained 76% of the variance of general ecological behavior.

In addition to associational studies to examine the relationship between attitudes and ERB, there have been several other studies investigating students' attitudes and its determinants. These studies aimed to measure not only students' general attitudes (Bogner & Wiseman, 1997; Bonnett & Williams, 1988; Reid & Sa'di, 1997; Bradley,

Walickzec & Zajicek, 1999; Eagles & Demara, 1999; Makkı, et al., 2003) but also their attitudes toward specific environmental topics / issues such as animals (Eagles & Muffitt, 1990).

Eagles and Demara (1999) conducted a study to examine 72 6th graders' moralistic and ecologistic attitude toward environment. They found a positive correlation between student's environmental involvement and ecological score, and a positive correlation between student's environmental involvement and moralistic score. Reid and Sa'di (1997) did a study to find out the British and Joardian children's general attitudes toward the environment. Results showed that the Joardian children's positive attitudes were lower than British children's and the Joardian pupils scored significantly lower than the British pupils. Although no difference was found between Joardian male and female students having same scores, the British female students scored significantly higher than the male students. A study done by Bonnett and Williams (1988) aimed to explore six years students' attitude toward nature and environment and how student understand environment. Their study indicated that students felt themselves to be part of nature, and they also felt strong empathy towards certain aspects of nature. The study conducted by Makkı et al., (2003) aimed to assess 660 secondary school students' general environmental knowledge and attitudes, and also to explore relationship between participants' knowledge and attitudes and biographical and academic variables, and commitment to environmental friendly behavior in the Greater Beirut. The findings pointed out those participants' attitudes towards the environment were positive, and participants didn't have adequate environmental knowledge.

2.7.2.5. Intention to Act

Intention has been viewed "*as the conative component of attitude and it has usually been assumed that this conative component is related to attitude's affective component. This conceptualization has led to the assumption of a strong relation between attitudes and intentions* (Fishbein & Ajzen, 1975, p.289)." Intention to act is

considered as one of the important variables taking place in the model of Hines et al. (1986/87). Moreover, intention to act is one of the major variables under the category of empowerment variables in the model of Hungerford and Volk (1980). They claim that it is closely connected with both perceived skill in taking action and locus of control. They also believe that there may be a synergetic relationship between personal investment and intention to act. Different name that correspond to this variable has been observed in the literature. For example, it has interchangeably been used with verbal commitment (Bogner & Wiseman, 1997; Hines et al, 1986/87).

It is apparent in the selected literature that intention to act is one of the best psychological predictors of ERB (Barr, 2007; Bogner & Wilhelm, 1996; Cottrell & Graefe, 1997; Fishbein & Ajzen, 1975; Harland, Staats & Wilke, 1999; Hines et al., 1986/87; Hsu, 1997; Hsu & Roth, 1998, 1999; Kaiser, Ranney, et al., 1999; Kaiser, Wölfing, et al., 1999; Lindström & Johnsson, 2003). A meta-analysis of six studies which assessed the relationship between intention and behavior revealed correlation coefficient of .49 (SD = .13) (Hines et al., 1986/87). Of ten selected variables in Hines et al.' meta-analysis, intention was observed to be strongest variable predicting ERB. This result suggests that people who reported intention to take action will more likely take action than the ones with no such intention. They realized that intention seemed to be a moderator of other variables (e.g. skills, knowledge, and personality variables) acting together. Bogner and Wiseman (1997) conducted a research with 3523 11-16 years old pupils from urban, rural and suburban areas in Munich. They found significant correlation between pupils' reported environmental behaviors and their verbal commitment (r = .596, p < .001). Cottrell and Graefe (1997) tested a conceptual framework regarding predictors of REB. They examined the predictors of 291 boat owners' ERB and found that verbal commitment was the best predictors of ERB. They reported that verbal commitment (β = .386) and perceived knowledge of ecology (β = .238) were together explained 21.8% of the variances of ERB (R^2 = .218, p < .001). Harland et al., (1999) examined the relationship between intention of 445 Dutch people and their past pro-environmental actions. They observed significant and quite high correlation between intention and participants' use of

unbleached paper (r = .47, p < .001, n = 277), and use of other transportation than car, (r = .60, p < .001, n = 198), turning off faucet while brushing teeth (r = .64, p < .001, n = 275) and low correlation between intention and participants' use of energy saving light bulbs (r = .25, p < .001, n = 277). Similarly, it emerged from the study of Hsu and Roth (1999) that intention to act was one of the powerful predictors of ERB. In their study, intention to act explained 9.16% of the variance of ERB. They also reported three best predictors of intention to act as skill in using environmental action strategies, environmental responsibility and locus of control. A model of "ecological behavior as a function of environmental attitude extended by responsibility feeling" proposed by Kaiser, Ranney, et al. (1999) was tested by use of structural equation modeling. Their results indicated that environmental behavior intention could be explained by environmental knowledge (β = .33), environmental value (β = .20) and responsibility feeling (β = .26). Their results also showed that environmental behavior intention by itself could explain 76% of the variance of general environmental behavior. Further, in their study with 137 Swedish adult, Lindström and Johnsson (2003) found significant correlation between intention to act and ecological behavior (r = .29, p < .01) as well.

2.7.2.6. Environmental Sensitivity

Environmental sensitivity which has been found to be one of the precursors of ERB (Sia et al., 1985/86) was first observed in an aspect of awareness proposed to be one of the major objectives of EE both in Belgrade Workshop (UNESCO, 1975; Schmeider, 1977) and in Tbilisi Conference (UNESCO, 1978). Since then, it has been included in goals and objectives of EE. Environmental sensitivity is also observable in the definition of ERB (Hungerford & Volk 1990) and assumed to be the major entry-level variable in responsible environmental citizenship model developed by Hungerford and Volk (1990). The research studies have shown that environmental sensitivity, an apathetic view of the environment (Hungerford et al., 2000), has long been equated with significant life experiences (Sward & Marcinkowski, 2001). Stapp (1974) referred to the environmental sensitivity with

regard to exposure to, exploration of, appreciation of, respect for (Sward & Marcinkowski, 2001) and care about the environment (Hsu, 1997).

Early studies in 1980s regarding environmental sensitivity were realized by Tanner and Peterson (Sward & Marcinkowski, 2001). They used combination method of questionnaire and interview in order to identify and/or assess this psychological construct. They believed that significant life experiences contribute to development of environmental sensitivity. In their researches, they related participants' past experiences with the formation of sensitivity. Tanner (1980) studied with 45 professional staffs and chapter officers of four conservation organizations. Peterson (1980, as cited in Sward & Marcinkowski, 2001) interviewed 22 EE educators in USA. The results of these two studies revealed that an interplay of outdoor experiences, favorable human interaction and knowledge about the natural environment results probably in development of environmental sensitivity. Especially at early ages, peoples' contact with the outdoors either alone or with friends/peers and family members appears to result in its development. Further, loss of natural environment to which people develop sense of closeness and attachment contributes to sensitivity as well. It was found in another study that individuals' connection to natural setting contributed to the development of ERB (Vaske & Korbin, 2001).

Sia et al. (1985/86) analyzed the selected predictors of ERB and they found that level of environmental sensitivity (η^2 =.1292) seemed to be one of the strongest predictors of ERB. Subsequent to this finding, a measure of environmental sensitivity and significant life experiences has seen to be worth investigating in different context and with different sample in several research studies (Ramsey & Hungerford, 1989; Sivek & Hungerfor, 1990; Palmer, 1993; Ramsey, 1993; Chawla, 1998; Hungerford, Volk & Ramsey, 2000; Negev, et al., 2006). It appears that significant life experiences which are "*interaction with the natural, rural and pristine habitats*" (Tanner, 1980, p.21) help individuals develop environmental sensitivity (Sward & Marcinkowski, 2001) functioning as one of the significant predictors of ERB

(Hungerford et al., 2000). Hsu (1997) summarized five studies with regard to environmental sensitivity and came to conclusion that "*those individuals who engage in more responsible environmental behavior have a higher degree of environmental sensitivity*" (p.49).

2.7.2.7. Locus of Control

Locus of control (LOC) was defined as "individuals' *perception of whether or not he/she has the ability to bring about change through his/her own behavior*" (Peyton & Miller, 1980, p. 174). In the context of this dissertation study, LOC can be defined as an individuals' perception(s) of his/her ability to influence the resolution and prevention of environmental problems of any kind. This psychological term was first defined by Rotter in 1954 and categorized as internal and external locus of control (Peyton & Miller, 1980). Whereas internal locus of control is regarded as individuals' perception of events as a result of peoples' own action, external locus of control is more regarded as individuals' perception of events as a result of chance, luck, fate and so on. Peyton and Miller (1980) indicated based on considerable research that development of an individuals' locus of control appeared to be influenced by four main factors; family origins, ethnicity, social class and mental age.

LOC and its association with ERB have been a topic of several research studies (Arbuthnot, 1977; Sia et al., 1985/86, Culen et al., 1986; Hines et al., 1986/87; Sivek & Hungerford, 1980; Ramsey, 1993; Smith-Sebasto & Fortner, 1994; Smith-Sebasto, 1995; Hsu, 1997; Allen & Ferrand, 1999; Hsu & Roth, 1999; Hwang, Kim & Jeng, 2000; Hsu, 2004).

A meta-analysis of 15 empirical studies dealing with the relationship between LOC and REB revealed correlation coefficient of .365 referring that LOC is one of the predictors of ERB (Hines et al., 1986/87). Their analysis also pointed out that individuals showing internal LOC tended to report engaging in ERB more than the

ones who exhibited more external LOC. Subsequent research studies also supported this significant relationship. Sia et al. (1985/86) reported significant correlation (r=.38, p<.05) between LOC and ERB. Further, Smith-Sebasto and Fortner (1994) found positive significant correlation (r = .33, p < .01) between these two variables. Another meta-analysis of 67 empirical studies regarding consumers' recycling behavior and its determinants (Hornik & Cherian, 1995) supported initial findings. Hornik and Cherian (1995) reported high correlation between locus of control and recycling behavior (r = .301). In the study of Sivek and Hungerford (1989/90) with the members of three Wisconsin Conservation Organizations, the variable of locus of control seemed to be the predictors of behaviors of members in only one organization. However, its effect was very small (r^2 = .0277, p < .0305 for Wisconsin Trappers' Association sample, n = 90). Culen et al. (1986), Ramsey (1993), and Hsu (2004) observed the effects of intervention on the significant changes in LOC. Furthermore, Ramsey et al, (1981), Ramsey and Hungerford (1989) and Ramsey (1993) found that individuals' internal LOC may emerge when they are given chances to apply / use environmental action skills in their own community. Hsu and Roth (1999) found a significant relationship between LOC and ERB (r^2 =. 27, p < .05, n = 236 Taiwanese Teachers) In the structural model proposal by Hwang et al. (2000), it was reported significant effects of LOC on intention to act which has probably significant impact on ERB.

2.7.2.8. Environmental Responsibility

This refers to human dimensions of responsibility (personal and others') (Hsu, 1997) toward in reference to the environment as a whole and/or in reference to only solutions of environmental problems (Hines et al., 1986/87). Personal responsibility defined as personal obligation or sense of duty to implement actions (Boerschig & DeYoung, 1993) or individuals' feelings of duty or obligation (Hines et al. 1986/87) or moral obligation to act (Schultz & Zelezny, 1998) is considered to be one of the personality factors and is accepted to likely develop a desire to take action in the model of Hines et al. (1986/87). Environmental responsibility is also one of the

major variables in the behavioral model of Hungerford and Volk (1990) and one of the components of EL framework (Marcinkowski & Rehring, 1995). Awareness on consequences as a result of certain behavior may influence on a sense of responsibility (Heberlein & Black, 1976).

Personal responsibility is observed one of the strongest predictors of ERB as a result of meta-analysis of 6 studies (Hines et al, 1986/87). Their meta-analysis resulted in a corrected correlation coefficient of .328 (*SD* = .121) indicating that the people who had a sense of personal responsibility toward the environment tended to demonstrate more ERB than the ones with no such feeling. The inter-correlation analysis of Hsu and Roth (1998, 1999) indicated a medium level correlation between environmental responsibility and REB ($r = .30$, $p < .05$, $n = 157$, $r = .27$, $p < .05$, $n = 226$). Hsu and Roth (1999) reported that environmental responsibility is one of the predictors of ERB of urban teachers, but not of rural teachers. The multiple regression analysis of Hsu (1997) pointed out that environmental responsibility is one of the predictors of ERB and explained 7.53% variance.

Schultz and Zelezny (1998) performed a cross-cultural study with a total number of 958 college students from five countries to investigate the predictors of pro-environmental behaviors (recycling, public transportation, water and energy conservation, and safe product purchasing). They found that pro-environmental behavior was significantly correlated with responsibility ($r = .14$, $p < .05$ for Mexican sample, $r = .40$, $p < .001$ for Spanish sample, and $r = .29$, $p < .001$ for the USA sample).

2.7.2.9. Environmental Curiosity

Environmental curiosity refers to being eagerness to learn about environment and wondering to explore the relationship between man and the environment. Only one study (Dresner & Gill, 1994) was found to investigate the relationship between environmental curiosity and environmental behavior. In their comprehensive review

of science education literature, Lawson, Costenson and Cisneros (1984) reported Harty, Anderson and Enveles' study concerning the relationship among science interest, attitudes and curiosity. Dresner and Gill (1994) studied with 28 10-13 years old students who involved in a two weeks summer program. Their purpose was to determine whether participation in Wolf Creek Nature Camp increased participants' self-esteem, naturalist life skills, environmentally responsible action and interest in and curiosity about the natural world. The nature camp included training activities on hiking, backpacking, bird watching and night walks. Students learned about the relationship between nature and the people and the relationship within the ecosystem. Sustainable life style was emphasized at the camp as an environmental action program such as recycling, conserving energy and water. The correlation analysis depicted that there was a correlation between self-esteem and ERB. Furthermore, increase in curiosity on nature was correlated with increase in naturalistic life skills; and with an increase in self-esteem which strongly correlated also with action taking. Furthermore, Harty et al. (1984, as cited in Lawson et al, 1984)) found significant correlations between science interest and curiosity ($r = .47$, $p < .001$) and between science attitudes and curiosity ($r = .40$, $p < .002$)

2.7.2.10. Environmental Information Sources

Students could get environmental information from different sources. Many researcher paid attention to investigate the sources of students' environmental knowledge. Ostman and Parker (1987) investigated the effects of reading newspaper and TV use on developing environmental knowledge, concerns and behaviors. They found that newspaper use was not related to knowledge ($r = .04$, $p > .05$), but related to concerns ($r = .14$, $p < .01$) and behaviors ($r = .21$, $p < .001$). TV use was found to be not significantly related with knowledge, concerns and behavior. Contrary to this later finding, television has been found to be one of the important sources which contribute to environmental knowledge development in some other research studies (e.g. Alaimo & Doran, 1980; Barraza & Cuaron, 2004; Bonnett & Williams, 1998; Chan, 1996; Connell et al., 1999; Huang & Yore, 2003; Hsu & Roth, 1998;

Tunnicliffe & Reiss, 2000). In addition, Blum (1987), Hausbeck, Milbrath and Enrigth (1992) and Connell et al. (1999) identified the media and the school as two major sources from which young people obtain their environmental information. Alaimo and Doran (1980) indicated that junior and senior high school students reported TV as a more common source of environmental information than magazines and newspapers. 4-6 years old students in the study of Bonnett and Williams (1998) identified school, parents, relatives and TV as the sources of their environmental knowledge. Furthermore, in the study of Connell et al. (1999), personal experiences were cited as the most reliable sources of environmental information. In the comparative study of Huang and Yore (2003) with 5th grade students from Canada and Taiwanese, TV, family and teachers were the most reported sources of both group of children's environmental knowledge. Arbuthnot (1974) reported the reading of environmental books as a one of the best predictors of having environmental knowledge. In the study of Chan (1996) with the sample of 992 secondary school students in Hong Kong, television (n=853), school (n=566), and newspaper (n=529) were the most frequently reported three sources. The other main sources the students reported were magazines (n=408), radio (n=405) and family (n=142). Hsu and Roth (1996) reported that mass media was the major source of environmental information in the Haulien area of Taiwan community leaders. Similar finding was subsequently reported in Hsu and Roth (1998)'s other study with teachers in that three most popular sources of teachers' environmental information were newspaper, TV and books and magazines. Tunnicliffe and Reiss (2000) reported homes (family members, TV, Video, CD, Book) and direct observation as the most important sources for 5-14 years old students' knowledge on the plants. Barraza and Cuaron (2004) studied with 256 school children in Mexico and England. Their study revealed that children obtained environmental information from the school (29.8 %), television (29.4 %), parent (25.6 %), books (15.6 %), and science club and shop (0.4 %) respectively. Shin et al. (2005) and Chu et al. (2006) found in their nationwide study that outdoor learning and books were major information sources for 3rd graders, newspapers/magazine and books for 7th graders and family and field trips for 11th graders.

2.8. Research on EL in Turkey

A systematic analysis of the Turkish literature revealed more than 60 research studies pertaining to one or more components of environmental literacy carried out between the years of 1997-2008. The studies in which primary and nursery school students (K-8) were sampled were considered and summarized here. Since most of the research studies selected for this part were descriptive in nature rather than associational (relationship and correlation), selected studies are synthesized by considering their corresponding EL components. Many of the researchers did not report effect size(s), (inter)correlation among the variables and the effects of personality and categorical variables on the components of EL. Whereas some studies focused only upon one component of EL, the remaining paid attention to more than one component of EL. Due to the stated reasons, the studies and their findings are categorized under five main categories rather than under selected variables. These categories are background (categorical) variables, knowledge, skills, affect and behavior.

2.8.1. Background Variables

From the review of the literature, socio-demographic characteristics of the subjects emerged as a relevant dimension of these studies. This dimension included: the age, grade, and gender of students; the type of school attended (public and private); familial characteristics such as socioeconomic status (SES), parent education level and residence (urban-rural or city-village; and others (e.g., nationality). Some studies did not consider any of the demographic/categorical variables or their relationship with any of the EL dimensions. However, the variables that were considered in some studies were treated as independent variables and some were found to be highly correlated with selected dimensions of EL. For example, *age* and *grade* were found to be important indicators of environmental attitudes and knowledge. When the grade increases, students' environmental knowledge increases (Alp et al., 2005, 2006b) whereas their attitudes toward environment decrease (Tuncer et al., 2005). Similarly,

students' understanding of environmental conceptions increases as their age increases. *Gender* seems to be another characteristic related to attitudes, but not knowledge. Study results indicated that female students tended to show more positive attitudes toward the environment than male ones, although there was no statistically significant difference between male and female students with regard to environmental knowledge (Alp et al. 2006a, 2008). One of the demographic indicators of environmental attitudes is *residence*. The students in the urban area seem to have greater awareness of environmental problems in general and in Turkey, and sense of individual responsibility (Tuncer, Sungur, et al. 2006; Tuncer, Tekkaya, et al. 2005). Furthermore, students in urban areas tend to be more optimistic about solutions of environmental problems and show more positive attitude than the ones in rural area (Yılmaz et al., 2004). Due to the number of the studies in which school type (public and private), socioeconomic status - SES (high, medium and low), parent education level, cultural diversity, and nationality (country of origin) were investigated are very few, either insufficient evidence or ambiguous results rendered it impossible to detect and report any pattern in their relationship to dimensions of environmental literacy.

2.8.2. Knowledge

Three main components of EL pertaining to Knowledge are; (1) Knowledge of Natural History and Ecology, (2) Knowledge of Environmental Problems and Issues, and (3) Socio-Political-Economic Knowledge. The selected research studies associated with any of these three components are synthesized in this part.

Knowledge of Ecology and Natural History

This component includes seven sub-components. Among the selected studies, topics of the 20 studies were regarded as ecosystems and biomes. Abiotics factors and matter cycles were investigated in 19 of the selected studies. 11 of the selected studies were paid more attention to the topics of species and population. Other five

sub-components received relatively less attention. Students' knowledge on environments and habitats were investigated in eight of the studies, on communities and interaction in six studies, on physical and biological history (natural history) in one study. On the other hand, none of the studies determined students' knowledge of natural and social system.

Students' misconceptions and understanding of several ecological concepts were investigated in many of the studies (Alkış, in-press-a, in-press-b, in press-c; Alkış 2006; Bacanak, Küçük, & Çepni, 2004; Bahar, Cihangir & Gözün, 2002; Balcı, Çakıroğlu & Tekkaya, 2006; Çetin, 2004; Çetin & Ertepınar, 2004; Dikmenli, Çardak, & Türkmen, 2002; Erdoğan & Erentay, 2007; Erentay & Erdoğan, 2006; Gökdere, 2005; Özkan, Tekkaya & Geban, 2004; Süleyman, Aydoğdu, Yıldırım, & Şensoy, 2005; Şensoy, Aydoğdu, Yıldırım, Uşak, & Hançer, 2005; Yazıcı & Samancı, 2003; Yeşilyurt, 2003). These concepts are regarded as producers, consumers, decomposers, eco-systems, notion of energy flow, food pyramid, food chain, food web, biotic and a-biotic factors, energy, living and non-living organisms, photosynthesis and respiration, sea and lake, animal classification and flowery plants. It is apparent in the results of these selected studies that most of the researchers paid more attention to the students who enrolled in 5^{th} -8^{th} grades. However, number of the studies which involved K-4^{th} grade level students was limited. The sample sizes of many of the studies might be considered as limited in order to portray the students' knowledge on ecology and environmental sciences nationwide.

Bahar et al. (2002) and Yeşilyurt (2003) investigated lower grade students' conceptions of living and non living organisms through the use of pictures. The findings of both studies seemed to be quite consistent. Both reported students' misconceptions on living and non-living organisms based upon students' categorization of the pictures. Dikmenli et al. (2002) conducted two-staged individual interview in order to investigate alternative conceptions of 60 primary school students regarding animal and animal classification. They found that students

had alternative conceptions that were not scientific. Some of them classified animals under different categories.

Çetin (2004) investigated culturally different students' level of understanding of ecological concepts such as food chain and food web. Her study pointed out that both student groups had both full understanding and partial understanding levels. However, these levels were higher in English students than Turkish ones. She explained the reason of this difference as a result of different instructional methods used in Turkey and in England. Çetin and Ertepınar (2004) investigated the effects of grade level on students' understanding of ecological concepts. They realized that most of 7th graders understood the selected ecological concepts (food chain, food web, decomposition and carbon cycle) despite a few misconceptions. On the other hand, 9th graders' level of complete understanding and partial understanding on selected ecological concepts (biotic and a-biotic factors, food chain, phosphor cycle, and environmental pollution) were relatively high, but their misconception level was relatively low. Gökdere (2005) aimed to determine 524 6th to 8th grade students' knowledge on food chain and energy sources. The findings of his study seemed to be in line with the findings of Çetin (2004)'s and Çetin and Ertepınar (2005)' studies.

Bacanak et al. (2004) studied with 108 5th graders and 112 8th graders to determine their misconceptions and understanding level of the concepts of photosynthesis and respiration. They found that 5th and 8th graders did not understand photosynthesis and respiration and their definitions, and also had several misconceptions regarding them. Similarly, two other studies were conducted by Balcı et al. (2006) with 101 8th graders and Şensoy et al. (2005) with 562 6th, 7th and 8th graders. The findings of the later two studies supported initial findings in that students held several misconceptions on these topics. He further found that students' living in different residence (city, town and village) did not create any difference in terms of students' understanding of food chain and energy sources.

Özkan et al., (2004) realized that students in primary level held several misconceptions regarding ecology related concepts. They conducted an experimental study with 57 7th graders to identify their misconceptions on ecological concepts (such as producers, consumers, decomposers, ecosystems, notion of energy flow, food chain, energy pyramid and food web) and to investigate the effects of conceptual-change-text-oriented instruction of dealing with and/or eliminating these identified misconceptions. Their results were consistent with the results of others studies (Çetin, 2004; Çetin & Ertepınar, 2004; Gökdere, 2005)

Doğar and Başıbüyük (2005) reported primary and secondary school students' misconceptions regarding the concepts of climate and weather. They also reported that students' understanding differed according to grade level. Another study performed with 300 5th graders aimed to investigate their perceptions and knowledge regarding cloud, rain, rainfall, precipitation types and formation (Alkış, in-press-a, in-press-b, in press-c; Alkış 2006). The findings revealed limited knowledge and misconceptions of students on the selected topics.

The results of the comparative studies (Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007) among the 5th to 8th grade students from four countries; Turkey, Bulgaria, Romania and the USA, reported children's specific knowledge on endangered species. While students' knowledge on the endangered species was limited at the beginning of the study, their knowledge was increased at the end of study as a result of series of field trips and one-year instruction on the endangered species.

Knowledge of Environmental Problems and Issues

This component also includes eight sub-components, two of which were added based on the analyzed studies and on four environmental sciences books examined (Enger, & Smith, 2002; Cunningham, & Saigo, 2001; Raven, & Berg, 2001; Miller, 1998). These components were "*Risk, Toxicology and Health*" and "*Natural Disaster*".

Students' knowledge on bio-physical problems was investigated in 25 studies, causes of these problems in 17 studies, the effects of problems and issues in 14 studies, alternative solutions and actions in 11 studies, socio-political issues in 9 studies, risk, toxicology and health in 6 studies, and the causes of the environmental issues in 5 studies. The investigation of students' knowledge on the environmental problems focused on global environmental problems and issues (such as global warming, acid rain, ozone layer and its depletion and greenhouse effects) (Bozkurt & Aydoğdu, 2004; Bozkurt & Orhan, 2004; Bozkurt, Hamalosmanoğlu, Darçın & Samancı, 2006; Darçın, Bozkurt, Köse & Hamalosmanoğlu, 2006; Darçın, Orhan, Bozkurt, & Yaman, 2006; Kaya & Turan, 2005; Yaman, Bozkurt, Aydın, Uşak, & Gezer, 2005), and national and residential environmental problems (such as water, air and soil pollution, erosion, recycling and waste management, biodiversity, loss of endangered species and threatened environments) (Alp, 2005; Alp, Ertepınar, Tekkaya &Yılmaz, 2006a, 2006b, 2008; Armağan, 2006; Bozkurt, Akın & Uşak, 2004; Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007; Kaya & Turan, 2005; Özcaner, 2005; Yücel, & Morgil, 1999). In addition to specific physical problems and issues, students' general perceptions and knowledge on general environmental problems were also investigated (Çobanoğlu, Er, Demirtaş, Ozan & Bayran, 2006). In addition to students' knowledge on bio-physical problems, students' knowledge on the causes and effects of these problems attracted attention, as well. Relatively, environmental issues that are more politically, economically, and philosophically oriented were not dealt with in the examined studies as often as were environmental problems. It is striking to note that even though Turkey has been experiencing natural disasters such as earthquakes, there was no study found in which students' knowledge of natural disasters was investigated in the selected studies. Researchers paid too much attention to 6th and 8th grade students for sampling. The number of studies that focused upon this component among 5th grade students was not substantial. Other grades received very little attention.

6th, 7th and 8th grade students' misconceptions regarding global environmental problems such as greenhouse effects (Darçın et al., 2006), ozone layer and its

function (Bozkurt & Aydoğdu, 2004; Kaya & Turan, 2005), acid rain (Bozkurt & Orhan, 2004), ozone layer depletion (Darçın et al., 2006) and global warming (Bozkurt, et al., 2006 - in press) were investigated in several research studies. The results of these studies seemed to be consistent with and support to one another. About all these studies reported students' lack of knowledge and misconceptions on the global environmental problems. Multiple-choice test was the main data collection instrument used in many of these studies. Darçın et al. (2006), who used Likert type scale with 36 items, examined the effects of grade level on students' understanding and misconceptions on greenhouse effects. Their results indicated that the higher level students had significantly more knowledge on the greenhouse effects than the lower ones. The researchers believed that these misconceptions might be dealt with by use of conceptual-change-text-oriented instruction (Özkan et al, 2004) and including adequate information to science books and through the correct use of communication devices (TV, newspapers, radio…etc) (Bozkurt & Cangüsü, 2002).

Other researchers paid more attention to local and residential environmental problems in Turkey. One of the comprehensive studies was performed by Alp (2005) with 2536 6^{th}, 8^{th} and 10^{th} grade students in Ankara. She used Turkish version CHEAKS initially developed in English (Leeming, Dwyer & Bracken, 1995) and widely used (e.g. Walsh-Daneshmandi & MacLachhan, 2006) in the world. Knowledge part of the T-CHEAKS included sub-parts pertaining to animals, energy, recycling, water, pollution and general issues. Similar to Darçın et al. (2006)'s study, Alp also found that grade level had significant effect on students' knowledge. This result was consistent with her other study (Alp, et al., 2006a) undertaken with 1140 6^{th} and 8^{th} graders. Male students' environmental knowledge was significantly higher than female ones for only 6^{th} grade. However, Alp et al. (2006a, 2006b, 2008) found no significant difference between male and female students with regard to environmental knowledge. She further reported significant, but low correlation between knowledge and attitude. Furthermore, Alp et al. (2008) reported students' limited environmental knowledge regarding recycling, water and energy usage and environmental pollution. Alp's and Alp, et al.'s results related to recycling and waste

management supported to the results of Yücel and Morgil (1999) who reported students' limited knowledge on recycling and waste management.

Armağan (2006) conducted a research with 212 7th and 8th grade students in Kırıkkale in order to determine students' knowledge on and awareness of environmental issues. She prepared multiple choice and open ended questions by considering TIMSS and PSA items. Her study indicated that the students seemed to have sufficient knowledge on the topics of pollutions, the reasons of pollution, recycling and energy. She also reported students' knowledge on global environmental problems (especially ozone layer and acid rain). Her results supported initial findings of Bozkurt and Aydoğdu (2004), Kaya and Turan (2005), Bozkurt and Orhan, (2004) and Darçın et al. (2006) in that students indicated their insufficient knowledge on ozone layer and acid rain. Bozkurt et al. (2004) investigated 6th, 7th and 8th grade students' misconceptions regarding erosion. Their findings revealed that students had insufficient knowledge on erosion, and they confused the erosion with earthquake and landslide. To investigate the effects of constructivist learning on 5th grade students' achievement and retention of the topics of biodiversity, environmental pollution and erosion. He found significant effects of instruction designed based on constructivism on increasing students' knowledge on the selected topics.

One of the aims of the research done by Erentay and Erdoğan (2006) with 5th grader was to investigate students' knowledge on Yanardöner Plant (Centaurea tchihatcheffii), which is endemic to Ankara, and on Mogan Lake, which is located in east of Ankara and loosing the quality and quantity of its water. As a result of regular meetings held with students and a series of field trips to Mogan Lake and its surroundings, it was observed that students' initial knowledge on these topics significantly changed. Students' started to talk about the reasons of loss of these environmental values and about the necessary precautions needed to be taken to protect them. Similar study (Erdoğan & Erentay, 2007) was performed with 5th to 7th grader to determine students' knowledge on Dikkuyruk Bird (Oxyura leucocephala),

which is endangered, and on Eymir Lake, which has faced with several environmental problems. The researchers performed a series of field trips with invited students and their families to Eymir Lake, and encouraged students to conduct water monitoring experiments. Likewise to initial studies of Erentay and Erdoğan (2006), the results indicated students increased knowledge on the selected topics at the end of the field trips.

Çobanoğlu et al. (2006) focused on students' knowledge on general environmental problems and studied with 103 3rd grade, 89 5th grade, 83 6th grade and 62 8th grade students to determine their understanding on environmental problems. They found that students' understanding of environmental problems differed according to their age, gender and SES. 43 % of the male students tended to draw environmental problems whereas 32 % of the female students tended to draw visual pollution. 36 % of the students with low SES drew the picture of environmental problems. On the other hand, 45 of the students with high SES drew the picture of visual pollution. The results also indicated that the students have several misconceptions about the environmental problems.

Socio-Politic-Economic Knowledge

This component also consisted of six sub-components. This component of environmental literacy attracted relatively little attention in selected studies when compared to the other knowledge areas. The studies pertaining to this component of EL investigated students' knowledge on geographical pattern (Akbaş, 2002; Alkış, 2006; Alkış, in-press-a, in-press-b, in-press-c; Cin, 2004; Cin & Yazıcı, 2002; Yazıcı & Samancı, 2003), citizenship participation (Erentay & Erdoğan, 2006), societal and social system (Alp, 2005; Alp, et al., 2006a, 2006b; Kaya, & Turan, 2005), governmental and political system (Erentay, & Erdoğan, 2006), cultural values and activities (Alkış & Oğuzoğlu, 2005a), and economic values and activities (Alkış & Oğuzoğlu, 2005b). The topics covered in these studies were about economic values of natural historical places in Turkey (e.g. Peri Bacalari in Kapodakia),

environmental related-laws, governmental acts towards the environment, economic and global values of endangered species, citizenship responsibilities of individuals, and the roles of NGOs with regard to the environment.

Comparatively, the number of the studies undertaken with 5th grade students was higher than the ones with 6th to 8th grade students. There was only one study in which 1st and 2nd grade students were invited to investigate their knowledge on geographical pattern. None of these studies focused upon socio-political-economic knowledge of kindergarten children, and 3rd and 4th graders.

Students understanding of and misconceptions regarding geography-related concepts were investigated in several studies. 150 6th grade students' misconceptions on the features of the world (polar, equator, latitude, longitude…etc.) and the geographic status (position) of the world (local hour, mathematical position…etc) were investigated through the use of open-ended questions and interviews by Akbaş (2002). He found that students confused the 14 concepts with one another and they reported several misconceptions regarding these concepts. Similarly, Yazıcı and Samancı (2003) investigated 44 5th graders' understanding of 30 different topics from Social Studies curriculum (e.g. damp, river, erosion, plateau, marine…etc). They found that the students had no knowledge on the concept of delta (93.2 %), basin and catchments (90.9 %), plateau (90.9 %) and bay (79.5 %). They also found that students had several misconceptions, for example, on the concept of region (45.5 %), rainfall (40.9 %), climate (34.1 %), bosphorus (34.1 %), and river (29.5 %). The concepts that the students easily understood were forest (81.8 %), volcano (65.9%), steppe (56.8 %) and forecast (56.8 %). Cin (2004) studied with 50 1st year students to determine their knowledge on the topics related with sea. He realized that even though students could identify the basic characteristics of sea, they held misconceptions of the sources of the sea water. He investigated the relationship between 80 eight-year-old children's idea on the formation of the water-based landscape features and their direct experiences of these features. In order to examine the effects of the residence on students' conceptions, the students living in two

different areas, one was from island and one was from coastal, were invited to the study. The most common expression done by the students in both areas was that the phenomena (shape and/scenery) were made by either humans or God. Few of the students indicated that the sea and lake were naturally formed. There was no difference between students in both areas with regard to their conceptions of lake and sea and the formation of these concepts. Alkış conducted a study to investigate 300 5th grade students' understanding and misconceptions regarding the cloud (Alkış, in-press-a), the relationship between the cloud and the rain (Alkış, in-press-b), precipitation (Alkış, 2006), and precipitation types and formation (Alkış, in-press-c). The results of her study seemed to support previous studies in which students in different grades showed several misconceptions on geography-related concepts. She reported 5th graders' limited knowledge on the selected topics.

Studies investigated 5th grade students' knowledge on governmental responsibilities for protecting natural environment (Erdoğan & Erentay, 2006) revealed students' limited knowledge. Alp (2005) and Kaya and Turan (2005) investigated also students' knowledge on non-governmental organizations working on the environment. Kaya and Turan called it as "*environmental organization knowledge*" and found that this knowledge seemed to be significantly higher among the students in private schools than the ones in public schools.

Alkış and Oğuzoğlu (2005a), who have emphasized the importance of historical environment education (Alkış, 2002; Alkış & Oğuzoğlu, 2005b) conducted a study to investigate 394 5th and 326 8th graders' knowledge on historical environment in Bursa. They used three Historical Environment Knowledge Instruments each included different types of items (open-ended items, likert types items and pictures). Each of them was designed by considering the content of Social Studies curriculum. The results revealed students' limited knowledge on historical environment and their low level of awareness of the historical environmental places and events.

2.8.3. Cognitive Skills

This component includes six sub-components associated with skills, but commonly associated with the problem-solving process. Relatively, this component seemed to get the least attention in the selected studies. The exploration of students' problem and issue investigation skills were found in very few studies (Armağan, 2006; Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007). Students' skills investigated in these studies were related to issue analysis, identifying variables and writing research question(s), data collection, data analysis, and planning and undertaking action. Most of these studies involved 5th grade students, while 7th grade and 8th grade students were invited in only two the studies. Other grades were not included.

As observed in the Turkish literature, students' skills related to environmental problem solving seemed to be very limited. Research is also available on investigating students' scientific process skills (e.g. Bozyılmaz & Bağcı-Kılıç, 2005), but they did not focus on students' environmental problem solving skills. Armağan (2006) studied with 212 7th and 8th graders and investigated their problem identification and problem solving skills as well as their environmental knowledge. She provided several cases and tables to the students asked them to investigate the problems in some of them and also suggest to possible solutions to the given problems. For example, she found that 84.1 % of 7th graders and 76.4 % of 8th graders suggested reasonable solutions for preventing air pollution. Furthermore, 54.9 % of 7th graders and 51.5 % of 8th graders suggested reasonable solutions for dealing with erosion. Students were asked to interpret the data given in the table regarding ozone layer. 1.4% of 7th graders and none of 8th grader correctly answered this question. Her results pointed out that the students could not be able to respond correctly to the cases/questions that required higher order skills like judgment, analytical thinking and interpretation.

Erentay and Erdoğan (2006) and Erdoğan and Erentay (2007) investigated 5th to 7th grade students' cognitive skills with regard to solving environmental problems. The

students were taken to the field trips to Mogan lake in 2005 and Eymir Lake in 2006, and the students were encouraged to conduct water quality tests, record their findings, interpret the results of the tests, observe the cause and effect relationships, determine the problems and brainstorm possible solutions. The field trip tests were given to the students at the beginning and end of the field trips. The results revealed that the students identified the problems and analyze the problems in both Lakes through their observations, discussions, collaborations and the use of hand-on science experiments, and also provided solutions for solving the problems in these Lakes.

2.8.4. Affect

This component includes eigth sub-components one of which was added to those based on the material encountered during the analysis. This was "Intention or Eagerness to Learn / Curiosity". This was included considering to the results of Erdoğan and Aydemir (2007)'s study aiming to design an environment course for 5th grade students based on student' previous knowledge and curiosity (intention to learn) regarding specific environmental topics (e.g. energy, damps, food chain, plants and animals). Furthermore, students' affective dispositions/tendencies and personal characteristics were investigated in several research studies (Alkış & Oğuzoğlu, 2005; Alp, 2005; Alp, et al., 2006a, 2006b, 2008; Erdoğan & Erentay, 2007; Erentay & Erdoğan, 2006; Erten, 2003, 2004; Kaya & Turan, 2005; Morgil, Yilmaz & Cingör, 2002; Yücel & Morgil, 1999; Tecer, 2007; Tuncer, Tekkaya, Sungur & Ertepinar, 2005; Tuncer, Ertepınar, Tekkaya & Semra, 2005; Tuncer, Sungur, Tekkaya & Ertepınar, 2006; Yasar, Gultekin, & Anagun, 2005; Yılmaz, et al., 2004). These research studies paid more attention to students' environmental appreciation and sensitivity, environmental attitudes, environmental values, self-efficacy/locus of control, personal responsibility, and intention to act. None of the studies focused on the students' ethical and moral reasoning for the environment. The 5th, 6th and 8th grade students most often served as subjects in studies pertaining to affective component of the environmental literacy. On the other hand, 7th grade students

received little attention, 3rd and 4th grade students received very little attention. There were no studies that involved Kindergarten, 1st grade, and 2nd grade students.

Compared to the other sub-components of affect, most of the attention was given to investigate students' environmental attitudes and its determinants. Other sub-components were paid relatively less attention.

Two types of attitudes were apparent in the selected studies; (1) attitudes toward the environment as a whole and (2) attitude toward a part of the environment. Alp (2005) and Alp et al. (2006a, 2006b, and 2008) reported students' favorable positive attitudes toward the environment as a general. This finding supports the findings of other researches investigating students' attitudes toward the environment and ecology as a whole (Tuncer, Tekkaya, Sungur, & Ertepinar, 2005; Tuncer, Ertepınar, Tekkaya, & Semra, 2005; Tuncer, Sungur, Tekkaya, & Ertepınar, 2006; Yılmaz et al., 2004). Alp and Alp et al. measured students' attitudes through the use of one of the sub-part of T-CHEAKS. Tuncer and et al. used Environmental Attitude Questionnaire including four dimensions; (1) awareness of environmental problems, (2) awareness of national environmental problems, (3) general attitude about solutions, and (4) awareness for individual responsibility and attitude through changing life styles. Similarly, students' favorable attitudes toward endangered species (Erdoğan & Erentay, 2007; Erentay & Erdoğan, 2006) and toward historical environment (Alkış & Oğuzoğlu, 2005) were also found. Erdoğan and Erentay developed their own instrument to measure students' attitudes toward endangered species. This instrument, Attitude toward Endangered Species, included 13 items on a four point Likert type scale. Alkış and Oğuzoğlu also developed their own instrument including 15 items on a five point Likert type scale.

Students' environmental sensitivity was investigated by Kaya, & Turan, (2005) and Tecer, (2007). Kaya and Turan (2005) reported students' higher environmental sensitivity in private school then the ones in public schools, based on the students' awareness of environmental problems in the World, in Turkey and in their own

residence. More recently, Tecer (2007) measured 429 primary school students' environmental sensitivity by asking frequency of TV watching, participation in E-NGOs and use of written and visual media. Her findings revealed that 45.8 % of the students watched TV 3-4 hours in a day. 61.1 % of the students regularly followed the environmental related publications. Female students showed more tendencies to follow these publications. 27.7 % of the students already participated in NGOs and community organizations, and still joined their activities.

Not the use of whole questionnaire, but with the some of the questionnaire items, students' personal responsibility and intention to act (Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007) and students' self-efficacy and locus of control (Alp et al, 2006a, 2008; Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007) were investigated. These studies indicated that students felt responsible for helping protect the natural environment for sustainable way of life and demonstrated willingness to take action for the environment. Furthermore, the students believe in their internal and also external efficacy and control for taking responsible environmental action.

2.8.5. Behavior

This component includes six sub-components; conservation (physical and direct) and eco-management, consumer and economic action, interpersonal and public persuasion, governmental and political action, legal action and law enforcement, and other forms of citizen action. Few research studies (Alp, 2005; Alp et al., 2006a, 2006b, 2008; Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007; Erten, 2002, 2003; Yücel & Morgil, 1999) were found to be related to this component. Students' conservation and eco-management types of responsible action, interpersonal and public persuasion type of responsible action, consumer and economic types of responsible behavior and governmental and political type of responsible action were investigated in the selected studies above. Students in grade 6^{th} and 8^{th} equally, and then grade 5^{th} and 7^{th} were involved in these studies. None of these studies included students in grades K to 4.

In the study of Erten (2002) with 671 6th, 7th and 8th graders, the students reported that they did not talk with their parents about the environment and they did not separate their garbage as battery and bottle. Erten also concluded that while students' recycling behavior seemed to be very low, their energy saving behavior was quite high. Erten (2003) implemented a lesson plan regarding garbage reduction to 230 5th graders. He observed that his implementation of the lesson plan increased students' behaviors of garbage reduction. Yücel and Morgil (1999) observed very few of the participants of their study took an active participation in the organization working on the environmental protection. Alp (2005) conducted a research with 6th, 8th and 10th graders in the district of Ankara. She found that environmental friendly behavior was significantly correlated with behavioral intention ($r = .663$, $p < .01$), and affect ($r = .702$, $p < .01$), but not with knowledge ($r = .036$, $p > .01$). Alp et al. (2006b) further reported that behavioral intention, environmental affects, gender and age were observed to be the predictors of ERB. In their other study, they found significant positive correlation of behavior with intention and feeling, but significant negative correlation with knowledge (Alp et al., 2006a). Alp et al. (2006b) reported as a result of the analyses of the data collected from 1140 students that the linear combination of environmental knowledge, behavioral intentions, affects and locus of control explained 58 % variances of environmental friendly behavior. Erentay and Erdoğan (2006) and Erdoğan and Erentay (2007) investigated 5th grade students' responsible behavior for protecting endangered species and threatened environment. The students in their study reported that after participating in the project, they started to go to Mogan Lake with their parents to pick up spilled garbage around the Lake and talk to the people who came to that place for a picnic and who polluted the Lake. Furthermore, some of the students informed their families, schoolmates and relatives about endangered species and threatened environments in order to let them know the importance of these regions and species as environmental values.

2.9. Summary

The part of this chapter reviewed the relevant literature regarding the studies on EL and ERB abroad and Turkey. The survey of the literature revealed only three national EL assessment studies (e.g. The USA, Israel and South Korea) and two local EL assessment studies (e.g. Israel and Taiwan). The EL framework proposed by Simmons (1995) was mainly used in these studies. The authors of these studies developed their own instrument by considering Simmons' framework of EL and their country context addressing to how EL conceived. Furthermore, this part also reviewed the selected predictors of ERB which are categorical variables, environmental knowledge, cognitive skills, environmental attitudes, intention to act, environmental sensitivity, locus of control, environmental responsibility and environmental curiosity. Previous studies examined the relationship between these selected variables and ERB point out that these all variables strongly contribute to ERB. Moreover, among the demographic variables, age, gender, income and parent education level were observed to be significantly correlated with ERB. The information about the effects of some other categorical variables such as school type, region and culture was insufficient.

Review of Turkish literature revealed more than 60 research studies undertaken from 1997 to present. These selected studies investigated one or more components of environmental literacy. Analysis of these selected studies indicated that three components of EL were paid more attention; students' knowledge of ecology and natural history, knowledge of environmental problems and issues, and affective dispositions toward the environment. Most of the selected studies focused upon determining students' ecological Nd environmental scinces knowledge, food chains and food webs, biotic and a-biotic factors, living and non-living organisms, photosynthesis and respiration. The authors of these studies also investigated the topics of global environmental problems and issues (global warming, acid rain, ozone layer depletion and greenhouse effects) and national and residential environmental problems and issues (water, air and soil pollution, erosion, recycling

and waste management). Students' attitudinal attributes in the studies were regarded as general affect (e.g. attitudes toward historical environment, concern on waste management, attitudes toward solutions of environmental problems) and as specific affect (e.g., attitudes toward endangered species and threatened ecological environments). The other components of environmental literacy were paid little attention in these selected studies in Turkey.

In most of the studies, subjects were drawn from 5th to 8th grade level. On the other hand, students from K to 4th grade level received little attention. Demographic variables were not clearly identified in many of the studies. Although evidence on the influence of age (grade level), gender, and residence on students' knowledge and attitudes was reported, there were very limited or no evidences obtained regarding their influence on students' cognitive skills and ERB. Number of the studies in which the other demographic variables, such as SES, school type, parent education level, cultural diversity and country were used seems to be quite limited and insufficient. Thus, their relationships with any components of environmental literacy need to be clarified.

CHAPTER III

METHOD

This chapter presents the method used for conducting the study and explains why this method was preferred for addressing to the research questions. This chapter starts with overall design of the study accompanied with its schematic representation and the follows with population and sample, data collection instrument, validity and reliability of data collection instrument, data collection and data analysis procedures, proposed path model, and limitations.

3.1. Overall Design of the Study

The design of the study was a survey that is one of the descriptive methods of quantitative studies (Frankel & Wallen, 2006). This study was a nation wide survey which helps describe the basic characteristics of the target group. This study was designed as two-fold. In the first fold, it was aimed to describe environmental literacy characteristics of 5^{th} graders through collecting survey data. In the second fold, it was aimed to investigate the factors affecting fifth grade students' environmentally responsible behaviors that are assumed to be one of the dimensions of Environmental Literacy (Volk & McBeth, 1997). Presented in Figure 1, the study was initiated by constructing a conceptual framework based on a comprehensive review of literature. Categorical variables such as gender, parent education level, types of school, attendance of pre-school, SES, residence, curiosity and family concern were identified. Furthermore, cognitive, affective, and psychomotor dimensions of EL were considered as continuous variables of the study. Next, fifth grade students in Turkey were sampled in accordance with pre-determined selection criteria. Selecting students was realized in several steps as shown in Figure 3.1 and Figure 3.2.

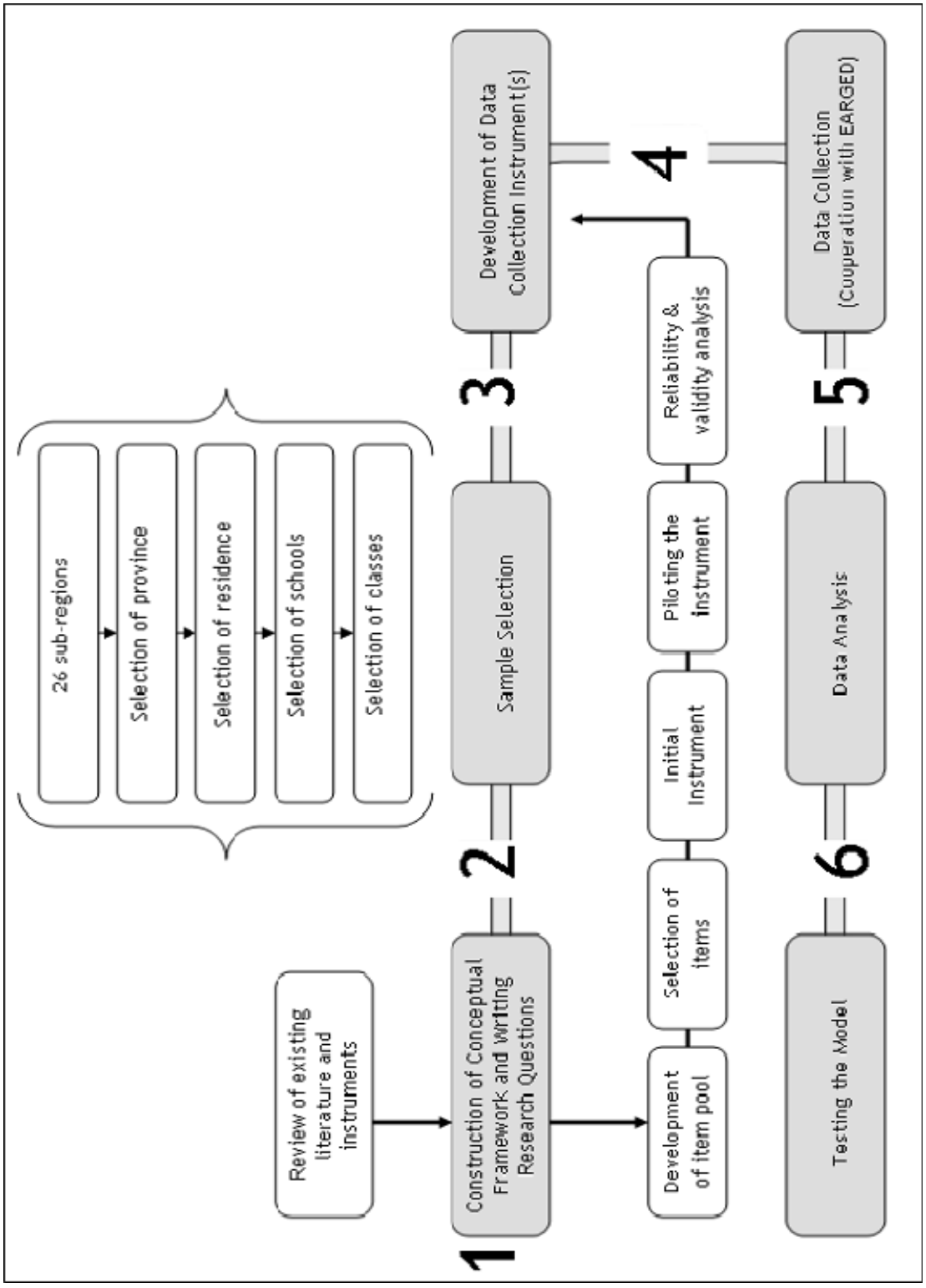

Figure 3.1 Steps of the Overall Design of the Study

Then, the data collection instrument consisting of five major parts (such as I - demographic information, II - Test of Environmental Knowledge, III - Affective Disposition Scale, IV - Children Responsible Environmental Behavior Scale and V – Problem Identification and Problem Solving Skills Test) was developed in six stages by mainly considering characteristics of the sample and the conceptual framework. After that, data collection process was initiated after obtaining permission (see Appendix A) from EARGED to conduct this nationwide study. Having collected data, the data set was prepared and then subjected to statistical analysis. Finally, depending on the literature reviewed, a model representing to factors influencing children's environmentally responsible behaviors was proposed and then, this conceptual model was tested by means of LISREL 8.30. In order to explain the model, the fit indeces such as Chi-Square, GFI, CFI, AGFI, SRMR, and RMSEA were considered. These six steps in the research design are mentioned in following titles.

3.2. Population and Sample

Population of the present study was all fifth grade elementary students in Turkey. There are three main rationales behind selecting this grade level. First, the students in this grade have experienced newly developed curriculum because the influences of new curriculum on ERB is also main emphasis of the study. Since newly developed science and technology curriculum have included a dimension of environment, an environmental concern is expected to be considered by fifth grade students taking the course. In other words, the new developed curricula are fully implemented into first cycle of the primary education while the new curricula have been implemented gradually in the second cycle of the primary education. Second, based on the Piaget's Cognitive Development Theory, students of 10 to 11 years of age can be assumed to be literate in math, science, Turkish literature compared to the first, second and third grade students in primary school.

Third, since students of grade 6-8 are mainly concentrated on preparation for the so called high school entrance exam (Exam of Level Determination - SBS) it might be likely to observe a competition among sixth, seventh and eight grade students. Students might have an exam anxiety after starting sixth grade. Thus, it is assumed that the students in the fifth grade may not be experiencing such an anxiety. For the above mentioned reasons, it is decided that fifth grade children are more appropriate for the present study.

Table 3.1
*The List of Selected Province in Each Region****

Name of Region*	Selected Province	Number of primary school**			
		Public	Private	Total	Invited schools
1. Istanbul sub-region	Istanbul	1263	191	1454	3
2. Ankara sub-region	Ankara	913	66	979	3
3. İzmir sub-region	İzmir	1032	41	1073	3
4. Bursa sub-region	Bursa	591	23	614	3
5. Kocaeli sub-region	Kocaeli	327	13	340	3
6. Tekirdağ sub-region	Tekirdağ	184	5	189	3
7. Adana sub-region	Adana	713	17	730	3
8. Aydın sub-region	Denizli	373	5	378	3
9. Antalya sub-region	Antalya	681	21	702	3
10. Balıkesir sub-region	Balıkesir	580	7	587	3
11. Zonguldak sub-region	Zonguldak	326	7	333	3
12. Manisa sub-region	Manisa	733	15	748	3
13. Konya sub-region	Konya	947	26	973	3
14. Gaziantep sub-region	Gaziantep	596	14	610	3
15. Hatay sub-region	Hatay	627	8	635	3
16. Kayseri sub-region	Kayseri	565	15	580	3
17. Kırıkkale sub-region	Kırıkkale	155	1	156	3
18. Samsun sub-region	Samsun	1224	7	1231	3
19. Trabzon sub-region	Rize	144	3	147	3
20. Malatya sub-region	Elazığ	442	5	447	3
21. Kastamonu sub-region	Kastamonu	429	1	430	3
22. Erzurum sub-region	Erzincan	189	3	192	3
23. Şanlıurfa sub-region	Diyarbakır	1030	5	1035	3
24. Mardin sub-region	Batman	378	2	380	3
25. Ağrı sub-region	Kars	414	2	416	3
26. Van sub-region	Van	773	2	775	3
Total		15629	505	16134	78

* 2003 Socio-Economic development of provinces (www.dpt.gor.tr/bgyu/seg/iller2003.html and http://www.dpt.gov.tr/bgyu/seg/duzey12003.html)
** 2004-2005 National Education Statistics (Eğitim Teknolojileri Genel Müdürlüğü, 2005)
*** Arranged in a descending order (most developed to least developed sub-region)

In order to select a representative sample, some pre-determined criteria were taken into account. First of all, rather than just considering seven regions in Turkey, twenty six sub-regions in accordance with their socioeconomic development level as determined by State Planning Organization (DPT) were initially considered. Since most of these regions include more than one province, the most developed province in each region was determined. In other words, the selected province in each region was the most developed province, but it would be less developed one when relatively compared to those in other regions. Table 3.1 shows the sub regions, the most developed province in each region and number of the public and private schools in each province selected as sample of the study and the number of the invited schools. For the study, three schools (one private school and one public school from urban area, and one public school from rural area) from each sub-region were invited to participate. Thus, 78 schools (26 private and 52 public) were included in the study.

Once 26 provinces have been selected from the regions, number of public and private schools was determined from the web page of MONE in Turkey. For each province urban (city center) area and rural (county and/or village) area was considered, since it was observed that residence (living urban area or rural area) had a significant impact on individuals' environmental concern (Van Liere & Dunlap, 1980). One private and public school from urban area and one public school from rural area were randomly selected from two lists available in MONE's web page.

In the first list, name, telephone number and addresses of all public schools (pre-schools, elementary schools and high schools) all around Turkey are included. In the second list, found under Private Education Directorate (Ozel Kurumlar Müdürlüğü), all private educational institutions are included. Since private schools in Turkey have been generally located in the urban areas, these areas were only considered while selecting private schools. Further, one fifth grade class was selected randomly from each selected school. Figure 3.2 represents the steps followed in the sample selection process.

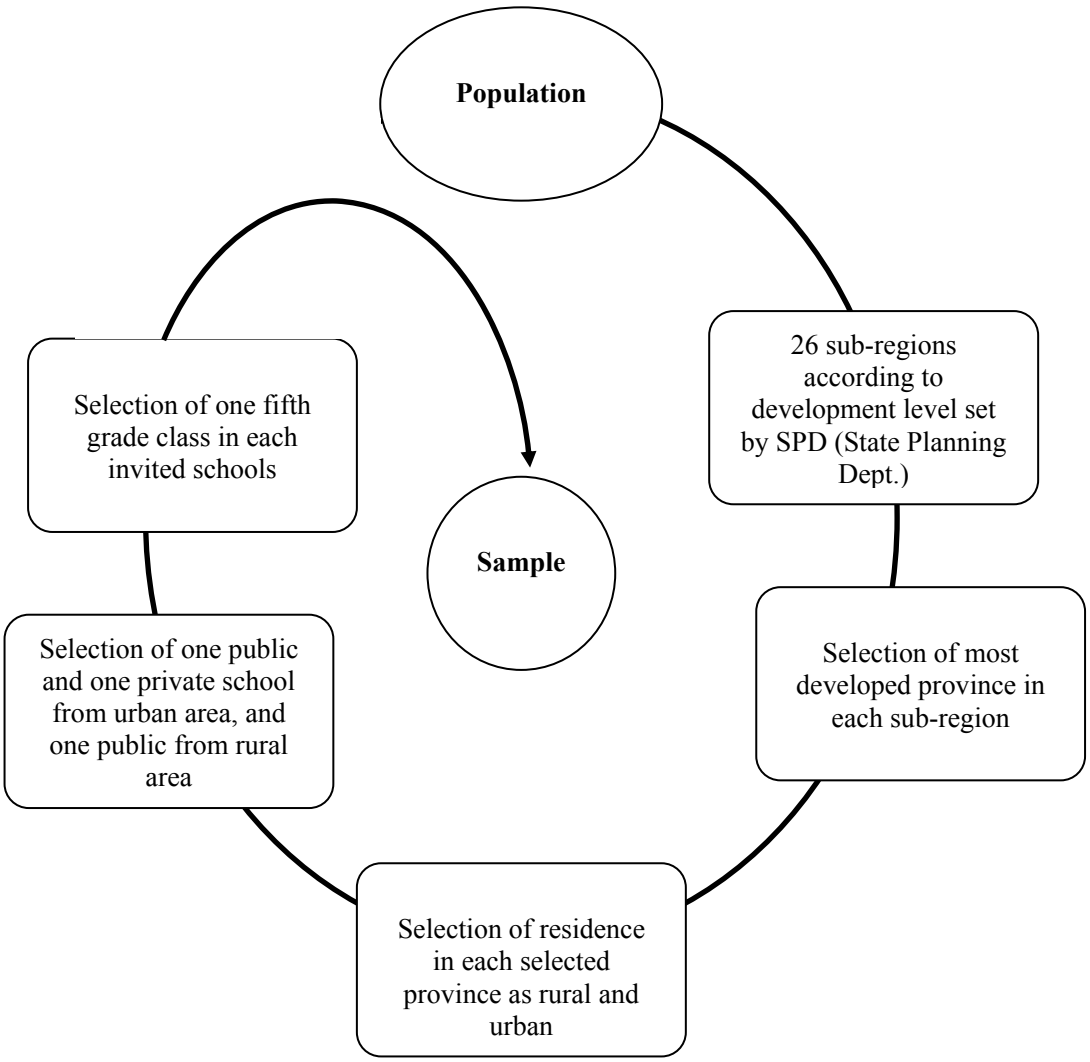

Figure 3.2 Sample Selection Steps

Based upon criteria and steps identified in figure 3.2, sample of the study was selected among the invited schools through the use of multi-stage sampling procedure. Thus, subjects of the present study were 2412 fifth grade students drawn from 26 private and 52 public schools in 26 provinces from all around Turkey. Table 3.2 illustrates the number of the students from rural and urban areas in 26 provinces.

Table 3.2
Number of the Students Drawn from Rural and Urban Areas in 26 Provinces

Selected Province	Residence			Total
	Students in Urban Public Schools	Students in Rural Public Schools	Students in Urban Private Schools	
Adana	40	62	23	125
Ankara	40	37	23	100
Antalya	27	5	14	46
Balıkesir	40	17	20	77
Batman	79	33	21	133
Bursa	39	14	23	76
Denizli	49	49	10	108
Diyarbakır	40	34	23	97
Elazığ	16	11	12	39
Erzincan	65	12	23	100
Gaziantep	39	42	23	104
Hatay	40	41	23	104
İstanbul	32	13	23	68
İzmir	28	22	23	73
Kars	31	26	20	77
Kastamonu	40	36	23	99
Kayseri	40	42	22	104
Kırıkkale	57	20	23	100
Kocaeli	40	42	14	56
Konya	40	42	23	105
Manisa	40	25	23	88
Rize	40	39	23	102
Samsun	38	42	5	85
Tekirdağ	40	37	15	92
Van	40	40	23	103
Zonguldak	39	49	23	111
Total	1059	832	521	2412

The basic characteristics of the participants are summarized in Table 3.3. The ages of the students ranged between 10 and 11. 1207 of them were female (50%) and 1185 were male (49.1%). 20 students left gender question blank. 1891 (78.4%) of the students were from public schools and 521 (21.6%) were from private schools. Among the students in public schools, 1059 (43.9%) were from urban areas and 832 (34.5%) were from rural areas. All of the students in private schools were from urban areas (n = 521, 21.6%).

Table 3.3
Descriptions of the Sample (*N*=2412)

Variables	*f* (frequency)	% (percent)
Gender		
Female	1207	50
Male	1185	49.1
Missing	20	0.9
School Type		
Students in Public Schools	1891	78.4
Students in Private Schools	521	21.6
Participation in Pre-school Education		
Students Who took Pre-school Ed.	1083	44.9
Students Who did not take Pre-school Ed.	1299	53.9
Missing	30	1.2
Residence		
Students in Urban Public Schools	1059	43.9
Students in Rural Public Schools	832	34.5
Students in Urban Private Schools	521	21.6
Income		
500 TL and below	243	10.1
501 – 1000	321	13.3
1001 – 1500	117	4.9
1501 – 2000	63	2.6
2001 and above	158	6.6
I do not know and Missing	1510	62.5

1083 (44.9%) of the students took pre-school education whereas 1299 (53.9%) of the students did not take pre-school education. 30 students did not respond to the item about preschool attendance. Income of the parents of the students varied. Family income of 243 students (10.1%) was 500TL and below, of 312 students (13.3%) was between 501 and 1000, of 117 students (4.9%) was between 1001 and 1500, of 63 students (2.6%) was between 1501 and 2000, and of 158 students (6.6%) was 2001 and above. 1510 students (62.5%) either left blank or said "I do not know." Mother and father education level of the students was another variable identified in the study. Table 3.4 shows the parents education level of the participants. As observed in Table

4, 256 of the mothers and 64 of the fathers were illiterate. It means that they did not participate in any level of education. Most of the mothers (n=994) and fathers (n= 704) only completed elementary education. Number of the mothers and fathers who completed either master or PhD was quite low. Fathers' education level seems to be higher than mothers' education level.

Table 3.4
Education Level of Participants' Parents

	Mother		Father	
	f	%	*f*	%
Level of Education				
Illiterate	256	10.6	64	2.7
Elementary School	994	41.2	704	29.2
Middle School	222	9.2	351	14.6
High School	382	15.8	518	21.59
University	282	11.7	428	17.7
Master & PhD	71	2.9	133	5.5
I do not know	152	6.3	156	6.5
Missing	53	2.2	58	2.4

3.2.1. Protection of Human Subjects

This study was conducted ethically by getting permission (see Appendix B) from Middle East Technical University (METU), Ethic Committee. The policies and procedures of Ethic Committee in METU were utilized. Together with Application Form for Human Research, Project Information Form, Volunteer Participation Form and Data Collection Instrument were given to Committee for further review of whether the study was in line with the ethical guideline of the human researches.

3.3. Data Collection Instrument

In order to collect data from the sampled students, Elementary School Environmental Literacy Instrument (ESELI) was developed by the researcher. The instrument basically included five main parts. The instrumentation process was initiated with the development of conceptual framework for both the study itself and the instrument.

The steps followed for the development of ESELI, the specifics actions which were taken for each step and the characteristics of each part of the instrument are explained in the following sections. Figure 3.3 illustrates these six steps and further sub-steps which were followed for developing the data collection instrument.

3.3.1. Instrumentation Process

Six stages were followed in developing ESELI. These stages are as follows.

(1) Developing conceptual framework for the instrument
(2) Analysis of the existing literature in Turkey
(3) Analysis of primary school objectives
(4) Developing item pool and constructing the instrument
(5) Taking expert opinion
(6) Pilot administration of the instrument

3.3.1.1. Stage 1: Developing Conceptual Framework for the Instrument

In the first stage, substantial professional literature in the World and in Turkey regarding environmental education (EE) and environmental literacy (EL) was initially reviewed. This review of literature of EE and EL research revealed the dimensions that were studied previously and that have potential importance for the present research. Two main dimensions emerged from the review of literature. First dimension was entitled as *categorical dimension* that could be also called as *background dimension*. This dimension included the variables of *age and grade* (Bacanak, et al., 2004; Bahar, et al. 2002), *gender* (Alp, 2005; Erdogan & Aydemir, 2007; Erten, 2003), *school type* (public and private) (Kaya & Turan, 2005; Tuncer, Tekkaya, Sungur & Ertepinar, 2005), *socioeconomic status* - *SES* (high, medium and low) (Yılmaz, et al., 2004), *parent education* (Erdogan, 2004), *residence* (urban-rural or city-village) (Gökdere, 2005).

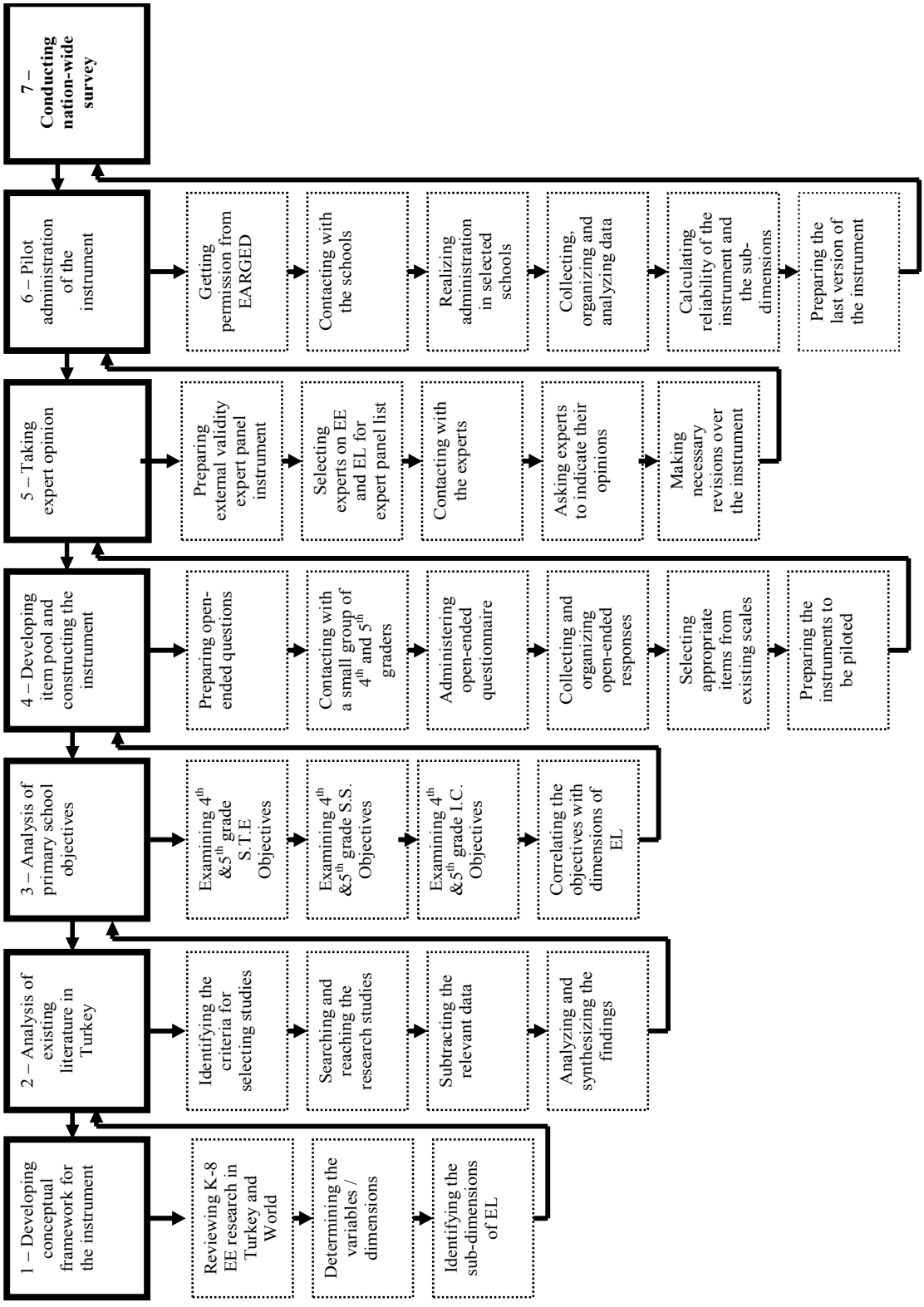

Figure 3.3 The Steps Followed in Developing Data Collection Instrument

The variable titled "*participation in pre-school"* was later included in this dimension because of its potential importance and not being measured previously. Second dimension was called as *environmental literacy* including variables pertaining to cognitive, affective and psychomotor domains. Environmental literacy dimension consisted of *knowledge* (knowledge of natural history and ecology, knowledge of environmental issues and problems and socio-economic knowledge), *affect and additional determinants of ERB* (sensitivity, concern, attitudes, values, ethics, locus of control, personal responsibility and willingness to act), *cognitive skills* and *types of ERB* (persuasion, political action, eco-management, legal action and consumer & economic action) (Harvey, 1977; Hines, et al., 1986/87; Hungerford & Volk, 1990; Hungerford, et al., 1980; Roth, 1992; Simmons, 1995; UNESCO, 1978; Volk & McBeth, 1997; Volk & McBeth, 2005; Wilke, 1995). These components were also observed in other national EL assessment studies performed in South Korea (Lee at al., 2003), Israel (Negev et al., 2006), and the U.S. (McBeth, 2006).

3.3.1.2. Stage 2: Analysis of the Existing Literature in Turkey

In the second stage, the research studies conducted in Turkey for investigating environmental education were reviewed. In order to better understand and portray the environmental literacy in these studies in Turkey, following criteria (delimitations) were taken into account.

(1) The studies sampling Turkish students,
(2) The studies including kindergarten and primary school children (K-8),
(3) The studies indicating empirical data
(4) The studies published in academic Journals and conference Proceedings, and as departmental report and Master and PhD dissertation,
(5) The studies carried out between the dates of 1997-2007,
(6) The studies addressing to EE and any components of EL.

Considering the criteria above, four steps were initially followed for analyzing the selected studies such as (1) searching the articles, (2) subtracting the related information, (3) constructing the tables on emerged information and (4) synthesizing and analyzing the findings. The data sources used for the study were refereed journals published in Turkey (e.g. MEB electronic journal, Education and Science…etc), EARGED Library, the conference proceedings with full-text, the conference proceedings with abstracts, Turkish Academic Network and Information Center (ULAKBIM), different academic data bases and unpublished dissertations. Furthermore, the researchers who were studying on the topic of environmental education were contacted and their studies on the basis of stated criteria were also requested. Thus, more than 60 studies were finally reached, but 53 studies associated with environmental education were selected because of their relevance to the criteria followed. These collected studies were further analyzed with regard to pre-determined categories; *that is*, sub-components of EL. Three aspects of these studies were examined: (a) features of the research methodology; (b) socio-demographic characteristics of the subjects; and (c) components of environmental literacy assessed (Simmons, 1995; Volk & McBeth, 1997). Three charts were constructed to support these analyses; e.g., one for each analysis.

3.3.1.3. Stage 3: Analysis of Primary School Objectives

In the third stage, correlation analysis between objectives and the dimensions of EL was realized in order to determine to what extend the objectives are congruent with the dimensions of EL. For this reason, the objectives, so called attainments in new curricula of 2004, in the newly developed 4^{th} and 5^{th} grade social sciences, 4^{th} and 5^{th} grade science and technology course curriculum and interdisciplinary subjects (e.g. Human Rights and Citizenship Education, Health and Sport Education, and Special Education) were taken from the corresponding guide books and analyzed with regard to sub-components of environmental literacy. The reason of selecting these curricula was because they were found to be more related to environmental education

compared to other courses. The objectives in selected courses were firstly listed and carefully examined.

A table including the dimensions of EL and name of units, learning domains, grade and how the attainments were related to EL dimensions was included in Appendix C and D

3.3.1.4. Stage 4: Developing Item Pool and Constructing the Instrument

In the fourth stage of the instrument development process, item pool was developed by considering the results of the stage-1, stage-2 and stage-3. In order to have a representative sample of 4^{th} and 5^{th} grade objectives, number of the objectives/attainment in 4^{th} and 5^{th} grade Social Sciences (MEB, 2004), 4^{th} and 5^{th} grade Science and Technology Course and Interdisciplinary Courses' (Health Education, Disaster Education, Civic Education…etc.) (MEB, 2005) was considered. Based upon the analyses done in previous stages, the initial data collection instrument consisted of five parts, each of which corresponded to one or more sections of final version of the instrument. The analysis of research studies indicated substantial evidences for constructing (writing) items pertaining to the dimensions of Knowledge, and Affect along with demographic information. The parts of the instruments and initial items in each part were as follows;

Part 1: ***Demographic Information*** **[DI]:** This part of the instrument included items on students' background and/or socio-demographic information. In this part, there were eleven questions asked to identify students' background information. More specifically; these items are related to *gender* (Alp, 2005; Erten, 2003), *school type* (public and private) (Kaya & Turan, 2005; Tuncer, Tekkaya, Sungur & Ertepinar, 2005), *enrolment in pre-primary school, parent education* (Sağır et al., 2008), *income* (Yılmaz, et al., 2004), *residence* (urban-rural or city-village) (Gökdere, 2005), *curiosity* on the environment (Erdoğan & Aydemir, 2007), *source of environmental knowledge* (Barraza, & Cuaron, 2004), e*xperience in the natural*

environments (Negev et al., 2006) and *parents' concern on the environmental problems* (Erten, 2002). The name of the school is also asked to students to cross-match the socio economic background of the school and the residence in which students are living. These background items were selected because it was observed in the literature that these items were significantly associated with one or more components of environmental literacy.

Part 2: *The Test for Environmental Knowledge* [TEK]: The items in the test were selected by considering the three sub-components of the environmental knowledge; namely, (1) knowledge on ecology and natural history, (2) knowledge on environmental problems and issues and (3) socio-political-economic knowledge. In order to form the item pool for this part, the items and the questions in the 53 research studies (see Chapter 2) were carefully examined. The items were taken from the studies based upon the number of objectives analyzed (table of specification) in stage-3 that corresponded to each sub-components of environmental knowledge. Among more than 60 studies selected from Turkish literature, some did not provide any items / questions in the texts, some others provided partial information about the items used, and the rest included the data collection instruments and full items / questions in the article. As a result, the item pool composed of sixty-five questions was built. From the item pool, twenty-four items were initially selected. This pool included basically 20 multiple choice and 4 T-F type questions. 14 multiple choice questions and 4 T-F type items were drawn from the item pool to prepare the tool for measuring students' environmental knowledge. This reduction was done by considering the number of the attainments and their proportion in 4^{th} and 5^{th} grade Science and Technology Course, 4^{th} and 5^{th} grade Social Science Course and Interdisciplinary Courses (e.g. special education, human rights, health education…etc). Six multiple choice questions were written by the researcher because adequate questions related to natural history and cultural values, human health, geography, habitat, natural disaster and abiotic-factors were not found in the existing questionnaires, thus in the item pool.

Having received opinions from 17 experts [in external validity panel], two of the questions were excluded from TEK because it was thought that these items were not appropriate for the level of 5th grade students. Thus, 22 items in TEK was composed of 19 four alternatives multiple-choice items and three T-F items.

Part 3: ***The Affective Disposition toward Environment Scale*** **[ADTES]:** The third part of ESELI was designed to assess students' feelings and tendencies about the environment such as sensitivity, attitudes, locus of control, responsibility and willingness to participate in environmental problems solving. Initially this part included 20 items to be ranked on a six point scale, ranging from strongly agree to strongly disagree. However, fourth and fifth grade teachers and a measurement and evaluation expert in the external validity panel did not believe that fifth grade students could understand the word "strongly." Thus, the options strongly agree and strongly disagree were excluded from the scale.

As it is stated in the above paragraph the third part of ESELI was built on five components. The sensitivity component was designed to assess students' value judgment regarding the environment (Yılmaz et al., 2006), students' feelings and their life experience related to environmental sensitivity. These items were mainly extracted from MSELI developed by McBeth (2006) on environmental sensitivity. The attitude items were designed to assess students' attitude toward natural resources (Erentay & Erdogan, 2006), environmental problems (Alp, 2006, T- CHEAKS), environmental pollutions, landscape and biodiversity (Yılmaz et al., 2006). Locus of control items were designed to assess whether students are intrinsically motivated to solve environmental problems. One of the locus of control items was designed by author whereas the other was adapted from the study of Erentay and Erdogan (2006). In order to assess students' perception on the individual and governmental responsibility for dealing with environmental problems, the responsibility items were included on the basis of the prior research study, including individual and governmental responsibility, done with 6th grade students (Tuncer et al., 2005). The

willingness items were written by the author in order to assess students' willingness to participate in solving environmental problems.

Three of the items in the scale were consciously designed as negative-worded. This was done for refreshing students and controlling whether they are carefully reading / responding the items or not. However, this was later changed by EARGED for the reason not to trick students and not to make them feel uncomfortable.

Part 4: ***Children Responsible Environmental Behavior Scale*** **[CREBS]:** In order to prepare the items regarding behavior dimension of ESELI, an open ended questionnaire was initially developed for pre-research. The questionnaire consisted of four open-ended questions (each pertaining to eco-management, consumer action and economic action, individual and public persuasion, and political action). In the form, the students were asked to indicate (at least) up to five behaviors that they demonstrated and/or planned to demonstrate to help prevent and resolve environmental problems and issues in last one year.

These open-ended questions were examined by two elementary school science and technology teachers and one curriculum developer. They checked the items with regard to their understandability and appropriateness to the aim of the study and students development level. Next, some of the wording of the statements was revised in accordance with the feedback received. In order to ensure the diversity among the students, some categorical variables such as school type, SES, grade level and province were considered while selecting the sample of this administration. Then, the researcher contacted with two public schools [one from Ankara and one from Istanbul] and two private schools [one from Ankara and from Denizli] to administer this open-ended questionnaire. In each school, except a private school in Ankara, one 4^{th} and one 5^{th} grade were sampled for the study. The questionnaires were sent to teachers in the invited school. The purpose and importance of this initial work was introduced to the teachers who would realize the administration and they were encouraged to respond to students' questions about the items. During the

administration, the purpose of this particular work was clearly explained by the teachers to the students. After administration was completed, the responses were mailed to the researcher. Number of the students in this initial administration, their grade level, gender and province are given in Table 3.5.

Table 3.5
Number of the Students and Schools That Were Invited for Determining the Items of Behavior Scale

Province / School	Grade	Number of the students		Total
		Male	Female	
Ankara / Public School	4th	21	19	40
	5th	19	17	36
Istanbul / Public School	4th	17	21	38
	5th	14	23	37
Denizli / Private School	4th	13	10	23
	5th	23	16	39
Ankara / Private School	4th	-	-	-
	5th	10	6	16
Total		117	112	229

The students provided more responses to first question compared to the other questions. Most of the students gave at least five responses to first question. However, their responses to the last question were relatively limited. Upon which the responses had been given by 229 students, most frequently given responses were considered in order to create / write behavioral items for the scale. Ten items for eco-management action, six items for economic and consumer action, six items for individual and public persuasion and six items for political action were prepared.

In the instrument developed, the students are asked to indicate how many times they demonstrated the given behavior in last one year. The responses of the items ranged from never (0 times), 1 time, 2 times, 3 times, 4 times, 5 times to more than five times. At the end, CREBS with twenty-eight items on a seven point scale was prepared for pilot administration.

Part 5: ***The Problem Identification and Problem Solving Skills Test*** **[PIPSST]:** Review of Turkish and international literature pertaining to environmental education revealed that studies associated with scientific process skills, cognitive skills, issue analysis, investigation and evaluation skills were quite limited. They do not provide sufficient evidences, idea and/or understanding for developing skill test. Among these, one research study (McBeth, 2006) done with middle school American students seemed to be parallel to the framework of the present study. One of the parts of that instrument was used in this nation-wide Environmental Literacy Assessment study by getting permission from its developer. As the instrument was written in English, firstly it was translated into Turkish. After that, the test including a text with following two questions was simplified for 5th grade students. The pilot test of this adapted test with 673 students indicated that this part was somehow misunderstood and was not responded as intended. For that reason, another instrument was developed by researcher including two questions and piloted with 98 5th grade students in public school in the rural of Ankara. This test aims to investigate students' environmental related scientific process skills. It includes a case regarding water pollution following with two questions. In the first question, the students are asked to order the list of the seven steps to identify the environmental pollution in the given case. In the second question, the students are asked to provide their own solution for resolving this water pollution.

3.3.1.5. Stage 5: Taking Expert Opinions

Before pilot testing, in order to get expert opinion about the items in ESELI, external validity expert review panel was formed. For the expert review, 17 people from different areas of specialization (such as ecology, environmental sciences and environmental education, curriculum instruction, science education, science and technology course, social studies course, measurement evaluation…etc) were invited to the panel. It was believed that reaching those people from varied areas would provide a rich amount of feedbacks. A complete list of the people who were invited to the external validity panel is given in Appendix E.

Once they accepted the invitation, six documents were prepared for clarifying the review of the instrument and were sent to all. Additionally, they were asked to reflect their opinions if any. Furthermore, it was contacted with Ministry of National Education, Board of Education who is responsible for curriculum reform in Turkey. They assigned two teachers for this study, one of whom was text-book writer of 4th grade Science and Technology Education (STE) course and one of whom was text-book writer of 5th to 8th grade STE course. They were kindly asked to examine the items and report whether items in the instrument were in line with the environmental related topics and objectives (attainments) in 4th and 5th grade STE curriculum and textbooks.

In order for 4th and 5th grade students to make the items understandable and relevant, a Turkish expert who wrote a series of book for these grades of students was contacted. He was asked to examine the wordings of the items and to shorten the items if any of these was long and ambiguous. Furthermore, a measurement and evaluation specialist was asked to examine the items and alternatives, and indicate whether these alternatives were appropriate for the instrument and for the further statistical analyses.

Data collectors' observations during the pilot administration, and pilot test results also provided evidences about the difficulty of the students while responding to the items.

Along with the direction, five different but related documents were sent to the experts in the panel. These documents and what they were about are described below. In the direction, the instruction about how the experts would examine/review ESELI and what they were supposed to report in their review was stated. First document was designed to inform the experts about the purpose, method, sample, sampling, instrumentation, analysis and the model to be tested in the dissertation. Each part of the dissertation was briefly explained in this document. Second document includes brief information about the theories and the basic components of

EL. In the document three, initial form of ESELI with five parts and 82 items was given. Forth document included five different tables, each of which was designed to better understand what each of the items in the instrument is about. Their correspondence to any of forty sub-components of EL was also indicated in these tables. Furthermore, the source of the items [developers of the items], were also given in the table.

Given in Appendix F, document five included "External Validity Panel Evaluation Questionnaire" which was designed by the researcher to obtain experts' opinions about the items in and overall of ESELI. This evaluation form consisted of three main parts. In the first part, three questions were asked to obtain some demographic information about the panel members. In the second part, five yes-no question following with explanation were asked. First three questions were designed to determine whether there were any gender bias [discrimination], cultural and ethnic bias, and social and regional bias in the overall ESELI or not. The other question was designed to determine whether the items in the instrument were clear, understandable and unambiguous for 4^{th} and 5^{th} grade students. The last question of this part was designed to determine the effective and efficient way of administrating the instrument to the students, and the panel members were required to select from the alternatives for the most efficient way and explain the reasons. Part three was designed as opinionaire with 18 items on a five point Likert type scale ranging strongly disagree to strongly agree. In this part, three issues were asked to the panel members: (1) whether the items were representing environmental related attainments of 4^{th} and 5^{th} grade Science and Technology Course, 4^{th} and 5^{th} grade Social Sciences Course, (2) whether any of the parts of the instrument were valid assessment for each section of the instrument, and (3) whether the items were understandable for these age group students. At the end of the instrument, the panel was asked to indicate their further concern and make necessary changes (e.g. language, wording, and additional information) over the instrument.

3.3.1.6. Stage 6: Pilot Testing of ESELI

A permission request letter was sent to Educational Research and Development Directorate (E.A.R.G.E.D.) in order to get permission to conduct pilot testing of ESELI in the public and private elementary schools in Ankara. Along with permission letter, a document including brief description (aims, methods and analysis) of the study, list of the schools in Ankara and process of the pilot study were also sent to EARGED. A project committee in EARGED examined the data collection instrument and the other documents, and gave permission to carry out pilot study in selected 20 elementary schools. While selecting the schools, their location (urban-suburban), their type (public-private) and students' socio-economic status were considered.

Having obtained the permission from the EARGED, each of twenty schools in the list was contacted and then informed about the pilot study. Nearly all of them indicated their desire to participate in the study; however some of the schools, because of the very heavy schedule, could not participate in the piloting process. From each school, at least one 4^{th} grade class and one 5^{th} grade classes were selected (Note: 4^{th} graders were not considered for real administration for their low level of understanding of the items in ESELI). In some schools, the instrument was administered to more than one class.

The instrument was arranged as two forms to check for practicality, response rate and time needed to complete it. After all these steps were completed, two different designs of the instrument were ready for the pilot administration. An appointment was gathered from both vice principal and teachers before each administration. Later, a schedule, including school, class and date was prepared. The first format of the instrument was designed so as it could be completed in a single sitting. Time of completion was recorded for each classroom. The second form was designed so as it could be completed in two consecutive sessions. This format and procedure was preferred because experts considered as too long for one sitting. Table 3.6

summarizes order of the parts in both formats and administration, number of spent to complete the instrument.

Table 3.6
Order of the Parts, Number of the Students and Average Time for Both Administrations

	One-sitting administration	Two-sitting administration	
		First sitting	*Second sitting*
Order of the parts	DI, TEK, ADTES CREBS and PIPSST	DI, TEK, PIPSST	ADTES, CREBS
Number of the students who joined the sitting	522	151	151
Average time for completing the instrument	45-50	20	25

Pilot testing of ESELI was realized with 673 students (329 female, 339 male and 5 did not indicate) in seven public schools and one private school. Of the students, 332 were from 4th grade (in 13 classes) and 351 were from 5th grades (in 15 classes).

Pilot testing of ESELI showed how 4th and 5th grade students responded to the items and whether the items were in line with their understanding level or not. Most of the 4th graders in the pilot study did not responded to the items in intended level. Further, even though grade level had not been considered as a discriminating variable with regard to components of EL for the present study, statistical significance was observed between 4th and 5th graders in terms of many of the components of EL. Thus, only 5th graders were considered for the nationwide survey.

3.3.2. Validity of the Data Collection Instrument

Validity refers to "*appropriateness, correctness, meaningfulness and usefulness"* (Fraenkel & Wallen, 2003; p.158) of inferences based on the data. It is also identified

as appropriate interpretation of the data and scores (Gay, Mills & Airasian, 2006). There are several types of validity, each of which requires collecting different, but complementary evidences to support the soundness of interpretation of the data gathered through the data collection instrument. Each type of validity is ensured by use of different methods. The evidences regarding content and face was determined by making use of expert opinions and a broad review of literature, and construct validity evidence was assured by applying statistical procedure, e.g., factor analysis. Each of these procedures is explained in the following sections.

3.3.2.1. Content and Face Validity

The main focus of *content validity* is content and format of the instrument and it refers the degree to which the instrument includes intended content and reflects relevant (visual, understandable and easy to follow items) format for the target group. Gay et al. (2006) divide content validity as *item validity* and *sampling validity*. Whether the items in the instrument are relevant to the intended content area is the main concern of item validity. Sampling validity is concerned how well the instrument prepared reflects the total content area to be tested. The other type of validity which is conceived to support the content validity is *face validity*. Face validity is more concerned about the format of the instrument. Fraenkel and Wallen (2006) identifies the format of the instrument as the clarity of printing, size of type, adequacy of work space, appropriateness of language, and clarity of direction.

Different ways were used for providing adequate evidences for content and face validity of ESELI. For each part of the instrument, test of specification table was prepared. 4^{th} and 5^{th} grade science and technology course attainments, social studies attainments and interdisciplinary course attainments were examined with regard to sub-components of EL. Preparing table of specification for constructing each part of the instrument provides content coverage of the overall instrument. Furthermore, obtaining expert opinions from 17 people indicated in-depth evidences for content and format of the instrument. Experts were asked to indicate their opinions in terms

of content coverage, format of the parts, clarity of item and directions and relevance of the items for 4th and 5th graders.

3.3.2.2. Construct Validity

Construct-related evidence of validity is concerned about whether the instrument measures the hypothetical psychological construct to be tested, non-observable traits such as intelligence, attitude, and anxiety (Gay, et al., 2006; Fraenkel & Wallen, 2006). Balcı (2004) mentions about two ways to provide evidences for *construct validity*; namely, (1) Factor analysis and (2) Matching with the test and/instrument that was already validated. In this study, first way was preferred to test the construct validity of Part-III (ADTES) and Part-IV (CREBS) whereas second way was preferred for the Part-II (TEK) and Part-V (PIPSST), since all of these parts were developed based on the theoretical structure of EL already validated by Volk and McBeth (1997) and used in national assessment of EL in South Korea (Lee at al., 2003), Israel (Negev et al., 2006), and the U.S. (McBeth, et al., 2007; McBeth, 2006). Furthermore, the items in the Part-II and Part-III were prepared by considering the previously validated instruments. Part-IV was prepared based on the themes emerged from 229 students' responses to 4 open-ended questions.

Construct Validity for Part III (ADTES)

A factor analysis was performed to examine whether there is a single dimension or are multiple dimensions underlying the 20 affective dispositions items. Before running the factor analysis, the data was cleaned by considering the following analysis; normality of each variable (skewness and curtosis), outlier and missing cases. Normality of each data was ensured with the accepted level (± 3.29) of skewness and curtosis values. Then, missing data analysis was conducted in order not the drop the cases. The statistical procedure permits to replace the missing value with mean if each variable has at least 10 % missing value (Tabachnick & Fidell, 2001). It was observed that each of the cases had missing value, but less then 10 % of

the given responses. Thus, each variable was replaced with mean. After that, outlier analysis was performed with the data including 673 cases. Univariate outlier(s) was examined by use of scatter plot and multivariate outlier(s) was examined by use of Mahalanobis distance. Three multivariate outliers and 17 univariate outliers were observed and then deleted from the data set.

Having cleaned the data, a reliability analysis with 20 items was firstly performed to examine the item corrected total correlation. Evidence for the reliability of the scale was provided by calculating internal consistency estimate. Six items were found to have a corrected total correlation lower than .25 (George & Mallery, 2001). The items numbered as 3, 4, 8, 9, 15 and 18 were excluded from the analysis. Other 14 items' corrected total correlation scores were higher than .25.

In order to examine the construct validity and factor structure, these 14 items in Affective Disposition Scale (ADTES) was subjected to exploratory factor analysis with Principle Component Analysis (PCA) method. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy test (measuring whether distribution of values is adequate for performing factor analysis) yielded .816 which was marvelous (Field, 2005) and acceptable. This meant that factor analysis could be performed adequately with this subject. Bartlett's test of sphericity (measuring multivariate normality and testing whether the correlation matrix is an identity matrix) had significant value [$\chi^2(91) = 711.96, p<.0001$], which meant that the normality assumption was met but the identity matrix assumption was not. The factor analysis indicated a four factors structure with the eigenvalue greater than 1.0 (Hair et al., 2006). However, the scree plot (see figure 3.4) revealed three sharp descent and other plots starts to level off. Then, explanatory factor analysis was run again for the rotation for three factors by use of Principle Component Analysis (PCA). Oblimin rotation with Kaiser Normalization was used since it was believed the factors are correlated. Three factors accounted for 44.69 % of the total variance in the participants' responses. Eigenvalue of factor I was 3.68 (accounted for 26.31 %), of factor II was 1.39 (accounted for 9.99 %) and of factor III was 1.17 (accounted for 8.38 %). The factors were

interpreted by considering their size of factor loading, and then named according to conceptual framework used in the recent EL literature (Lee at al., 2003; McBeth, et al., 2007; McBeth, 2006; Negev et al., 2006; Volk & McBeth, 1997).

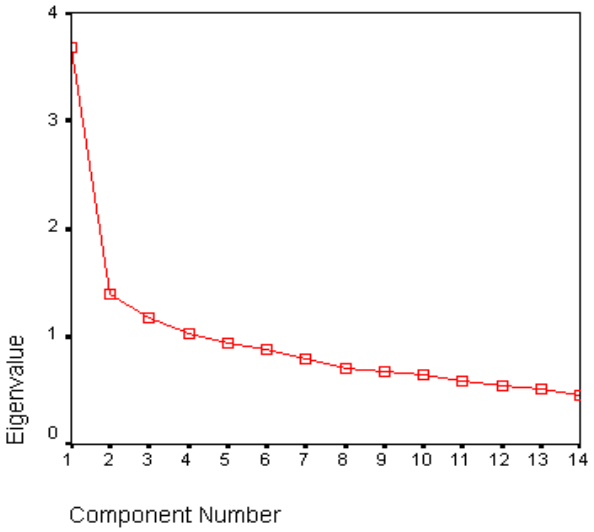

Figure 3.4 Scree plot for ADS

Table 3.7 summarizes factor names, abbreviations, eigenvalues, and variances of each factor.

Table 3.7
Factor Names, Abbreviations, Eigenvalues, Variances of Factors and Cronbach's Alpha Values for ADS

Factor name	Abbreviation	Eigenvalues	% of Variance
Willingness to Take Environmental Action	INTENTION (Factor 1)	3.684	26.311
Environmental Attitudes	ATTITUDE (Factor 2)	1.399	9.99
Environmental Sensitivity	SENSITIVITY (Factor 3)	1.174	8.389

All these results showed three dimensions behind the scale. The factor loadings of each item are given in Table 3.8. Factor loading less than .30 (Stevens, 2002) were suppressed and never considered for the analysis.

Table 3.8
Factor Loadings and Communalities of ADS items

Item Number	Factor Loadings			Communality
	Factor 1	Factor 2	Factor 3	
HIS19	**.707**			.504
HIS20	**.664**			.481
HIS14	**.537**			.319
HIS13	**.509**			.449
HIS12	**.474**			.395
HIS10		**-.717**		.504
HIS1		**-.695**		.556
HIS7		**-.596**	-.320	.493
HIS17		**-.547**		.364
HIS11		**-.479**	.383	.404
HIS5			**.743**	.555
HIS16			**.544**	.389
HIS2		-.365	**.490**	.452
HIS6	.361		**.461**	.393

As far as the items loading on factor 1 were concerned, item 12, 13, 14, 19, and 20 only loaded on factor 1. Thus, factor 1 included six items. Conceptually, item 19 and 20 are more related to intention, item 12 and 13 are related to locus of control and item 14 are related to environmental responsibility. In the present study, all these items loaded on the same factor. This factor and the loading items were given to two different people who were asked to name this factor. The communication with the one expert working on EE and one expert on the psychology came to the conclusion that all these items are quite related and they seems to measure similar affective disposition. Based upon what they suggested and relevant literature, this factor was named as "*Willingness to Take Environmental Action* (INTENTION)".

Item 10, 1 and 17 loaded only on factor II. On the other hand, item 7 and 11 loaded both on factor 2 and factor 3. However, these two items were conceptually related with other three items. Thus, five items were considered as attitude items and grouped under factor 2. Based on the content of the items and the conceptual framework, this factor was named as "*Environmental Attitude* (ATTITUDE)". Item 5

and 16 only loaded on factor 3. On the other hand, item 2 loaded both on factor 3 and factor 2. Similarly, item 6 loaded both on factor 3 and factor 1. Conceptually, item 2 and 6 were categorized under factor 3. Since these items were related to sensitivity, factor 3 was named as "*Environmental Sensitivity* (SENSITIVITY)".

Construct Validity for Part IV (CREBS)

A reliability analysis was performed with the data cleaned previously. First of all, item total corrected scores of 28 items in CREBS were examined. It was observed that item 10 (A10) and 15 (B5) had a score less than .25, and then these two items were initially excluded. Other items had acceptable level of corrected score.

In order to examine the construct validity and factor structure, 26 items of Children Responsible Environmental Behavior Scale (CREBS) was subjected to exploratory factor analysis with Principle Component Analysis (PCA) method. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy test (measuring whether distribution of values is adequate for performing factor analysis) yielded .910 which was marvelous (Field, 2005) and acceptable. This meant that factor analysis could be performed adequately for this subject. Bartlett's test of sphericity (measuring multivariate normality and testing whether the correlation matrix is an identity matrix) had significant value [$\chi^2(325) = 325$, $p<.0001$], which meant that the normality assumption was met but the identity matrix assumption was not.

The analysis pointed out five factors with the eigenvalue greater than 1.0 (Hair, et al., 2006). However, the scree plot (see Figure 3.5) revealed four sharp descent and other plots started to level off.

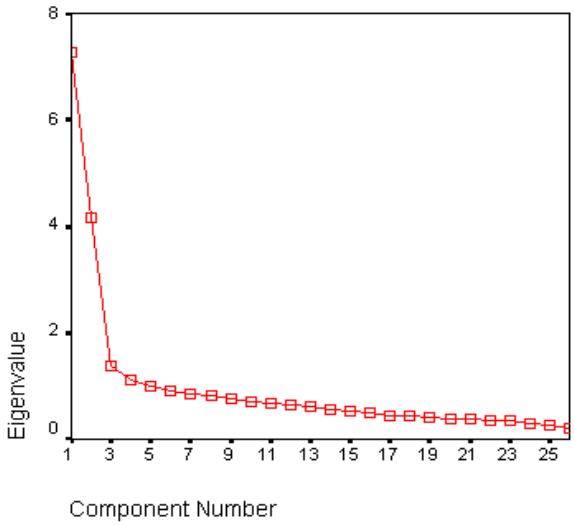

Figure 3.5 Scree plot for CREBS

Then, explanatory factor analysis was run again for the rotation for four factors by use of PCA. Oblimim rotation with Kaiser Normalization was used, since it was believed that the factors are correlated. Four factors accounted for 53.56 % of the total variance in the participants' responses. Eigenvalue of factor I was 7.272 (accounted for 27.97 %), of factor II was 4.155 (accounted for 15.98 %), of factor III was 1.373 (accounted for 5.28 %) and of factor IV was 1.123 (accounted for 4.32%).

Table 3.9
Factor Names, Abbreviations, Eigenvalues, Variances of Factors and Cronbach's Alpha Values for CREBS

Factor name	Abbreviation	Eigenvalues	% of Variance
Political Action	POLITICAL (Factor 1)	7.272	27.97
Eco-Management	PHYSICAL (Factor 2)	4.155	15.98
Consumer and Economic Action	ECONOMICAL (Factor 3)	1.373	5.28
Individual and Public Persuasion	PERSUASION (Factor 4)	1.123	4.32

The factors were interpreted by considering their size of factor loading and then named according to conceptual framework used in the recent EL literature (Lee at al., 2003; McBeth, et al., 2007; McBeth, 2006; Negev et al., 2006; Volk & McBeth, 1997) and the responses of 229 students who were asked to respond to four-item open-ended behavior questionnaire. Factor names, abbreviations, eigenvalues, and variances of each factor are given in Table 3.9.

Table 3.10
Factor Loadings and Communalities of CREBS Items

Items	Factor Loadings				Comunality
	Factor 1	Factor 2	Factor 3	Factor 4	
DAVD4	**.872**				.738
DAVD5	**.864**				.752
DAVD3	**.814**				.659
DAVD2	**.814**				.644
DAVD6	**.782**				.697
DAVD1	**.754**				.650
DAVC6	**.490**				.497
DAVA2		**.745**			.590
DAVA9		**.705**			.564
DAVA1		**.607**	.321		.550
DAVA7		**.591**			.384
DAVA3		**.563**			.402
DAVA8		**.319**			.262
DAVB4			**.725**		.579
DAVB6			**.724**		.588
DAVB3			**.628**		.483
DAVC4			**.477**		.510
DAVA5			**.367**		.321
DAVB2				**-.771**	.569
DAVC2				**-.623**	.539
DAVB1				**-.621**	.562
DAVC3				**-.619**	.566
DAVC1				**-.609**	.540
DAVC5				**-.560**	.584
DAVA6				**-.509**	.296
DAVA4				**-.388**	.397

These results revealed four dimensions behind the scale. The factor loading and communality value of each item are given in table 3.10. Factor loading less than .30 (Stevens, 2002) were suppressed and never considered for the analysis.

As it is observed in the table 10, factor 1 included seven items. These all items only loaded on this factor. Based upon 229 students' responses and the conceptual framework of ERB, this factor was named as "*Political Action (POLITICAL)*". Factor 2 included six items. However, one of the items loaded both on factor 2 and factor 3, but this was accepted under factor 2 due to its higher loading on the factor 2 and the conceptual framework present in the literature. Similarly, based on the same resources (literature and students' responses) and the nature of the items, this factor was named as "*Eco-Management (PHYSICAL)*". Factor 3 included five items, each of which only loaded on this factor. These all items are regarded as individuals' actions of consumption and effective use of individuals' own money. Thus, this factor was named as "*Consumer and Economic Action (ECONOMICAL)*". Factor 4 included eight items, each of which only loaded on this factor. These items are regarded not only as public but also as individual persuasion. Thus, this factor was named as "*Individual and Public Persuasion (PERSUASION)*".

The last version of ESELI with five parts and 81 items, after all factor analyses, is given in Appendix G.

3.3.3. Reliability of the Data Collection Instrument

Reliability refers to consistency of the scores (Murphy & Davidshofer, 2005; Fraenkel & Wallen, 2003) and is expressed numerically, as reliability coefficient. There are several types of evidences for reliability, each for different kind of consistency (Gay, et al., 2006). Internal consistency reliability, referring to consistency among the items, was used for testing the reliability of the data collection instrument in this study. In particularly, Kuder-Richardson (KR21) and Cronbach's Alpha Reliabilities were calculated to estimate how the items in the test

relate to one another in the same test. The reliability analysis was performed over the data gathered through the pilot testing with forth (n=322) and fifth (n=351) grade students. Since Kuder Richardson method is more appropriate for the items scored dichotomously (e.g. 0 and 1), this was used for TEK including Multiple Choice items and PIPSST including one matching item. In the TEK, correct responses were coded as 1 and wrong as 0. In the PIPSST, correctly matched items were coded as 1 and the rest was coded as 0. On the other hand, since Cronbach Alpha Reliability method is more appropriate for Likert Type items, this was used for ADTES and CREBS.

For TEK, Kuder Richardson 21 (KR21) formula was calculated for determining coefficient alpha (α) of the instrument. KR21 was used for nineteen multiple choice questions, but not for T-F items. The reliability of nineteen multiple choice items subjected to KR21 was found .69.

Four different reliability analyses were performed for exploring the internal consistency of ADTES and each sub-scale by means of SPSS 11.5. Cronbach's alpha correlation coefficient (α) of ADTES was found .78, which shows high internal consistency among the items within the instrument. Cronbach's alpha of each sub-scale was found .66 for INTENTION, .63 for factor ATTITUDE and .58 for factor SENSITIVITY.

The review of the literature and open-ended responses of 229 students indicated that CREBS includes theoretically four main sub-components for 5^{th} graders. Reliability analysis for each factor/component was performed by use of SPSS 11.5 version. Cronbach's alpha reliability coefficient (α) of factor I (Political Action) was found .91, reliability (α) of factor II (eco-management) was found .71, reliability (α) of factor III (consumer & economic action) was found .73, and reliability (α) of factor IV (individual and public persuasion) was found .81. Reliability of the CREBS as a whole was found .89.

Similar procedure used for TEK was also preferred for PIPSST, because of the nature of TEK. KR21 was calculated and reliability coefficient (α) of The Issue Identification and Evaluation Skills Scale was found .59. The reliability values of each part of ESELI are summarized in Table 3.11 below.

Table 3.11
Reliability Coefficient of Parts in ESELI

Parts	Number and type of items	(α)
II. The Test for Environmental Knowledge [TEK]	19 (Multiple Choice)	.69
III. The Affective Disposition Scale [ADTES]		
Factor.1 Willingness to Take Environmental Action	5 (Likert Type)	.66
Factor.2 Environmental Attitudes	5 (Likert Type)	.63
Factor.3 Environmental Sensitivity	4 (Likert Type)	.58
IV. Children Responsible Environmental Behavior Scale [CREBS]		
Factor.1 Political Action	7 (Likert Type)	.91
Factor.2 Eco-management	6 (Likert Type)	.71
Factor.3 Consumer and Economic Action	5 (Likert Type)	.73
Factor.4 Individual and Public Persuasion	8 (Likert Type)	.81
V. The Problem Identification and Problem Solving Skills Test (PIPSST)	7 (Matching item)	.59

3.4. Data Collection Procedure

A permission request letter was again sent to the Ministry of National Education in order to get permission to conduct the nationwide survey in the selected 52 public and 26 private primary schools in 26 provinces. The list of the public and private primary schools was obtained from Ministry of National Education. Educational

Research and Development Directorate (E.A.R.G.E.D.) was applied for support. After getting permission (Appendix A) from EARGED, the administration was realized by classroom teacher in the classroom environment in one class hour. After two months period, the school principals sent all completed questionnaire to EARGED and thus to researcher.

3.5. Data Analysis Procedure

In order to analyze the data gathered, the following steps were considered. First of all, the data cleaning and screening process were performed in order to detect and analyze missing values and then manipulate them. Once data screening was completed, basic descriptive statistics were initially performed by means of SPSS (Statistical Package for Social Sciences) version 11.5 so as to screen and describe the data. Furthermore, series of independent t-tests and ANOVAs were also performed for addressing to the research questions. Then, the same data in SPSS file was imported to PRELIS 2.30 for Windows for data screening again and checking distribution and normality of the variables. Later, path model (called as proposed odel) which was proposed earlier was tested with the help of LISREL (Linear Structural Relations Statistics Package Program) 8.30 for Windows SIMPLIS Command Language (Jöreskog & Sörbom, 1993). At the end, through the use of LISREL, estimation of path model including relationships, β weights, and t-values among variables was examined.

3.6. Path Model and Fit Indices

Path Model is an advanced and comprehensive statistical procedure and serves similar purposes of Regression. Path model, like structural equation modeling (SEM), provides the researchers with the opportunities to examine the modeling of interactions, nonlinearities, correlated independents, measurement error, correlated error terms and multiple latent independents (Garson, 2006) on the proposed model.

Path model process, as also described in SEM, mainly includes two stages; namely *validating the measurement model* and *fitting the structural model* (Garson, 2006).

For the purpose of examining the overall fit of confirmatory factor analysis and model fit, the related fit indices such as goodness of fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), root mean squared error of approximation (RMSEA) and standardized root mean squared residual (SRMR) were taken into account. As suggested by Schumacker and Lomax (1996), the expected fit indices for good (fitted) model are above .90 for GFI, AGFI and CFI and below .05 for RMSEA and SRMR. For clarification, definitions of some useful terms regarding path analysis are given below.

Path Analysis: A statistical method which uses both bivariate and multiple linear regression techniques to test the causal relationship among the variables in the proposed model (Olobatuyi, 2006).

Endogenous Variable (Dependent variable): A variable whose variation is explained by independent variable and caused by other variables in the causal system (Olobatuyi, 2006, p.30).

Exogenous Variable (Independent variable): A variable whose variation is to be determined by causes outside the causal model and which also affects the endogenous variables (Olobatuyi, 2006, p.31).

Path Coefficient / Path Weight: Numerical estimates of the causal relationship between variables in the path analysis. It is calculated as the amount of expected changes in the dependent variables due to a unit change in the independent variable (Olobatuyi, 2006).

Chi-Square (χ^2): A non-significant χ^2 implies non-significant difference between the covariance matrix implied by the model and the population covariance matrix. A

non-significant χ^2 means the model fits the data. The χ^2 criterion is very sensitive to sample size, because the χ^2 criterion has a tendency to indicate a significant probability level when the sample size increases generally above 200 (Schumacker & Lomax, 1996).

Goodness of Fit Index (GFI): The ratio of the sum of the squared differences between the observed and reproduced matrices to the observed variances is the base of the GFI (Schumacker & Lomax, 1996). The range of the GFI is from 0 to 1. The values exceeding 0.9 indicates a good fit to the data (Kelloway, 1998).

Adjusted Goodness of Fit Index (AGFI): The AGFI index is the adjusted GFI for the degrees of freedom of a model relative to the number of variables (Schumacker & Lomax, 1996). As GFI, the AGFI has a range from 0 to 1, with values 0.9 indicating a good fit to the data (Kelloway, 1998).

Root Mean Squared Error of Approximation (RMSEA): it is computed on the basis of the analysis of residuals. Values below 0.10 indicate a good fit, values below 0.05 indicate a very good fit and the rarely obtained values below 0.01 indicate an outstanding fit to the data.

As claimed by Cohen (1988), standardized path coefficient with absolute values less than 0.10 may indicate a small effect; values around 0.30 indicate medium effect, and values above 0.50 indicate large effect.

3.7. The Proposed Path Model

The following model was proposed for the present study so as to determine the factors predicting (or affecting) the environmentally responsible behavior of fifth grade students in Turkey. This model was constructed by considering the comprehensive literature (initial models, frameworks, definitions…etc) surveyed. The following model (figure 3.6) includes observed variables.

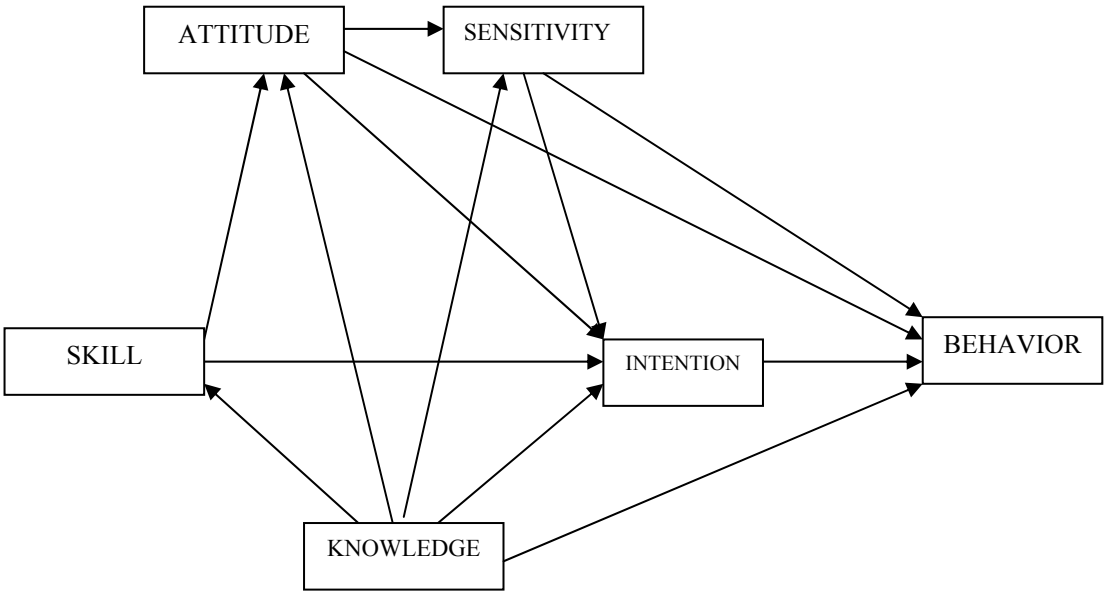

Figure 3.6 Model Representing the Factors Affecting ERB

3.8. Limitations of the Study

Though its strengths, the research has some limitations. The limitations of the study are about the number of the participants, sampling, and administration process. The limitations of the study are explained in detail below as threads to external and internal validity.

3.8.1. External Validity Threats

The extent to which the results of a study can be generalized determines the external validity (Fraenkel & Wallen, 2006). To make generalization from sample to population, sample drawn from population should best represent the population. In this study, sample was drawn from 78 schools in 26 provinces. This was not considered for the representation, but done for providing diversity within the sample.

In other word, this was done for reflecting the characteristics of the population. From each sub-residence of selected provinces, 3 schools were randomly selected to ensure external validity of the study. However, since this study was carried out with only fifth grade students, the results could not be generalized for the students in other grades, but provide evidences for further studies to be carried with other grades. Thus, the study was limited to 5th grade students enrolled in public and private schools in 26 provinces within Turkey in the 2007-2008 school year.

3.8.2. Internal Validity Threats

In order to control internal validity of study, the threats that affect the internal validity should be eliminated. There might possibly be four threats to internal validity of the study. One of them is subject characteristics. Subject characteristics may affect the internal validity because of participants' socioeconomic status and the ability level of elementary schools classes. Subject of the study live in different region, have different annual income, and have different ability level. This was controlled by including students' different characteristics. Loss of subject (mortality) may be, due to illness, unwillingness, the requirements of other activities and so on, another thread to internal validity. Some of the respondents may drop out the study. This was controlled by administering the data collection instrument in the class hour by the classroom teacher. The communication was done with the school principal/director and the instrument was sent each school through the help of EARGED. Thus, the teacher feel responsible themselves to apply the instrument. Since data collection instruments were sent to the schools through mailing, the administration process and the problems and/or difficulties faced by the teachers during the administration are unknown to the researcher. Data collector characteristics and bias could also threaten to internal validity. Classroom teachers conducted the administration of ESELI in their own classroom. An instruction sheet (regarding the administration) was sent to each of them to standardize the administration and deal with the data collector bias. Moreover, location may be

another threat to internal validity. Each teacher was encouraged to administer the data collection instrument in the classroom environment and the instrument was administered to the students at the very beginning of the spring semester when no exam or quizzes were given to the students. Even if the instrument was administered in the laboratory environment, the students would not be affected by the location since none of the items of ESELI are related to experimentation and laboratory facilities.

CHAPTER IV

RESULTS

This chapter presents a description of the participants and the results of the study. It was initiated with brief descriptions of the participants. The results were given in two separate sections. First section included preliminary analyses such as missing data analysis, outlier analysis and descriptive statistics for each section of ESELI. The data regarding demographic characteristics of the sample were given in descriptive manner with frequencies and percentages. Furthermore, in this part, the data on each item in the part-II to part-V of ESELI were presented by making use of tables, frequencies and percentages in order to present the comparable results and better understand these results. Second section presented the findings pertaining to two main and further sub-questions. The results were presented in the same sequence as the research questions were stated in the introduction part. In order to observe the effects of demographic characteristics of sample on their ERB, series of one-way-ANOVA were used for each categorical variable. Path Analysis was used among the continuous variables so as to test the model proposed earlier. Finally, a summary was also provided at the end of the analyses of the research questions which were lengthy descriptions. The steps followed in presenting the findings are illustrated in Figure 4.1.

4.1. Preliminary Analysis and Descriptive Results on EL/ERB

In this part, preliminary analysis mainly including missing data analysis and outlier analysis was firstly conducted. Later, descriptive statistics pertaining to each part in ESELI were presented in line with the figure given in 4.1.

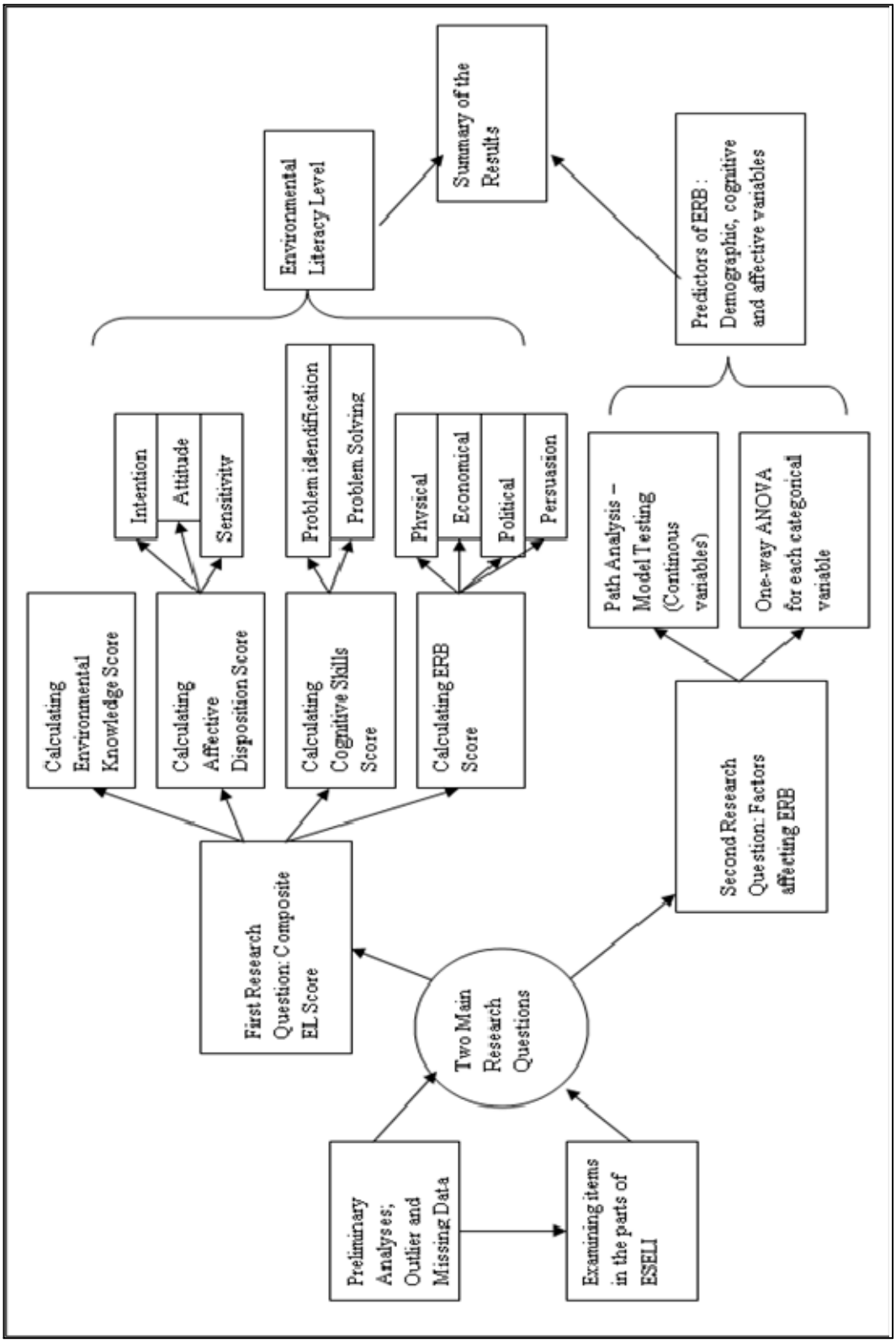

Figure 4.1 A Frame for the Presentations of the Results

4.1.1. Missing Data and Outlier Analyses

Before the analyses were conducted, descriptive analysis was run for checking missing data in all of the major variables. This is necessary for safely using LISREL software program which runs path analysis since this procedure needs only a single N size. The pattern of the missing values was examined and the pattern was found to be random. For only Part II, III and Part IV, "*replaced with mean procedure*" was utilized since the pattern was random and none of the variables had missing values more than 10 % (Hair, Black, Babin, Anderson & Tatham, 2006). However, this procedure was not employed for other parts due to the nature of the variables in these parts. In the Part-I, students' demographic characteristics were investigated and no mean value for any of these variables was required. In the Part V, students' problem investigation and problem solving skills were investigated through one matching and one open ended items. That's why the missing values in these parts were not manipulated. The results of missing data analysis and some basic descriptive statistics are given in Table 4.1. Furthermore, outlier analysis over the data was run. First of all, total score calculated for each section was standardized to examine univariate outliers. The standardized z scores up to ±4 (Hair et al., 2006) were not assumed to be potential outlier, the standard scores not falling in this range were treated as outliers. This criterion was considered, because Tabachnick and Fidell (2001) claimed that standardized z score may not fall into ±3.29 range due to big sample size. As result of outlier analysis, 2 cases which did not meet this criterion were treated as outliers and excluded from the data set. Thus, all the data analyses were performed with data obtained from 2410 subjects

4.1.2. Characteristics of the Sample

The general characteristics of the survey participants are presented below. Some of the basic characteristics of participants were already given in Method Part (Chapter 3).

Table 4.1

Summary of Descriptive Statistics by Each Part in ESELI (N=2410)

Parts of the ESELI	# of items	Range	Sample size			*M*	*SD*	Median	Mod
			n	Missing	%				
1. Personal Information									
Gender	1	-	2391	19	0.9	-	-	-	-
School Type	1	-	2410	-	-	-	-	-	-
Participation in Pre-school Education	1	-	2381	29	1.2	-	-	-	-
Residence	1	-	2410	-	-	-	-	-	-
Income	1	-	2284	126	5.2	-	-	-	-
Environmental Curiosity	1	-	2392	18	0.7	-	-	-	-
Participation in Nature Activities	1	-	2378	32	1.3	-	-	-	-
Parent Education Level									
Mother	1	-	2358	52	2.2	-	-	-	-
Father	1	-	2352	58	2.4	-	-	-	-
Parent Environmental Concern	1	-	2371	39	1.6	-	-	-	-
2. Environmental Knowledge (KNOWLEDGE)	22	0-22	2406*	4	0.2	15.55	3.47	16	18
3. Affective Disposition (AFFECT)									
2.1. Willingness to Take Env. Action (INTENTION)	5	5-20	2272*	138	5.7	17.09	3.39	18	20
2.2. Environmental Attitudes (ATTITUDE)	5	5-20	2297*	113	4.7	18.04	3.54	20	20
2.3. Environmental Sensitivity (SENSITIVITY)	4	4-16	2304*	106	4.4	12.68	2.63	13	14
4. Environmentally Responsible Behavior (ERB)									
3.1. Political Action (POLITICAL)	7	0-42	2231*	179	7.4	9.42	11.29	5	0
3.2. Eco-Management (PHYSICAL)	6	0-36	2296*	114	4.7	26.51	6.98	27	26
3.3. Consumer and Economic Action (ECONOMICAL)	5	0-30	2266*	144	6.0	21.44	6.91	22	30
3.4. Individual and Public Persuasion (PERSUASION)	8	0-48	2175*	235	9.8	22.14	11.77	22	22
5. Cognitive Skills (SKILL)									
4.1. Problem Identification and Evaluation (PIDEV)	7	0-7	1987	423	17.6	3.29	1.88	3	2
4.2. Problem Solving (PSOL)	1	0-1	2019	391	16.2	-	-	-	-

*replaced with mean for further analyses

This part mainly included the results regarding students' curiosity level, the sources of environmental information, their level of leisure activities in the natural environment and their parents' concern of environmental pollution. The results pertaining to gender, school type, participation in pre-school, residence, income and parent education level were already given while describing the participants in method section.

Curiosity Level of the Students: The students were asked to indicate how much they were curious about environmental news and information. Of the students, 56% (*n* = 1351) reported that they were very much curious, 37.2% (*n* = 898) had average curiosity and 4.1% (*n* = 100) had little curiosity. On the other hand, 1.8% (43) of the students indicated that they were not curious about environmental news and information. 19 students did not answer the question.

Sources of Environmental Information: Students reported that they gathered environmental related information from various sources. Different types of resources mostly utilized by the students in order to obtain environmental information were schools and teachers (n = 1895), family members (mother, father and siblings) (n = 1658), internet (n = 1562), TV (news and documentaries) (n = 1536), environmental related books (n = 1529), newspapers and magazine (n = 1519), encyclopedias (n = 1273), individual observations during picnic and field trips (n = 1010), and environmental clubs and E-NGOs (n = 908). On the other hand, friends (n = 710), relatives (uncle, aunt…etc) (n = 597) and grandfather and grandmother (n = 469) were less cited environmental information sources. 111 students added some other sources that they made use of; *namely*, radio, projects, billboards, posters, and pictures.

Frequency Leisure Activities in the Natural Environment: In the third question, the students were asked to respond how frequently they had been involved in activities (e.g. picnicking, camping, and fishing) in natural setting in last year. More than half of the subjects (56.2%, *n* = 1355) reported that they were sometimes involved in

nature-related activities in last year. 17.2% (n = 414) of the students were frequently involved, 13.9% (n = 334) never involved and 11.5% (n = 276) rarely involved in nature-related activities. Of the students, 32 did not respond to this item.

Parents' Environmental Concern: In order to determine participants' families concern for environmental pollution, one of the common environmental problems in Turkey, the students were asked to indicate whether their families were concerned about the environmental pollution and who (mother, father, sibling, grandmother and grandfather) was/were they. 78.90% of the students (n = 1890) reported that any of the members of their families were concerned about environmental problems. Furthermore, the students indicated that their mother (n = 1432, 59.4%), father (n = 1248, 51.8%) and sibling(s) (n = 700, 29%) were concerned about environmental pollution. They also reported that their grandmother and grandmothers were concerned as well. On the other hand, 519 students' (21.5%) reported that their families were not concerned at all.

4.1.3. Students' Environmental Knowledge

The results for the 22 items on the Test for Environmental Knowledge are presented in Appendix H (Table 1 for multiple choice items and Table 2 for true-false items). Out of 22 questions, the mean score was 15.55 with the standard deviation of 3.47. Total score of knowledge items ranged from 0 to 22. Only 14 students correctly answered all knowledge items. When individual items in the test were considered, correct responses were grouped as 75% and above, 74%-50%, between 49%-25% and less than 25%.

More than 75% of the students knew that bacteria can only be seen under microscope among others (worm, grasshopper and ant) (94.4%, n = 2278; item-7), planting more trees can prevent erosion and land slide (90.7%, n = 2187; item-22), stone layer, water layer and fire layer are three of the layers of the Earth (89.3%, n = 2155; ite16), rain, snow, ice, fog and cloud are different forms of water (88.2%, n = 2126;

item-20), “people” as one of the most influential actor causing environmental pollution (86.3%, *n* = 2079; item-11), coal and petroleum are two typical examples of types of fossil resources (84.6%, *n* = 2040; item-4), the differences between light and sound (82.2%, *n* = 1981; item-19), petroleum is not a recyclable material compared to can, plastics and paper (82%, *n* = 1977; item-12), sun is the first source of the energy in food chain (79.8%, *n* = 1924; item-5), eating too much bread and meat can harm human health (79.1%, *n* = 1907; item10), and all people on the Earth are influenced by the environmental pollution (78%, *n* = 1881; item-13).

50% to 74% of the students knew that light is not always necessary for all animals, but food, water and shelter are always needed by the animals (73.3%, *n* = 1769; item-18), multi-storey (skyscrapers) are not the reason of earthquake (70.6%; *n* = 1702, item-17), Kelaynak is one of the protected animals in Turkey (67.8%, *n* = 1635; item-2), developing environmental consciousness is strongly connected with protecting natural balance (61.5%, n = 1483; item-6), grasshopper eats small plants/grass and is eaten by another animal (e.g. frog) (57.5%, *n* = 1386; item-9), sea turtles are endangered as a results of touristic activities in the southern resorts of Turkey (56.6 %, *n* = 1364, item-1), wind is one of the clean energy sources (56.2%, *n* = 1354; item-21),and food wastes does not cause permanent pollution (52.9%, *n* = 1276; item-15).

25% to 49% of the students knew that big heads (monuments) on Nemrut Mountain were not naturally established (48.3%, *n* = 1164; item-8), lightening appliances consumed the most energy among other household appliances (TV, Computer and water heater) (46.5%, *n* = 1120; item-14), and destructing animals’ homes is most important reasons of why animals are endangered (26.5%, *n* = 638, item-3).

4.1.4. Students’ Affective Disposition toward the Environment

There were 14 four point Likert type items in Part III, which includes three sub-scales. The first sub-scale consisting of five items is “Willingness to Take

Environmental Action (INTENTION)". The mean score of this sub scale was 17.09 with the standard deviation of 3.39. Total score of Willingness to Take Environmental Action sub-scale ranged from 5 to 20. Of the students, 85.6 % (n = 2064) emphasized the importance of personal responsibility for preventing environmental pollutions, 84.7% (n = 2042) were willing to persuade other people to take responsible action for protecting environment, 83.8% (n = 2021) reported that they could do something for protecting natural environments of the living organisms, 83.3% (n = 2009) believed in their own strengths and claimed that they could help the people who work on dealing with environmental problems and 81.7% (n = 1970) were willing to talk with official people for environmental protection. Table 3 in Appendix H presents students' responses to the Intention items.

The second sub-scale consisting of five items is Environmental Attitude (ATTITUDE). The mean score of the sub-scale was 18.04 with the standard deviation of 3.54. Total score of this sub-scale ranged from 5 to 20. Of the participants, 90.5% (n = 2182) believed that people should give importance to the environment, 89% (n = 2146) claimed that natural resources should be used very carefully, 89% (n = 2145) believed the importance of planting tree for preventing land slide and erosion, 83.8% (n = 2019) were against killing wild animals because they believed that these animals also had right to survive and 83.4% (n = 1021) emphasized the importance of taking physical action such as recycling for protecting environment. Table 4 in Appendix H presents students' responses to attitude items in Environmental Attitude sub-scale.

The third sub-scale consisting of four items is Environmental Sensitivity (SENSITIVITY). The mean score of the sub-scale was 12.68 with the standard deviation of 2.63. Total score of this sub-scale ranged from 4 to 16. While 86.6% (n = 2087) of the students felt themselves quite sensitive to environment, 12.5% (n = 302) did not have same feeling. 76.3% (n = 1838) frequently read writings (e.g. books, magazines…etc) related to the environment and nature. However, 21.2% (n = 535) did not frequently read such documents. Similarly, 79.5% (n = 1917) followed

the nature- and environment-related TV programs whereas 19.3% (*n* = 464) did not watch such programs whenever it comes out in TV. 73.2% (*n* = 1767) reported that they were ready to change their own life style / habits for protecting natural resources. On the other and, about 25% (*n* = 606) indicated that they could not change their life style for the sake of protecting natural resources. Table 5 in Appendix H presents the students' responses to sensitivity items in the Environmental Sensitivity sub-scale.

4.1.5. Students' Environmentally Responsible Behaviors

Part-IV in ESELI included four sub-scales and total 26 items with seven alternatives. In this part, the students were asked to indicate how many times they performed the given behavior in last one year. The range of the alternatives is from never (0) to more than five times. The responses / alternatives were later categorized in four groups as never, 1 to 3, 4 to 5 and more. The responses of the students were tabulated for better observing the results.

First sub-scale consisting of seven items is Political Action (POLITICAL). The mean score of the sub-scale was 9.42 with the standard deviation of 11.29. Total score of this sub-scale ranged from 0 to 42. The most frequent response reported by the students was 0 (Mod). More than 50% of the students never engaged in political action for preventing and protecting environmental problems. On the other hand, about 20% performed such actions at least 1 to 3 times and about 7%-9% did same actions 4-5 times; *namely* planning to communicate with governmental officials (1-3 times, 20.6%, *n* = 497; 4-5 times, 9.1%, *n* = 220), visiting and encouraging mayor (1-3 times, 18.5%, *n* = 446; 4-5 times, 7.7%, *n* = 185) and executive officer of a district (1-3 times, 23.2%, *n* = 558; 4-5 times, 8.6%, *n* = 207) for taking environmental protection measures, talking with regional officials about their giving fine to the people who harmed the environment (1-3 times, 18.5%, *n* = 447; 4-5 times, 9.7%, *n* = 226), encouraging officials to prepare newspapers, posters and magazines to make the people aware of natural environment (1-3 times, 21.1%, *n* = 509; 4-5 times,

9.4%, *n* = 227), cooperating and working in the same project with NGOs and governmental officials (1-3 times, 21.4%, *n* = 516; 4-5 times, 10.4%, *n* = 250) and preparing news and writings and then distributing them to other people (1-3 times, 22.6%, *n* = 545; 4-5 times, 11.1%, *n* = 11.1). Only 6.8% to 10.9% of the students engaged in the political action more than five times. Table 6 in Appendix H presents the responses given to seven political action items.

Second sub-scale consisting of six items is Eco-Management (PHYSICAL). The mean score of the sub-scale was 26.51 with the standard deviation of 11.29. Total score of this sub-scale ranged from 0 to 36. The most frequent response reported by the students was 26 (Mod). Students seemed to engage in physical protection activities more. Number of the students who never performed any of given physical action is low, except for the behavior pertaining to using recycling bin for used paper, glass, plastic, box, aluminum, and batter (19.2%, *n* = 462). Many of the students reported that they engaged in physical action more than five times. Among these students, 70.5 % (*n* = 1699) disposed of their rubbish to waste-bin appropriately in school, on picnic, at home and street, 63.6 % (*n* = 1532) took water-saving precautions, and 51.4% (*n* = 1238) protected plants. Combining 1-3 times and 4-5 times together, more than 50% of the students collected the littered wastes and put into waste-bin (1-3 times, 26%, *n* = 627; 4-5 times, 27.9%, *n* = 673) and protected cats, dogs and birds living outside (1-3 times, 29.5%, *n* = 711; 4-5 times, 21.5.9%, *n* = 518). Furthermore, 48.6 % of the students used recycling bin 1-5 times (1-3 times, 25.6%, *n* = 618; 4-5 times, 23%, *n* = 555). Table 7 in Appendix H presents the students' responses given to six Eco-management (PHYSICAL) items.

Third sub-scale consisting of five items is Consumer and Economic Action (ECONOMICAL). The mean score of the sub-scale was 21.44 with the standard deviation of 6.91. Total score of this sub-scale ranged from 0 to 30. The most frequent response reported by the students was 30 (Mod). Similar to Physical actions, many of the students engaged in economical action several times last year. Except for the behavior related to purchasing products which are recyclable or done by

recycled stuff (never, 20.5%, *n*=495; more, 35.6%, *n*=858), less than 11% of the students never engaged in economical action. On the other hand, more than 40% engaged in such actions more than five times. Of these students, 63.4% (*n*=1527) purchased fresh, healthy and organic products, 56.8% (*n*=1368) purchased products guaranteed by Turkish Standards Institutes (TSE) and Ministry of Agriculture and Village, 47.8% (*n*=1152) warned other people for environmental protection and 43.6% (*n*=1050) gave their used stuffs (books, dress, toys and others) to the people who needed them and to the organizations. The percentage of the students who engaged in such economical actions 1-5 times ranged 27.9% (*n*=672) to 44% (*n*=1036). Table 8 in Appendix H presents students' responses given to five Consumer and Economic Action (ECONOMICAL) items.

Forth sub-scale consisting of eight items is Individual and Public Persuasion (PERSUASION) items. The mean score of the sub-scale was 22.14 with the standard deviation of 11.77. Total score of this sub-scale ranged from 0 to 48. The most frequent response reported by the students was 22 (Mod). More than a quarter of the participants never engaged in some of the persuasion types of behavior regarding donating money to national and regional NGOs (42.2%, *n* = 1021) and to community organizations (29.5%, *n* = 712), preparing environmental-related documents to hang on the school and street billboards (39.5%, *n* = 951), and preparing recycling bin (32.6%, *n* = 785) and encouraging other people to protect environment (28.5%, *n* = 688). On the other hand, more than a quarter of the participants engaged in the other persuasion types of behavior more than five times such as planting tree, flowers, vegetables and other types of plants for beautifying the environment (33.4%, *n* = 806) and encouraging their own parents to protect and not to harm the environment (29.5%, *n* = 711). 24.6% (*n* = 593) of them encouraged their friends to protect and not to harm the environment more then five times. The percentage of the other students who performed these eight items 1 to 5 times ranged 43.7% (DAVC5, *n* = 1053) to 53.3% (DAVA6, *n* = 1289). Table 9 in Appendix H presents students' responses given to eight Individual and Public Persuasion (PERSUASION) items.

4.1.6. Students' Cognitive Skills on the Environmental Protection

Part-V in ESELI includes two items subsequent to a case pertaining to one of the environmental problem; water pollution. In the first item, seven scientific processes were given and the students were asked to put them in order for identifying, assessing and solving the given environmental problem in the case. Of the 2410 students, only 120 students correctly ordered the given processes. About half of the students (46.8%, n = 1128) knew that identifying and assessing a problem starts with searching for relevant information on the problems from books, internet web pages and others. Only 643 (26.7%) knew that last step could be reporting and presenting the data collected. Students' responses to each step are given in Table 10 in Appendix H.

In the second item, the students were asked to provide their own solutions and future plans to deal with the environmental pollution given in the case. 83.77% (n = 2019) of the students reported their own solutions. Whereas many of them provided only one solution, some of them reported more than one. Since this question is open-ended, the responses were subjected to content analysis which involves identifying coherent and important examples, themes and patterns in the data (Patton, 1987, p.149). Considering their meaningfulness, the emerging codes were grouped under three themes which shape main categories that existed in the data. In other words, the solutions and plans of the students were grouped under three types of behaviors such as (1) Physical action, (2) Persuasion and (3) Political action. For establishing the framework for in-depth description of the students' responses, the codes were related to established themes. Only mostly cited responses were given under these three themes below.

Students' Solutions and Plans regarding Physical Action: Among the solutions and plans regarding physical action, the students reported that they planned to pick up / collect the garbage over and around the lake, do clean-up activities, not to dispose their waste products (e.g. used papers, nuts, plastics, glass…etc) into the

lake, ask for help from the family and teachers for cleaning-up the lake, take water samples from the lake in order to investigate the water pollutants and search for the causes and the consequences of the water pollution in the internet, books, magazines and encyclopedias, stand guard around the lake, plant trees and place the garbage and recycling bins around the lake and brainstorm with other people to produce solutions for the problem.

Students' Solutions and Plans regarding Persuasion: Students' solutions and plans regarding persuasion can further be divided into sub-themes such as warning, individual persuasion and public persuasion. They planned to warn people by giving fees and warning verbally to other people who are polluting the lake. The students more focused on persuasion rather than warning. As an individual persuasion, they planned to encourage other people to keep the lake clean, talk with the people who were picnicking around the lake, talk with their friends and their siblings not to spill their garbage over the lake, inform their friends about the pollution in the lake, talk with factory managers not to discharge their waste water into the lake, try to make people become aware of the pollution and its consequences and encourage people to be a member of environmental non-governmental organizations (e.g. TEMA). As a public persuasion, they planned to prepare posters, wall sign, banner and writings, hang on writings and posters on the walls and trees around the lake, distribute the brochures to the people in the street, writing letter, organizing and realizing protests, and administering questionnaire to the people.

Students' Solutions and Plans regarding Political Action: Regarding political action, the students planned to talk to ministers, mayor, governor and executive officer of a district to take necessary precautions to prevent environmental problems in the lake, not to establish factories near the lake, to give fees to the people who pollute the lake, to put several guards around the lake, to hang on posters around the lake, to put video-camera to regularly record, watch and monitor the lake and the people around the lake.

4.2. The Level of Environmental Literacy of Fifth Graders across Turkey

The first research question of this study aimed to investigate the level of environmental literacy of 5th grade students across Turkey, covering the four main components; environmental knowledge, cognitive skills, affect and ERB. For the first research question, composite score was calculated by combining part-II to part-V in a single score. For the sake of clarity, the composite scores for the overall Environmental Literacy were introduced first, and then results in relation to each component were presented successively.

4.2.1. Environmental Literacy Composite Score

The ESELI instrument consists of several components of EL which reflects different conceptual variables such as knowledge, affect, cognitive skills and behavior. Each part in ESELI included a different number of items and a different range of raw scores. Calculation process of EL composite score was discussed earlier by McBeth and others (2008). They believed that calculating this score would combine different type of metric (measure) and potentially mask the differences in measures, but would be very beneficial for educational policy makers, administrators and practitioners.

While calculating EL composite score, the procedures which McBeth et al. (2008) followed was utilized and adapted for the present study since the same structure (components) of EL was employed in this study and McBEths' study. There were mainly four sections (conceptual variables) each of which equally contributes to EL composite score. Since number of the items and the range of raw scores were different in each section, a multiplier was decided to be used in order to equalize them. This procedure was adapted from the method proposed in Mcbeth et al. (2008) study. Total mean score gathered from each section of ESELI was then multiplied by the multipliers to yield a maximum adjusted score of 60 for each of four parts. Method used for transforming the raw score into adjusted score is summarized in

Table 4.2. These adjusted scores were then summed to yield a maximum composite score of 240 (with the range of 15-240).

For more concrete interpretation of the students' composite score, this range was divided into three parts as low (15-90), moderate (91-165) and high (166-240). Furthermore, similar procedure was applied for each section of ESELI. For the three components "*Ecological Knowledge*", "*Cognitive Skills*" and "*Environmentally Responsible Behavior (ERB)*", the range of 0-60 was divided into three categories as low (0-20), moderate (21-40) and high (41-60). For the "*Affect*" component, the range of 15-60 was divided into three categories as low (15-30), moderate (31-45) and high (46-60).

Given in Table 4.3, the adjusted environmental knowledge score of the participants was 42.42 (*SD*=9.48) which fell in high-range (41-60) of possible environmental knowledge score reflecting a high level of environmental knowledge. Of 2410 students, 1607 students (66.7%) scored between 41 and 60 and categorized as high level of environmental knowledge. Knowledge level of 738 students (30.6%) was moderate. Only 65 students had low environmental knowledge.

Adjusted affective disposition score of the participants was 52.27 (*SD* = 9.07) which falls in high-range (46-60) of possible affective disposition score reflecting a high level of affective disposition tendencies. Considering to their adjusted score, most of the students (86%, *n* = 2073) fell into the high level of affective disposition. Only 124 students' affective disposition score fell in low level.

Table 4.2
Method Used for Transforming Raw Score into Adjusted Score

Conceptual Components of EL	Specific Conceptual Variables	Parts of ESELI	# of item	Range	Multiplier	Adjusted Score
Ecological Knowledge	Environmental Knowledge (KNOWLEDGE)	Part II. Test of Environmental Knowledge (TEK)	22	0-22	2.727	60
						Total=60
Affect	Willingness to Take Env. Action (INTENTION)	Part III. Affective Dispositions toward the Environment Scale (ADTES)	5	5-20	1.072	21.44
	Environmental Attitude (ATTITUDE)		5	5-20	1.072	21.44
	Environmental Sensitivity (SENSITIVITY)		4	4-16	1.072	17.15
						Total=60
Cognitive Skills	Problem Identification and Evaluation (PIDEV)	Part V. Problem Identification and Problem Solving Skills Test (PIPSST)	7	0-7	7.5	52.5
	Problem Solving (PSOL)		1	0-1	7.5	7.5
						Total=60
Behavior	Political Action (POLITICAL)	Part IV. Children Responsible Environmental Behavior Scale (CREBS)	7	0-42	0.3846	16.55
	Eco-Management (PHYSICAL)		6	0-36	0.3846	14.18
	Consumer and Economic Action (ECONOMICAL)		5	0-30	0.3846	11.82
	Individual and Public Persuasion (PERSUASION)		8	0-48	0.3846	18.91
						Total=60
	Total		70	14-242		240

Table 4.3
Students' Levels of EL According to the Components of EL

		Low	Moderate	High	Mean	*SD*
Knowledge	Range	*(0-20)*	*(21-40)*	*(41-60)*		
	f	65	738	1607	42.42	9.48
	%	(2.7%)	(30.6%)	(66.7%)		
Affect	Range	*(15-30)*	*(31-45)*	*(46-60)*		
	f	124	213	2073	52.27	9.07
	%	(5.1%)	(8.8%)	(86%)		
Cognitive Skills*	Range	(0-20)	(21-40)	*(41-60)*		
	f	952	897	377	24.67	14.69
	%	(39.5%)	(37.2%)	(15.6%)		
ERB	Range	(0-20)	*(21-40)*	*(41-60)*		
	f	398	1581	433	30.58	10.89
	%	(16.4%)	(65.6%)	(18%)		
EL Composite score	Range	*(15-90)*	*(91-165)*	*(166-240)*		
	f	22	1545	659	149.66	26.19
	%	(0.9%)	(64.1%)	(27.3%)		

* There are 184 missing items which were never replaced with mean

Adjusted cognitive skill score of the participants was 24.67 (*SD* = 14.69) which fell in mid-range (21-40) of possible cognitive skill score reflecting a moderate level of cognitive skills. While 935 students' (39.5%) level of cognitive skills was low, 897 students' (37.2%) level of cognitive skill was moderate. Only 377 students' cognitive skill score fell into range of 41-60 which refers to high level of cognitive skills. Adjusted ERB score of the participants was 30.58 (*SD* = 10.89) which fell in the mid-range (21-40) of possible ERB score reflecting a moderate level environmentally responsible behaviors. Many of the students' (65.6%, *n* = 1581) responsible behavior toward the environment was at moderate level. Only 433 students (18%) engaged in high level ERB, whereas 398 students (16.4%) engaged in low level ERB.

The total Environmental Literacy composite mean score of the students was 149.66 (*SD* = 26.19). This score fell in the mid range (91-165) of the possible score which reflect moderate level of environmental literacy. Out of 2226 students (Note: the rest 184 students did not respond to Skill Test at all, they were treated as missing and was not replaced with mean), many of the students (64.1%, *n* = 1545) had moderate level environmental literacy. On the other hand, more than a quarter of the participants (27.3%, *n* = 659) held high level environmental literacy. Only 22 students (0.9%) showed low level environmental literacy.

4.3. Predictors of Environmentally Responsible Behavior

Predictors of ERB were investigated in ten sub-questions. Nine of them addressed to individual effect of each categorical variables (gender, type of school, taking pre-school education, parent educational level, residence, income, level of nature experiences, level of curiosity and family environmental concern) on students' ERB scores. In the last sub-research question, proposed path model including all components of EL was tested.

4.3.1. The Effect of Gender on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that 5th grade female students demonstrate more ERB than 5th grade male students. The hypothesis was rejected since the mean difference between male (*M* = 78.41, *SD* = 28.69) and female (*M* = 80.63, *SD* = 28.02) students was not found statistically significant [*F* (1, 2389) = 3.663, *p* = 0.056].

4.3.2. The Effect of School Type on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that 5th grade students in private schools demonstrate more ERB than 5th grade students in public schools. The hypothesis was accepted since significant mean difference [F (1,

2408) = 17.55, p<0.001, partial η^2 = 0.007] was observed between the students in public (M = 78.25, SD = 28.66) and the students in private schools (M = 84.11, SD = 26.64) in favor of the ones in private schools.

4.3.3. The Effect of Pre-School Education on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that 5th grade students who took pre-school education demonstrate more ERB than the ones who did not. The hypothesis was accepted since the mean difference between the 5th grade students who took pre-school education (M = 80.99, SD = 27.66) and the ones who did not take such education (M = 78.33, SD = 28.89) was significant [F (1, 2379) = 5.19, p < 0.05, partial η^2 = 0.002] and in favor of the ones who took pre-school education.

4.3.4. The Effect of Parent Education Level on ERB

Two separate one-way analysis of variance (ANOVA) were conducted to test a hypothesis 5th grade students whose parents received higher education demonstrate more ERB than the ones whose parents received low education. Based upon both ANOVAs' results, this hypothesis was accepted. One of the ANOVAs was performed for investigating the effect of mother education level on students' ERB scores. The effect of *mother* education level on ERB score was found significant [F (1, 2201) = 3.97, p < 0.01, partial η^2 = 0.007]. Since overall F test was found significant, post hoc comparison was conducted to examine pair-wise differences among the level of education for mothers. Furthermore, since Levene's Test of Equality of Error Variance was found insignificant suggesting equal variances among the groups, Scheffe procedure was preferred for Post hoc comparison. Given in Table 4.4, Post hoc follow up test with Scheffe revealed that the students whose mother received secondary (high school) (M = 81.93, SD = 26.93) and university education (M = 83.09, SD = 26.37) scored significantly higher on ERB than the ones

whose parents were illiterate (M = 75.11, SD = 28.62). Other pair wise differences were not significant.

Table 4.4
Follow up (Post hoc) Test Results for Mother Education Level

Mother Education Level	Mean	*SD*	1	2	3	4	5
1. Illiterate	75.11	28.62	-	NS	NS	*	*
2. Primary School Education	78.64	29.48		-	NS	NS	NS
3. Middle School Education	81.01	29.07			-	NS	NS
4. High School Education	81.93	26.94				-	NS
5. University Education	83.09	26.31					-

* The mean difference is significant at the 0.01 level
NS = non-significant

Another ANOVA was conducted to investigate the effect of *father* education level on students' ERB scores. The effect of father education level on ERB score was found significant [F (1, 2191) = 6.39, $p < 0.01$, partial $\eta^2 = 0.012$]. Since overall F test was found significant, post hoc comparison was conducted to examine pair-wise differences among the level of education for fathers. Furthermore, since Levene's Test of Equality of Error Variance was found insignificant suggesting equal variances among the groups, Scheffe procedure was preferred for Post hoc comparison.

Table 4.5
Follow up (Post hoc) Test Results for Father Education Level

Father Education Level	Mean	*SD*	1	2	3	4	5
1. Illiterate	74.59	26.99	-	NS	NS	*	*
2. Primary School Education	76.19	28.91		-	NS	*	*
3. Middle School Education	77.73	28.31			-	NS	*
4. High School Education	81.71	28.60				-	NS
5. University Education	83.21	27.55					-

* The mean difference is significant at the 0.01 level
NS = non-significant

Given in Table 4.5, Post hoc follow up test with Scheffe procedure revealed that the students whose father received secondary (high school) (M = 81.71, SD = 28.60) and

university education (M = 83.21, SD = 27.55) scored significantly higher on ERB than the ones whose father was illiterate (M = 74.59, SD = 27.55) and received primary school education (M=76.19, SD=28.91). Also, the students whose fathers received university education had significantly higher ERB score than the ones whose fathers received middle school education (M=77.19, SD=28.31).

4.3.5. The Effect of Residence on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that 5th grade students in urban area demonstrate more ERB than the ones in rural area. The ANOVA result was significant [F (2, 2407) = 10.12, $p < 0.001$, partial $\eta^2 = 0.008$]. But, this hypothesis was only partially accepted since the Post Hoc comparison with Scheffe test results revealed that significant mean difference was only observed between the ones in urban private school (M = 84.11, SD = 26.64) and urban-public school (M = 79.19, SD = 28.43), and between the ones in urban-private schools and the ones in rural-public schools (M = 77.06, SD = 28.92). However, no significant mean difference was observed between the ones in urban-public school and the ones in rural-public schools.

4.3.6. The Effect of Family Income on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that 5th grade students with high SES/ family income demonstrate more ERB than the ones with low SES/family income. This hypothesis was rejected since no significant mean difference was found between these two groups [F (1, 897) = 0.75, p = 0.99].

4.3.7. The Effect of Nature Experiences on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that the more the 5th grade students are involved in the natural environment (involved in natural activities – camping, fishing…etc), the more they demonstrate ERB. The

ANOVA result was significant [F (3, 2374) = 37.82, $p < 0.001$, partial $\eta^2 = 0.046$]. Thus the hypothesis was accepted. This result suggests that 4.6 % of the variance on ERB can be explained by frequency of experience with nature-related activities. Table 4.6 presents the Post hoc comparison results performed subsequent to significant ANOVA result to investigate the pair-wise differences among the possible groups. Since Levene's Test of Equality of Error Variance was found insignificant suggesting equal variances among the groups, Scheffe procedure was preferred for Post hoc comparison.

Table 4.6
Follow up (Post hoc) Test Results for Nature Experience

Frequency of nature activities	Mean	*SD*	1	2	3	4
1. Never involved	69.80	27.56	-	NS	*	*
2. Rarely involved	70.33	28.35		-	*	*
3. Sometimes involved	81.01	27.66			-	*
4. Frequently involved	87.87	27.13				-

* The mean difference is significant at the 0.01 level
NS = non-significant

As observed in Table 4.6, 5th grade students who were frequently involved (M = 87.87, SD = 27.13) in nature-related activities in their leisure time engaged in ERB significantly higher than the ones who were sometimes (M = 81.01, SD = 27.66), rarely (M = 70.33, SD = 28.35) and never (M = 69.80, SD = 27.56) involved. Furthermore, the ones who were sometimes involved in nature-related activities engaged in ERB significantly higher than the ones who were rarely and never involved.

4.3.8. The Effect of Environmental Curiosity on ERB

One-way analysis of variance (ANOVA) was conducted to test a hypothesis that the 5th grade students who have high level of curiosity toward environmental information demonstrate more ERB than the ones who have less curiosity toward environmental information. The hypothesis was accepted since significant mean difference was

observed among the four levels of environmental curiosity [F (3, 2388) = 40.24, $p <$ 0.001, partial $\eta^2 = 0.048$]. This result suggests that 4.8% of the variance on ERB can be explained by the level of curiosity toward environmental information. Since overall F test was found significant, post hoc comparison was conducted to examine pair-wise differences among the levels of environmental curiosity of the students. Furthermore, since Levene's Test of Equality of Error Variance was found insignificant suggesting equal variances among the groups, Scheffe procedure was preferred for Post hoc comparison.

Table 4.7
Follow up (Post hoc) Test Results for Environmental Curiosity

Levels of curiosity	Mean	*SD*	1	2	3	4
1. No curiosity	61.79	30.56	-	NS	*	*
2. Low curiosity	64.12	23.15		-	*	*
3. Moderate curiosity	74.53	26.73			-	*
4. High curiosity	84.47	28.53				-

* The mean difference is significant at the 0.01 level
NS = non-significant

As presented in the Table 4.7, the ones who indicated high level of environmental curiosity (*M* = 84.47, *SD* = 28.53) demonstrated significantly higher ERB than the ones who reported moderate level of environmental curiosity (*M* = 74.53, *SD* = 26.73), low level of curiosity (*M* = 64.12, *SD* = 23.15) and no curiosity (*M* = 61.79, *SD* = 30.56) toward obtaining environmental information. Furthermore, the ones who had moderate level of environmental curiosity demonstrated significantly higher ERB than the ones who had little and no curiosity toward environmental news and information.

4.3.9. The Effect of Parent Environmental Concern on ERB

One way analysis of variance (ANOVA) was conducted to test a hypothesis that 5th grade students coming from families holding environmental concern demonstrate more ERB than the ones coming from families holding no environmental concern.

The ANOVA result was significant [F (1, 2407) = 48.80, $p < 0.001$, partial $\eta^2 = 0.020$], so, the hypothesis was accepted, because a significant mean difference was observed between the ones whose family hold environmental concern (M = 81.59, SD = 27.80) and the ones whose family do not hold environmental concern (M = 71.88, SD = 28.93). The difference was in favor of those holding environmental concern. Furthermore, in order to examine the effects of mother, father and sibling environmental concern on students' ERB, three-way ANOVA was performed. Only the main effects were found significant. The single effect of mother environmental concern [F (1, 2407) = 56.36, $p < 0.001$, partial $\eta^2 = 0.023$], father environmental concern [F (1, 2407) = 76.28, $p < 0.001$, partial $\eta^2 = 0.031$] and sibling environmental concern [F (1, 2407) = 34.93, $p < 0.001$, partial $\eta^2 = 0.014$] on their students' ERB are significant. The ones whose father (M = 84.29, SD = 27.66), mother (M = 83.04, SD = 27.55) and sibling (M = 84.79, SD = 27.31) hold environmental concern demonstrated higher ERB than the ones whose father (M = 74.35, SD = 28.15), mother (M = 74.31, SD = 28.67) and sibling (M = 77.33, SD = 28.46) hold no environmental concern. Table 4.8 summarizes the differences in ERB scores by the categorical variables.

4.3.10. Path Analysis for Model Testing: The Effects of Knowledge, Affect and Cognitive Skills on ERB

Since the primary analysis of this particular investigation was path analysis, bivariate correlations among the continuous variables were computed to examine the inter-relationships among the variables. The matrix emerging from the correlation analysis which showed the correlations among observed variables (see Table 4.9) and the correlations among all observed variables including sub-scales (see Table 4.20) for the entire sample is presented in following tables. This correlation matrix showed whether the relationships among the predictors and criterion variables were in line with the expectations, and as well as assessed the presence of singularity and multicollinearity.

Table 4.8
Differences in ERB scores by Background Variables

Background Variables	Levels	*M**	*SD*	*N*
Gender	Female	80.63	28.02	1207
[F (1, 2389) = 3.663, p=0.056]	Male	78.41	28.69	1184
School type	Public School	78.25	28.66	1889
[F (1, 2408) = 17.55, p<0.001, partial η^2 = 0.007]	Private school	84.11	26.64	521
Pre-school education	Pre-School Education	80.99	27.66	1082
[F (1, 2379) = 5.19, p<0.05, partial η^2 = 0.002]	No pre-school education	78.33	28.89	1299
Mother Education Level	Illiterate	75.11	28.62	256
[F (1, 2201) = 3.97, p<0.01, partial η^2 = 0.007]	Primary School Education	78.64	29.48	993
	Middle School Education	81.01	29.07	222
	High School Education	81.93	26.94	382
	University Education	83.09	26.37	352
Father Education Level	Illiterate	74.59	26.99	63
[F (1, 2191) = 6.39, p<0.01, partial η^2 = 0.012]	Primary School Education	76.19	28.91	703
	Middle School Education	77.73	28.31	351
	High School Education	81.71	28.60	518
	University Education	83.21	27.55	561
Residence	Urban Public School	79.19	28.43	1058
[F (2, 2407) = 10.12, p<0.001, partial η^2 = 0.008]	Rural Public School	77.06	28.92	831
	Urban Private School	84.11	26.64	521

*These are the total mean scores for ERB

Table 4.8 (Continued)

Background Variables	Levels	*M**	*SD*	*N*
Income (SES)	500YTL and below	79.58	30.15	243
[F (1, 897) = 0.75, p=0.99]	501YTL – 1000YTL	80.18	29.77	321
	1001YTL – 1500YTL	78.88	27.88	117
	1501YTL – 2000YTL	81.02	27.09	63
	2001YTL and above	79.96	26.85	158
Level of Experience in Natural Area	Never Involved	69.80	27.55	334
[F (3, 2374) = 37.82, p<0.001, partial η^2 = 0.046]	Rarely Involved	70.33	28.35	276
	Sometimes Involved	81.01	27.66	1354
	Frequently Involved	87.87	27.13	414
Level of Curiosity	No (very little) Curiosity	61.79	30.56	43
[F (3, 2388) = 40.24, p<0.001, partial η^2 = 0.048].	Little Curiosity	64.12	23.15	100
	Average Curiosity	74.53	26.73	898
	Very much Curiosity	84.47	28.53	1351
Mother Environmental Concern	Yes	83.04	27.55	1432
[F (1, 2407) = 56.36, p<0.001, partial η^2 = 0.023]	No	74.31	28.67	977
Father Environmental Concern	Yes	84.29	27.66	1248
[F (1, 2407) = 76.28, p<0.001, partial η^2 = 0.031]	No	74.35	28.15	1161
Sibling Environmental Concern	Yes	84.79	27.31	700
[F (1, 2407) = 34.93, p<0.001, partial η^2 = 0.014]	No	77.33	28.46	1709

*These are the total mean scores for ERB

None of the correlations exceed .90 which refers to the absence of singularity and multicollineairty (Tabacknic & Fidell, 2001).

Table 4.9
Intercorrelations among the Study Variables

Variables	ERB	Knowledge	Affect
ERB	-		
Knowledge	.069**	-	
Affect	.171**	.188**	-
Cognitive Skills	-.012	.291**	.114**

** Correlation is significant at the 0.01 level (2-tailed).

Of the six correlations depicted in Table 4.9, five relationships were observed to be significant. Insignificant relationship was only observed between cognitive skills and ERB which is consistent with the results of Korean EL assessment study (Chu et al, 2006), but inconsistent with the results of other studies (Sia et al., 1985/1986; Hsu & Roth, 1999).

Presented in table 4.10, mostly significant and theoretically expected relationship between the sub-scales of behavior and other observed study variables were encountered. Among the 20 correlations, 17 of them were significant and small to moderate in magnitude ranging from -.17 to .35. Environmental knowledge and environmental attitudes were only negatively related to political action. Furthermore, cognitive skills were negatively related to both political action and persuasion. Other correlations were positive. On the other hand, no significant relationship was obtained between knowledge and persuasion, attitude and persuasion, and intention and political action.

These results pointed out that the higher the 5th grade students have environmental knowledge the higher they demonstrated physical action (r = .24, p < 0.01) and economic action (r = .35, p < 0.01), but the less they demonstrated political action (r = -.17, p < 0.01). The more they were willing to engage in environmental action, the

more they tended to engage in physical action ($r = .25$, $p < 0.01$), economical action ($r = .19$, $p < 0.01$), and persuasion ($r = .16$, $p < 0.01$).

Table 4.10
Intercorrelations among the Variables in the Proposed Model

Variables	1	2	3	4	5	6	7	8
1. Knowledge	-							
2. Intention	.16**	-						
3. Attitude	.22**	.72**	-					
4. Sensitivity	.10**	.68**	.59**	-				
5. Political Action	-.17**	.01	-.08**	.08**	-			
6. Physical Action	.24**	.25**	.16**	.28**	.22**	-		
7. Economic Action	.35**	.19**	.16**	.20**	.19**	.59**	-	
8. Persuasion	-.01	.16**	.02	.25**	.61**	.53**	.45**	-
9. Cognitive Skills	.29**	.12**	.13**	.03	-.16**	.09**	.19**	-.04*

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The more the students had environmental attitudes, the more they demonstrated physical action ($r = .16$, $p < 0.01$) and economical action ($r = .216$, $p < 0.01$), but the less they demonstrated political action ($r = -.08$, $p < 0.01$). The more the students were sensitive toward the environment, the more they demonstrated all types of behavior ($r = .08$ $p < 0.01$ for political action; $r = .28$, $p < 0.01$ or physical action; $r = .20$, $p < 0.01$ for economical action; and $r = .25$, $p < 0.01$ for persuasion). The more the students had cognitive skills for assessing and then solving environmental pollution, the more they demonstrated physical action ($r = -.16$, $p < 0.01$) and economic action ($r = .19$, $p < 0.01$), but the less they demonstrated political action ($r = -.16$, $p < 0.01$) and persuasion ($r = -.04$, $p < 0.05$).

Having examined the intercorrelations among the study variables taking place in the proposed model (see Figure 4.2) which was designed according to the relevant literature, path analysis was employed by making use of Lisrel 8.30 (Jöreskog & Sörbom, 1993a).

Path model examined the whole model as well as the direct and indirect effects of the study variables on ERB. Through the use of the model, it was tested whether the model explained the direct effect of affective disposition on ERB and willingness to take environmental action (intention); the direct effect of environmental knowledge on ERB, cognitive skills, affective disposition and intention; the direct effect of cognitive skills on affective disposition and intention; direct effect of intention on ERB; and indirect effect of cognitive skills on ERB.

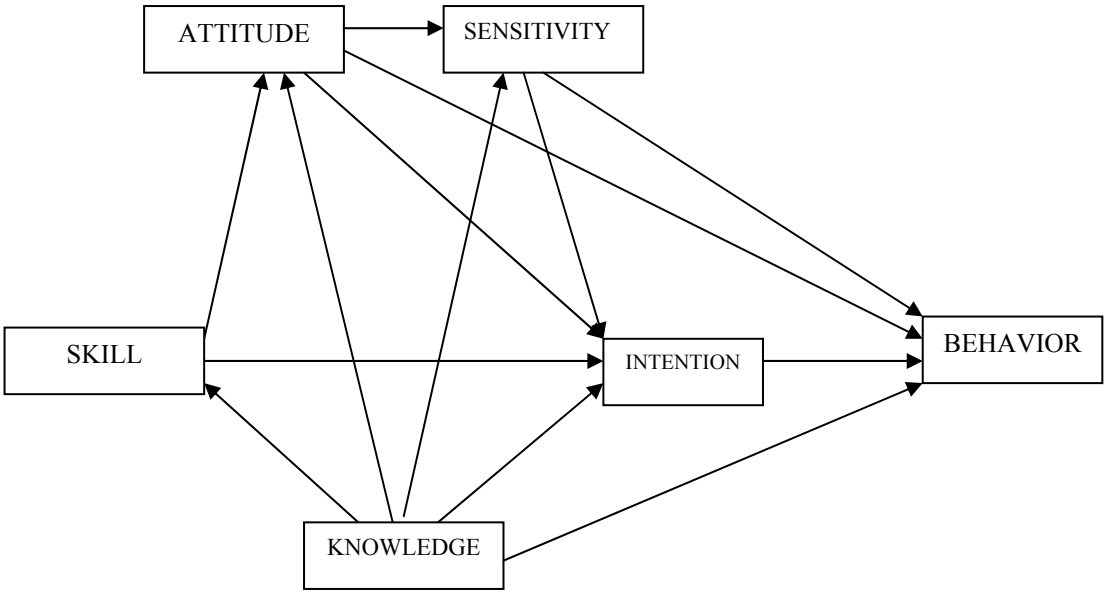

Figure 4.2 Proposed Model Representing the Factors Affecting ERB

A set of criteria were computed in order to see whether the proposed model fit the data. These criteria and/or standards and their acceptable limits (Schumacker & Lomax, 1996) are given in Table 4.11.

The expected values for a good model data fit interpretation are possible if the GFI and AGFI index values are above .90; SRMS and RMSEA index values are below .05. Based upon these criteria and their acceptable level, overall model was firstly assessed. Later, individual paths in the model were tested with regard to their

significance. Insignificant paths were excluded from the model and the second path analysis was run again for revised model.

Table 4.11
Selected Goodness of Fit Criteria and Acceptable Fit Interpretation

Selected Goodness of Fit Criteria	Acceptable Level	Interpretation
Chi-Square (χ^2)	Chi-Square value in the table (tabled χ^2 value)	Compares obtained χ^2 value with tabled value for given *df*
Goodness-of-fit Index (GFI)	0 (no fit) to 1 (perfect fit)	Value close to .90 reflects a good fit
Adjusted Goodness-of-fit Index (AGFI)	0 (no fit) to 1 (perfect fit)	Value adjusted for *df* with .90 a good model fit
Root-Mean Square error of Approximation (RMSEA)	<.05	Value less than .05 reflects a good model fit
Standardized Root Mean Square (SRMS)	<.05	Value less than .05 reflects a good model fit

4.3.10.1. Results of Fit Indices

The summary of fit indices gathered from two path analyses (initial model and revised model) is presented in table 4.12.

Table.4.12
Summary of Goodness of Fit Statistics for the Proposed Model and Its Revised Version (N=2226)

Goodness of Fit statistics	χ^2	*p* value	*df*	RMSEA	GFI	AGFI	SRMS
Initial Model	704.15	0.000..	3	0.30	0.91	0.42	0.15
Revised Model	3.11	0.38	3	0.004	1.00	1.00	0.0061

It is possible to say by looking that this table that fit indexes were satisfactory for the model changed in light of the modifications suggested by the LISREL output. The last version of the path analytic model yielded satisfactory results and the data fit the model which suggested high adjustment between model and the data.

First path analysis was conducted for the proposed model. However, the model did not fit the data and the syntax output suggested adding three paths among the variables to the proposed model and removing some of the suggested paths from the model. Second path analysis was performed for revised model. In both analyses, Chi-square (χ^2) value, "a measure of overall fit of the model to the data" (Jöreskog & Sörbom, 1993b, p.122), was initially calculated. A small chi-square corresponds to the good fit whereas a large chi-square corresponds to bad fit. In the first path analysis, chi-square was found to be quite high representing bad fit. In the second analysis, chi-square was found to be small enough for the fit of the model to the data. The other criterion to assess the fit of the model to the data is the ratio to degrees of the freedom (χ^2 / df) (Kenny & McCoach, 2003). Contrary to first path analysis, this ratio was found 1.036 suggesting good fit, since generally this ratio less then 3 is accepted to be adequate. The other selected goodness of fit statistics for the revised model were; RMSEA = 0.004, $p < 0.05$; GFI = 1.00; AGFI = 1.00; SRMS = 0.0061. These values also indicated the adequacy of the model fit since they were in line with the minimum standards given in table 4.21.

4.3.10.2. Results of Direct and Indirect Effects: Individual Paths

The results presented here are only based on the path analysis output for the revised model. The revised path model with the standardized path coefficients (Beta Weight) for each significant path is shown in Figure 4.3.

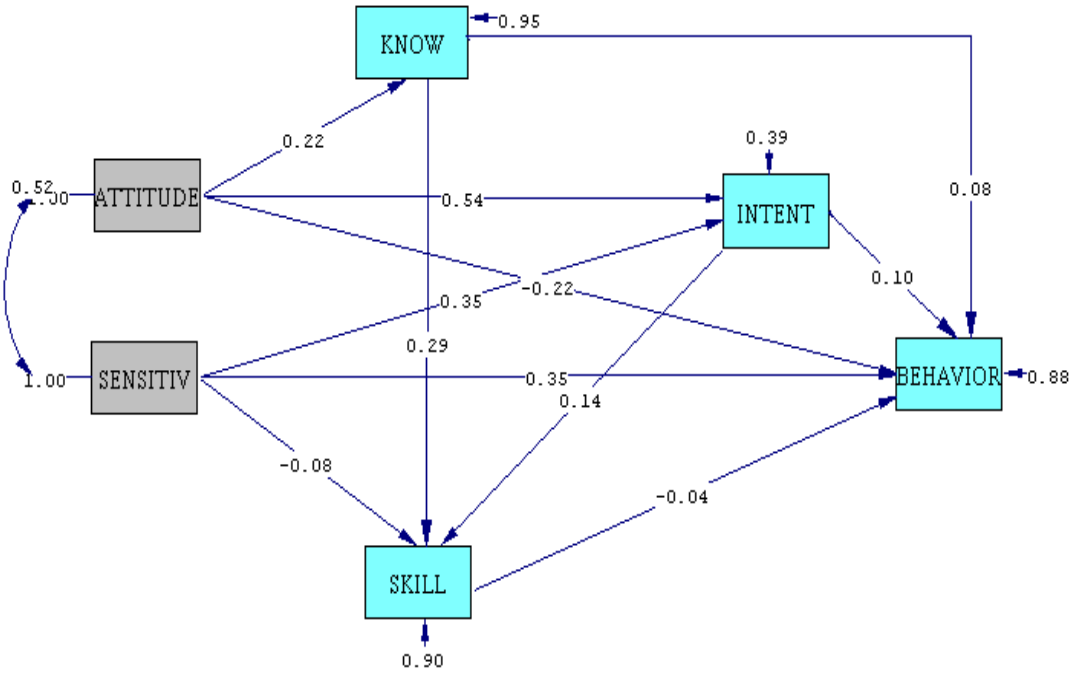

Figure 4.3 Standardized Path Coefficients for Revised Model

In the model, the arrows (also called as path) showed the direction of the causation. The standardized path coefficient above each arrow refers to the strength of the causation. The results of path analysis among the variables for the revised model are summarized in Table 4.13.

The coefficients ranged from -0.22 to 0.54. As claimed by Cohen (1988), standardized path coefficient (β) with absolute value less than .10 may indicate small effect; value around .30 indicate medium effect and values above .50 indicate large effect. According to the Cohen's criteria, environmental attitude had the largest effect on environmental intention. On the other hand, cognitive skills had the lowest effect on ERB. Of all paths, three paths were negative. The results of path analysis revealed that 5th grade students' sensitivity toward environmental issues (β = 0.35) moderately predicted their responsible behavior referring that developing higher environmental sensitivity results in demonstrating more environmentally responsible behavior.

Table 4.13
Path Weights, Standard Errors, t and p Values for Direct and Indirect Paths for the Revised Model

Paths	Weight (β)	SE	*T*	*p*
ERB (BEHAVIOR) from:				
Environmental Knowledge (KNOW)	0.08	0.18	3.78	0.01
Willingness to Take Env. Action (INTENT)	0.10	0.26	3.28	0.01
Cognitive Skills (SKILL)	-0.04	0.36	-2.13	0.01
Environmental Sensitivity (SENSITIV)	0.35	0.23	13.54	0.01
Environmental Attitude (ATTITUDE)	-0.22	0.22	-7.40	0.01
Willingness to Take Env. Action (INTENT) from				
Environmental Attitude (ATTITUDE)	0.54	0.015	34.61	0.01
Environmental Sensitivity (SENSITIV)	0.35	0.016	22.20	0.01
Environmental Knowledge (KNOW) from				
Environmental Attitude (ATTITUDE)	0.22	0.02	10.69	0.01
Cognitive Skills (SKILL) from				
Environmental Knowledge (KNOW)	0.29	0.0098	14.41	0.01
Willingness to Take Env. Action (INTENT)	0.14	0.012	5.21	0.01
Environmental Sensitivity (SENSITIV)	-0.08	0.013	-3.06	0.01

Furthermore, environmental knowledge (β = 0.08) and willingness to take environmental action (β =0.10) were found to have significant direct effect on ERB suggesting that having higher environmental knowledge and higher willingness to take environmental action feeling leads to engaging more in responsible behavior toward the environmental protection. Environmental attitude (β = -0.22) and cognitive skills (β = -0.04) of 5th grade students also predicted their environmentally responsible behavior. However, both of these variables' direct effects on ERB were found to be reverse (negative). This result suggested that the relationship between ERB and environmental attitude and between ERB and cognitive skills were reverse. When combining all these variables together, it was observed that 12 % of the variance of 5th grade students' environmentally responsible behaviors could be

predicted by their environmental sensitivity, willingness to take environmental action, environmental knowledge, cognitive skills and environmental attitudes.

When examining the direct paths to INTENT, environmental attitudes (β = 0.54) and environmental sensitivity (β = 0.35) predicted willingness to take environmental action. This result suggested that higher environmental attitudes and environmental sensitivity resulted in higher willingness to take environmental action.

Given in Figure 4.3, environmental attitude was found to be the predictor of environmental knowledge. Environmental attitude, by itself, predicted environmental knowledge with a beta weight (β) of .22 suggesting that higher environmental attitude resulted in higher environmental knowledge.

Environmental knowledge, willingness to take environmental action and environmental sensitivity were three predictors of cognitive skills. Environmental knowledge moderately predicted cognitive skills with a beta weight (β) of .29 referring that higher environmental knowledge led to higher cognitive skills for investigating and solving environmental problems. Similarly, willingness to take environmental action predicted cognitive skills with a beta weight (β) of .14 in a small magnitude suggesting that higher willingness to take environmental action leads to cognitive skills. On the other hand, environmental sensitivity predicted cognitive skill with small and negative beta weight (β = -.08) indicating that increased environmental sensitivity results in decreased cognitive skills.

Overall, 12% of the variance in environmentally responsible behavior was accounted for a combination of environmental knowledge, intention, cognitive skills, environmental attitudes and environmental sensitivity.

Furthermore, environmental attitudes and environmental sensitivity explained 61 % of the variance of intention. Environmental attitude itself explained about 5% of the

variance in environmental knowledge. Furthermore, 10% of variance in cognitive skills was accounted by environmental knowledge, intention and environmental sensitivity.

4.4. Summary of the Results

Students' level of EL and the factors affecting their environmentally responsible behaviors were explored with two main and further sub-questions. The data gathered were analyzed though the use of not only descriptive statistics but also inferential statistics. Although 56% of the students (n = 1351) reported their high level of environmental curiosity, only 17.2% (n = 414) indicated that they were frequently involved in nature-related activities such as camping, fishing, picnicking…etc. Schools and teachers, family members, internet, TV, books, newspaper and magazines, and encyclopedia were mostly cited environmental sources that students obtained environmental information. More than 75 % of the students reported that any member of their families (mother, 59.4%; father 51.8%; sibling, 29%) was concerned about the environmental pollution.

Out of 22 knowledge items, 11 of them were correctly answered by more 75% of the students, 8 items were correctly answered by 50% to 75% of the students, and the rest 3 items were correctly answered by only less than 50% to 25% of the students. Students showed high level of willingness to take environmental action (M = 17.09, SD = 3.39, Range = 5-20), environmental attitudes (M = 18.04, SD = 3.54, Range = 5-20) and environmental sensitivity (M = 12.68, SD = 2.63, Range = 4-16). Among the four types of environmentally responsible behavior, more than 50% of the students never engaged in political type of ERB (M = 9.42, SD = 11.29, Range = 0-42) for preventing and protecting environmental problems. Students were observed to be more engaged in eco-management type of ERB (M = 26.51, SD = 6.98, Range = 0-36) when compared with their other types of ERB. On the other hand, their level of behavior regarding consumer and economic action (M = 21.44, SD = 6.91, Range = 0-30) were found to be average. However, they demonstrated low level of

individual and public persuasion (M = 22.14, SD = 11.77, Range = 0-48). Only 120 students correctly ordered seven scientific processes given for identifying the environmental problem. In addition, 83.77% (n = 2019) of the students reported their own solutions and plans for solving one of the environmental pollution; water pollution. Their solutions of the problems are categorized under tree types of behavior such as physical action, persuasion and political action.

Interpretation of EL composite score which was calculated by combining all components of EL showed that average EL score of students was 149 (SD = 26.19) suggesting moderate level of EL and many of the students (64.1%, n = 1545) fell in the mid range (91-165) reflecting moderate level EL. Only 22 students (0.9%) showed low level EL.

Predictors of ERB were investigated series of ANOVA though the use of SPSS and path analysis through the use of LISREL. The main effects of school type (partial η^2 = .007), taking pre-school education (partial η^2 = .002), mother education level (partial η^2 = .007), father education level (partial η^2 = .012), residence (partial η^2 = .008), experiences in the natural regions (partial η^2 = .042), environmental curiosity (partial η^2 = .048), mother environmental concern (partial η^2 = .023), father environmental concern (partial η^2 = .031) and sibling environmental concern (partial η^2 = .014) on 5th grade students' ERB was found significant. On the other hand, the main effects of gender and parent SES (income) on ERB were found insignificant. Table 4.14 summarizes the effects of categorical variables on ERB and their directions. Furthermore, the effects of continuous variables on ERB were investigated through the use of path analysis. The results revealed that a combination of environmental knowledge, willingness to take environmental action, cognitive skills, and environmental attitude and environmental sensitivity explained 12% of the variance in ERB.

Table 4.14
Significant and Non-Significant Effects of Categorical Variables on ERB, and Directions of Significant Effects

Variables	Effect size and Significance level	Direction of Significant Difference
Gender	Non significant	-
School type	partial η^2 =.007, p<0.001	Private school > Public school
Pre-school education	partial η^2 =.002, p<0.05	The ones who took pre-school education > the one who did not take pre-school education
Parent Education level	partial η^2 =.007, p<0.01 (mother)	University education > illiterate
	partial η^2 =.012, p<0.01 (father)	University Edu. = Secondary Edu. > Illiterate = Elementary School Edu. University Edu. > Middle School Edu.
Residence	partial η^2 =.008, p<0.001	Urban-private school > Urban-public School Urban-private school > Rural-public School
Income (SES)	Non-significant	-
Level of Experience in Natural Area	partial η^2 =.046, p<0.001	Frequently > sometimes, rarely and never Sometimes > rarely and never
Level of Curiosity	partial η^2 =.048, p<0.001	Very much > average, little and no Average > little and no
Mother Environmental Concern	partial η^2 =.023, p<0.001	Concerned mother > Non concerned mother
Father Environmental Concern	partial η^2 =.031, p<0.001	Concerned father > Non concerned father
Sibling Environmental Concern	partial η^2 =.014, p<0.001	Concerned sibling > Non concerned sibling

CHAPTER V

DISCUSSION

This chapter presents the discussions and implications of the results which were achieved / reached in this study. In this part, the results were discussed with regard to their consistency with national and international research studies. Furthermore, this chapter presents the implications for practice and further research.

5.1. Discussions of Results

The purpose of the study was twofold. In the first fold, 5th grade students' level of Environmental Literacy (EL) was assessed. For this analysis, composite EL score was calculated by combining the components of EL. The procedure proposed by McBeth et al. (1997) was adapted for the present study for calculating EL score. In the second fold, the factors affecting 5th grade students' Environmentally Responsible Behaviors (ERB) were investigated. More specifically, in this fold, the present study examined the effects of various selected categorical variables, cognitive variables and personality variables on 5th grade Turkish students' ERB.

5.1.1. Fifth Graders' EL across Turkey

Considering its theoretical bases, early definitions, Tbilisi Declarations, review of EER, meta-analysis of research on ERB and proposed models, EL mainly consists of four main categories; knowledge, affect, cognitive skills and behavior (Hsu, 1997; McBeth & Volk, 1997). Present study was designed by considering these categories. Similar design was previously utilized in some nation wide EL assessment studies in the USA (McBeth, 2006), South Korea (Shin et al., 2005) and Israel (Negev et al., 2006).

In this nation-wide study across Turkey, the EL composite mean score of fifth grade students was found 149.66 (*SD*=26.19, Range=15-240), reflecting a moderate level of environmental literacy. The contribution of each of four dimensions to total EL score was assumed to be equal (McBeth et al., 2008). Among the students, 27.3% showed high level EL, 64.1% showed moderate level EL and 0.9% showed low level EL. The highest scores were attained in environmental knowledge and affect, and moderate score was attained in behavior. The lowest score was obtained in the cognitive skills. These results are somewhat consistent with the national EL Assessment study with middle school students in the USA (McBeth et al., 2008; *n*=1042 6^{th} graders and 962 8^{th} graders) in that students demonstrated moderate level EL, and also they attained moderate level knowledge, affect, cognitive skills and behavior. Parallel with the present study, American students' highest score was obtained in knowledge, and the lowest score in cognitive skills. The other national EL assessment studies were conducted in South Korea (Shin et al., 2005) and Israel (Negev et al., 2006). Both of these studies preferred to report single score for each of the components of EL rather than reporting adjusted composite EL score. Various levels in terms of categories of EL were also observed in both of these studies. In the regional study conducted by Hsu and Roth (1998) on EL held by Taiwanese teachers, revealed high level of environmental attitude, environmental sensitivity and environmental responsibility, but moderate level of knowledge on ecology and environmental sciences. With regard to ERB, they found that the teachers were most active in eco-management (physical action), relatively less active in consumer/economic action and persuasion and quite less active in political and legal action. Based on the students' drawings, Shepardson, (2005) concluded that the students did not have the knowledge required to be environmentally literate. They also concluded that the students were observed to be in a nominal level of environmental literacy according to Roth (1992)'s categorization. All these studies indicated that individuals could have different levels of knowledge in different countries. This is also valid for the other components of EL. This difference could be related to the several reasons regarding the differences in educational systems, school curriculum, formal, non-formal and informal EE opportunities, information sources

and culture. These reasons are discussed below together with each component of EL as well as parallelism and contradiction of the findings with both Turkish and foreign literature.

***Environmental Knowledge*;** Among the 22 knowledge items in part II of ESELI, more than 75% of the students correctly answered half of the knowledge items. With these eleven items, students' knowledge was examined regarding species [microscopic living organisms], geographic pattern [layer of the Earth], cause of environmental problems, a-biotic factors [energy, light and sound], recycling [recyclable materials], ecosystem [energy in food chain], risk, health and toxicology [human health], effects of environmental problems, geography [types of water] and solutions of environmental problems [erosion and landslide]. 50% to 74% of the students correctly answered other eight items each of which assessed students' knowledge regarding habitat, natural disaster [earthquake], species and populations [endangered and protected species], cause of environmental problems [natural balance], eco-system [food chain], environmental problems [proper disposal of waste product] and clean and alternative energy [wind energy]. The remaining three items were correctly answered by only 25% to 49% of the students. These three items assessed students' knowledge of natural history [tourism and effects of nature on places], use of energy at home and causes of environmental problems on species [animals].

The mean score out of 22 environmental knowledge items was found 15.55 (*SD* = 3.47, Range = 0-22) and adjusted environmental knowledge mean score was found 42.42 (*SD* = 9.48, Range = 0-60) reflecting 5th grade students high level of environmental knowledge according to the criteria set by McBeth et al. (2008). The findings of the present study seemed to be consistent with what Çetin and Ertepınar (2004) found in their study on the knowledge level of 7th and 9th grade students on the selected ecological concepts. On the other hand, what was found in the findings of this study were not consistent with studies carried out with Turkish participants in various grades (K-8) on general environmental knowledge and/or knowledge on

different environmental concepts. Alp et al., (2006b), for example, investigated students' general environmental knowledge and found low level of environmental knowledge of 6th to 10th grade students. Other studies reported, students' limited knowledge regarding plant species (Gökdere, 2005, *n* = 524), erosion (Bozkurt et al., 2004, *n* = 35), photosynthesis and respiration (Bacanak et al., 2004, *n* = 108; Balcı et al., 2006, *n* = 101; Şensoy et al., 2005, *n* = 562), ecology concepts (Özkan et al., 2004, *n* = 57), climate and weather (Alkış, 2006, *n* = 300; Doğar & Başıbüyük, 2005, *n* = 173), ozone layer and acid rain (Armağan, 2006, *n* = 212; Bozkurt & Aydoğdu, 2004, *n* = 504).

Furthermore, students' moderate and low (or limited) level of environmental knowledge was also reported in research studies undertaken abroad. McBeth et al. (2008) found that out of 17 knowledge items, 6th grade students' environmental knowledge score was 11.24 (*SD* = 3.26) and 8th grade students' environmental knowledge score was 11.62 (*SD* = 3.32) suggesting middle school American students' moderate level environmental knowledge. However, Gambro and Switzky (1996) reported low level of environmental knowledge of about 2900 American students. Barrow and Morrisey (1988/89) found low level energy knowledge of students in Canada. Additionally, in a study with 332 Greek students, low level knowledge regarding sea turtles was observed (Dimopoulos & Pantis, 2003). The other study conducted with Dutch students by Kuhlemeier, Bergh and Lagerwij (1999) indicated students' limited and fragmented knowledge on the environment.

Compared to the previous findings reported in the EE literature both in Turkey and abroad, the present study revealed 5th grade Turkish students' high level of environmental knowledge (more specifically knowledge on ecology and environmental sciences, environmental problems and issues, and socio-economic and political knowledge). Even though very few studies in Turkey seemed to support the findings of the present research, the inconsistency observed between this study and other studies carried in more or less similar context. This difference may be related to several factors. First, the sample of this study is much bigger. Second, the items of

the instrument (Test for Environmental Knowledge- TEK) used in this study were derived from a table of specification prepared according to the frequency of the environmental related-attainments of 4th and 5th grade Science and Technology, Social Studies and Interdisciplinary Courses. The participants of the study were assumed to cover at least some of the environmental related topics in the 5th grade school curriculum. The students in the present study have already experienced newly developed science and technology curriculum since 2004. One of the main dimensions of this "new" curriculum was environment which incorporates more environmental-related topics and thus attainments/objectives into the curriculum. Experiencing such topics might help students develop their own environmental knowledge. Various types of sources may also help the students obtain information about the subjects/concepts in TEK as well as the school which is main source of environmental knowledge (Barraza & Cuaron, 2004). This was supported with what students reported about the environmental information sources. They indicated that family members (n = 1658), internet (n = 1562), TV (n = 1536), environmental related books (n = 1529), and newspapers and magazines (n = 1519) contributed to their environmental knowledge development. Parallel findings are also observed in the literature. School (Kaya & Turan, 2005), TV (Alaimo & Doran, 1980; Chan, 1996; Huang & Yore, 2003), parents (Bonnett & Williams, 1998) and books on environment (Arbuthnot, 1974) were identified as major sources which contribute to environmental knowledge gain. In the study of Connell et al. (1999), three main source of obtaining information about the environment were identified such as media (television news, documentaries, advertisement, magazines and newspaper), schools, and individual experiences. Another factor which contributes to environmental knowledge development could be the curiosity level of the students toward the environmental-related information. In the present study, 1351 (56%) students reported high level curiosity for obtaining environmental information. Their high level curiosity toward environmental-related information may result in their high level environmental knowledge. In addition, students' direct experiences with the natural environment might also play a role for knowledge acquisition on the environment. This was evident in students' high level of involvement in natural

activities. Another evidence was the significant relationship between environmental attitude and knowledge obtained in path analysis indicating that 4.9% of the variation in environmental knowledge was associated with the environmental attitude which is consistent with the results of Chu et al., (2006), and Meinhold and Malkus (2005).

***Affective Dispositions*;** This component of EL in the present study consisted of three sub-scales such as willingness to take environmental action, environmental attitudes and environmental sensitivity. Combining all these three sub-scales together, students' affective disposition score was 47.83 (*SD* = 8.46, Range = 14-56) and adjusted affective disposition score was 52.27 (*SD* = 9.07, Range = 15-60) referring to students' high level of affective disposition tendencies. This result also indicated students' positive orientation toward the environment (86%). As far as the responses given to sub-scales were concerned, the findings pointed out students' high level of willingness to take environmental action, positive and favorable high environmental attitudes and high environmental sensitivity. More than 80% of the whole students were observed to be willing to persuade other people (*n* = 2042) and to talk with the governmental officials (*n* = 1970) for environmental protection. Looking at the available literature, Bonnett and Williams (1988) who investigated sixth year students' attitudes toward the natural environment reported that the students felt they were a part of the nature and also had a strong empathy toward the certain aspects of nature. However, Shepardson (2005) observed in the students' drawings that they did not see themselves as a part of nature.

Furthermore, students' responses revealed high level (higher than 83% of the students) of internal locus of control for protecting the natural environment and helping others to protect the environment, and also indicated high level sense of responsibility for environmental protection (85.6%). Consistent with the other studies, Turkish students seemed willing to take necessary action (Alp, 2005) to cooperate with governmental officials and E-NGOs (Erdoğan & Erentay, 2007) and to develop individual responsibility to protect the environment (Tuncer et al, 2004). The findings are also complementary to the findings of Borden and Schettino (1979)

who indicated students' willingness to demonstrate ERB in the future. About 90% of the students emphasized the importance of the environment in general and natural resources in particular. They also believed that wild animals need to be protected since they have also right to get by. They claimed that they were ready for changing their own life style for the sake of protecting the environment and preventing environmental problems. Tuncer et al. (2004) also found that even though the students (n=1497; 6th to 10th graders) in Turkey were not sure about the priority of the environment over other issues, they believed in the importance of individual responsibility for preventing environmental problems. 16 to 17 years old students in Australia (Connell et al. 1999) referred to this attitude by saying that change could emerge as a result of change in people's own attitudes and life style. Furthermore, Barrett et al., (2002) concluded that young people in Japan believed in changes in lifestyle, values and human behavior for better environmental protection. Similarly, in the other study conducted with 5th to 7th grade students in Turkey (Erdoğan & Erentay, 2007), students believed in the importance of protecting natural resources and species due to their contribution to the ecological balance. These students were highly concerned about protecting the environmental and indicated their willingness to change their lifestyle and engage in environmental protection. Students' valuing and appreciating the environment and their positive attitudes toward the environment were also observed in several research studies conducted in Turkish context (Alp, 2005; Tuncer et al., 2005; Yılmaz et al., 2004)..

Cognitive Skills; This component of EL assessed students problem identification and problem solving skills of the students for the environmental pollution. Only 120 (4.98%) students correctly ordered the scientific processes for identifying and assessing the environmental problem in the given case regarding water pollution. 1128 students (%46.8) knew that identifying an environmental problem and issue starts with obtaining relevant information regarding the problem from the printed and electronic sources. As far as students' action strategies and plans for solving the water pollution was concerned, it could be stated that the students tended to demonstrate mainly three different types of environmental behaviors; physical

action, persuasion and political action. 37.2% (n = 897) of students showed moderate level cognitive skills whereas 39.5% (n = 952) of students showed low level cognitive skills for identifying and solving the given environmental problem; water pollution. Number of the studies which investigated students' skills related to identifying and solving environmental problems is very few. Consistent with the present study, Armağan (2006) investigated students' (7^{th} to 8^{th}) problem identification and problem solving skills by asking the students to identify the problems in the given case and suggest possible solutions to them. She concluded that the students could not respond correctly to the cases/questions that required higher order skills like judgment, analytical thinking and interpretation.

The reasons behind why the students demonstrated low or moderate level of scientific process skills for the environment related problems could be due to school curriculum and their teachers. Erdoğan and Erentay (2007), and Erentay and Erdoğan (2006) observed students' limited skills (such as data collection, data analyses…etc) for identifying and solving water pollution in Mogan Lake in Ankara. Surprisingly, as a result of two semester skill instruction, students favorably developed scientific process skills for identifying and solving environmental problems. The latter study showed the importance of skill instruction for developing basic and higher order thinking skills for the students. The research on this area revealed both of the reasons. Scientific process skills (SPS) have been considered as one of the main dimensions of Science and Technology Education Curriculum which was integrated into school curriculum in 2004-2005 academic year in Turkey. Taşar, Temiz and Tan (2002) claimed the insufficiency of the Science Education Curriculum of 2000 for developing students' SPS. As concluded by Hazir and Türkmen (2008), teaching SPS depends mainly on teachers and their orientations. It was pointed out that teachers could not adequately emphasize skill instruction because such activities take a lot of time, regardless of attention given to SPS by the new curriculum. Furthermore, skill instruction could not be sufficiently performed in the schools due to crowded classrooms, limited equipments and materials, and time limitations mainly (Ercan,

1996) and teachers' lack of knowledge and competency on SPS instruction (Kırıkkale & Tanrıverdi, 2006).

Environmentally Responsible Behavior; In the present study, ERB consisted of four sub- scales, namely political action, physical action, economic action and persuasion. The mean score obtained from Children Responsible Environmental Behavior Scale was 79.52 (*SD* = 28.33, Range = 0-156) and adjusted total mean score was 30.58 (*SD* = 10.89, Range = 0-60) suggesting students' moderate level responsible behaviors toward the environment. More specifically, students reported their moderate level engagement in physical (eco-management) and economic action, but low level engagement in political action and persuasion types of ERB. Compared to the three other sub scale scores, students seemed to demonstrate more physical action. Number of the students who never engaged in any of given physical action was quite low, except for recycling behavior. This was somewhat consistent with the study of Erten (2002, 2003) in that students were not adequately engaged in recycling behavior. He observed an increase in students' recycling behavior as a result of one week instruction on disposal of the waste product. He concluded that family could play an important role for shaping their children's recycling behavior. Furthermore, 20.5% of the students in the present study never purchased the products which are recyclable and produced by recycled materials. This may be due to the fact that either these products are not widely sold or they could be relatively pricy. Furthermore, the students seemed to be very cautions while purchasing the products. More 55% of the students reported that they purchased fresh, health and organic products and also would like to be ensured that the products they purchased are certified and guaranteed by TSE and Ministry of Agriculture and Village. Their purchasing of these types of products could be influenced by the news on the health problems of some people as a result of consuming genetically modified and uncertified foods and products even though the parents do not frequently let and/or encourage their children to purchase the products for their house. Consistent with the findings of Erten (2002) who undertook a study with 5th grade students, in this study 43.6% of the students engaged in re-using behavior by giving their used and old stuffs to other

people who needed them. Erten (2002) found the effectiveness of waste management instruction on students' recycling, re-using and waste management behavior.

The findings further indicated that more than 50% of the students disposed of their rubbish to waste-bin, took water saving precautions and protected plants more than five times during last one year. Erten (2002) also found that 55.6% of the students turned the water fountain off after they used, but many of the students were not carefully disposed of their garbage. Recently, some of the environmental related governmental (e.g. ANÇEVA) and non-governmental (e.g. ÇEVKO) organizations have started a project in the schools for increasing students' recycling and waste management behavior. This might increase students' similar behaviors. The shortage of water and the increase in forest fire in the last ten years in Turkey could have result in increased awareness for water-saving behavior and plant protection behavior.

More than 50 % of the students never engaged in political action such as planning a communication with national or provincial governmental officials, municipal officials and executive officers of a district for law enforcement to protect and beatifying the environment and preventing environmental problems. Their low level engagement in political action could be due to lack of guidance by school teachers and family members. More than a quarter of the students never engaged in persuasive behaviors for protecting the environment and preventing the environmental problems. This could be related with many other factors such as local administrations and democratic action orientation. In line with the EE literature, students in the present study did not frequently persuade their family members, friends and other people for taking necessary action to protect the natural environment and prevent the environmental problems. Students limited knowledge on how to take responsible action for the environment and limited interaction (socialization) with others could be a reason of their infrequent persuasion activity. Teachers' lack of guidance could also be a reason of students' low engagement in political action. This argument is evident in the study of Erten (2006) where he

discussed the sociological and psychological foundations of some type of environmental friendly behaviors (EFB) and concluded that the main sources for developing EFB are family, friends (peers) and experience in the natural environment. School curricula, curricular activities and the teachers may also play an important role for developing students' political action.

5.1.2. Predictors of Fifth Graders' ERB

The present study revealed that there were different types of variables which add to the variations in ERB. These variables can be grouped as categorical variables, cognitive variables and personality variables. Almost all of the selected categorical variables (school type, pre-school education, parent education level, nature experience, environmental curiosity, and parent environmental concern) were observed to have an impact on the formation of students' responsible behavior toward the environment whereas the single effects of gender and income were found to be insignificant. The effects of each of categorical variables were discussed across the findings in EE literature.

Gender; Even though the female students scored higher on ERB items than the males did, there was no statistically significant difference between the two groups regarding ERB. Male and female difference regarding ERB has been substantially assessed in the literature. Most of the studies reported favorable higher ERB score of females over the males (Barr, 2007; Hines et al., 1986/87; Shin et al., 2005) despite few exceptional findings (Oweni & Houri, 1999; Theodori & Luloff, 2002). As indicated in the meta-analysis of research on ERB of Hines at al. (1986/87), female students were observed to more likely engage in responsible environmental behavior than the males did. On the other hand, Evans et al. (2007) investigated the correlation between socio-demographic characteristics and children's environmental attitudes and behavior score. Similar to present study, their study showed no significant difference between male and female children with regard to environmental behavior. In the other study, Gifford, Hay and Boros (1982/83) reported non-significant

relationship between gender and actual behavior. Why male and female difference with regard to ERB was found non-significant might be due to the education they have taken and the parents' similar attitudes and behaviors regarding the environment.

School Type; The second categorical variable considered in this study was school (private vs. public). The students in private schools demonstrated higher ERB than the ones in public school. School type variable itself explained 0.7% of the variance in ERB. Due to higher financial and physical resources, and projects in private schools, EE is much more wide emphasized in private schools. For example Eco-School activities may cover recycling, planting and waste-management. Getting some grants like the green flag show school's policy and orientation regarding the environment. Other two studies revealed that students in private schools showed high level environmental sensitivity (Kaya & Turan, 2005) and environmental attitudes (Tuncer et al., 2005) which contributes to the development of ERB (Sward & Marcinkowski, 2001). Reasons like socio-cultural level (Kaya & Turan, 2005), parents level of education (Tuncer et al., 2005), family background, experience, teachers' competence, the curriculum offered, and the quality of the instruction could also play a role (Kuhlemeier et al. 1999).

Pre-School Education; The third categorical variable was related to preschool education (attending vs. not-attending). Taking pre-school education seemed to contribute to the development of ERB of the students. The students who took pre-school education demonstrated significantly higher ERB than the ones who did not take such education. However, its effect was relatively low (η^2 = 0.002). It should be noted that the pre-school curriculum includes several topics related to nature and the environment. The consumptions habits, saving behavior and some other basic issues are also introduced to the students during the preschool education. As indicated by Russo (2001), taking pre-school education helps children become aware of their own environment thus they start to comprehend the natural environment in early ages. Since students' environmental knowledge and environmental attitudes are

formed at early ages (Basile, 2000), environmental related topics integrated in pre-school curriculum will contribute to the development of environmental attitudes (Wilson, 1996) and thus ERB. In addition, Evans et al. (2007) discussed the sources of young children's environmental attitudes and behavior. They concluded that early childhood encounters with the nature could be a sign of more positive environmental values. For that reason, pre-school education could play an important role for shaping students as behaving responsibly toward the environment.

Parent Education Level and Income; The other categorical variable which predicted the variance in ERB was parent education level (Chu et al., 2006: Goldman et al., 2006). As far as the effects of mother (η^2 = 0.007) and father (η^2 = 0.012) education level on students' ERB were concerned, the present study revealed consistent results with the literature. The students whose mother and father had high level education engaged in ERB much more than the ones whose mother and father were illiterate and had low level of education. The effect of parent education level on environmental attitudes and knowledge, which contributed to the variation in ERB, was substantially discussed in the available literature. For example, as discussed by Tuncer et al. (2006), despite man-dominated Turkish culture, mothers tend to take care of household level of education. The mother education level plays a role in the environmental awareness. On the other hand, in another study of Makki et al. (2003) with Lebanese students coming from man-dominated culture, students with more-educated father had higher environmental knowledge. But, their knowledge level was not associated with mother education level. Makki et al. (2003) concluded that fathers set the household education in the family in Lebanese. Similarly, Alp et al. (2008) and Gambro and Swiztky (1994) reported significant effect of father education level on student environmental knowledge, but not of mother education level. As indicated by Alp et al. (2008), students whose fathers were more educated were possibly exposed to the richer home environment including more access to environmental related scientific resources and educational materials. They also related their findings with the function of Turkish culture in which mothers are not as much dominant as fathers in their children's education. Another reason could be that

adults who were more educated show higher environmental concern about environmental issue and problems (Evans et al., 2007). On the other hand, Sağır et al. (2008) could not observe any significant effect of neither mother nor father education level on students' environmental knowledge and attitudes. The present study suggested that both father and mother appeared to share the responsibility while setting household education level of the family members. Newly developed school curriculum which has been implemented since 2004 put more emphasis on parent-school cooperation. More educated parents seem to be more involved in shaping their children's learning and education by studying at home, guiding homework, and reading books and magazines. Thus, it is reasonably considered that father' and mother' education level play crucially important role in developing ERB of their children. Furthermore, inconsistent with Alp et al.'s claim, the present study indicated that family income did not have significant impact on developing students' ERB. Even though more than half of the students (62.5%) did not report their family income, the rest reported various level of family income. Although the parents with high income might be expected to provide more educational opportunities and resources (e.g. book, magazines and CDs regarding the environment) to their children, the present study did not test and prove this argument. The previous research studies seemed to support present findings that socioeconomic status did not have a significant impact on students' environmental knowledge and attitudes (Atasoy & Ertürk, 2008), and environmental behavior (Evans et al., 2007).

Parent Environmental Concern; Consistent with the literature, the study revealed that parents' environmental concern significantly contributed to Turkish students' ERB. The students whose mother (η^2 = 0.031), father (η^2 = 0.023) and sibling (η^2 = 0.014) were concerned about the environmental pollution engaged in ERB much more than the ones whose mother, father and sibling had no such concern. Supporting these findings, as reported by 68.8% of the students (n = 1658), family members (mother, father and siblings) were seen as one of the main information sources for obtaining information regarding the environment. Both of these consistent results are evidenced that family members reflected their environmental

concern on their children which significantly turned into development of responsible behaviors toward the environment. As claimed by Evans el at. (2007), parental environmental attitudes and behaviors may play a role in shaping the development of children's environmental attitudes and behavior.

Residence; Residence is the other variable the impact of which has been significantly observed in the literature. The present study indicated no significant mean difference between urban public schools students' and rural public schools students' ERB. On the other hand, the students in urban private schools engaged in ERB more than the ones in public urban and public rural schools. The study of Arcury and Cristianson (1993) also reported no significant effect of rural-urban differences on action by controlling for socio-demographic variables (age, income, gender and education). They stated that education, income, age and gender accounted for much of the variance of environmental world view and global environmental knowledge of the respondents. Leftridge and James (1980), on the other hand, reported rural and urban population differences with regard to environmental and ecological perceptions. In the survey study of Bogner and Wiseman (1997) with 2400 pupils in rural, sub-urban and urban residence of Bavaria, the results revealed that rural pupils scored negative and differed significantly from both urban and sub-urban pupils with regard to verbal commitment to protect environment. However, they did not observe any statistically significant urban-rural differences in environmental attitudes and behavior. This could be due to the fact that the students living in the urban areas might encounter with several environmental problems (e.g. air, water and noise pollution). They could have developed environmental awareness and intention to engage in environmental protection activities. On the other hand, the students living in village and other rural places may not encounter many of these environmental problems. As indicated in the study of Fransson and Gärling (1999), people who lived in urban areas tended to have higher environmental concern than those in rural areas. The people in the urban areas are expected to be more likely facing environmental problems due mainly to industrialization and population growth. Thus, one can say that the people in urban areas could more likely engage in actual behavior toward environmental protection.

However, similar to the findings of Bogner and Wiseman (1997), the present study did not show rural-urban difference in public school in students' ERB, but showed rural-urban difference between public and private schools in students' ERB. This difference could be a function of school type which is one of the predictors of ERB.

Nature Experience and Environmental Curiosity; The study also indicated that students' involvement in the nature-related activities (η^2 = 0.046) and their curiosity to obtain environmental information (η^2 = 0.048) were observed to predict some of the variation in ERB. The students who were involved in the nature- related activities and were curious about environmental information engaged in ERB much more than the ones who never engaged in such activities and were not curios about environmental information. Leeming et al., (1993) reviewed the outcome research in EE and reported that participation in nature-related activities led the students to appreciate the nature and accept the environmental issues. Students' curiosity about and involvement in the natural activities could develop individuals' sense of responsibility and motivation to take environmental action (Erdoğan & Mısırlı, 2007). Matthews and Riley (1995) concluded that development of the environmental responsibility can be best realized in the outdoors, which are natural settings that increases interest towards the natural environment and allows to individuals participate actively in outdoor activities. Dresner (1994) proposed a model illustrating that increased interests and curiosity about nature stimulates learning about environmental issues which turn into motivation to take environmentally responsible actions. Outdoor and nature activities can provide the students with an opportunity to understand first hand environmental issues (Neal, 1994). This method has been effective in helping students develop awareness toward the environment (Howe & Disinger, 1988; Palmerg & Kuru, 2000). During nature activities, the students could explore the beauty and uniqueness of the nature with their curiosity toward the environment. Their exploration of cause-effect relationship in the nature will assist them to understand the possible effects of environmental pollutions on the natural environment, and thus on themselves. Furthermore, understating the impact

of individuals on the natural environmental and the natural resources will motivate the students take responsible action.

The path model assessed the direct and indirect effect of continuous variables (cognitive and personality variables) on students' ERB. In addition to selected categorical variables, the present study also revealed that 5th grade students' ERB can be predicted by their environmental sensitivity, willingness to take environmental action, environmental knowledge, environmental attitudes and cognitive skills. All of these variables accounted for 12% of the variance in ERB. Several reasons can be suggested to clarify why the contribution of these continuous variables to the explanation of variation in ERB remained at this level. Behavior is a very complex variable which is possibly influenced by several other factors (e.g. demographic, social, cultural, psychological, cognitive and philosophical in nature). As clearly identified in Chapter III, the data was gathered from 2412 students in 26 provinces selected from seven regions in Turkey which means that the study includes a wide range of students with different background. Limited number of the variables selected for the present study might not be enough for explaining the total variance of ERB. As aforementioned, socio-demographic variables (e.g. residence, parent education level, school type) explained the variation in ERB to some extend. However, there are still several variables uncovered in the study such as culture, ethnicity, religion, philosophical beliefs, traditional habits, and situational factors. Thus, these uncovered variables and some other unknown and variables could explain the some of the remained variation in ERB. The other reason might be due to the measurement instrument. Since research on EE is still at a beginning level (primitive level) (Tuncer et al., 2007) in Turkey, number of the instruments assessed the factors affecting ERB and developed in the context of Turkey is very limited. Several researchers adapted instrument(s) which was already developed (e.g. Alp, 2005) whereas the remaining researchers developed their own (e.g. Erten, 2002, 2003). For that reason, possible factors which have an impact on ERB in Turkish culture could not be adequately assessed. ESELI is one of few instruments recently developed based upon the review of 53 EE research studies, national school

curriculum and open-ended responses of 226 4th and 5th grade students. Thus, ESELI included the emerged variables in already published research in Turkey and basically reflect Turkish context. Alp et al. (2008), for example, utilized CHEAKS and LOC instrument by adapting into Turkish. They found that 58% of the variance in environmentally friendly behavior was explained by the linear combination of environmental knowledge, behavioral intentions, affects and locus of control.

Environmental Sensitivity; Among the variables, the highest percentage of the variation in ERB was attributed to environmental sensitivity referring that the higher the students hold environmental sensitivity, the more they engage in responsible behaviors for protecting the environment. Derived from the results, the following items were evidences of students' high level of environmental sensitivity. Most of the students within the sampled students felt themselves quite sensitive to environmental issues (86.6%), followed nature- and environmental-related writings (e.g. books and magazines) (76.3%), TV programs (79.5%) and promised to change their lifestyle and habits (73.2%). Through printed and visual media, the students might have monitored the environmental problems, the impacts on these problems on the life pace of the human being and also the action strategies to overcome these problems. What students' reported in terms of sources they used to obtain environmental information supported to this result. More than 60% of the students reported that they utilized TV (n=1536), magazines and books (n = 1519) to obtain environmental information. The significant relationship between sensitivity and behavior could be interpreted as students' transferring their sensitivity into action. Students' promise to change their life style was also an evidence for this relationship. The finding is consistent with the literature in that environmental sensitivity was found to be one of the precursors of ERB. Sia et al. (1985/86) analyzed the selected predictors of REB and they found that level of environmental sensitivity (η^2 = .13) seemed to be one of the strongest predictors of REB. It appears that significant life experiences which are "*interaction with the natural, rural and pristine habitats*" (Tanner, 1980, p.21) could develop environmental sensitivity of the individuals

(Sward & Marcinkowski, 2001) which functions as one of the predictors of ERB (Hungerford et al., 2000).

Willingness to Take Environmental Action; Another variable which contributed to the variance of ERB was willingness to take environmental action (intention). This was also confirmed with the existing literature in that intention is one of the best psychological predictors of ERB (Barr, 2007; Bogner & Wilhelm, 1996; Cottrell & Graefe, 1997; Fishbein & Ajzen, 1975; Harland, Skatts & Wilke, 1999; Hines et al., 1986/87; Hsu, 1997; Hsu & Roth, 1998, 1999; Kaiser, Ranney, et al., 1999; Kaiser, Wölfing, et al., 1999; Lindström & Johnsson, 2003). Comparing to the effect of environmental sensitivity, the willingness to act was poorly associated with ERB (β = .10). This result indicated that the 5th grade students could transfer high environmental sensitivity into ERB whereas they could not show high willingness to put much effort into taking responsible action. Even though the students indicated high level of willingness to take environmental action, they could not appropriately turn them into action. One of the possible explanations of this poor relationship could be due to students' knowledge of the consequences of their actions on the natural environment. The other explanation might be that students were willing to take action, but did not know how to act responsibly toward the environment. This is related to know-how paradox. In addition, Kuhlemeier et al. (1999) discussed other possible reason to explain this poor relationship. They asserted that school-aged students are more dependent to their parents. The students do not have entire liberty, for example, to do shopping. They may want to purchase appropriate products, but they are not allowed.

Environmental Knowledge; The relationship between environmental behavior and environmental knowledge was significant, but low in magnitude (β = 0.08) suggesting that students were knowledgeable about the ecology and natural sciences, but they could not appropriately transfer their knowledge into action. The low strength of the relationship was observed to be due to the fact that Test for Environmental Knowledge basically assessed students' knowledge on ecology,

environmental sciences, problem and issues, and socio-politic-economic knowledge, but not the knowledge on action strategies. Barr (2007) in this sense reported knowledge for action as a significant predictor of behavior. Parallel with this finding, as also reported by Hsu and Roth (1999), knowledge of environmental action was one of the best predictors of ERB. In addition, it was indicated in their study that knowledge of environmental problems and issues did not explain the variation in ERB. Furthermore, Sia et al., (1985/86) reported strong correlation between perceived knowledge of environmental action strategies and environmental behavior (r = .55). Based on the analysis of 67 empirical studies on recycling behavior, Jacob and Joseph (1995) concluded that knowledge of recycling was strongest predictor of recycling behavior (r = .551). As shown in the study of Hsu and Roth (1999), the responsible behavior was strongly correlated with perceived knowledge of action strategies, but moderately correlated with perceived knowledge of ecology and environmental sciences. Marcinkowski (2001) compared three dissertations with regard to predictors of ERB. He concluded that knowledge of action strategies was a strong predictor of ERB. On the other hand, inconsistent with the previous researches, Işıldar and Yıldırım (2008) reported in-significant correlation between environmental knowledge and environmental behavior. Alp (2005) found negative relationship between knowledge of environmental issues and environmentally friendly behavior. All these findings could be accepted as evidence that students' knowledge of action strategies are expected to be highly associated with ERB rather than knowledge of ecology and environmental sciences. This conclusion was also supported with the studies of Sia et al., 1985/86, and Smith-Sebasto and Fortner (1994). Scott and Willits (1994) concluded that the reason of the low correlation between knowledge and behavior could be due to the inconsistency between what people say and what they actually do.

Environmental Attitudes; Although the attitude was observed to be one of the predictors of ERB (Chan, 1996; Newhouse, 1990), Adams (2003) claims by considering substantial researches that "attitudes do not necessarily influence or lead to overt behavioral changes" (p.15). However, significant relationship between

attitude and behavior was observed in several research either positively (e.g. Chan, 1996; Makki et al., 2003; Meinhold & Malkus, 2005) or negatively (e.g. Grob, 1995; Sia et al., 1986/87; Thapa, 1999). The finding of the present study that the environmental attitude was poorly and negatively related with ERB (β = - 0.22) was not expected. Consistent with this finding, Sia et al., (1986/87) found weak correlation between environmental behavior and attitude toward pollution (r = -.26, p < .05, n = 171) and further no correlation between environmental behavior and attitude toward technology (r = -.08, p > .05, n = 171). Also, Grob (1995) reported significant negative relationship between environmental behavior and belief in science and technology (r = -.16, p < .01). This reverse relationship between attitude and behavior found in the present study suggested that 5th grade students had high emotional feeling toward the environment, but they could not put their feeling into action. This seems to be somewhat contradictory to the notion "what people think influence what they do". Several reasons can be put forward to explain this poor and negative relationship. Young children showed higher environmental attitudes (Alp et al., 2006b), but lower environmental behavior (Hines et al, 1986/87) when compared to older ones. Supporting to this point of view, 5th grade students in the present study showed high level environmental attitudes, but relatively low level ERB which basically resulted in negative relationship. Yılmaz et al., (2004) concluded for high level of attitudes of young students that environmental topics were first introduced at early science classes. Evans et al. (2007) who reported no correlation between young children's attitudes and behavior came to the conclusion that socioeconomically and geographically diverse participants may demonstrate a greater range of engagement in ERB. They also concluded that the relationship between behavior and attitude might be increased when the obstacles behind the engagement in the behavior are removed. Tanner (1999) discussed constrains on environmental behavior and reported that "attitudinal factors should not be conceived as direct predictors of environmental behavior" (p.152). The other reason could be due to parents' environmental attitudes and behavior. It was not investigated in the present study, but the attitude and behavior of family members (mother, father and sibling) and of role models (e.g. teachers and friends) of the students might also influence young

children's environmental attitudes and behavior. Even though the students and their parents were concerned about the environmental pollutions, students who do not have direct experience with the local and global environmental problems might less likely engage in environmental protection. Increasing students' awareness of environmental problems in local-global scale and their direct experience with these problems may render their behavior more likely engage in the action. Thus, the attitude-behavior relation will accordingly increase. The phenomena of social desirability (Özgüven, 1998) could also be an underlying reason of this reverse relationship (Thapa, 1999) even though, as concluded by Milfont (2008, online first), socially desirable responding are not seen as a problem in measuring environmental attitude and behavior. Negev et al., (2008) in this sense reported students' inclination to overreport socially desirable while responding to attitude and behavior items. The other reason, as discussed by Scott and Willits (1994), could be the wording of the questions/items and the measurement error.

Cognitive Skills; Inconsistent with many of the studies (e.g. Hsu 1999; Hsu & Roth, 1998; Sia et al., 1985/86), skills for identifying and solving an environmental problem (water pollution in particular) was observed to be negatively and very poorly related to ERB. When considered the total score obtained from Part-IV and part-V of ESELI, the adjusted mean score of Part-V was 24.67 (SD = 14.69) reflected that the students showed slightly higher than low level cognitive skills and 39.5% of the students (n = 952) showed quite low cognitive skills. Comparing to this result, 65.6% students (n = 1581) demonstrated moderate level ERB (M = 30.58). In particularly, 5th grade students had low level cognitive skills, but moderate level ERB. These both scores are evidenced of the reverse skill-behavior relation. One of the reasons of the reverse relationship is because of low skill score and moderate ERB score. The nature of the items in the skill test (PIPSST) might also influence this reverse relationship. There are two items in PIPSST. First item including seven steps was designed to assess students' identification and evaluation of the given environmental pollution. Second item, which is designed as open-ended, addressed to students' problem solving skill. The first item in PIPSST is not behavior-oriented and

not in line with the items in CREBS. For this reason, the poor relationship could be attributed to nature of the items. Supporting to this reason, the literature revealed that environmental behavior was highly correlated with skill in using environmental action strategies (Hines et al., 1986/87; Hungerford & Volk, 1990) but not with skill in identifying and assessing environmental problems (Chu et al., 2006). Sia et al. (1985/86) found quite high correlation between perceived skill in using environmental action strategies and environmental action (r = .59, p <.05). Similarly, Hsu and Roth (1998) and Hsu (1999) conducted a research with Taiwanese secondary teachers and found high relationship between perceived skill in using environmental action strategies and ERB (r = .46, p <.05 and r = .45, p <.05, respectively). In their National EL Assessment Study with 3003 students in 3rd to 10th grade, Chu et al., (2006) found no relationship between skill and behavior for 3rd graders and poor relationship for 7th and 10th graders. The skill test for 3rd graders was only included skill items regarded as identifying and defining problems and risk analysis. The skill tests for 7th and 10th graders, on the other hand, were included the items regarded as using ability to forecast, think ahead and plans as well as the items included in 3rd graders' skill test. This might be a reason of non-significant skill-behavior relationship of Korean Study.

5.2. Implications

Numerous implications follow from the results of this nation-wide environmental assessment study. These implications can be grouped into two sets; implications for educational policy and practice, and implications for further research.

5.2.1. Implications for Educational Policy and Practice

Environmental behavior and development of environmentally literate citizenry have been considered as the desired end points of EE (Disinger, 1983; Disinger & Roth, 1992; Harvey, 1977; Hungerford & Volk, 1990, 1998). In the present study, 5th grade students' level of EL was explored. Furthermore, determinants of ERB of 5th grade

Turkish students were assessed across categorical, cognitive and personality variables.

This study presented several evidences regarding the effects of students' demographics on ERB. This refers to the necessity of considering individual differences during the instructions, and that the homogeneity among the students with regard to knowledge, affect, skill and behavior should be ensured if the differences are mainly due to school factor. Based on students' responses, school seems to contribute a lot to the development of EL and ERB. As students reported, school (text books, teachers and within and out-of school activities as a result of curriculum and school policy and curriculum itself) is the mostly cited source for environmental information. Moreover, students' engagement in ERB in private schools was significantly higher than the ones in public schools. It has been well known that financial well being of the private schools could provide several opportunities to these schools to undertake environmental/nature-related activities and projects. However, this might not be applicable for the public schools due to crowded classrooms, lack of infrastructure (materials and equipments) and economic reasons. In a short period of time, it does not seem to deal with these problems of public schools, but the teachers should be encouraged to engage in curricular and extra curricular activities by using easy-to-use and easily-accessed materials/equipments. The students, for example, could be taken to natural settings nearby school or teachers, under the guidance of the school principle, could use the school gardens as prototype of ecological cycle by establishing a small wetland, farm land and/or greenhouse. The activities related to planting, energy-water saving, recycling and waste-management could easily be carried out by the school without putting too much effort and money. Students' experiences with the certain behavior (recycling collection) have a potential effect on their future environmental behavior (Barr, 2007). In school, students should be given chance to experience environmental action such as tree planting, waste management, rubbish collection and alike. Furthermore, both types of schools should adopt environmental school policy and include the notion of the "environmentally literate students" in their school vision

and mission statements. Environmental friendly schools could be established though considering these basic suggestions. In addition, school halls could also be used as a space to disseminate information on environmental problems, and encourage environmentally responsible and friendly behaviors of their possible solutions.

Despite its small effect, students' participation in preschool education helps them develop ERB to some extend. Children's understanding of natural environment starts with early ages corresponding to pre-school education. About half of the students in the present study were observed to take this education. This is late for the rest of the students to go back and take the pre-school education again. The families could not be encouraged to send their children to private schools because of financial reasons/concerns, but they are encouraged to send their younger children at least to pre-school education. Even though pre-school education is not compulsory in Turkey, the government and policy makers, in this sense, should encourage parents to send their children to pre-school which is free of charge.

Owning to the fact that EE is interdisciplinary in nature, environmental-related topics/subjects and within/out-of school activities should be incorporated into school curriculum and infused in all courses, because developing environmentally literate and responsible individuals can only be achieved though EE (Hungerford & Volk, 1990). Infusion of EE in curriculum should be started with pre-school (Erten, 2005; Sağır et al., 2008; Taşkın & Şahin, 2008). Turkish education system has recently introduced a reform starting 2004. One of the biggest reforms is the integration of the dimension of the "environment" into the Science and Technology Curriculum (4^{th} to 8^{th}). The topics related to ecology, environmental issues and problems are more observable when compared to the topics in the previous curricula (Erdoğan & Ok, 2008). With this integration, students' literacy on science in general and environment in particular have been emphasized. This could be used as a tool for developing students' ERB and EL. In this sense, teachers play crucially important role while teaching environmental-related topics and conducting environmental-related activities. Their knowledge of environmental related activities and topics may

facilitate students' learning on the environment. In the study of Aydemir (2007), science and technology teachers reported that they had sufficient knowledge to teach environmental-related topics which was contradictory with their responses to knowledge test given to them. This shed light on the importance of EE in pre-service and in-service teacher education. EE should be infused in pre-service teacher education programs by considering its interdisciplinary nature. Similarly, training and workshops on EE should also be undertaken during the in-service education of the teachers.

In addition to school, students reported family members, media and books as three main sources which help them to obtain environmental related information. More environmental information should be transmitted by both visual and printed media to disseminate the environmental information to widest possible audience. The content of TV programs, newspapers and magazines should more emphasize the awareness of the global and local environmental problems, and possible solutions of these problems. As far as the influences of family members on students' ERB and EL development are concerned, the present study emerged that students' ERB was directly associated with parents' environmental concern. Therefore, the awareness of family members should be increased through continuing and adult education programs. For that reason, the cooperation among universities, E-NGOs, municipalities and local organizations should be enhanced to plan and organize such EE programs for the family members. Field trips, service learning and tree planting could be some examples of these programs.

Environmental curiosity and frequency of experiences in the natural setting were also observed to contribute to the variation in ERB. Students also reported that their observation in the natural setting enabled them to learn about the environment to some extend. Combining all these findings, in their spare time (weekend, summers and holidays), the parents should frequently take their children to the natural settings for different purposes; picnicking, tracking, bird watching, trash collecting and so on. Students could develop awareness of the natural balance and develop environmental

curiosity which more likely motivates them to engage in responsible environmental behavior to take steps to protect the uniqueness of the natural balance. In addition, the students, under the guidance of their class teachers, should be taken to zoo(s), natural history museum(s), and recycling center(s) in order for the students to obtain first-hand experiences. Furthermore, subsequent to a small instruction in the school, the field trips to the natural settings nearby school could be organized by the class teacher(s). Activity sheets can be prepared to help the students better observe the nature, the possible problems impacting the natural balance and the responsible behavior to be taken to protect the nature. Students' curiosity and individual responsibility could be developed by taking students to different natural and man-made settings. The parents could also be invited to these field trips. Additionally, policy makers and pressure groups may play an important role for developing students' ERB and EL. The Ministry of Environment, E-NGOs and TUBITAK, for example, should jointly design nature-education programs where the students are invited not only from public schools but also from private schools in various parts of Turkey. Also, these nature education programs should be disseminated to different parts of Turkey. National parks, for example, can be used for this purpose. Students' curiosity toward the natural environment and their involvement in nature-related activities can be increased as a result of these programs.

Moreover, municipalities should allocate more spaces for the public parks including various types of animals and plants. These parks can develop children's and adults' awareness of different types of plant and animal species, and also of the harmony in plant-animal interaction. Number of the recycling bin which has been already put in the center of the cities may not be enough for increasing individuals' recycling-behavior. For that reason, municipalities should put more recycling boxes (each for paper, metallic stuff, battery and glass) not only in city centers but also in each corner of the streets. Municipalities should cooperate with the schools to organize a project which involves collection of students' old and used staffs (e.g. books, dress, and newspaper). This could enhance students' saving and re-use behaviors.

5.2.2. Implication for Further Research

This study was undertaken only with 5th grade students in Turkey due to considering three assumptions; *Literacy level – maturation*, *experiences fully with newly developed curriculum* and *SBS exam* (see Chapter III). The responses gathered from 2410 fifth graders revealed several recommendations to be taken for elementary school curriculum. The present study seems to provide a strong base for further EL assessment stud(ies)y with a wide range of participants and to be an initial study which will be complementary to other EL assessment studies. It is suggested the other researchers to conduct nation-wide EL assessment studies with middle school, high school and university students. The results to be collected from these participants will shed light on establishing and practicing a stronger EE policy in Turkish Education system.

A new instrument, Elementary School Environmental Literacy Instrument (ESELI), was developed for the preset study by fully paying attention to Turkish culture and context. For that reason, attainments of 4th to 5th grade Science and Technology, Social studies and Interdisciplinary courses were analyzed with regard to the components of EL. Furthermore, K-8 EE research studies done between the years of 1997-2007 in Turkey were subjected to content analysis by considering the components of EL. Both of these analyses emerged which components of EL got higher attention and which variables were already explored. The gap in EE research in Turkey was investigated. Similar procedure could also be used for developing EL instrument for other target groups.

In the present study, the effects of socio-demographic, personality and cognitive variables on ERB were investigated. Except few, almost all of the results were found to be consistent with the literature. Whether adjusted EL score, affect, knowledge and cognitive skill differ according to the selected socio-demographic variables were not explored in the present study and thus should be a direction of the future research.

Only 12% of the variation in ERB accounted for a linear combination of the selected cognitive and personality variables. Furthermore, the individual effect of demographic variables (school type - %0.7, pre-school education - %0.2, mother education level - %0.7, father education level - %1.2, residence - %0.8, nature experience - %4.6, level of curiosity - %4.8, mother environmental concern - %2.3, father environmental concern - %3.1 and sibling environmental concern - %1.4) were observed to predict the variation in ERB to some degree. Based on the review of literature, several other factors were observed to possibly contribute to ERB. These variables pertaining to socio-demographics, culture, societal, parental, philosophical beliefs, schooling system and curriculum should be carefully securitized in the future research.

The EL framework used in the present study is the same as the one developed by considering the substantial review of literature and research on EE mostly undertaken in the context of the USA, and this framework most probably reflects the American culture. This structure has been used in various parts of the World. However, the poor knowledge-behavior relationship, negative behavior-attitude and behavior-skill relationship might be all evidenced that the EL framework used in the present study may not be reflecting Turkish culture and context. For this reason, an EL structure specific to Turkish culture should be developed. Or components and sub-components of EL should be contextualized according to Turkish culture. Increase in the number of the EE research in Turkey migth give a clear direction for constructing EL framework which is specific to Turkish culture and context.

The present study was exploratory in nature and “Why” question was not addressed in the study. It is strongly suggested to conduct a qualitative study subsequent to this exploratory study. Some of the schools can be either randomly or purposefully selected from the 76 schools where ESELI was already administrated. EL score of each school can be calculated and then the schools which have highest and lowest EL score could be a target of future qualitative study. Observation of halls, classrooms and school gardens, and the interview with principals, teachers and students in the

selected schools with regard to school policy and within- and out-of school activities could reflect hidden and explicit curriculum of the high and low scored schools. The findings to be gathered from the qualitative study can provide in-depth insights behind students' responses and schools policies about EL.

REFERENCES

Adams, W.J. (2003). *Promoting environmentally responsible behavior: An evaluation of the global learning and observations to benefit the environment (GLOBE) programme.* Unpublished masters' thesis, University of South Africa, South Africa.

Akbaş, Y. (2002). *Ilköğretim 6. sınıf öğrencilerinin coğrafi kavramları anlama düzeyleri ve kavram yanılgıları.* Unpublished masters' thesis, Black Sea University, Trabzon, Turkey.

Akyüz, Y. (1999). Türk *eğitim tarihi: Başlangıçtan 1999'a.* (7th ed.) İstanbul: Alfa Yayınları.

Alaimo, S.J., & Doran, R.L. (1980). Students' perceptions of environmental problems and sources of environmental information. *The Journal of Environmental Education, 12*(1), 17-21.

Alkış, S. (2002). İlköğretimde tarihi çevre eğitimi. Unpublished masters' thesis, Uludağ University, Bursa, Turkey.

Alkış, S. (2006). Öğrencilerin yağış kavramını algılama biçimleri. *Ilköğretim Online, 5*(2), 126-140. [Online; http://ilkogretim-online.org.tr].

Alkış, S. (in-Press-a). İlköğretim öğrencilerinin bulut kavramını algılamaları uzerine bir araştırma. *Marmara Üniversitesi, Marmara Coğrafya Degisi.*

Alkış, S. (in-Press-b). İlköğretim öğrencilerine göre bulut ve yağmur ilişkisi. *Marmara Üniversitesi, Marmara Coğrafya Dergisi.*

Alkış, S. (in-Press-c). İlköğretim beşinci sınıf öğrencilerinin yağış ceşitlerini ve oluşumlarını algılama biçimleri. *Eğitim Araştırmaları Dergisi [Eurasian Journal of Educational Research]*.

Alkış, S., & Oğuzoğlu, Y. (2005a). İlköğretim öğrencilerinin tarihi çevre bilgisinin değerlendirilmesi. *Uludağ Üniversitesi, Eğitim Fakültesi Dergisi, 18* (1), 23-46.

Alkış, S., & Oğuzoğlu, Y. (2005a). Ülkemiz koşullarında tarihi çevre eğitiminin önemi ve gerekliliğini arttıran etkenler. *Uludağ Üniversitesi, Eğitim Fakültesi Dergisi, 18* (2), 347-361.

Arkış, S., & Doğan, M. (1992). *The effect of water conservation unit integrated into 6th grade junior high school science curriculum on the water related and environmental attitudes of the students.* Unpublished masters' thesis, Middle East Technical University, Ankara, Turkey

Allen, J.B., & Ferrand, J.L. (1999). Environmental locus of control, sympathy and pro-environmental behavior: A test of Geller's activity caring hypothesis. *Environment and Behavior, 31*(3), 338-353.

Alp, E. (2005). *A study on students' environmental knowledge and attitudes: The effects of grade level and gender.* Unpublished masters' thesis, Middle East Technical University, Ankara, Turkey.

Alp, E., Ertepınar, H., Tekkaya, C., & Yılmaz, A. (2006a). İlkogretim öğrencilerinin çevreye yönelik tutum ve bilgileri üzerine bir çalışma. [Abstract] *Abstract Book of VII. Ulusal Fen ve Matematik Eğitimi Kongresi, Gazi Üniversitesi, Ankara,* Turkey, 110.

Alp, E., Ertepınar, H., Tekkaya, C., & Yılmaz, A. (2006b). A statistical analysis of children's environmental knowledge and attitudes in Turkey. *International Research in Geographical and Environmental Education, 15*(3), 210-223.

Alp, E., Ertepınar, H., Tekkaya, C., & Yılmaz, A. (2008). A survey on Turkish elementary school students' environmental friendly behaviors and associated variables. *Environmental Education Research, 14*(2), 129-143.

Amstrong, J.B., & Impara, J.C. (1991). The impact of an environmental education program on knowledge and attitude. *The Journal of Environmental Education, 22*(4), 36-40.

Arbuthnot, J. (1977). The roles of attitudinal and personality variables in prediction of environmental behavior and knowledge. *Environment and Behavior, 9*(2), 217-232.

Arcury, T.A., & Christianson, E.H. (1993). Rural-urban differences in environmental knowledge and actions. *The Journal of Environmental Education, 25*(1), 19-25.

Armağan, F.O. (2006). İlköğretim 7. ve 8. *sınıf öğrencilerinin çevre eğitimi ile ilgili bilgi düzeyleri (Kırıkkale il örneği)*. Unpublished masters' thesis, Gazi University, Ankara, Turkey.

Atasoy, E., & Ertürk, H. (2008). İlköğretim öğrencilerinin çevresel tutum ve çevre bilgileri üzerine bir alan araştırması. *Erzincan Eğitim Fakültesi Dergisi, 10*(1), 105-122.

Ayas, A., Çepni, S., & Akdeniz, A.R. (1993). Development of the Turkish secondary science curriculum. *Science Education*, *77*(4), 433-440.

Aydemir, M. (2007). *The investigation of teachers with respect to knowledge level on environmental concepts*. Unpublished masters' thesis, Middle East Technical University, Ankara, Turkey.

Babulski, K., Gannett, C., Myers, K., Peppel, K., & Williams, R. (1999). A white paper on the relationship between school reform and environmental education in Florida: Correlating Florida's Sunshine State Standards and an Environmental Literacy Framework. Melbourne, FL: Unpublished research paper, Science Education Department, Florida Institute of Technology.

Bacanak, A., Küçük, M., & Çepni, S. (2004). Ilköğretim öğrencilerinin fotosentez ve solunum konularındakı kavram yanılgılarının belirlenmesi: Trabzon örneklemi. *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi, 17*, 67-80.

Bahar, M., Cihangir, S., & Gözün, Ö. (2002). Okul öncesi ve ilköğretim çağındaki öğrencilerin canlı ve cansız nesneler ile ilgili alternatif düşünme kalıpları. *Proceeding of V. Ulusal Fen ve Matematik Eğitimi Kongresi, Orta Doğu Teknik Üniversitesi, Ankara.* Retrieved on 10th June, 2006 from http://www.fedu.metu.edu.tr/ufbmek-5/b_kitabi/b_kitabi.htm.

Balcı, A. (2004). *Sosyal bilimlerde araştırma: Yöntem, teknik ve ilkeler*. Ankara: Pegem A Yayıncılık.

Balcı, S., Çakıroğlu, J., & Tekkaya, C. (2006). 8. sinif ogrenclerinin fotosentez ve bitkilerde solunum konularindaki kavram yanilgilari. [Abstract]. *Abstract Book of XV. Ulusal Eğitim Bilimleri Kongresi, Muğla Üniversitesi, Mugla, Turkey,* 1457-1458.

Balderjahn, I. (1988). Personality variables and environmental attitudes as predictors of ecologically responsible consumption patterns. *Journal of Business Research, 17*, 51-56.

Barr, S. (2007). Factors influencing environmental attitudes and behaviors: A UK case study of household waste management. *Environment and Behavior, 39*(4), 435-473.

Barraza, L., & Cuaron, A.D. (2004). How values in education affect children's environmental knowledge. *Journal of Biological Education, 39*(1), 18-23.

Barrett, B. F. D., Kurado, A. & Miyomoto K. (2002) Ecological modernization, environmental knowledge and social change: attitudes and behavior of young people in Japan, *International Research in Geographical and Environmental Education, 11*, 237–261.

Barrow, L.H., & Morrisey, J.T. (1988/89). Energy literacy of ninth grade students: A comparison between Maine and New Brunswick. *The Journal of Environmental Education, 20,* 22-25.

Basile, C. G. (2000) Environmental education as a catalyst for transfer of learning in young children. *The Journal of Environmental Education, 32*(1), 21-27.

Blum, A. (1987). Students' environmental knowledge and beliefs concerning environmental issues in four countries. *The Journal of Environmental Education, 18*(3), 7-13.

Bluhm, W.J., Hungerford, H.R., McBeth, W.C., & Volk, T.L. (1995). The middle school report: A final Report on the development and pilot assessment of: The middle school environmental literacy instrument. In R. Wilke (Ed.), *Environmental education literacy/needs assessment project: Assessing environmental literacy of students and environmental education needs for teachers*. Final Report. (pp.8-29) The University of Wisconsin-Stevens Point, Wisconsin, The USA.

Boerschig, S., & DeYoung, R. (1993). Evaluation of selected recycling curricula. Educating the green citizen. *The Journal of Environmental Education, 24*(3), 17-22.

Bogan, M.B., & Kromrey, J.D. (1996). Measuring the environmental literacy of high school students. *Florida Journal of Educational Research, 36*(1). Retrieved on February 20, 2008 from http://www. coedu.usf.edu/fjer/1996/1996_Bogan.htm.

Bogner, F.X., & Wilhelm, M.G. (1996). Environmental perspectives of pupils: the development of an attitude and behavior scale. *The Environmentalist, 16*, 95-110.

Bogner, F.X., & Wiseman, M. (1997). Environmental perception of urban and rural pupils. *Journal of Environmental Psychology*, *17*, 111-122.

Bonnett, M., & Williams, J. (1998). Environmental education and primary children's attitude towards nature and environment. *Cambridge Journal of Education, 28*(2), 159-177.

Bozkurt, O., Akın, B. S., & Uşak, M. (2004). İlköğretim 6., 7. ve 8. sınıf öğrencilerinin erozyon hakkındaki ön bilgilerinin ve kavram yanılgılarının tespiti. *Gazi Üniversitesi Kırşehir Eğitim Fakültesi Dergisi, 5*(2), 277-285.

Bozkurt, O., & Aydoğdu, M. (2004). İlköğretim 6., 7. ve 8. sınıf öğrencilerinin "ozon tabakası ve görevleri" hakkındaki kavram yanılgıları ve oluşturma şekilleri. *Kastamonu Eğitim Dergisi, 12*(2), 369-376.

Bozkurt, O., & Orhan, A.T. (2004). İlköğretim öğrencilerinin asit yağmuru hakkında sahip oldukları yanlış kavramların tespiti. [Abstract]. *Abstract Book of VI.*

Ulusal Fen ve Matematik Eğitimi Kongresi, Marmara Üniversitesi, İstanbul, Turkey, 41.

Bozkurt, O. & Cangüsü, Ö. (2002). İlk öğretim öğrencilerinin çevre eğitiminde sera etkisi ile ilgili kavram yanılgıları. *Hacettepe Üniversitesi Eğitim Dergisi, 23*, 67-73.

Bozkurt O, Hamalosmanoğlu M, Darçın S.E., Samancı N. (2006-In-press). Ilköğretim ikinci kademe öğrencilerinin küresel isınma ve ozon tabakasının incelmesi hakkındaki bilgi düzeylerinin belirlenmesi. *Gazi Üniversitesi, Gazi Eğitim Fakültesi Dergisi.*

Bozyılmaz, B., & Bağcı-Kılıç, G. (2005). 4. ve 5. sınıf fen ve teknoloji dersi öğretim programının bilim-okuryazarlığı açısından analizi. *Proceeding of Yeni İlköğretim Programlarını Değerlendirme Sempozyumu, Ankara,* 320-327.

Bradley, J.C., Waliczek, T.M., & Zajicek, J.M. (1999). Relationship between environmental knowledge and environmental attitude of high school students. *The Journal of Environmental Education, 30*(3), 17-22.

Bruntland, G. (ed.), (1987). Our common future: The World Commission on Environment and Development. Oxford: Oxford University Press.

Budak, S. (2002). *Avrupa Birliği ve Türk çevre politikası: Avrupa Topluluğu'nun çevre politikası ve Türkiye'nin uyum sorunu*. Istanbul: Büke Yayınları.

Buethe, C., & Smallwood, J. (1987). Teachers' environmental literacy: Check and recheck, 1975 and 1985. *The Journal of Environmental Education, 18*(3), 39-42.

Buhan, B., (2006). *Okul öncesinde görev yapan öğretmenlerin çevre bilinci ve bu okullardaki çevre eğitiminin araştırılması.* Unpublished masters' thesis, Marmara University, Istanbul, Turkey.

Chan, K.K.W. (1996). Environmental attitudes and behavior of secondary school students in Hong Kong. *The environmentalist, 16,* 297-306.

Chawla, L. (1998). Significant life experiences revisited: A review of research on sources of environmental sensitivity. *The Journal of Environmental Education, 29*(3), 11-21.

Childress, R. B., & Wert, J. (1976). Challenges for environmental education planners. *The Journal of Environmental Education, 7*(4), 2-6.

Chu, H-E., Lee, E. A., Ko, H. R., Shin, D. H., Lee, M. N., Min, B. M. & Kang, K. H. (2007). Korean year 3 children's environmental literacy: A prerequisite for a

Korean environmental education curriculum. *International Journal of Science Education, 29*(6), 731-746.

Chu, H-E., Shin, D.H., & Lee, M.N. (2006). Korean students' environmental literacy and variables affecting environmental literacy. In S. Wooltorton and D. Marinova (Eds.) *Sharing Wisdom for Our Future: Environmental Education in Action*. Proceedings of the 2006 Conference of the Australian Association for Environmental Education.

Cicioğlu, H. (1983). *Türkiye Cumhuriyetinde ilk ve orta öğretim (Tarihi gelişimi).* Ankara: Ankara Üniversitesi Basımevi.

Cin, M., (2004). İlkokul 1. sınıf öğrencilerinin deniz kavramını algılamaları üzerine bir araştırma. *Kuram ve Uygulamada Eğitim Bilimleri*, *4*(1), 7-23.

Cin, M., & Yazici, H. (2002). The influence of direct experience on children's ideas about the formation of the natural scenery. *International Research in Geographical and Environmental Education, 11*(1), 5-14.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York: Lawrence Erlbaum Associates

Connell, S., Fien, J., Lee, J., Sykes, H., &Yencken, D. (1999). If doesn't directly affect you, you don't think about it: A qualitative study of young people's environmental attitudes in two Australian cities. *Environmental Education Research, 5*(1), 95-114.

Cordano, M. (1998). An environmental attitudes and environmental management behavior: An application of the theory of planned behavior. Unpublished doctoral dissertation. (University of Pietersburg, 1998) (UMI Number: 9919270)

Coppola, N.W. (1999). Greening the technology curriculum: A model for environmental literacy. *The Journal of Technology Studies, 25*(2), 39-46.

Cottrell, S.P., & Graefe, A.R. (1997). Testing a conceptual framework of responsible environmental behavior. *The Journal of Environmental Education, 29*(1), 17-27.

Culen, G.R. (2001). The status of environmental education with respect to the goal of responsible citizenship behavior. In H.R. Hungerford, W.J. Bluhm, T.L. Volk, and J.M. Ramsey, *Essential Readings in Environmental Education*. Stipes Publishing: Champaign, Illinois.

Culen, G.R., Hungerford, H.R., Tomera, A.N., Sivek, D.J., Harrington, M., & Squillo, M. (1986). A comparison of environmental perceptions and behaviors

of five discrete populations. *The Journal of Environmental Education, 17*(3), 24-32.

Culen GR, Volk TL (2000): Effects of extended case study on environmental behavior and associated variables in seventh- and eighth-grade students. *The Journal of Environmental Education 31*(2), 9–16.

Cunningham, W.P. & Saigo, B.W. (2001). *Environmental science: A global concern* (6th ed.). McGraw-Hill Companies: Boston.

Çobanoğlu, E.O., Er, D.Z., Demirtaş, E., Ozan, B., & Bayrak, C. (2006). Ilkogretim ogrencilerinin cevre sorunlarini algilamalari. [Abstract] *Abstract Book of XV. Ulusal Eğitim Bilimleri Kongresi, Muğla Üniversitesi, Muğla, Turkey,* 1032-1035

Çağlar, A. (1999). 75. yılda Cumhuriyet'in ilköğretim birkimi. In 75 Yılda Eğitim. İstanbul. Tarih Vakfı Yayınları. pp: 125-144.

Çetin, G. (2004). Besin zinciri ve besin ağı kavramlarının anlaşılması üzerine kültürlerarası bir çalışma: Ingiltere ve Türkiye örneği. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 4*(7), 69-79.

Çetin, G., & Ertepinar, G. (2004). Yedinci ve dokuzuncu sınıf öğrencilerinin bazı ekoloji kavramlarını anlama duzeylerinin karşılastırılması. [Abstract]. *Abstract Book of VI. Ulusal Fen ve Matematik Eğitimi Kongresi, Marmara Üniversitesi, İstanbul, Turley,* 42.

Darçın, E. S., Bozkurt, O., Köse, S., & Hamalosmanoglu, M. (2006). Determination of Elementary Students' Level of Knowledge and Misconceptions about Greenhouse Effect, *International Journal of Environmental and Science Education*, *1*(1), Retrieved September 23, 2008 from, www.ijese.com

Darçın S.E., Orhan A.T., Bozkurt O, & Yaman S., (2006-In-press). Sekizinci sınıf öğrencilerinin ozon tabakası hakkındaki algılama düzeylerinin incelenmesi. *Sakarya Universitesi Eğitim Fakültesi Dergisi*.

Daudi, S.S. (1999). Environmental Education as a vehicle to promote environmental literacy in low literate communities of the world. (pp. 85-92) International Workshop on Environmental Education in Asia and Beyond, October, 11-15, Korea.

Demirel, Ö. (2004). *Kuramdan uygulamaya eğitimde program geliştirme (7. baskı).* Ankara: Pegem-A Payıncılık.

Dikmenli, M., Çardak, O., & Türkmen, L. (2002). İlköğretim öğrencilerinin "hayvanlar alemi ve sınıflandırılması" kavramlarıyla ilgili alternatif görüşleri.

Proceeding of V. Ulusal Fen ve Matematik Eğitimi Kongresi, Orta Doğu Teknik Üniversitesi, Ankara Turkey. Retrieved June 10, 2006 from http://www.fedu.metu.edu.tr/ufbmek-5/b_kitabi/b_kitabi.htm

Dimopoulos, D.I., & Pantis, J.D. (2003). Knowledge and attitudes regarding sea turtles in elementary students on Zakynthos, Greece. *The Journal of Environmental Education, 34*(3), 30-38.

Disinger, J. F. (1983). Environmental education's definitional problem. (ERIC Information Bulletin #2). Columbus, OH:ERIC, SMEAC.

Disinger, J. F., & Roth, C.E. (1992). Environmental literacy. Columbus, Ohio: ERIC/SMEAC Information Reference Center. ED 351201.

Doğan, M. (1997). Ulusal çevre eylem planı: Eğitim ve katılım. Devlet Planlama Teşkilatı: Ankara.

Doğan, M., & Doğan, M. (1993). *The effect of soil conservation unit integrated into 6th grade junior high school science curriculum on the soil related and environmental attitude of the students*. Unpublished master's thesis, Middle East Technical University, Ankara, Turkey.

Doğar, C., & Başıbüyük, A. (2005). Ilköğretim ve ortaöğretim öğrencilerinin hava ve iklim olaylarını anlama düzeyleri. *Kastamonu Eğitim Dergisi, 13*(2), 347-358.

Dresner, M.G., & Gill, M. (1994). Environmental education at summer nature camp. *Journal of Environmental Education, 25*(3), 35-41.

Dündar, Ş. (2002). Köy Enstitüleri ve bugünün okullarında Köy Enstitüsü felsefesinden yararlanılması. *Trakya Üniversitesi, Bilimsel Araştırmalar Dergisi C Serisi, 2*(1), 19-26

Dwyer, W.O., Leeming, F.C., Cobern, M.K., Porter, B.E., & Jackson, J.M. (1993). Critical review of behavioral interventions to preserve the environment: Research since 1980. *Environment and Behavior, 25*, 275-321.

Eagles, P. F. J., & Demare, R. (1999). Factors influencing children's environmental attitudes. *The Journal of Environmental Education, 30*(4), 33-38.

Eagles, P.F.J., & Muffitt, S. (1990). An analysis of children's attitudes toward animals. *The Journal of Environmental Education, 21*(3), 41-44.

EETAP – Environmental Education & Training Partnership (2002). Johannesburg, summit: Implications for environmental education. EETAP Resource Library "Advancing Education & Environmental Literacy", EPA, 111.

Eğitim Teknolojileri Genel Müdürlüğü (2005). *National Education statistics 2004-2005*. Ankara: Devlet Kitapları Müdürlüğü Basımevi.

Eisler, A.D., Eisler, H., & Yoshida, M. (2003). Perception of human ecology; cross-cultural and gender comparison. *Journal of Environmental Psychology, 23*, 89-101.

Enger, E.D., & Smith, B.F. (2002). Environmental science: A study of interrelationship (8th ed.). McGraw-Hill Companies: Boston.

Environmental Protection Agency (EPA). (1999). *Environmental education advances quality education*. Retrieved January 15, 2007, from www.epa.org.

Ercan, E. (1996). *The perceptions of teachers on the development of the science process skills at the 4th and 5th grades.* Unpublished master's thesis, Middle East Technical University, Ankara., Turkey.

Erdoğan, M., & Aydemir, M. (2007). *Children's curiosity on environmental issues and problems: A case from Turkey*. International Conference on Environment: Survival and Sustainability, 19-24 February, Nicosia-Northern Cyprus.

Erdoğan, M., & Erentay, M. (2007). *Children's perceptions on endangered species and threatened environments: results from Unique and Universal Project.* Proceedings of the 4th International Conference on Hands-on Science. Costa MF, Dorrío BV, Reis R (Eds.); 2007, July 23-27; University of Azores; Ponta Delgada, Portugal. 2007. (pp. 141-148).

Erdoğan, M., & Marcinkowski, T. (2007). *Results of an analysis of K-8 environmental education research in Turkey, 1997-2007.* (Research Symposium) 34th North American Association for Environmental Education Annual Conference and Research Symposium, Virginia Beach, USA, 13-14, November, 2007.

Erdoğan, M., & Mısırlı, A. (2007). Graduate students' perspectives on the human-environment relationship. *Journal of Turkish Science Education, 4*(2), 21-30.

Erdoğan, M., & Ok, A. (2008). Environmental literacy assessment of Turkish children: The effects of background variables. In I. H. Mirici, M.M. Arslan, B.A. Ataç, and I. Kovalcikova (Eds.) *Creating a Global Culture of Peace: Strategies for Curriculum Development and Implementation, Vol.1* (pp. 214-227). Antalya: Anıttepe Publishing.

Erentay, N. & Erdoğan, M. (2006). *Initial Findings of "UNIQUE and UNIVERSAL'' Project*. Proceedings of the 3rd International Conference on Hands-on Science. Costa MF, Dorrío BV (Eds.); 2006 September 4-9; University of Minho; Braga, Portugal. 2006. (pp. 390-398)

Erten, S. (2002). İlköğretim okulu öğrencilerinde çevreye yararlı davranışların araştırılması. *Proceeding of V. Ulusal Fen ve Matematik Eğitimi Kongresi, Orta Doğu Teknik Üniversitesi, Ankara., Turkey.* Retrieved June 10, 2006 from http://www.fedu.metu.edu.tr/ufbmek-5/b_kitabi/b_kitabi.htm

Erten, S. (2003). 5. Sınıf öğrencilerinde "çöplerin azaltılması" bilincinin kazanadırlmasına yönelik bir öğretim modeli. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 25*, 94-103.

Erten, S. (2004). İlk ve ortaöğretim öğrencilerinin insan biyolojisi ve çevre koruma konularına yönelik ilgilerinin araştırılması. A paper presented at VI. Ulusal Fen ve Matematik Eğitimi Kongresi, Marmara Üniversitesi, İstanbul, Turkey.

Erten, S. (2006). Enerji tasarrufu davranısında ortaya çıkabilecek psikolojik ve sosyolojik engeller. 25. Enerji verimliligi konferansı. 23-34 Subat. ANKARA. Hacettepe Üniversitesi. Elektrik İsleri Etüt İdaresi Genel Müdürlügü Yayını (Kitap).

Evans, G.W., Brauchle, G., Haq, A., Stecker, R., Wong, K., & Shapiro, E. (2007). Young children's environmental attitudes and behaviors. *Environment and Behavior, 39*(5), 635-659.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention. and behavior. An introduction to theory and research. Reading, MA: Addison-Wesley.

Fien, J., & Corcoran, P.B. (1996). Learning for a sustainable environment: Professional development and teacher education in environmental education in the Asia-Pacific Region. *Environmental Education Research, 2*(2), 227-237.

Field, E. (2005). Discovering statistics using SPSS. London: SAGE.

Fraenkel, J.R., & Wallen, N.E. (2006). *How to design and evaluate research in education* (6th ed.). Boston, MA: The McGraw-Hill Companies.

Fransson, N., & Gärling, T. (1999). Environmental concern: conceptual definitions, measurement methods, and research findings. *Journal of Environmental Psychology, 19*, 369-382.

Gambro, J. S., & Switzky, H.N. (1994). The national survey of environmental knowledge in high school students: Level of knowledge and related variables. *Proceedings of American Educational Research, New Orleans,* 2-41.

Gambro, J. S., & Switzky, H.N. (1992). Locus of control as a motivational determinant of environmental knowledge in high school. Paper presented at the Annual Meeting of the International association for Cognitive Education, Riverside, CA. (ERIC Document Reproduction Service No. ED379163)

Garson, G. D. (2006). Structural equation modelling. Retrieved March 13, 2006 from http://www2.chass.ncsu.edu/garson/pa765/structur.htm.

Gay, L.R., Mills, G.E., & Airasian, P. (2006). *Educational research: Competencies for analysis and applications* (8thed.). New Jersey: Pearson Prentice Hall.

George, D., & Mallery, P. (2001). *SPSS for windows: Step by step* (3rd ed.). Boston: Allyn and Bacon.

Gifford, R., Hay, R., & Borıs, K. (1982/83). Individual differences in environmental attitudes. *The Journal of Environmental Education, 14*(2), 19-23.

Gillett, D.P., Thomas, P., Skok, R.L., & McLaughlin, T.F. (1991). The effects of wilderness camping and hiking on the self-concept and the environmental attitudes and knowledge of twelfth graders. *Journal of Environmental Education, 22*(3), 33-44.

Goldman, D., Yavetz, B., & Pe'er, S. (2006). Environmental literacy in teacher training in Israel: Environmental behavior of new students. *Journal of Environmental Education, 38*(1), 3-22.

Gökdere, Y. (2005). A study on environmental knowledge level of primary students in Turkey. *Asia-Pacific Forum on Science Learning and Teaching, 6*(2). Retrieved May 13, 2006 from http://www.ied.edu.hk/apfslt/.

Gözütok, F.D. (2003). Curriculum development in Turkey. In W.F. Pinar (Ed.). *International Handbook of Curriculum Research*. (pp. 607-622). London: Lawrance Erlbaum Associates, Publishers.

Grob, A. (1995). A structural model of environmental attitudes and behavior. *Journal of Environmental Psychology, 15*, 209-220.

Hair, J.F., Black, W.C., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate data analysis*, (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Harland, P., Staats, H., & Wilke, H.A.M. (1999). Explaining proenvironmental intention and behavior by personal norms and the theory of planned behavior. *Journal of Applied Social Psychology, 29,* 2505-2528.

Hart, E.P. (1981). Identification of key characteristics of environmental education. *The Journal of Environmental Education, 13*(1), 12-16.

Hart, P., & Nolan, K. (1999). A critical analysis of research in environmental education. *Studies in Science Education, 34,* 1-69.

Harvey, G. (1977). A conceptualization of environmental education. In J. Aldrich, A. Balckburn, and G. Abel (Eds.), *A Report on the North American Regional Seminar on Environmental Education* (pp. 66-77). Columbus, OH: ERIC / SMEAC.

Hausbeck, K.W., Milbrath, L.W., & Enrigth, S.M. (1992). Environmental knowledge, awareness and concern among 11th grade students: New York State. *The Journal of Environmental Education, 14*(1), 27-34.

Hazır, A., & Türkmen, L. (2008, in press). İlköğretim 5. sınıf öğrencilerinin bilimsel süre beceri düzeyleri. *Selçuk Üniversitesi, Ahmet Keleşoğlu Eğitim Fakültesi Dergisi*.

Heberlein, T.A., & Black, J.S. (1976). Attitudinal specificity and the prediction of behavior in a field setting. *Journal of Personality and Social Psychology, 33*, 474-479.

Herremans, I.M., & Reid, R.E. (2002). Environmental awareness of the sustainability concept. *The Journal of Environmental Education, 34*(1), 16-20.

Hines, J., Hungerford, H., & Tomera, A. (1986/87). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education, 18*(2), 1-8.

Hornik, J., Cherian, J., Madansky, M., & Narayana, C. (1995). Determinants of recycling behavior: A synthesis of research results. *Journal of Socio-Economics, 24*(1), 105-127.

Hotinli, G. (2002, October). Çocuklara çevre eğitiminde STK'ların rolü. P*aper presented at Uluslararası Çevre ve Çocuk Sağlığı Sempozyumu. İstanbul,* Turkey.[Çevre Eğitimi Paneli]

Howe, R., & Disinger, J (1988). Teaching environmental education using out-of-school settings and mass media. ERIC/SMEAC Environmental Education Digest No. 1 Washington, DC: Office of Educational Research and Improvement (ERIC Document Reproduction Service No. ED 320 759)

Hsu, S. J. (1997). An assessment of environmental literacy and analysis of predictors of responsible environmental behavior held by secondary teachers in Hualien country of Taiwan. Unpublished doctoral dissertation. (Ohio State University) (UMI Number: 9731641)

Hsu, S.J., (2004). The effects of an environmental education program on responsible environmental behavior and associated environmental literacy variables in Taiwanese college students. *The Journal of Environmental Education, 35*(2), 37-48.

Hsu, S.J., & Roth, R.E. (1998). An assessment of environmental literacy and analysis of predictors of responsible environmental behavior held by secondary teachers in the Hualien area of Taiwan. *Environmental Education Research, 4*(3), 229-249.

Hsu, S.J., & Roth, R.E. (1999). Predicting Taiwanese secondary teachers' responsible environmental behavior through environmental literacy variables. *The Journal of Environmental Education, 30*(4), 11-18.

Huang, H-P., & Yore, L.D. (2003). A comparative study of Canadian and Taiwanese grade 5 children's environmental behaviors, attitudes, concerns, emotional dispositions and knowledge. *International Journal of Science and Mathematics Education, 1*, 419-448.

Hungerford, H.R., & Peyton, R.B. (1977). A paradigm of environmental action. (ERIC Documentation Service ED137116).

Hungerford, H. R., Peyton, R.B., & Wilke, R.J. (1980). Goals for curriculum development in environmental education. *The Journal of Environmental Education, 11*(3), 42-47.

Hungerford, H.R. & Volk, T.L. (1984). The challenges of K-12 environmental education. In Arthur B. Sacks (Ed.) *Monographs in environmental education and environmental studies,* Volume 1 (pp. 3-30). Troy, OH: NAAEE.

Hungerford, H.R., & Volk, T.L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education, 21*(3), 8-22.

Hungerford, H.R., Volk, T.L., & Ramsey, J. (2000, October). Instructional impacts of environmental education on citizenship behavior and academic achievement. [Research on investigating and evaluating environmental issues and actions: 1979-2000]. A paper presented at the NAAEE Conference, South Padre Island, TX, The USA.

Hungerford, H.R., Volk, T.L., Ramey, J.M., Litherland, R.A., & Peyton, R.B. (1996). *Investigating and evaluating environmental issues and action: Skill development program.* Stipes Publishing L.L.C.: Illinois, USA.

Hwang, Y-H., Kim, S-I., & Jeng, J-M. (2000). Examining the causal relationship among selected antecedents of responsible environmental behavior. *The Journal of Environmental Education, 31*(4), 19-25.

Iozzi, L. (ed.) (1981). *Research in environmental education, 1971-1980*. Columbus, OH: ERIC/SMEAC. (ERIC Document No. 214 762)

Iozzi, L. (ed.) (1984). *A summary of research in environmental education, 1971-1982. The second report of the national commission on environmental education research.* (Monographs in Environmental Education and Environmental Studies, Vol. #2). Columbus, OH: ERIC/SMEAC. (ERIC Document No ED.259 879).

IUCN (1970). Environmental education workshop. Nevada. USA

IUCN (1972). European working conference on environmental conservation. International Union for the Conservation of Nature and Natural Resources, Morges, Switzerland: IUCN.

IUCN, UNEP & WWF (1991). *Caring for the earth: A strategy for sustainable living*. Gland, Switzerland: IUCN, UNEP, WWF

Jöreskog, K., & Sörbom, D. (1993a) *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Hillsdale, NJ: Lawrance Erlbaum Associates.

Jöreskog, K. G. & Sörbom, D. (1993b). *Structural equation modeling with the SIMPLIS command language*. Chicago: Scientific Software International.

Kaiser, F.G., Ranney, M., Terry, H., & Bowler, P.A. (1999). Ecological behavior, environmental attitude, and feeling of responsibility for the environment. *European Psychologist, 4*(2), 59-74.

Kaiser, F.G., Wölfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behavior. *Journal of Environmental Psychology, 19*, 1-19.

Karch, P. (2002). Environmental awareness in German and The USA: A comparative study of two selected student bodies. Unpublished doctoral dissertation, University of Southern California, California, The USA.

Kaya, N.Ç., & Turan, F. (2005). Sekizinci sınıf öğrencilerinin çevreye ilişkin bilgi ve duyarlılıkları: Ankara'da resmi ve özel ilköğretim okulları örneğinde bir çalışma. *Eğitim Araştırmaları Dergisi, 21*, 103-112.

Kaptan F. (1999). *Fen bilgisi öğretimi*. Milli Eğitim Basımevi: İstanbul.

Kellert, S.R. (1985). Attitudes toward animals; age-related development among children. *The Journal of Environmental Education, 16*(3), 29-39.

Kelloway, E. K. (1998). *Using lisrel for structural equation modeling*. London: Sage Publications.

Kenny, D.A., & McCoach, D.B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling, 10*(3), 333-351.

Kırıkkaya, E. B. & Tanrıverdi, B., (2006). The level of importance and the degree of achievement of learning outcomes related to skill, understanding, attitude and values in the science and technology education program. *Eurasia Journal of Educational Research*, *25*, 129-140.

Knapp, D. (1997). Twenty years after Tbilisi: UNESCO interregional workshop on reorienting environmental education for sustainable development. *NAI's Environmental Education Newsletter, 1*(1), 6.

Korhonen, K., & Lappalainen, A. (2004). Examining the environmental awareness of children and adolescent in the Ramomafana region, Madagascar. *Environmental Education Research, 10*(2), 195-216.

Kuhlemeier, H., Bergh, H. V. D., & Lagerweij, N. (1999). Environmental knowledge, attitudes, and behavior in Dutch secondary education. *The Journal of Environmental Education, 30*(2), 4-15.

Landers, P., Naylon, M., & Annette, D. (2002). Environmental literacy scope and sequence: Providing a systems approach to environmental education in Minnesota. MN Office of Environmental Assistance.

Lawson, A.E., Costenson, K., & Cisneros, R. (1984). A summary of Research in science education. (ERIC Document Reproduction Service No. ED269220)

Leeming, F. C., Dwyer, W. O., & Bracken, B. A. (1995). Children's environmental attitude and knowledge scale: Construction and validation. *The Journal of Environmental Education*, *26*(3), 22-31.

Leeming, F.C., Dwyer, W.O., Porter, B.E., & Cobern, M. K. (1993). Outcome research in environmental education: A critical review. *The Journal of Environmental Education, 24*(4), 8-21

Lee, M., Kang, K., Shin, D., Zew, H., Lee, E., Noh, K., Choi, S., & Park,J. (2003). A*n assessment of Korean students' environmental literacy and an analysis of predictors of responsible environmental behavior; Final report.* (Korea Research Foundation Grant #BS1055). Dankook University, Seoul.

Leeming, F.C., Dwyer, W.O., Porter, B.E., & Cobern, M.K. (1993). Outcome research in environmental education: A critical review. *The Journal of Environmental Education, 24*(4), 8-21.

Leftridge, R. E., & James, R. K. (1980). A study of perceptions of environmental issues of urban and rural high school students. *The Journal of Environmental Education, 12*(1), 3-7.

Lindström, M., & Johnsson, P. (2003). Environmental concern, self-concept and defence style: A study of the Agenda 21 process in a Swedish municipality. *Environmental Education Research, 9*(1), 51-66.

Linke, R.D. (1981). Achievement and aspirations in Australian EE. *The Journal of Environmental Education, 12*(2), 20-23.

Lunsford, J.C. (2000). Introduction to the greater everglades watershed. In M. Harrington, and L. Hill (Eds.), The everglades case study: An extended case study for the investigation of a threatened watershed and ecosystem. Florida Institute of Technology: Melbourne, FL, the USA.

Lyons, E., & Breakwell, G.M. (1994). Factor predicting environmental concern and indifference in 13- to 16-years-old. *Environment and Behavior, 26*(2), 223-238.

Makki, M.H., Abd-el-Khalıck, F., & Boujaoude, S. (2003). Lebanese secondary school students' environmental knowledge and attitudes. *The Journal of Environmental Education Research, 9*(1), 21-33.

Manzo, L.C., & Weinstein, M.D. (1987). Behavioral commitment to environmental protection: A study of active and non-active members of Sierra Club. *Environment and Behavior, 19*, 673-694.

Marcinkowski, T. (2001). Predictors of responsible environmental behavior: A review of three dissertation studies. In H. Hungerford, W. Bluhm, T. Volk and J Ramsey (Eds.), *Essential Readings in Environmental Education* (pp. 247-276). Champaign, IL: Stipes Publishing, L.L.C.

Marcinkowski, T. (2006). Analysis of the "forerunners" and their contributions. [EDS5410 Course notes]. Foundations of Environmental Education. Department of Science and Math Education, Florida Institute of Technology, Melbourne, FL, USA.

Marcinkowski, T., & Mrazek, R. (Eds.) (1996). *Research in environmental education research, 1981-1990.* Troy, OH, NAAEE.

Marcinkowski, T., & Rehring, L. (1995). The secondary school report: A final Report on the development, pilot testing, validation, and field testing of: The secondary school environmental literacy assessment instrument. In R. Wilke (Ed.), *Environmental education literacy/needs assessment project: Assessing environmental literacy of students and environmental education needs for teachers*. Final Report. (pp.30-76) The University of Wisconsin-Stevens Point, Wisconsin, The USA.

Marcinkowski, T., Meyers, R., Simmons, B., Hungerford, H., Volk, T. & McBeth, W. (2007, Nowember). A national environmental literacy assessment: Findings

and future efforts. A paper presented at 34th North American Association for Environmental Education Annual Conference and Research Symposium, Virginia Beach, The USA.

Matthews, B.E., & Riley, C.K. (1995). *Teaching and evaluating outdoor ethics education programs.* Vienna, VA: National Wildlife Federation. (ERIC Document Reproduction Service No. ED 401 097)

McBeth, W. (Primary investigator – PI). (2006). National environmental literacy assessment of middle school students in the U.S. (A Special Project Award to the North American Association for Environmental Education [Award no NAO6SEC4690009] by the National Oceanic and Atmospheric Administration, U.S. Department Commerce). Washington, D.C.: NAAEE.

McBeth, W., Hungerford, H., Marcinkowski, T., Volk, T., & Meyers, R. (2008). National environmental literacy assessment project: Year 1, National baseline study of middle grade students; final research report. Unpublished Project Report. Florida Institute of Technology, Melbourne, USA.

McBeth, W., Volk, T., Meyers, R., Marcinkowski, T., Hungerford, H., & Simmons, D. (2007, November). A national environmental literacy assessment. A paper presented at34th North American Association for Environmental Education Annual Conference and Research Symposium, Virginia Beach, The USA, 14-17, November, 2007

McCrea, E.J. (2006). The roots of environmental education: How the past supports the future. Retrieved on 07 September, 2006 from www.eetap.org.

McKenzie-Mohr, D., Nemiroff, L.S., Beers, L., & Desmarais, S. (1995). Determinants of responsible environmental behavior. *Journal of Social Issues, 51*(4), 139-156.

Meinhold, J.L., & Malkus, A.J. (2005). Adolescent environmental behaviors: Can knowledge, attitudes and self-efficacy make a difference? *Environment and Behavior, 37*(4), 511-532.

Milfont, T.L. (2008, online first). The effects of social desirability on self-reported environmental attitudes and ecological behavior. *Environmentalist*

Milfont, T.L., & Duckitt, J. (2004). The structure of environmental attitude: A first- and second-order confirmatory factor analysis. *Journal of Environmental Psychology, 24*, 289-303.

Milli Eğitim Bakanlığı (MEB) (2004). *İlköğretim Sosyal Bilgiler Dersi 4, 5. Sınıflar Öğretim Programı*. Talim ve Terbiye Kurulu Başkanlığı, Ankara.

Milli Eğitim Bakanlığı (MEB) (2005). *İlköğretim Fen ve Teknoloji Dersi; 4-5. Sınıflar Öğretim Programı*.. Ankara: Milli Eğitim Bakanlığı

Miller, G.T. (1998). *Living in the environment: Principles, connections and solutions* (10th ed.) Wadsworth Publishing Company: Belmont, CA.

Morgil, İ., Yilmaz, A., & Cingör, N. (2002). Fen eğitiminde çevre ve çevre koruma projesi hazırlamasına yönelik çalışma. Proceeding of V. Ulusal Fen ve Matematik Eğitimi Kongresi, Orta Doğu Teknik Üniversitesi, Ankara. Retrieved June 10, 2006 from http://www.fedu.metu.edu.tr/ufbmek-5/b_kitabi/b_kitabi.htm

Morrone, M., Mancl, K., & Carr, K. (2001). Development of a metric to test group differences in ecological knowledge as one component of environmental literacy. *The Journal of Environmental Education, 32*(4), 33-42.

Murphy, K.R., & Davidshofer, C.O. (2005). *Psychological testing: Principles and applications* (6th ed.). New Jersey: Pearson, Prentice Hall.

Nash, R. (1976). Logs, Universities and the environmental education compromise. Paper presented at the Annual Convention of the National Association of Environmental Education, 5th Atlanta, Georgia, (ERIC Reproduction Service No. ED 133 143)

The North American Association for Environment Education (2001). *Using environment-based education to advance learning skills and character development*. Washington D.C.: NAAEE

Negev, M., Sagy, G., Tal, A., Salzberg A., Garb, Y. (2006). *Mapping environmental literacy in Israel.* A paper resented at 35th Annual NAAEE Conference: Building Environmental Education in Society, St. Paul, MN, The USA.

Newhouse, N. (1990). Implication of attitude and behavior research for environmental conservation. *The Journal of Environmental Education, 22*(1), 26-32.

OECD (1999). *Environmental performance reviews: Turkey*. France: OECD.

Okumuş, K. (Ed.) (2002). Turkey's environment. European Commission, Directorate General Environment, Szentendre, Hungary.

Olobatuyi, M. E. (2006). *A User's guide to path analysis.* Maryland: University Press of America.

Osbaldiston, R. (2004). Meta-Analysis of the responsible environmental behavior literature. Unpublished doctoral dissertation. (University of Missouri-Columbia) (UMI Number: 3144447)

Ostman, R.E., & Parker, J.L. (1987). Impact of education, age, newspaper and television on environmental knowledge, concerns, and behaviors. *The Journal of Environmental Education, 19*(1), 3-10.

Ornstein, A.C. & Hunkins, F.P. (1988). *Curriculum: Foundations, principles, and issues.* United States of America: Englewood Cliffs.

Oweini, A., & Houri, A. (2006). Factors affecting environmental knowledge and attitudes among Lebanese college students. *Applied Environmental Education and Communication, 5*(2), 95-105.

Özalp, R., & Atatünal, A. (1983). Milli eğitimde kongreler ve şuralar: Cumhuriyet döneminde eğitim. İstanbul, MEB yayınevi.

Özcaner, M.D. (2005). *İlköğretim fen bilgisi dersi biyolojik çeşitlilik, çevre kirliliği ve erozyon konularının yapıcı (constructivist) öğrenme kuramına göre öğretiminin, akademik başarıya ve kalıcılığa etkisi.* Unpublished masters' Thesis, Çukurova University, Adana, Turkey.

Özdemir, I. (2003). The development of environmental consciousness in modern Turkey. In R. Foltz (Ed.), Environmentalism in the Muslim World, Boston: MIT Press.

Özgüven, İ.E. (1998). *Psikolojik testler* (2. Baskı). PDREM Yayınları: Ankara.

Özkan, O. Tekkaya, C., & Geban, Ö. (2004). Facilitating conceptual change in students' understanding of ecological concepts. *Journal of Science Education and Technology, 13*(1), 95-105

Palmer, J.A. (1993). Development of concern for the environment and formative experiences of educators. *The Journal of Environmental Education, 24*(3), 26-30.

Palmer, J.A. (1998). *Environmental education in the 21st century.* London; Creative Print and Design.

Palmberg, I.E., & Kuru, J. (2000). Outdoor activities as a basis for environmental responsibility. *The Journal of Environmental Education, 31*(4), 32-37.

Patton, M.Q. (1987). *How to use qualitative methods in evaluation.* Beverly Hills, CA: Sage.

Peyton, R.B. & Miller, B.A. (1980). Developing an internal locus of control as a prerequisite to environmental action taking. In A. B. Sacks, L.L. Burrus-Bammel, C.B. Davis, and L.A. Iozzi (Eds.), Current Issues VI: The Yearbook of Environmental Education and Environmental Sciences (pp.173-192). Columbus, Ohio: ERIC/SMEAC, ED197 947.

Poortinga, W., Steg, L., & Vlek, C. (2004). Values, environmental concern and environmental behavior: A study into household energy use. *Environment and Behavior, 36*(1), 70-93.

Ramsey, J.M. (1993). The effects of issue investigation and action training on eight-grade students' environmental behavior. *The Journal of Environmental Education, 24*(3), 31-36.

Ramsey, J.M., & Hungerford, H.R. (1989). The effects of issue investigation and action training on environmental behavior in seventh grade students. *The Journal of Environmental Education, 20*(4), 29-34.

Ramsey, J.M., Hungerford, H.R., & Tomera, A.N. (1981). The effects environmental action and environmental case study instruction on the overt environmental behavior of eight grade students. *The Journal of Environmental Education, 13*(1), 24-29.

Ramsey, J., & Rickson, R. (1977). Environmental knowledge and attitudes. *The Journal of Environmental Education, 8*(1), 10-18.

Raven, P.H., & Berg, L.R. (2001). *Environment* (3rd ed.). Harcourt College Publishers: Fort Worth.

Reid, I., & Sa'di, I. (1997). Joardian and British primary schoolchildren's attitudes toward environment. *Education Studies, 23(3),* 473-481.

Rickinson, M. (2001). Special issue: Learners and learning in environmental education: A critical review of the evidence. *Environmental Education Research, 7*(3), 208-320.

Rillo, T.J. (1974). Basic guidelines for environmental education. *The Journal of Environmental Education, 6*(1), 53-56.

Rockcastlei V. (1989). Environmental literacy; Philosophy, content and strategies. *Nature Study, 43*(1-2), 8-9, 22.

Roth, C.E. (1992). *Environmental literacy: Its roots, evolution and directions in the 1990s*. (ERIC Reproduction service No. ED348 235).

Roth, R.E. (1970). Fundamental concept for environmental management education (K-16). *Environmental Education, 1*(3), 65-74.

Russo, S. (2001). Promoting attitudes toward E.E. depends on early childhood education: What view do we hold? *Australian Science Teachers' Association, 17*(4), 34-36

Sağır, Ş. U., Aslan, O., & Cansaran, A. (2008). The examination of elementary school students' environmental knowledge and environmental attitudes with respect to different variables. *İlköğretim Online, 7*(2), 496-511. [www.ilkogretim-online.org.tr]

Sato, M. (2006). *Evolving environmental education and its relation to EPD and ESD: Overview of the conceptual development based on a series of international discussion on environmental education.* A paper presented at the UNESCO Expert Meeting on Education for Sustainable Development (ESD): Reorienting Education to Address Sustainability, 1-3 May 2006 at Kanchanaburi, Thailand.

Schmieder, A.A. (1977). The nature and philosophy of environmental education: Goals and objectives. In UNESCO, Trends in environmental education (pp. 23-34). Paris, France: UNESCO.

Schneider, S.H. (1997). Defining and teaching environmental literacy. *Trends in Ecology and Evolution, 12*(11), 457.

Schoenfeld, C. (1969). What's new about environmental education? *The Journal of Environmental Education, 1*(1), 1-4.

Schultz, P.W., & Zelezny, L.C. (1998). Values and pro-environmental behavior: A five-country survey. *Journal of Cross-Cultural Psychology, 29*(4), 540-558.

Schumacker, R.E., & Lomax, R.G. (1996). *A beginner's guide to structural equation modelling.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Scott, D., & Willits, F.K. (1994). Environmental attitudes and behavior: A Pennsylvania survey. *Environment and Behavior, 26*(2), 239-260.

Shepardson, D.P. (2005). Student ideas: What is an environment? *The Journal of Environmental Education, 36*(4), 49-58.

Shin, D., Chu, H., Lee, E., Ko, H., Lee, M., Kang, K., Min, B., & Park, J. (2005). An assessment of Korean students' environmental literacy. *Journal of Korean Earth Science Society, 26*(4), 358-364.

Sia, A.P., Hungerford, H.R., & Tomera, A.N. (1985/86). Selected predictors of responsible environmental behavior: An analysis. *The Journal of Environmental Education, 17*(2), 3-40

Simmons, D. (1995). *Working paper # 2: Developing a framework for national environmental education standards.* In papers on the Development of Environmental Education Standards (pp. 53-58). Troy, OH: NAAEE.

Sivek, D.J., & Hungerford, H. (1989/90). Predictors of responsible behavior in members of three Wisconsin conservation organizations. *The Journal of Environmental Education, 21*(2), 35-40.

Smith-Sebasto, N.J. (1992). The revised perceived environmental control measure: A review and analysis. *The Journal of Environmental Education, 23*(2), 24-33.

Smith-Sebasto, N.J. (1995). The effects of environmental studies course on selected variables related to environmentally responsible behavior. *The Journal of Environmental Education, 24*(3), 8-21.

Smith-Sebasto, N.J., & D'Acosta, A. (1995). Designing a liker-type scale to predict environmentally responsible behavior in undergraduate students: a multistep process. *The Journal of Environmental Education, 26*(4), 30-35.

Smith-Sebasto, N.J., & Fortner, R.W. (1994). The environmental action internal control index. *The Journal of Environmental Education, 25*(4), 23-29.

Stables, A. (1998). Environmental literacy: functional, cultural, critical. The case of the SCAA guidelines. *Environmental Education Research, 4*(2), 155-164.

Stapp, W. B. (1974). Historical setting of environmental education. In J. Swam and W. Stapp (Eds.) *Environmental Education* (pp. 42-49). New York: J Willey and Sons.

Stapp, W.B. (1975). UNESCO's Environmental Education program. *The Journal of Environmental Education, 6*(4), 6-8.

Stapp, W.B. (1978). Impressions on the first intergovernmental meeting on environmental education. *The Journal of Environmental Education, 9*(2), 2-4.

Stapp, W.B. (1979). International environmental education – Developing UNESCO's program. *The Journal of Environmental Education, 11*(1), 33-37.

Stapp. W. B. et. al. (1969). The concept of environmental education. *The Journal of Environmental Education, 1*(1), 30-31.

Stevens, J. (2002). *Applied multivariate statistics for the social sciences* (4th ed.). New Jersey: Lawrence Erlbaum Associates.

Süleyman, A., Aydoğdu, M., Yıldırım, H.I., & Şensoy, O. (2005). Fen eğitiminde ilköğretim 6. sınıflarda çiçekli bitkiler konusunun öğretiminde bilgisayar destekli öğretimin öğrenci başarısına etkisi. *Kastamonu Eğitim Dergisi, 13*(1), 103-116.

Swan, M. (1984). Forerunners of environmental education. In N. McInniss and D. Albrecht (eds.), *What makes education environmental?* (pp. 4-20). Medford, NJ: Plexus Publishing Company.

Sward, L.L., & Marcinkowski, T. (2001). Environmental sensitivity; A review of the research, 1980-1998. In H. Hungerford, W. Bluhm, T. Volk and J Ramsey (Eds.), *Essential Readings in Environmental Education* (pp. 277-288). Champaign, IL: Stipes Publishing, L.L.C.

Şensoy, O., Aydoğdu, M., Yıldırım, H.I., Uşak, M., & Hancer, A.H. (2005). Ilköğretim öğrencilerinin (6., 7. ve 8. sınıflar), fotosentez konusundakı yanlış kavramların tespiti üzerine bir araştıma. *Milli Eğitim Bakanlığı Dergisi, 33* (166). Retrieved September 10, 2006 from http://yayim.meb.gov.tr/dergiler /166/index3-hancer.htm

Tabachnick, B.G.,&Fidell, L.S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn and Bacon.

TTKB (Talim ve Terbiye Kurulu Baskanlıgı). (2004). *Talim terbiye kurulu program geliştirme çalışmaları.* 5 Mayıs 2005 tarihinde, www.ttkb.meb.gov.tr adresinden edinilmiştir.

Tanner, C. (1999). Constraints on environmental behavior. *The Journal of Environmental Psychology, 19,* 145-157.

Tanner, R.T. (1974a). Conceptual and instructional issues in environmental education today. *Journal of Environmental Education, 5* (4), 48-53.

Tanner, R.T. (1974b). *Ecology, environment and education.* Professional Educators Publications: Lincoln, Nebraska, The USA.

Tanner, T. (1980). Significant life experiences: A new research area in environmental education. *The Journal of Environmental Education, 11*(4), 20-24.

Taşar, M. F., Temiz, B.K., & Tan M., (2002). Ilköğretim fen öğretim programının bilimsel süreç becerilerini geliştirmede hedefler, içerik ve eğitim durumları bakımından incelenmesi. Proceeding of V. Ulusal Fen ve Matematik Eğitimi

Kongresi, Orta Doğu Teknik Üniversitesi, Ankara. Retrieved June 10, 2006 from http://www.fedu.metu.edu.tr/ufbmek-5/b_kitabi/b_kitabi.htm

Tecer, S. (2007). *Çevre için eğitim: Balıkesir ili iköğretim öğrencilerinin çevresel tutum, bilgi, duyarlılık ve aktif katılım düzeylerinin belirlenmesi üzerine bir çalışma.* Unpublished master's thesis, Zonguldak Karaelmas University, Zonguldak, Turkey.

Tekışık, H. H. (2004). Köy merkezli tarımsal üretime destek projesi ve okullarda tarım çalışmaları. *Çağdaş Eğitim Dergisi, 29*(310), 1-3.

Thapa, B. (1999). Environmentalism: The relation of environmental attitudes and environmentally responsible behaviors among undergraduate students. *Bulletin of Science, Technology and Society, 19*(5), 426-438.

Theodori, G. L., & Luloff, A.E. (2002). Position on environmental issues and engagement in proenvironmental behaviors. *Society and Natural Resources, 15*, 471-482.

Tican, S., Doğan, M. 1996. *The effect of air conservation unit integrated into 8th grade junior high school science curriculum.* Unpublished master's thesis, Middle East Technical University, Ankara, Turkey.

Tikka, P.M., Kuitunen, M.T., & Tynys, S.M. (2000). Effects of educational background on students' attitudes, activity levels and knowledge concerning the environment. *The Journal of Environmental Education, 31*(3), 12-19.

Tuncer, G., Ertepınar, H., Tekkaya, C., & Sungur, S. (2005). Environmental attitudes of young people in Turkey: Effects of school type and gender. *Environmental Education Research, 11*(2), 215-233.

Tuncer, G., Sungur, S., Tekkaya, C., & Ertepınar, H. (2006). Kırsal ve kentsel alanlarda yaşayan 6. sınıf öğrencilerin çevreye yönelik tutumları: Ankara'da bir çalışma. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 26,* 167-175.

Tuncer, G., Tekkaya, C., Sungur, S., & Ertepınar, H. (2005). The effects of region and gender on students' attitudes towards environment. [Cinsiyet ve Kırsal – Kentsel Kesim Farklılıkların Öğrencilerinin Çevreye Yönelik Tutumlarına Etkisi]. *Eğitim ve Bilim, 30*(136), 77-83.

Tung, C., Huang, C., & Kawata, C. (2002). The effects of different environmental education programs on the environmental behavior of seventh-grade students and related factors. *The Journal of Environmental Health, 64*(7), 24-29.

Tunnicliffe, S.D., & Reiss, M.J. (2000). Building a model of the environment: How do children see plants? *Journal of Biological Education, 34*(4), 172-177.

Turan, S. (2000). John Dewey's report of 1924 and his recommendations on the Turkish education system revisited. *History of Education, 29*(6), 543-555.

Türkoğlu, P. (2000). *Tonguç ve enstitüleri.* Ankara: Türkiye İş Bankası, Kültür Yayınları.

UNESCO (2007). United Nations Conference on the Human and Environment. Retrieved on 7th February, 2007, from http://portal.unesco.org/education/en/ev.php-URL_ID=38142&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO (2005). *United Nations decade for education for sustainable development, 2005-2014: International implementation scheme*. Paris, France: UNESCO.

UNESCO (2002). *Education for sustainability, from Rio to Johannesburg: Lessons learnt from a decade of commitment*. Paris, France: UNESCO.

UNESCO (1997a). International Conference Environment and Society: Education and Public Awareness for Sustainability; Declaration of Thessaloniki. Retrieved on October 02, 2006 from http://ncseonline.org/ncseconference/2003conference/thessaloniki_declaration.pdf

UNESCO (1997b). International conference, Environment and Society: Education and Public Awareness for Sustainability. Retrieved on 20 February, 2007, from http://ncseonline.org/ncseconference/2003conference/thessaloniki_declaration.pdf

UNESCO (1997c). *Educating for sustainable future: A Transdisciplinary vision for concerted action.* Paris, France: UNESCO.

UNESCO (1987). Moscow `87: UNESCO-UNEP International congress on environmental education and training. *Connect, 12*(3), 1-8.

UNESCO (1984). Activities of the UNESCO – UNEP International Environmental Education Programme (1975 – 1983). Paris, France: UNESCO.

UNESCO (1978). Intergovernmental conference on environmental education: Final report. 14-26 October, UNESCO and UNEP: Tbilisi (USSR).

UNESCO (1977). *Trends in environmental education.* Paris, France: UNESCO.

UNESCO (1975). The Belgrade charter: A Global framework for environmental education. Retrieved on 7th February, 2007 from http://portal.unesco.org/education/en/ev.php-URL_ID=33037&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO-UNEP (1988). *International strategy for action in the field of Environmental Education and Training for the 1990s*. Nairobi, Paris: UNESCO and UNEP.

UNESCO-UNEP (1975). Recommendations of the Belgrade Workshop on Environmental Education. Retrieved on 24 February, 2007 from http://unesdoc.unesco.org/images/0001/000198/019863EB.pdf

United Nations (1992). Chapter *36: Promoting education, public awareness and training. In Earth Summit: Agenda 21, The United Nations Programme of Action from Rio*. New York, NY: United Nations.

United Nations (1972). *The United Nations conference on human environment: Declaration on human environment.* United Nations: New York, USA.

Ünsal, Y. (2004). Türkiye'de son yıllardaki fen müfredatı geliştirme çabaları 1992 ve 200 Fen Müfredatının genel görünümü. *Abant İzzet Baysal Üniversitesi, Eğitim Fakültesi Dergisi, 4*(8) 53-67.

Van Liere, K.D., & Dunlap, R.E. (1980). The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public Opinion Quarterly*, *44*(2)181-197

Varış, F. (1983). Program geliştirme çalışmaları: In MEB. Cumhuriyet Döneminde Eğitim (193-214). İstanbul: MEB Yayınevi.

Vaske, J.J., & Kobrin, K.C. (2001). Place attachment and environmentally responsible behavior. J*ournal of Environmental Education, 32*(4), 16-21.

Volk, T. & McBeth, W. (2005). Environmental literacy in the Unites States. In H. Hungerford, B. Bluhm, T. Volk and J. Ramsey (Eds.) *Essential Readings in Environmental Education* (pp.75-80). Campaign, IL: Stipes Publishing Company.

Volk, T. & McBeth, W. (1997). Environmental literacy in the Unites States: What should be…What is…Getting from here to there. A report funded by the U.S. Environmental Protection Agency and submitted to the Environmental Education and Training Partnership, NAAEE. Washington, DC: U.S. EPA.

Yaman, S., Bozkurt, O., Aydin, H., Uşak, M., & Gezer, K. (2005). Primary school students' knowledge levels about greenhouse effect, ozone layer and acid rains. *The Mediterranean Journal of Educational Studies*, *10*(2), 81-95

Yaşar. S., Gültekin, M., Anagün, S.S. (2005, September). *Ilköğretimde öğrencilere çevre bilinci kazandırmada probleme dayalı öğrenme kapsamında geliştirilen*

örnek uygulamalar. A paper presented at XIV. Ulusal Eğitim Bilimleri Kongresi bildiri kitabi, Pamukkale Üniversitesi Eğitim Fakültesi, Denizli, Turkey.

Yazıcı, H., & Samancı, O. (2003). Ilköğretim öğrencilerinin sosyal bilgiler ders konuları ile ilgili bazi kavramlari anlama duzeyleri. *Milli Eğitim Dergisi, 158.* Retrieved September 10, 2006 from http://yayim.meb.gov.tr/dergiler/158/yazici.htm

Yeşilyurt, S. (2003). Ana sınıf öğrencileri ve ilköğretim birinci sınıf öğrencilerinin canlı ve cansız kavramlarını anlama düzeyleri üzerine bir araştırma. *Erzincan Eğitim Fakültesi Dergisi, 5*(2), 83-96

Yerkes, R., & Haras, K. (1997). Outdoor education and environmental responsibility. (ERIC Document Reproduction Service No. ED 414 112).

Yılmaz, Ö., Boone, W.J., & Andersen, H.O. (2004). Views of elementary and middle school Turkish students toward environmental issues. *International Journal of Science Education, 26*(12), 1527-1546.

Yücel, A.S., & Morgil, F.İ. (1999). Çevre eğitiminin geliştirilmesi. *Balıkesir Üniversitesi, Fen Bilimleri Enstitüsü Dergisi, 1*(1). 76-89.

Walsh-Daneshmandi, A. & MacLachhan, M. (2006). Towards effective evaluation of environmental education: Validity of the Children's environmental attitude and knowledge scale using data from a sample of Irish adolescent. *The Journal of Environmental Education, 37*(2), 13-23.

Wilke, R. (1995). Literacy model development and framework. In R. Wilke (ed.), *Environmental Education Literacy/Needs Assessment Project: Assessing Environmental Literacy of Students and Environmental Education Needs of Teachers*; Final Report for 1993-1995 (pp.5-6). (Report to NCEET/University of Michigan under U.S. EPA Grant NT901935-01-2). Stevens Point, WI: University of Wisconsin – Stevens Point.

Wilson, R. A. (1996). Environmental education programs for preschool children. *The Journal of Environmental Education, 27*(4), 28-33.

Zimmerman, L.K. (1996). Knowledge, affect, and the environment: 15 years of research. *The Journal of Environmental Education, 27*(3), 41-44.

APPENDICES

APPENDIX A

PERMISSION FROM EARGED

T.C.
MİLLÎ EĞİTİM BAKANLIĞI
Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığı

Sayı : B.08.0.EGD.0.33.05.00-311- 866 / 5194 26 /12/2007
Konu : Araştırma

Sayın Mehmet ERDOĞAN

Orta Doğu Teknik Üniversitesi
Eğitim Fakültesi
ANKARA

İLGİ: 14.12.2007 tarih ve 3832 sayılı dilekçeniz.

İlgi dilekçeniz eki, "İlköğretim 5. Sınıf Öğrencilerinin Çevreye Yönelik Sorumlu Davranışlarının Değerlendirilmesi ve Bu Davranışları Etkileyen faktörlerin Analizi" konulu araştırma öneriniz Bakanlığımızca incelenmiş ve desteklenmesi uygun bulunmuştur.

Ek-1'de gönderilen protokolün imzalanarak Bakanlığımıza gönderilmesi hâlinde, araştırma resmen başlatılmış olacaktır.

Ayrıca, destek verilen araştırmalarla ilgili olarak araştırmacılar tarafından, protokol gereği hazırlanmış olan ve Ek-2'de gönderilen "Destek Araştırmaları Gelişim Raporu" formunun her altı ayda bir doldurularak, Bakanlığımız Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığına gönderilmesi gerekmektedir.

Bilgilerinizi ve gereğini rica ederim.

İbrahim DEMİRER
Bakan a.
Daire Başkanı

EKLER :
1- Protokol (1adet-1sayfa)
2- Destek araştırmaları gelişim Raporu örneği (1adet-1sayfa)

GMK. Bulvarı No:109
06570 Maltepe/ANKARA
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APPENDIX A
(Continued)

EĞİTİM ARAŞTIRMALARI DESTEK PROTOKOLÜ

Bu protokol, Millî Eğitim Bakanlığı Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığı (EARGED)'nda gerçekleştirilecek araştırmalar için kabul edilen Eğitim Araştırmaları Destek Programı çerçevesinde, doktora öğrencilerinin ve üniversitelerde doktora ve doktora üstü araştırma yapacak öğretim elemanlarının, EARGED'ce belirlenen eğitim konuları üzerinde yapacakları araştırmalara destek sağlamak ve bu konuda EARGED'in ve araştırmacıların yükümlülüklerini belirlemek amacıyla hazırlanmıştır.

Bu protokol çerçevesinde araştırmacı:

1. Araştırması ile ilgili gelişmeleri, EARGED tarafından düzenlenmiş "Destek Araştırmaları Gelişim Raporu"na uygun olarak **altı ayda** bir EARGED Başkanlığı'na bildirecektir.
2. Araştırmasını EARGED tarafından kabul edilen ve araştırma önerisinde belirtilen süre içerisinde teslim edecektir. Herhangi bir süre uzatma söz konusu olduğunda, gerekçesiyle birlikte EARGED'e bildirecektir.
3. Tamamlanan araştırma raporunun son halini Microsoft -Word programlarında yazarak CD ortamında ve bilgisayar çıktısı olarak teslim edecektir
4. Araştırmacı tamamladığı araştırmanın en az 10 (on) slaytlık Power Point programında hazırlanmış sunusunu araştırma raporu ile birlikte CD ortamında teslim edecektir.
5. Yabancı dilde tez hazırlayanlar araştırmanın kuramsal çerçevesi, yöntemi, bulguları ve önerilerini kapsayan geniş bir raporu Türkçe olarak teslim edecektir.
6. Tamamladığı araştırmayı, EARGED bir panel veya seminer düzenlediği takdirde Bakanlığın ilgili birimlerine sunacaktır.
7. Tamamladığı araştırmanın rapor kapağına "**Bu Araştırma Millî Eğitim Bakanlığı Eğitimi Araştırma Geliştirme Dairesi Başkanlığının Desteği ile Yapılmıştır**" ibaresi konulacaktır. Araştırmanın verileri kullanılarak yapılacak çalışmalarda EARGED kaynak olarak belirtilecektir.
8. Araştırmasını kitap olarak yayımlandığı takdirde basılan kitapların beş (5) adedi EARGED'e verecektir.
9. Araştırmasını birden fazla araştırmacı ile tamamlaması halinde araştırmacıların hepsi EARGED'e karşı eşit derecede sorumludur.
10. Araştırmacı / Araştırmacılar araştırmalarını EARGED'e teslim etmeden herhangi bir yerde yayınlayamaz ve sunamazlar.
11. Öğrenci ise yukarıda belirtilen yükümlülükleri yerine getirmesine ilişkin sorumluluk danışmanına aittir.

EARGED tarafından araştırmasına destek sağlanması için protokol imzalanan araştırmacı veya araştırma grubuna aşağıdaki destekler sağlanacaktır:

1. Araştırmacılar tarafından hazırlanan veri toplama araçlarının çoğaltılması,
2. Veri toplama araçlarının postalama işlemleri için gerekli olan kağıt, zarf ve pul masraflarının karşılanması,
3. Veri toplama araçlarının resmî bir yazı ile uygulama alanına gönderilmesi ve geri dönüşlerinin sağlanması,
4. Veri toplama araçlarının geri dönüşünün tamamlandığının araştırmacıya bildirilmesi,
5. Araştırmacının uygulama için alana gidişinde ilgili birimlerle iletişim kurmasına yardımcı olunması,
6. Araştırmacının araştırmasını tek başına bitirmesi durumunda -6 adet-, grup çalışması ile bitirilmesi durumunda -10 adet- çoğaltılarak araştırmacılara teslim edilir (Teslim yeri Ankara'dır. Araştırmacının talep etmesi durumunda ödemeli olarak kargo ile adresine gönderilir).
7. Araştırmanın Bakanlık ilgili birimlerine dağıtılması
8. Tamamlanan araştırmanın Bakanlığa dağıtılan nüshalarına EARGED Başkanlığı tarafından hazırlanan EARGED logolu kapak ve bir Sunuş sayfası eklenecektir.
9. Araştırmacının yükümlülüğünü yerine getirmemesi veya aksatması halinde EARGED ilgililerden açıklama isteyebilir ayrıca protokolü iptal edebilir.
10. Destek Araştırmaları Programının kapsamı EARGED'in imkânlarıyla sınırlıdır.

İbrahim DEMİRER
Bakan a.
Daire Başkanı

Araştırmanın Adı : İlköğretim 5. Sınıf Öğrencilerinin Çevreye Yönelik Sorumlu Davranışlarının Değerlendirilmesi ve Bu Davranışları Etkileyen Faktörlerin Analizi

Protokol No : 2007 / 10 **Protokol Tarihi** : .../...12.../.2007

Araştırmacı
Mehmet ERDOĞAN

Danışman
Doç.Dr. Ahmet OK

Adres: GMK. Bulvarı No:109
06570 Maltepe/ANKARA
Tel: (0312) 230 36 44-230 39 26
Fax: 231 62 05

APPENDIX B

PERMISSION FROM ETHIC COMMITTEE

1956

Sayı : B.30.2.ODT.0.E1.00.00/2008/400-
Konu : Mehmet Erdoğan hk.

Orta Doğu Teknik Üniversitesi
Middle East Technical University
Sosyal Bilimler Enstitüsü
Grad. Sch. of Social Sciences
06531 Ankara, Türkiye
Phone: +90 (312) 2102094
Fax: +90 (312) 2103703
www.sbe.metu.edu.tr

13/02/2008

REKTÖRLÜK MAKAMI'NA,

Eğitim Bilimleri Anabilim Dalı Doktora Programı öğrencisi **Mehmet Erdoğan'ın,** Şubat-Mart 2008 tarihleri arasında doktora tezi kapsamında "İlköğretim 5. Sınıf Öğrencilerinin Çevreye Yönelik Sorumlu Davranışlarının Değerlendirilmesi ve Bu Davranışları Etkileyen Faktörlerin Analizi" başlıklı çalışmasına ilişkin olarak ekte isimleri verilen Milli Eğitim Bakanlığı'na bağlı 26 ilde bulunan İlköğretim okullarında okuyan yaklaşık 2700 5. sınıf öğrencisine uygulama yapması için görevlendirme başvurusu incelenmiş; ilgili Anabilim Dalı Başkanlığı'nın görüşüne dayanarak adı geçen öğrencinin isteği doğrultusunda görevlendirilmesi, Etik Komite onayı koşulu ile uygun görülmüştür.

Gereği için bilgilerinize saygılarımla sunarım.

Prof. Dr. Sencer AYATA
Sosyal Bilimler Enstitüsü Müdürü

Ekler: YKK
EABD görüşü
Öğrenciye ait ilgili evraklar

Etik Komite Onayı

Uygundur

12../02./2008

...EN
...lamalı Etik Araştırma Merkezi
(UEAM) Başkanı
ODTÜ 06531 ANKARA

APPENDIX C

ANALYSIS OF 4TH AND 5TH GRADE SCIENCE AND TECHNOLOGY EDUCATION CURRICULUM ACCORDING TO COMPONENTS OF EL

Table 1. Analysis of Science and Technology Curriculum Attainments according to Components of EL

Learning Domains	Canlılar ve Hayat (Living Organism and Life)		Madde ve Değişim (Matter and Change)		Fiziksel Olaylar (Physical Events)		Dünya ve Evren (Earth and Universe)		Total
Categories and sub-categories	4th grade	5th grade	4th grade	5th grade	4th grade	5th grade	4th grade	5th grade	
1. Knowledge of Natural History and Ecology									
1.1.Species & Population	8	15	-	-	-	-	-	-	23
1.2. Environments & Habitats	-	2	-	-	-	-	-	-	2
1.3. Communities & Interactions	1	4	-	-		-	-	-	5
1.4. Abiotics & Material Cycles	-	1	10	14	2	1	12	-	40
1.5. Ecosystem & Biomes	1	8	-	4	2	-	-	-	15
1.6. Natural & Social System	-	-	-	-	-	2	-	4	6
1.7. Physical & Biological History (natural history)	-	1	-	-	3	-	1	1	6
2. Knowledge of Environmental Problems and Issues									
2.1. Risk, Toxicology and Human health	-	3	-	-	2	-	-	-	5
2.2. Bio-Physical Problems	-	2	-	-	3	1	1	-	7
2.3. Causes of Problems	2	1	-	-	1	-	-	-	4
2.4. Socio-Political Issues	-	-	-	-	-	-	-	-	-
2.5. Causes of Issues	-	-	-	-	-	-	-	-	-
2.6. Effects of Problems and Issues	-	-	-	-	4	-	-	-	4
2.7. Natural Disasters	-	-	-	-	-	-	-	-	-
2.8. Alternative Solutions and Actions	1	-	1	-	4	3	-	-	9
3. Socio-Economic-Political Knowledge									
3.1.Caltural Values & Activities	-	-	-	-	-	-	-	-	-
3.2. Economic Values & Activities	-	1	-	-	1	-	1	-	3
3.3. Societies & Social Systems	-	-	-	-	-	-	-	-	-
3.4. Government & Political System	-	-	-	-	-	-	-	-	-
3.5.Geographic Patterns	-	-	-	-	-	1	-	13	14
3.6.Citizenship Participation	1	1	-	-	1	-	-	-	3

Table 1. Continued

Learning Domains	Canlılar ve Hayat (Living Organism and Life)		Madde ve Değişim (Matter and Change)		Fiziksel Olaylar (Physical Events)		Dünya ve Evren (Earth and Universe)		Total
	4th grade	5th grade	4th grade	5th grade	4th grade	5th grade	4th grade	5th grade	
4. Skills									
4.1. Problem and Issue Identification Skills	1	-	-	-	2	-	1	-	4
4.2. Issue Analysis Skills	-	-	-	-	1	-	-		1
4.3.Variable and Research Question Skills	-	-	-	-	-	-	-	-	-
4.4. Data Collection Skills	-	1	-	-	1	1	-	-	3
4.5. Data Analysis Skills	-	1	-	-	1	3	-	-	5
4.6. Action Skills	1	-	-	-	-	-	-	-	1
5. Affect and Determinants of Behavior									
5.1. Environmental Appreciation and Sensitivity	-	-	1	-	2	-	1	-	4
5.2.Environmental Attitudes	-	-	-	-	-	-	-	-	-
5.3. Environmental values	-	-	-	-	-	-	-	-	-
5.4. Ethical & Moral Reasoning	-	-	-	-	-	-	-	-	-
5.5. Efficacy / Locus of Control	-	-	-	-	-	-	-	-	-
5.6. Personal Responsibility	1	-	-	-	-	-	-	-	1
5.7. Willingness/ Motivation / Intention to act	1	-	-	-	-	-	-	-	1
6. Responsible of Environmental Behavior									
6.1. Conservation and Eco-management	-	-	-	-	1	-	-	-	1
6.2. Consumer and Economic Action	-	1	-	-	-	-	-	-	1
6.3. Interpersonal and Public Persuasion	-	1	-	-	-	-	-	-	1
6.4. Governmental and Political Action	-	-	-	-	-	-	-	-	-
6.5. Legal Action and Law Enforcement	-	-	-	-	-	-	-		-
6.6. Other Forms of Citizen Participation	-	1	-	-	-	-	-	-	1

APPENDIX D

ANALYSIS OF 4TH AND 5TH GRADE SCIENCE AND TECHNOLOGY EDUCATION, SOCIAL SCIENCES and INTERDISCIPLINARY SUBJECTS CURRICULUM ACCORDING TO COMPONENTS OF EL (Combined Table)

Table 2. Analysis of Three Curricula' Attainments according to Components of EL

	4th and 5th Grade Curriculum					
	Science and Technology		Social Sciences		Interdisciplinary Courses	
Dimensions of Environmental Literacy	4th grade	5th grade	4th grade	5th grade	4th grade	5th grade
1. Knowledge of natural History and Ecology	**40**	**57**	7	5	1	-
2. Knowledge of Environmental Problems and Issues	**19**	**10**	1	3	3	4
3. Socio-Political Knowledge	4	**17**	**14**	**24**	1	2
4. Cognitive Skills	8	6	-	-	-	-
5. Affect and Determinants of Behavior	6	-	1	3	3	1
6. Responsible of Environmental Behavior	1	3	6	-	1	3

APPENDIX E

EXTERNAL VALIDITY EXPERT REVIEW PANEL (N = 17)

Name	Institution	Subject Areas	Working as a/an…
Dr. İlhami Kızıroğlu	Hacettepe University, Dep. of Secondary Science and Math Education, Biology Teaching, Ankara, Turkiye	Ecology, Environmental Education, Biology Didactic, Biodiversity, Ornithology, Etology	Academic Staff, Prof. Dr.
Dr. Ali Yıldırım	METU, Dep. Of Educational Sciences, Ankara, Turkiye	Curriculum and Instruction	Academic Staff, Prof. Dr.
Dr. Gaye Tuncer	METU, Dep. of Elementary Science Education, Ankara, Turkiye	Environmental and Sustainable Development Education	Academic Staff, Assist. Prof.
Dr. Özgül Yılmaz	METU, Dep. of Elementary Science Education, Ankara, Turkiye	Environmental education, Beliefs-Attitudes, Epistemology, Metacognition,	Academic Staff, Assist. Prof.
Dr. Sinan Erten	Hacettepe University, Dep. of Elementary Science Education, Ankara, Turkiye	Responsible Environmental Behavior, Environmental Education	Academic Staff, Assist. Prof.
Dr. Yeşim Çapa Aydın	METU, Dep. Of Educational Sciences, Ankara, Turkiye	Measurement and Evaluation, applied statistics, teacher education, self-efficacy beliefs	Academic Staff, Assist. Prof.
Dr. Eyüp Coşkun	Mustafa Kemal University, Dep. of Turkish Education, Hatay, Turkiye	Turkish teaching, child literature, language development, writing and reading, text knowledge	Academic Staff, Assist. Prof.,

APPENDIX E
(Continued)

Name	Institution	Subject Areas	Working as a/an…
Ayse Ela Köksal (PhD Candidate)	Middle East Technical University, Dep. of Secondary Science and Math. Education, Biology Teaching, Ankara, Turkiye	Inquiry Research, Scientific Process Skills, Out-of-school learning environment (museums and national parks), measurement and evaluation	Researcher
Aysegul Mısırlı (PhD Candidate)	Middle East Technical University, Dep. of Educational Sciences, Ankara, Turkiye	Curriculum and Instruction, Social Science Curriculum, Civic and Citizenship Education	Researcher
Murat Aydemir (Master Student)	Middle East Technical University, Dep. of Elementary Science Education, Ankara, Turkiye	Teacher education, Environmental Education, 4^{th} -8^{th} grade newly Developed Science and Technology Education	Researcher
Melih Koçanoğlu (PhD Candidate)	Ministry of National Education, Ilkogretim Genel Mudurlugu, Program Subesi Gazi University, Department of Biology Education	Problem-based learning, cooperative learning, learning style, motivation style	Biology Teacher Author of Science and Technology Course Textbooks (4^{th} grade) Curriculum developer of Agriculture Course Program (6^{th} – 8^{th} grade)

APPENDIX E
(Continued)

Name	Institution	Subject Areas	Working as a/an…
Özgül Keleş	Ministry of National Education, Ilkogretim Genel Mudurlugu, Kitap Yazimi Komisyonu	Environmental Education, Sustainable Development Education, Ekological footprint education	Science and Technology Teacher Author of Science and Technology Course Textbooks (5-8 grade)
Doç. Dr. Gulru Hotinli	World Wild Foundation (WWF-Turkiye), Istanbul, Turkiye Green Steeps Environmental Foundation, Istanbul, Turkiye	Environmental and Sustainability Education and Communication, Rural Development	WWF and Green Steps, Environmental Education Project Consultant
Sebnem Feriver	Regional Environmental Center, REC – TUKEY, Ankara, Turkiye	Environmental Education, Education for Sustainability	Green Pack Environmental Education Project Coordinator
Nilgun Erentay	METU, Foundation Schools, Primary School , Ankara, Turkiye	Environmental Education,	Private School – Science and Technology Teacher
Sibel Kars	Sakarya Ilkogretim Okulu, Ankara, Turkiye	-	Public School – Science and Technology Teacher
Seyhan Bozkurt	Sakarya Ilkogretim Okulu, Ankara, Turkiye	-	Public School – Classroom Teacher

APPENDIX F

ESELI EXTERNAL VALIDITY PANEL EVALUATION QUESTIONNAIRE (TURKISH)

BÖLÜM - I
Değerlendirmeyi yapan kişinin;

(1) Adı ve Soyadı: _____

(2) Çalıştığı Kurum ve Görevi: _____

_____

(3) Uzmanlık veya _____

Araştırma Alanları : _____

BÖLÜM - II
Değerlendirmeyi yapan kişinin İlköğretim Çevre Okuryazarlığı Anketi ile ilgili genel görüşleri;

(4) Ankette ***cinsiyet ayrımcılığı*** veya ***cinsiyet önyargısı*** ile ilgili herhangi bir problem var mı?

Evet ( ) Hayır ( )

Eğer var olduğunu düşünüyorsanız, lütfen nedenini açıklayınız.

_____

(5) Ankette ***etnik / kültürel ayrımcılık*** veya ***önyargı*** ile ilgili herhangi bir problem var mı?

Evet ( ) Hayır ( )

Eğer var olduğunu düşünüyorsanız, lütfen nedenini açıklayınız.

_____

(6) Ankette ***sosyal / bölgesel ayrımcılık*** veya ***önyargı*** ile ilgili herhangi bir problem var mı?

Evet ( ) Hayır ( )

Eğer var olduğunu düşünüyorsanız, lütfen nedenini açıklayınız.

_____

(7) Ankette yer alan soruların / maddelerin ilköğretim 4. ve 5. sınıf öğrencileri için uygun olduğunu düşünüyor musunuz?

Evet ( ) Hayır ( )

Eğer cevabınız hayır ise, lütfen nedenini açıklayınız.

_____

(8) Ankette toplam beş farklı bölüm ve toplam 82 madde ve/veya soru yer almaktadır. 4. ve 5. sınıf öğrencilerinin 82 soruyu cevaplaması için uzun bir süre gerekebilir. Bu durumu gözönüne alarak, lütfen aşağıdaki soruları yanıtlayınız.

(8.1) Sizce anket bir oturumda (*bir veya iki ders saati*) uygulanabilir ve verimli sonuçlar elde edilebilir mi?

Evet ( ) Hayır ( )

(8.2) Eğer cevabınız hayır ise, sizce aşağıdakilerden hangisi bu durumun çözümü olabilir?

A) *Anket iki oturum halinde uygulanmalı*

Eğer cevabınız bu ise, sizce anket hangi anlamlı iki kısma ayrılabilir, [bölüm olarak]?

I. Oturum: _____

II. Oturum: _____

B) *Anketteki bazı bölümler çıkartılmalı*

Eğer cevabınız bu ise, sizce anketteki hangi bölüm veya bölümler çıkartılmalı?

_____

_____

C) *Anketteki bazı sorular / madeler çıkartılmalı*

Eğer cevabınız bu ise, sizce anketteki hangi bölüm(ler)deki madde(ler) çıkartılmalı? [Gereksiz olduğunu düşündüğünüz veya amacına uygun olmayan soru-maddeler olduğunu düşünüyorsanız lütfen burada belirtiniz]

_____

_____

_____

_____

BÖLÜM – III
Değerlendirmeyi yapan kişinin "İlköğretim Çevre Okuryazarlığı Anketi" maddelerinin geçerliliği ile ilgili görüşleri

Aşağıda "**İlköğretim Çevre Okuryazarlığı Anketi**"nde yer alan bölüm ve soru/maddeler ile ilgili bir dış değerlendirmeci olarak sizlerin görüşlerinizi belirlemeye yönelik maddeler yer almaktadır. Lütfen bu maddeler ile ilgili görüşlerinizi yan tarafta yer alan skaladan size uygun seçeneği işaretleyerek belirtiniz.

	Kesinlikle katılmıyorum	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Kesinlikle Katılıyorum**
(9) Bölüm-1 [**1 - 11. sorular**], öğrencilerin demografik bilgilerini belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(10) Bölüm-2 [**12 - 35. sorular**], 4. ve 5. sınıf öğrencilerinin Çevre Bilgilerini ölçmeye yönelik geçerli bir ölçüm aracıdır.	1	2	3	4	5
(11) Bölüm-2'deki sorular, yeni geliştirilen 4-5. sınıflar *Fen ve Teknoloji Dersinde* yer alan çevre ile ilgili hedefleri / kazanımları temsil etmektedir.	1	2	3	4	5
(12) Bölüm-2'deki sorular, yeni geliştirilen 4-5. sınıflar *Sosyal Bilgiler Dersinde* yer alan çevre ile ilgili hedefleri / kazanımları temsil etmektedir.	1	2	3	4	5
(13) Bölüm-3 [**36 - 37. sorular**], öğrencilerin çevre problemlerini çözmeye yönelik becerilerini belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(14) Bölüm-4 [**38 - 57. maddeler**], öğrencilerin çevre ile ilgili duyuşsal eğilimlerini belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(15) Bölüm-4'teki **38. madde**, çevreye yönelik geliştirilen *değerleri* belirlemeye yönelik geçerli bir maddedir.	1	2	3	4	5
(16) Bölüm-4'teki **39. - 43**. maddeler, öğrencilerin *çevre duyarlılıklarını* belirlemeye yönelik geçerli maddelerdir.	1	2	3	4	5
(17) Bölüm-4'teki **44. - 48.** maddeler, öğrencilerin *çevreye yönelik tutumlarını* belirlemeye yönelik geçerli maddelerdir.	1	2	3	4	5
(18) Bölüm-4'teki **49. - 50.** maddeler, öğrencilerin *çevreye yönelik kontrol odaklarını / özyeterlilik inançlarını* belirlemeye yönelik geçerli maddelerdir.	1	2	3	4	5
(19) Bölüm-4'teki **51. - 53.** maddeler, öğrencilerin *çevreye yönelik sorumluluklarını* belirlemeye yönelik geçerli maddelerdir.	1	2	3	4	5
(20) Bölüm-4'teki **54. - 57.** maddeler, öğrencilerin *çevreyi korumada gönüllü katılımlarını* belirlemeye yönelik geçerli maddelerdir.	1	2	3	4	5
(21) Bölüm-5 [**58 - 82. maddeler**], öğrencilerin *çevreye yönelik sorumlu davranışlarını* belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(22) Bölüm-5, Kısım-A [**58 - 64. maddeler**], öğrencilerin *çevreye yönelik fiziksel koruma davranışlarını* belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(23) Bölüm-5, Kısım-B [**65 - 70. maddeler**], öğrencilerin *çevre ile ilgili tüketim ve ekonomi davranışlarını* belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(24) Bölüm-5, Kısım-C [**71 - 76. maddeler**], öğrencilerin *çevre ile ilgili bireysel ve toplumsal ikna davranışlarını* belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(25) Bölüm-5, Kısım-D [**77 - 82. maddeler**], öğrencilerin *çevre ile politik davranışlarını* belirlemeye yönelik geçerli bir ölçme aracıdır.	1	2	3	4	5
(26) "**İlköğretim Çevre Okuryazarlığı Anketi**"nde yer alan sorular ve maddeler 4. ve 5. sınıf öğrencilerinin analayabileceği düzeydedir / açıklıktadır.	1	2	3	4	5

Yukarıdaki maddeler ile ilgili eklemek istediğiniz öneri ve görüşlerinizi diğer sayfada belirtiniz.

Eğer ankette yer alan maddelerin bu yaş grubu öğrenciler için açık olmadığını düşünüyorsanız, lütfen hangilerinin anlaşılır olmadığını belirtiniz ve gerekli gördüğünüz yerlerde anket üzerinde değişiklik yapınız. (Not: Eğer düzeltme yaparsanız, düzeltme yaptığınız yerleri farklı renkler ile gösteriniz)

_____

_____

_____

_____

_____

Eklemek Istedikleriniz:_____

_____

_____

Dış Güvenilirlik Komitesinin bir panalisti olarak,
belirtmiş olduğunuz değerli görüşleriniz ve soruları cevaplamak için harcamış oldugunuz zaman için sonsuz teşekkürler.

APPENDIX G

ELEMENTARY SCHOOL ENVIRONMENTAL LITERACY ASSESSMENT SURVEY

İLKÖĞRETİM ÇEVRE OKURYAZARLIĞI ANKETİ

Sevgili Öğrenciler,

Bu çalışma, sizlerin çevre ile ilgili sahip olduğunuz bilgileri, çevreye yönelik duygu ve hislerinizi, çevre problemlerini çözme konusunda sahip olduğunuz becerilerinizi ve bir sorumlu vatandaş olarak çevre problemlerinin çözümüne yönelik neler yaptığınızı belirlemek amacı ile hazırlanmıştır. Anket 5 bölümden oluşmaktadır. Her bölümün başında o bölümle ilgili açıklamalar yer almaktadır.

Ankete vermiş olduğunuz cevaplar gizli tutulacak ve sadece araştırma amacı ile kullanılacaktır. Anketlerin üzerlerine isimlerinizi yazmanıza gerek yoktur. Sizden elde edilen bilgiler araştırma amacı ile kullanılacağı için vermiş olduğunuz bilgiler son derece önemlidir. Dolayısı ile her bir soruyu cevaplamaya çalışınız.

Çalışmaya katıldığınız için teşekkür ederim.

Mehmet Erdoğan
Orta Doğu Teknik Üniversitesi
Eğitim Fakültesi
Eğitim Bilimleri Anabilim Dalı Doktora Öğrencisi
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BÖLÜM 1: KİŞİSEL BİLGİLER

Bu bölümde yer alan 11 soru, sizler hakkında bazı kişisel bilgileri belirlemeye yönelik olarak hazırlanmıştır. Lütfen her bir soruyu dikkatlice oku ve sana uygun olan seçeneği (X) ile işaretle ve boş bırakılan yerelere sizden istenilenleri yaz.

(1) Öğrenim görmekte olduğun okulun tam ismini yaz.	.....		
(2) Cinsiyetin :	( ) Kız	( ) Erkek	
(3) Okuduğun okulun türü :	( ) Devlet Okulu	( ) Özel Okul	
(4) Ana okuluna / Kreşe gittin mi?	( ) Evet	( ) Hayır	
(5) Anne ve babanın eğitim durumu nedir? Lütfen uygun olan seçeneği işaretle		Anne	Baba
	Okuma yazma bilmiyor	( )	( )
	İlkokul mezunu	( )	( )
	Ortaokul mezunu	( )	( )
	Lise mezunu	( )	( )
	Üniversite mezunu	( )	( )
	Yüksek Lisans /Doktora	( )	( )
	Bilmiyorum	( )	( )

(6) Ailenin toplam aylık geliri nedir? Lütfen sağ tarafta boş bırakılan yere yaz	..... ( )Bilmiyorum
(7) Yaşadığın yerin tam ismini yaz?	.....
(8) Çevre ve doğa ile ilgili haber ve bilgileri ne kadar merak ediyorsun?	( ) Hiç Merak Etmiyorum ( ) Çok Az Merak Ediyorum ( ) Orta Düzeyde Merak Ediyorum ( ) Çok Merak Ediyorum
(9) Yan tarafta yer alan kaynaklardan hangisi veya hangileri senin çevre ve doğa ile ilgili bilgi sahibi olmana katkı sağlıyor? Birden fazla işaretleyebilirsin.	( ) İnternet ( ) Okulum [öğretmenlerim ve dersler] ( ) Çevre ile ilgili kitaplar ( ) Ailem ( ) Arkadaşlarım ( ) Akrabalarım ( ) Dedem ve ninem (babaanne ve anneanne) ( ) Seyrettiğim televizyon programları (belgesel...vb) ( ) Gazete ve dergiler ( ) Ansiklopediler ( ) Çevre ile ilgili dernekleri ve klüpler ( ) Kendi yaptığım gözlemler ( ) Diğer (Lütfen yazın).....
(10) <u>*Son bir yıl*</u> içinde boş zamanlarında doğal alanlara hangi sıklıkla gittin (Orman, göl kenarı, doğal parklar...vb.)	( ) Hiç gitmedim ( ) Nadiren gittim ( ) Bazen gittim ( ) Çok sık gittim
(11) Ailende çevre kirliliği konusunda endişe duyan var mı?	( ) Evet ( ) Hayır
Eğer varsa kim olduğunu belirtir misin?	( ) Annem ( ) Babam ( ) Kardeşim / Kardeşlerim ( ) Diğer(Lütfen belirt).....

BÖLÜM 2.
ÇEVRE BİLGİSİ TESTİ

Bu bölümde 19 çoktan seçmeli ve 3 doğru-yanlış sorusu olmak üzere toplam 22 soru yer almaktadır. Bu sorular sizlerin çevre ile ilgili sahip olduğunuz bilgileri ortaya koymaya yönelik olarak hazırlanmıştır. Her sorunun bir doğru cevabı vardır. Yanıtsız bir soru bırakmaman, elde edilen bilimsel bulguların güvenirliği açısından çok önemlidir.

YÖNERGE – I:

1'den 19'a kadar olan soruların dört tane seçeneği vardır. Lütfen her bir soruyu dikkatlice oku ve sana doğru gelen seçeneği yuvarlak içine alarak işaretle.

1. Güney sahillerimizde yapılan turistik tesisler nedeniyle yuvalama alanları tehlikeye giren hayvan türü asağıdakilerden hangisidir?

A) Akdeniz Fokları
B) Deniz Kaplumbağaları
C) Flamingo Kuşları
D) Muhabbet Kuşları

2. Aşağıdaki hayvanlardan hangisi ülkemizde koruma altında olan bir hayvandır?

A) Bıldırcın B) Denizli horozu
C) Kelaynak D) Leylek

3. Bugün birçok hayvanın neslinin tükenme tehlikesi altında olmasının **en önemli** nedeni asağıdakilerden hangisidir?

A) Aşırı avlanma ve yakalama
B) Kirlilikten dolayı üreyememeleri
C) Küresel iklim değişiklikleri
D) Yaşam alanlarının zarar görmesi

4. Kömür ve petrol hangi tür enerji kaynaklarına örnektir?

A) Alternatif enerji kaynaklarına
B) Fosil yakıtı kaynaklarına
C) Geri dönüşümlü kaynaklara
D) Yenilenebilir enerji kaynaklarına

5. Aşağıdakilerden hangisi, bir besin zincirinde kullanılan enerjinin **ilk** kaynağıdır?

A) Meşe ağacı yaprakları B) Güneş
C) Topraktaki mineraller D) Topraktaki su

6. Aşağıdakilerden hangisi, doğal dengenin bozulmasına yol açan nedenlerden biri **değildir?**

A) Düzensiz yapılaşma
B) Belediyenin çevreye yönelik hizmetlerinin aksaması
C) Kişilerde çevre bilincinin yerleşmesi
D) Çevre gözetilmeden kurulmuş fabrikalar

7. Aşağıdaki canlılardan hangisi **yalnız** mikroskop ile görülebilir?

A) Bakteri B) Çekirge
C) Solucan D) Karınca

8. Aşağıda yer alan turistik alanlarımızdan hangisi, doğal bir olay sonucu (rüzgar, su, deprem...vb. ile aşınma) **oluşmamıştır**?

A) Nemrut dağındaki heykeller- Adıyaman
B) Travertenler – Pamukkale
C) Peri Bacaları – Kapadokya, Nevşehir
D) Damlataş Mağarası - Antalya

9. Ot ⟶ **... ? ...** ⟶ Kurbağa ⟶ Leylek

Yukarıdaki besin zincirinde **….?....** yerine aşağıdaki canlılardan hangisi yazılmalıdır?

A) Çekirge B) Fare
C) Kirpi D) Tavşan

10. Aşağıdakilerden hangisi sağlıklı bir yaşam için yapılacak eylemlerden biri **değildir**?

A) Çok spor ve egzersiz yapmak
B) Alınan ürünlerin son kullanma tarihine bakmak
C) Çok ekmek ve kırmızı et yemek
D) Sigara ve içki içilen yerlerden uzak durmak

11. Aşağıdakilerden hangisi çevre kirliliğine yol açan nedenlerin **en başında** gelir?

A) İnsanlar B) Bitkiler
C) Hayvanlar D) Cansız varlıklar

12. Aşağıdakilerden hangisi geri dönüşümü olmayan [geri dönüştürülemeyen] bir maddedir?

A) Petrol B) Plastik
C) Teneke kutu D) Kâğıt

13. Çevre kirliliği aşağıdakilerden hangisi için bir tehdit oluşturmaktadır?

A) Gelişmemiş ülkelerde yaşayan insanlar
B) Sadece şehirlerde yaşayan insanlar
C) Sadece vahşi hayvanlar
D) Yeryüzündeki tüm canlılar

14. Türkiye'de genel olarak evlerde kullanılan aletlerden hangisi **en fazla** enerjiyi tüketmektedir?

A) Aydınlanma araçları B) Televizyon
C) Su ısıtıcısı D) Bilgisayar

15. Aşağıdakilerden hangisi kalıcı kirliliğe sebep olmaz?

A) Civa B) Kurşun
C) Plastik D) Yemek artıkları

16. Aşağıdakilerden hangisi dünyanın katmanlarından biri **değildir**?

A) Taş küre B) Su küre
C) Hafif küre D) Ateş küre

17. Deprem ile ilgili olarak aşağıda verilenlerden hangisi **yanlıştır**?

A) Deprem doğal bir felakettir.
B) Deprem fay hattının kırılması ile oluşur.
C) Depremin sebebi çok katlı binalardır.
D) Depremin tam yeri ve zamanı tahmin edilemez.

18. Aşağıdakilerden hangisi tüm hayvanların yaşamaları için her zaman gerekli olan koşullardan biri **değildir**?

A) Besin B) Barınak
C) Su D) Işık

19. Aşağıda verilen ses ve ışık ile ilgili ifadelerden hangisi **yanlıştır?**

A) Çok şiddetli sesler gürültü kirliliğine neden olur.
B) Gök gürültüsü doğal bir ses kaynağıdır.
C) Işık kirliliği kulak sağlığını olumsuz etkiler.
D) Güneş, doğal bir ışık kaynağıdır.

YÖNERGE - II:

Aşağıda çevre ile ilgili bazı durumlar verilmiştir (20'den 22'e kadar). Bu durumlar ile ilgili düşüncelerini her bir sorunun altında yer alan doğru veya yanlış seçeneklerinden birine (X) işareti koyarak göster.

20. Yağmur, kar, buz, sis ve bulut suyun farklı biçimleridir.

( ) Doğru ( ) Yanlış

21. Rüzgâr bir çeşit temiz enerji kaynağıdır.

( ) Doğru ( ) Yanlış

22. Daha fazla ağaç dikilmesi, erozyon ve toprak kaymalarını engelleyecektir.

( ) Doğru ( ) Yanlış

BÖLÜM 3. **ÇEVREYE YÖNELİK DUYUŞSAL EĞİLİMLER ÖLÇEĞİ** **Aşağıda, sizlerin çevreye yönelik duygu ve düşünceleriniz ile ilgili 20 farklı cümle yer almaktadır. Lütfen, her bir cümleyi dikkatlice okuyup sana en uygun olan kutucuğun içine (X) işareti koy.**	Katılmıyorum	Biraz katılmıyorum	Biraz katılıyorum	Katılıyorum
1. İnsanlar çevreye önem vermelidir.				
2. Kendimi çevreye çok duyarlı olarak görüyorum. (*Duyarlılık, çevreye yönelik olumlu duygular beslemek anlamına gelmektedir*)				
3. Sık sık çevre ve doğa ile ilgili yazılar (*kitap, dergi..vb.)* okurum.				
4. Televizyonda ne zaman bir doğa ve çevre ile ilgili bir program olsa izlerim.				
5. Doğal kaynaklar dikkatli kullanılmalıdır.				
6. Toprak kaymasını ve erozyonu önlemek için daha çok ağaç dikilmelidir.				
7. Yılan, kartal gibi yırtıcı ve vahşi hayvanlar öldürülmemelidir, çünkü onların da yaşama hakkı vardır.				
8. Çevre problemlerinin çözümü için bu konuda çalışan insanlara yardım edebilirim.				
9. Canlıların doğal yaşam alanlarının korunmasına yönelik benim de yapacak olduğum bir şeyler olduğunu düşünüyorum.				
10. Çevre kirliliginin önlenmesinde, kişisel sorumluluk çok önemlidir.				
11. Doğal kaynakları korumak için, yaşam tarzımda değişiklik yapabilirim.				
12. Çevre sorunlarını önlemek için tedbirler (*geri-dönüşümlü ürünleri kullanmak, yerlere çöp atmamak...vb.*) almak isterim.				
13. Çevreyi korumaları için insanları bir şeyler yapmaları konusunda teşvik etmek isterim.				
14. Çevrenin korunması için devlet yetkilileri ile konuşmak isterim.				

BÖLÜM 4.
ÇEVREYE YÖNELİK SORUMLU DAVRANIŞ ÖLÇEĞİ

Bu bölüm sizlerin çevreyi korumak ve çevre problemlerini çözmek için yapmış olduğunuz eylemlerin belirlenmesi için hazırlanmıştır. Bu bölümde çevrenin korunması ile ilgili birbirinden farklı bazı davranışlar verilmektedir. Her bir davranışı dikkatlice oku ve bu davranışları **son bir yıl içinde** hangi sıklıkla yaptığını yan taraftaki uygun seçeneklerden bir tanesini yuvarlak içine alarak belirt.

	Son bir yıl İçinde kaç kere yaptın?						
1) Okuldayken, evdeyken, piknikteyken ve sokaktayken çöplerimi uygun bir şekilde çöp tenekesine attım.	Hiç	1	2	3	4	5	5'den fazla
2) Okulda, park alanlarında ve sokakta yerlere atılan çöpleri toplayıp çöp tenekesine attım.	Hiç	1	2	3	4	5	5'den fazla
3) Kâğıt, cam, plastik, kutu, alüminyum ve pil gibi atıkları geri dönüşüm kutusuna attım.	Hiç	1	2	3	4	5	5'den fazla
4) Geri dönüşüm kutusu yapmaya ve gerekli yerlere (***Örneğin***, okula, evime, sokağıma...vb) koymaya yardımcı oldum.	Hiç	1	2	3	4	5	5'den fazla
5) Eski ve kullanmadığım kitap, giysi, oyuncak ve diğer eşyaları gereksinimi olan kişi ve kuruluşlara verdim.	Hiç	1	2	3	4	5	5'den fazla
6) Çevrenin güzelleştirilmesi için ağaç, çiçek, sebze ve diğer çeşit bitkilerden diktim ve yetiştirdim.	Hiç	1	2	3	4	5	5'den fazla
7) Bitkileri korumak için önlemler aldım (***Örneğin,*** *ağaç ve çiçeklerin dallarını kırmadım, çiçek ve çimleri koparmadım ve ezmedim)*	Hiç	1	2	3	4	5	5'den fazla
8) Sokaklarda yaşayan kedi, köpek ve kuş gibi hayvanları korumak için önlemler aldım.(***Örneğin,*** *onlara yuva yaptım, onlara yiyecek verdim, onları zararlardan korudum*)	Hiç	1	2	3	4	5	5'den fazla
9) Su tasarrufu yapmak için önlemler aldım (***Örneğin,*** *kullanılmayan çeşmeleri kapattım, banyo yaparken, el yıkarken ve diş fırçalarken aşırı su kullanmadım*)	Hiç	1	2	3	4	5	5'den fazla
10) Çevrenin korunması ve güzelleştirilmesi için çalışan ulusal ve yerel sivil toplum kuruluşlarına (***Örneğin***, *TEMA, Doğal Hayatı Koruma Derneği*) para yardımında bulundum.	Hiç	1	2	3	4	5	5'den fazla
11) Okuluma ve çevreyi koruma için çalışan yerel toplumsal kuruluşlara para yardımında bulundum (***Örneğin,*** *ağaç diktirmek için, çevre temizliği için*)	Hiç	1	2	3	4	5	5'den fazla
12) Geri dönüştürülebilen veya geri dönüşüm maddelerinden yapılmış ürünlerden satın aldım. (***Örneğin***, *üzerinde geri dönüşüm*  *işareti olan ürünlerden satın aldım*)	Hiç	1	2	3	4	5	5'den fazla

	Son bir yıl İçinde kaç kere yaptın?						
13) Türk Standartları Enstitüsü (TSE) ve Tarım ve Köy İşleri Bakanlığı tarafından onaylanan ve test edilen ürünlerden satın aldım.	Hiç	1	2	3	4	5	5'den fazla
14) Taze, sağlıklı, son kullanma tarihi geçmemiş ve organik / ekolojik ürünler satın aldım.	Hiç	1	2	3	4	5	5'den fazla
15) Çevrenin korunması ve çevreye zarar vermemek için ne yapabilecekleri konusunda ailem ile konuştum.	Hiç	1	2	3	4	5	5'den fazla
16) Çevrenin korunması ve çevreye zarar vermemek için ne yapabilecekleri konusunda arkadaşlarım ile konuştum.	Hiç	1	2	3	4	5	5'den fazla
17) Çevrenin korunması ve çevreye zarar vermemek için ne yapabilecekleri konusunda diğer insanlar ile konuştum.	Hiç	1	2	3	4	5	5'den fazla
18) Çevreye zarar veren ailemi, arkadaşlarımı ve diğer insanları uyardım. (***Örneğin**, yerlere çöp attıklarında, bitki ve hayvanlara zarar verdiklerinde, su ve elektriği gereksiz yere kullandıklarında*)	Hiç	1	2	3	4	5	5'den fazla
19) Okuldaki ve sokaklardaki ilan panolarına asmak için çevrenin korunması ile ilgili poster, resim ve yazılar hazırladım.	Hiç	1	2	3	4	5	5'den fazla
20) Çevrenin korunmasının önemi ile ilgili haber / yazı hazırladım ve halka (diğer insanlara) dağıttım.	Hiç	1	2	3	4	5	5'den fazla
21) Çevre korumanın önemi ve çevre koruma ile ilgili konularda, devlet yetkilileri (başbakan, çevre ve orman bakanı ve vali) ile iletişim kurmak için özel planlar yaptım. (**Örneğin**, *mektup hazırlamak, e-mail hazırlamak*)	Hiç	1	2	3	4	5	5'den fazla
22) Çevre koruma önlemleri almaları için belediye başkanını ziyaret ettim ve bu konuda onu teşvik ettim.	Hiç	1	2	3	4	5	5'den fazla
23) Çevre koruma önlemleri almaları için mahalle muhtarını ziyaret ettim ve bu konuda onu teşvik ettim.	Hiç	1	2	3	4	5	5'den fazla
24) Kurallara ve yasalara uymayarak çevreye zarar veren kişilere ceza vermesi için yerel devlet yetkilileri ile konuştum.	Hiç	1	2	3	4	5	5'den fazla
25) Halkın çevre duyarlılığını ve çevreyi korumaya yönelik desteğini arttırmak için, çevre ile ilgili gazete, dergi ve sokak panoları hazırlamaları konusunda devlet yetkililerini teşvik ettim.	Hiç	1	2	3	4	5	5'den fazla
26) Devlet yetkilileri ve sivil toplum kuruluşlarının temsilcileri ile çevre koruma projeleri hazırlamak ve bu projeleri uygulamak için ortak çalıştım.	Hiç	1	2	3	4	5	5'den fazla

BÖLÜM 5.
PROBLEM BELİRLEME VE PROBLEM ÇÖZME BECERİLERİ TESTİ

Bu bölüm, senin çevre sorunları ile ilgili ne düşündüğünü ve bu sorunların çözümüne yönelik nasıl davrandığını belirlemek amacıyla hazırlanmıştır. Aşağıda bir metin verilmiştir. Lütfen bu metni ve yönergeleri dikkatlice oku ve metnin ile ilgili soruları cevapla.

GÖL NEDEN KİRLİ?

O günkü Fen ve Teknoloji dersinde, sınıf öğretmeni su kaynaklarının kirlenmesinden bahsetmişti. Örnek olarak ta okullarının yakınında bulunan ve bir çok insanın çevresinde piknik yaptığı gölü vermişti. Bu gölün son zamanlarda çeşitli nedenlerden dolayı kirlendiğini ve içindeki balıkların bu kirlilik yüzünden öldüğünü anlatmıştı. Ders bitiminde sınıf öğretmeni gelecek haftanın ödevi olarak öğrencilerden, bu göldeki balıkların neden ölmüş olabileceğini araştırmalarını istemişti. Öğrencilerin elde ettikleri sonuçları sınıfta arkadaşlarıyla paylaşmalarını istedi. Eğer sen bu sınıfta bir öğrenci olsaydın bu konuyu araştırmak için aşağıdaki işlemleri hangi sırayla yapardın. (**Not:** Öğretmen araştırma için her türlü araç ve gereci sağlayacaktır.)

Yönerge:
Lütfen aşağıdaki tabloda A SÜTUNU'nda verilen işlemleri dikkatli bir şekilde oku. Daha sonra öğretmeninin verdiği ödevi tamamlamak için A SÜTUNU'nda yer alan işlemleri, hangi sıra ile yapacağını B SÜTUNU'nda verilen rakamların yanına uygun harfi yazarak belirt. Örneğin (1) _M_, (2) _S_....vb gibi. Her sıra için sadece bir işlem belirtebilirsin.

A SÜTUNU (İşlemler)		B SÜTUNU (Sıra)
(A)	Bu çevre sorununu daha iyi tanımlamak için göl suyu kirliliğinin nedenleri ile ilgili fen kitapları ve internetten bilgi toplarım.	(1) _____
(B)	Deney yapmak için gölden su örnekleri alırım.	(2) _____
(C)	Gölün bulunduğu alana gider göl çevresinde gözlemler yaparım.	(3) _____
(D)	Gözlem ve deney sonuçlarını yorumlarım.	(4) _____
(E)	Elde etmiş olduğum tüm verileri rapor haline getirerek sınıfta sunarım.	(5) _____
(F)	Deneyden elde ettiğim sonuçları defterime kaydederim.	(6) _____
(G)	Su örneklerini incelemek için öğretmenimin sağlayacağı araç ve gereçlerle deney düzeneğini hazırlarlayarak deneyi gerçekleştiririm.	(7) _____

GÖLÜN KİRLENMESİNİ NASIL ÖNLEYEBİLİRİM?

Öğretmeninin vermiş olduğu bu ödevi tamamlayıp, araştırma sonuçlarını sınıftaki diğer arkadaşların ile paylaştıktan sonra, gölün temizlenmesi ve tekrar kirlenmemesi için **sen** neler yapardın veya yapmayı planlardın? Lütfen aşağıda boş bırakılan alana yaz, **birden fazla öneri yazabilirsin.**

_____

_____

_____

_____

APPENDIX H

THE STATISTICAL TABLES ON THE ITEMS IN ESELI

Table 1
Number of the Responses Given to Multiple Choice Knowledge Items (N=2410)

Items regarding environmental knowledge	Correct Answer	Frequency (*f*) and Percentage (%)				
		A	B	C	D	Missing
1. Which of the following animal species' nesting areas are in danger because of tourist establishments in South beaches of Turkey?	B	664 27.6	**1364** **56.6**	213 8.8	107 4.4	62 2.6
2. Which of the following animals is one of the protected species in Turkey?	C	196 8.1	282 11.7	**1635** **67.8**	252 10.5	45 1.9
3. Which of the followings would be the most important reason why animals today could become extinct?	D	728 30.2	520 21.6	503 20.9	**638** **26.5**	21 0.9
4. Coal and petroleum are examples of…	B	176 7.3	**2040** **84.6**	70 2.9	97 4.0	27 1.1
5. Which of the following is the original source of energy flowing in food chains on land?	B	85 3.5	**1924** **79.8**	197 8.2	159 6.6	45 1.9
6. Which of the followings is not one of the reasons that ruin the natural balance of the environment?	C	244 10.1	260 10.8	**1483** **61.5**	376 15.6	47 2.0
7. Which of the following organisms can only be seen by making use of microscope?	A	**2278** **94.5**	33 1.4	43 1.8	41 1.7	15 0.6
8. Which of the following historical places was not formed /created as a result of natural events like rain, wind…etc?	A	**1164** **48.3**	311 12.9	435 18	404 16.8	96 4.0
9. Plants ⟶..?..⟶ Frog⟶ Stork Which of the following animals should be written in.…?.... above food chain?	A	**1386** **57.5**	85 3.5	174 7.2	713 29.6	52 2.2

Table 1 (Continued)

Items regarding environmental knowledge	Correct Answer	Frequency (*f*) and Percentage (%)				
		A	B	C	D	Missing
10. Which of the following actions would not be the one that can be done for a balanced and healthy life?	C	124 5.1	140 5.8	**1907** **79.1**	213 8.8	26 1.1
11. Which of the followings would have most influence on the environmental problems?	A	**2079** **86.3**	20 0.8	124 5.1	175 7.3	12 0.5
12. Which of the followings is not recyclable material?	A	**1977** **82**	177 7.3	128 5.3	122 5.1	6 0.2
13. Environmental problems are a threat for which of the followings?	D	212 8.8	108 4.5	163 6.8	**1881** **78**	46 1.9
14. Which of the following appliances used in the houses in Turkey are consuming most energy?	A	**1120** **46.5**	466 19.3	407 16.9	376 15.6	41 1.7
15. Which of the followings would not cause permanent /lasting pollution?	D	455 18.9	310 12.9	321 13.3	**1276** **52.9**	48 2.0
16. Which of the followings is not one of the layers of the earth?	C	54 2.2	99 4.1	**2155** **89.4**	72 3.0	30 1.2
17. Which of the following statements related to earthquakes would be wrong?	C	95 3.9	357 14.8	**1702** **70.6**	231 9.6	25 1.0
18. Which of the following is not one of the conditions necessary for all animals all the time to survive?	D	98 4.1	395 16.4	100 4.1	**1769** **73.4**	48 2.0
19. Which of the following statements related to *sound* and *light* would be wrong?	C	140 5.8	144 6.0	**1981** **82.2**	90 3.7	55 2.3

Table 2
Number of the Responses Given to True-False Knowledge Items (N=2410)

Items regarding environmental knowledge	Correct Answer	Frequency (*f*) and Percentage (%)		
		True	False	Missing
20. Rain, snow, ice, fog and cloud are different forms of water.	True	**2126** **88.2**	249 10.3	35 1.5
21. Energy produced from the wind is one of the clean sources of energy.	True	**1354** **56.2**	1009 41.8	47 2.0
22. Planting more trees helps prevent erosion and landslides.	True	**2187** **90.7**	191 7.9	32 1.4

Table 3
Number of Responses Given to Willingness to Take Environmental Action Items (*N*=2410)

Items regarding Willingness to Take Environmental Action (Intention)	Frequency (*f*) and Percentage (%)				
	DA	P-DA	P-A	A	Missing
12. I can help the people who are working on solving environmental problems.	166 6.9	196 8.1	752 31.2	1256 52.1	40 1.7
13. I think I can do something to help protect natural areas and habitats of living organisms	168 7	180 7.5	588 24.4	1433 59.4	41 1.7
14. Individual responsibilities are very important in protecting the environmental pollution.	183 7.6	114 4.7	296 12.3	1767 73.3	50 2.1
19. I am willing to encourage other people to do things that help to protect the environment.	196 8.1	135 5.6	473 19.6	1569 65.1	37 1.6
20. I would be willing to talk with governmental officials about environmental protection	246 10.2	171 7.1	503 20.9	1467 60.8	23 1

DA: Disagree, P-DA: Partially Disagree, P-A: Partially Agree, A: Agree

Table 4
Number of Responses to Given Environmental Attitudes Items (*N*=2410)

Items regarding Environmental Attitudes	Frequency (*f*) and Percentage (%)				
	DA	P-DA	P-A	A	Missing
1. People should give the importance to the environment.	194 8	23 1	32 1.3	2150 89.2	11 0.5
7. Natural resources should be carefully used.	176 7.3	64 2.7	142 5.9	2004 83.1	24 1
10. For preventing erosion and landslide, more trees should be planted.	197 8.2	38 1.6	109 4.5	2036 84.5	30 1.2
11. Wild animals like snake and owl should not be killed, because they also have a right to survive.	245 10.2	115 4.8	304 12.6	1715 71.2	31 1.2
17. I am willing to take steps to prevent environmental problems such as recycling, not littering...etc.	220 9.1	127 5.3	354 14.7	1657 68.7	52 2.2

DA: Disagree, P-DA: Partially Disagree, P-A: Partially Agree, A: Agree

Table 5
Number of Responses Given to Environmental Sensitivity Items (N=2410)

Items regarding Environmental Sensitivity	Frequency (*f*) and Percentage (%)				
	DA	P-DA	P-A	A	Missing
2. I consider myself to be very sensitive toward the environment.	147 6.1	155 6.4	783 32.5	1304 54.1	22 0.9
5. I often read about nature and the environment (e.g., books and magazines)	222 9.2	313 13	927 38.5	911 37.8	37 1.5
6. I watch TV programs about nature and the environment whenever they come on TV.	236 9.8	228 9.5	714 29.6	1203 49.9	29 1.2
16. I can change my life styles to protect natural resources	310 12.9	296 12.3	771 32	994 41.2	38 1.6

DA: Disagree, P-DA: Partially Disagree, P-A: Partially Agree, A: Agree

Table 6
Number of Responses Given to Political Action Items (N=2410)

Items regarding Political Action (POLITICAL)	Frequency (*f*) and Percentage (%)				
	Never	1-3	4-5	More	Missing
21. I made specific plans to communicate with national or provincial government officials about the importance of or topics related to environmental protection.	1327 56.9	497 20.6	220 9.1	236 9.8	85 3.5
22. I encouraged elected *municipal officials* and to take specific kinds of environmental protection measures.	1526 63.3	446 18.5	185 7.7	164 6.8	89 3.7
23. I encouraged elected executive officer of a district and to take specific kinds of environmental protection measures.	1330 55.2	558 23.2	207 8.6	204 8.5	111 4.6
24. I encouraged governmental officials to punish people who violate these laws and harm the environment.	1462 60.7	447 18.5	226 9.7	177 7.3	98 4.1
25. I encouraged governmental officials to create a newspaper, a magazine, and a public display to increase public awareness & support for environmental protection.	1387 57.6	509 21.1	227 9.4	209 8.7	78 3.2
26. I cooperated with government officials and/or representatives of other groups (e.g., NGOs) to develop or begin to carry out plans for specific environmental protection projects.	1335 55.4	516 21.4	250 10.4	230 9.5	79 3.3
27. I prepared or delivered a message for the general public about the importance of protecting the environment	1283 53.2	545 22.6	268 11.1	263 10.9	51 2.1

Table 7
Number of Responses Given to Eco-Management Items (N=2410)

Items regarding Eco-Management (PHYSICAL)	Frequency (*f*) and Percentage (%)				
	Never	1-3	4-5	More	Missing
1. Properly disposed of trash / garbage in schools, home, picnic areas, and streets	34 1.4	224 9.3	408 16.9	1699 70.5	45 1.9
2. In school, parking places and street I picked up the littered trashes and put into the garbage	158 6.6	627 26	673 27.9	900 37.3	52 2.2
3. I recycled materials such as paper, glass, plastic, cans, aluminum, and batteries)	463 19.2	618 25.6	555 23	709 29.4	65 2.7
7. I took steps to protect plants	144 6	451 18.7	504 20.9	1238 51.4	73 3
8. I took steps to protect homeless dogs, cats, and birds	243 10.1	711 29.5	518 21.5	883 36.6	55 2.3
9. I took steps to conserve water	68 2.8	330 13.7	429 17.8	1532 63.6	51 2.1

Table 8
Number of Responses Given to Consumer and Economic Action Items (N=2410)

Items regarding Consumer and Economic Action (ECONOMICAL)	Frequency (*f*) and Percentage (%)				
	Never	1-3	4-5	More	Missing
5. I gave my used stuffs such as books, dress and toys to the ones and institutions who need them	265 11	576 23.9	460 19.1	1050 43.6	59 2.4
12. I purchased materials that are recyclable and/or that are made from recycled materials	495 20.5	592 24.6	410 17	858 35.6	55 2.3
13. I purchased products that were guaranteed / certified by Turkish Standard Institute (TSE) and Ministry of Agriculture and Village Affairs.	240 10	384 15.9	374 15.5	1368 56.8	44 1.8
14. I purchased fresh, healthy, unexpired and organic / ecological products	161 6.7	294 12.2	378 15.7	1527 63.4	50 2.1
18. I warned family members, my friends and others who have harmed the environment	161 6.7	540 22.4	506 21.0	1152 47.8	51 2.1

Table 9
Number of Responses Given to Individual and Public Persuasion Items (N=2410)

Items regarding Individual and Public Persuasion (PERSUASION)	Frequency (*f*) and Percentage (%)				
	Never	1-3	4-5	More	Missing
4. I helped create and place recycling bins	785 32.6	699 29	476 19.8	386 16	64 2.7
6. I planted trees, plants, vegetables and other plants for beautifying the environment.	231 9.6	753 31.2	536 22.1	806 33.4	84 3.5
10. I donated money to national or regional NGOs working on the environment	1021 42.4	673 27.9	354 14.7	315 13.1	47 2
11. I donated money to Schools and/or local community / societal organizations working on the environment	712 29.5	811 33.7	438 18.2	397 16.5	52 2.2
15. I talked with *family members* about the what they can do to protect and/or not to harm the environment	369 15.3	767 31.8	507 21	711 29.5	56 2.3
16. I talked with *friends and/or schoolmates* about the what they can do to protect and/or not to harm the environment	463 19.2	777 32.2	504 20.9	593 24.6	73 3
17. I talked with *other people* about the what they can do to protect and/or not to harm the environment	688 28.5	735 30.5	463 19.2	447 18.5	77 3.2
19. I prepared slogans, posters, pictures, poems and/or writings about protecting environment to [hang on] use in school wall, in street displays	951 39.5	680 28.2	373 15.5	353 14.6	53 2.2

Table 10
Number of Responses Given to Cognitive Skill Items (N=2410)

Order	Frequency (*f*) and Percentage (%)							
	Processes to be ordered							
	A	B	C	D	E	F	G	Missing
Step 1	**1128**	233	476	26	37	27	93	392
	46.8	9.7	19.7	1.1	1.5	1.1	3.9	16.3
Step 2	283	539	**795**	134	41	56	167	397
	11.7	22.3	**33**	5.6	1.7	2.3	6.9	16.5
Step 3	236	**763**	367	227	95	81	294	394
	9.8	**31.6**	15.2	9.4	3.9	3.4	10.3	16.3
Step 4	114	210	180	478	160	229	**643**	398
	4.7	8.7	7.5	19.8	6.6	9.5	**26.7**	16.5
Step 5	88	90	74	601	320	**570**	268	401
	3.6	3.7	3.1	24.9	13.3	**23.6**	11.1	16.6
Step 6	105	101	64	**394**	324	771	251	402
	4.4	4.2	2.7	**16.3**	13.4	32	10.4	16.7
Step 7	87	98	65	153	**1012**	261	322	414
	3.6	4.1	2.7	6.3	**42**	10.8	13.3	17.2

APPENDIX I

TURKISH SUMMARY

TÜRKÇE ÖZET

5. SINIF ÖĞRENCİLERİNİN ÇEVRE OKURYAZARLIĞI VE BU ÖĞRENCİLERİN ÇEVREYE YÖNELİK SORUMLU DAVRANIŞLARINI ETKİLEYEN FAKTÖRLER

GİRİŞ

Son zamanlarda insanoğlu bir çok çevre problemi ile karşı karşıya gelmiştir. Bu problemlerin başlıcaları şöyledir; biyolojik kaynakların ve çeşitliliğin yok olması, küresel ısınma, have, su ve toprak kirliliği (Doğan, 1997; Palmer, 1998). Bu çevre problemlerinin ortaya çıkmasının temel nedeni insanoğlunun yaşam biçimi ve kaynakları sınırsız ve dikkatsiz bir şekilde kullanması olarak görülmektedir (Connell ve diğerleri, 1999; Tung ve diğerleri, 2002). Çevre problemlerinin ortaya çıkışı ve artması insanoğlunun yaşam kalitesini de etkilemektedir. Dolayısı ile insanoğlunun doğal çevreye olan olumsuz etkisini ve çevre problemlerinin kendi yaşantılarına olan etkisinin bir an önce farkına varması ve problemleri çözümeye yönelik çözüm yolları üretmeleri gerekmektedir. Bunun için genelde eğitimin, özelde ise çevre eğitiminin önemi her heçen gün hissedilmektedir (Doğan, 1997).

Çevre eğitimi ile ilgili alan yazında da görüldüğü gibi, çevre eğitiminin iki temel amacının olduğu görülmektedir; (1) bireylerin çevre okuryazarlığını (Roth, 1992; Stapp, 1969) ve (2) çevreye yönelik sorumlu davranışlarını (Hungerford ve Peyton, 1977) geliştirmek. Çevre okuryazarlığı kavramı bazıları tarafından bilişsel boyut ile ilişkilendirilmiş (örn: Daudi, 1999), ancak diğer arastırmacılar tarafından bu kavramın sadece bilişsel değil, duyuşsal ve psikomotor boyutları ile de ilişkili olduğu ortaya konulmuştur (Roth, 1992; Schneider, 1997; Staples, 1998). Çevre eğitimi

üzerine yapılan konferanslar (örn: UNESCO, 1978) ve çevreye yönelik sorumlu davranışlar ile ilgili araştırmaların meta-analizi (Hines ve diğerleri, 1986/87; Osbaldiston, 2004) çevre okuryazarlığının boyutları ile ilgili derinlemesine bilgi sunmaktadır. Buna göre çevre okuryazarlığı temel olarak dört boyuttan oluşmaktadır; (1) bilgi, (2) duyuş, (3) beceri ve (4) davranış (Hsu, 1997).

Çevre eğitimi ile ilgili alan yazın incelendiğinde, çevreye yönelik sorumlu davranışları araştıran bir çok araştırma ile karşılaşılmaktadır. Ancak, çevre okuryazarlığı ile ilgili araştırmaların sayısı oldukça azdır. Öğrencilerin çevreye yönelik sorumlu davranışlarını etkileyen faktörler araştırılmasına karşın, davranışı tamamı henüz açıklanamamıştır. Bu faktörlerin ortaya çıkarılması ve çevre okuryazarlığının boyutlarının incelenmesi, çevre eğitiminin geliştirilmesi ve bu alandaki politikaların oluşturulması açısından büyük önem taşımaktadır.

Çalışmanın Amacı

Bu araştırmanın amacı 5. sınıf Türk öğrencilerinin çevre okuryazarlık düzeylerinin belirlenmesi ve bu öğrencilerin çevreye yönelik sorumlu davranışlarını etkileyen faktörlerin ortaya çıkarılmasıdır. Bu temel amaç çerçevesinde, 2 ana ve 10 alt araştırma sorusu cevaplanmaya çalışılmıştır.

1) Türkiye genelindeki 5. sınıf Türk öğrencilerinin aşağıdaki boyutlar dikkate alındığında, çevre okuryazarlık düzeyi nedir?

a) Çevre Bilgisi

b) Duyuş

b.1) Çevreye yönelik tutum

b.2) Çevre duyarlılığı

b.3) Çevre davranışı için isteklilik

c) Çevreye Yönelik Sorumlu Davranış

c.1) Politik davranış

c.2) Fiziksel davranış

c.3) Tüketici ve ekonomi davranışı

c.4) Bireysel ve toplumsal ikna davranışı

d) Bilişsel Beceriler

d.1) Problem belirleme ve değerlendirme becerisi

d.2) Problem çözme becerisi

2) 5. sınıf öğrencilerin çevreye yönelik sorumlu davranışlarını yordayan değişkenler nelerdir?

2.1) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları cinsiyete göre farklılık göstermekte midir?

2.2) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları okul türüne göre farklılık göstermekte midir?

2.3) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları okul öncesi eğitimi alıp-almamaya göre farklılık göstermekte midir?

2.4) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları ailenin eğitim düzeyine göre farklılık göstermekte midir?

2.5) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları yaşam alanına göre farklılık göstermekte midir?

2.6) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları ailenin gelir düzeyine göre farklılık göstermekte midir?

2.7) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları doğal ortamlarda bulunma sıklığına göre farklılık göstermekte midir?

2.8) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları çevre merak düzeyine göre farklılık göstermekte midir?

2.9) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışları ailenin çevreye yönelik kaygılı olup-olmamalarına göre farklılık göstermekte midir?

2.10) 5. sınıf öğrencilerinin çevreye yönelik sorumlu davranışlarını yordayan değişkenleri gösteren en iyi yapısal eşitlik modeli hangisidir?

Çalışmanın Önemi

İnsanoğlu yaşam kalitesini arttırmak ve iyileştirmek için doğal kaynakları sınırsızca kullanmaktadır. Ancak bu durum yaşadığımız alanları giderek tehdit etmeye başlamıştır. İnsanların çevreye olan kendi etkilerinin farkına varmaları her geçen gün daha da önem kazanmaktadır. Bu durum okullarda ve eğitim sistemlerinde çevre eğitiminin önemini ortaya koymaktadır. Son yıllarda eğitim politikaları planlanırken çevre eğitimi de dikkate alınmaya başlanmıştır.

Türk Eğitim Sistemi'nde çevre eğitimi ayrı bir ders olarak yer almamaktadır. Bu eğitim, disiplinlerarası doğası gereği özellikle fen ve teknoloji dersi ve az da olsa sosyal bilgiler dersi kapsamında verilmektedir. Yapılan araştırmalar, çevreye yönelik sorumlu davranışların kazanılmasında ve/veya geliştirilmesinde çevre eğitiminin öneminden bahsetmektedir (örn: Hsu, 1997). Ancak bu öğretim programının var olmaması ve bu alanda Türkiye'de yapılan çalışmaların yeterli düzeyde (nicelik olarak) olmaması, ilköğretim düzeyindeki öğrencilerin çevre ile ilgili bilgi düzeyleri, çevreye yönelik duyuşsal eğilimleri, çevre ve doğayı korumada ve sürdürülebilirliklerinin sağlanmasında öğrencilerin sahip oldukları sorun çözme becerileri ve davranışları ile ilgili yeterli bilgi sahibi olmamız konusunda yeterli kanıt sağlamamaktadır. Türkiye'de çevre eğitimi ile ilgili yapılan çalışmalar incelendiğinde öğrencilerin çevre ile ilgili bilgilerini belirlemeye yönelik (Alp, 2005; Armağan, 2006; Bozkurt ve Orhan, 2004), çevreye yönelik duyuşsal eğilimlerini belirlemeye yönelik (Erdogan ve Aydemir, 2007; Erentay ve Erdogan, 2007; Kaya ve Turan, 2005) ve çevrenin ve doğanın korunmasına yönelik gösterilen davranışları (Erten, 2002) konu edinen araştırmalara ulaşılmıştır. Ancak, Türkiye'de ilköğretim düzeyinde çevre eğitimi alanında yapılmış olan 53 bilimsel çalışmasının eleştirel analizi, yapılan bu çalışmaların daha çok bağlam ile sınırlı kaldığı, genellenebilirlik konusunda kısıtlamalarının olduğu ve daha çok bilgi düzeyine yoğunlaşıldığını göstermiştir. Ayrıca bu eleştirel analiz, öğrencilerin duyuşsal eğilimleri, sahip oldukları bilişsel beceri ve davranışlarına yönelik yeterli kanıta sahip olmadığımızı göstermektedir. Bu araştırma önerisi ile Türkiye çapında genellenebilir sonuçların

elde edileceği ve sadece bilgi düzeyinin değil bunun yanında duyuşsal alanlar, bilişsel beceriler ve sorumlu davranışlara yönelik veriler elde edileceğine inanılmaktadır. Ayrıca, yeni geliştirilen ilköğretim programları ülke genelinden okullardan gelen geri dönütler ışığında sürekli olarak revizyona ve yenilenmeye tabi tutulmaktadır. Dolayısı ile bu çalışmada ülke genelinde elde edilecek olan bulguların program geliştirme ve ilköğretim programlarının çevre eğitimi açısından iyileştirilmesi çalışmalarına katkı sağlayacağı ve bu çalışmada kullanılacak olan kavramsal yapının ileride bu alanda yapılacak olan çalışmalara ışık tutacağı düşünülmektedir

Çevre Eğitiminin Tarihsel Gelişimi

Çevre eğitimin ortaya çıkmasında ve gelişmesinde iki önemli hareketin etkisi görülmektedir. Bu hareketler, çevre ve eğitim hareketleridir. Bu hareketlere paralel olarak çevre eğitiminin gelişmesine katkı sağlayan doğa çalışmaları, okul dışı eğitim ve koruma eğitimin ortaya çıkmıştır. Bu eğitim akımları çevre eğitiminin ilerlemesine çok büyük oranda katkı sağlamıştır (Marcinkowski, 2006).

Çevre eğitimin gelişmesine katkı sağlayan diğer akımlar ise, bu alanda yapılan ulusalararası konferanslar, çalıştaylar ve yayımlanan deklarasyonlardır. 1975 yılında Belgrad'ta yapılan Belgrad Çalıştayı ve 1977 yılında Tiflis'te yapılan Tiflis Hükümetlerarası Konferansı çevre eğitiminin gelişmesine en çok katkı sağlayan ve bu alanda gerçekleştirilen ilk etkinlikler arasındadır. Çevre eğitiminin amaçları, hedefleri ve ilkeleri ilk olarak bu etkinliklerde ortaya konulmuş ve bu amaç, hedef ve ilkeler farklı zamanlarda farklı ülkelerde gerçekleştirilen çevre eğitimi konferanslarında derinlemesine incelenmiştir.

Bu etkinliklerin çoğunda çevre eğitiminin iki temel amacı üzerinde durulmuştur. Bu amaçlar, bireylerin çevre okuryazarlık düzeylerinin ve çevreye yönelik sorumlu davranışlarının geliştirilmesi olarak özetlenebilir.

Çevre Okuryazarlığı ve Kavramsal Altyapısı

Çevre okuryazarlığı kavramı uzun bir süreden beri bir çok araştırmanın konusu olmasına rağmen, bu kavramın tam bir tanımı henüz yapılamamıştır (Disinger ve Roth, 1992). Bazı araştırmacılar bu kavramı bilişsel boyut ile ilişkilendirirken (Daudi, 1999), diğer bazı araştırmacılar ise bu kavramın sadece bilişsel boyut değil, duyuşsal ve psikomotor boyut ile de ilişkili olduğunu savunmaktadırlar (Roth, 1992; Schneider, 1997). Roth (1992) çevre okuryazarlığı kavramının bilişsel becerilerin üstünde bir kavram olduğunu ve sadece okuyabilme ve yazabilme becerisi ile ilişkili olmadığını belirtmektedir. Daha da ötesinde, Roth (1992) çevre okuryazarlığının dört temel boyutunun olduğu fikrini ortaya koymuştur. Bu boyutlar; bilgi, beceri, duyuş ve davranıştır.

Çevre eğitimi uzmanlarından oluşan Çevre Okuryazarlığı Değerlendirme Konsorsiyumu (Wilke, 1995), tarihsel tanımlar, çevre eğitimi ile ilgili tanımları, araştırma ve değerlendirme çalışmalarını dikkate alarak çevre okuryazarlığının alt boyutlarını belirlemişlerdir. Bu Konsorsiyum'a göre çevre eğitiminin alt boyutları şöyledir;

(1) Bilişsel Boyut – Bilgi ve beceri
(2) Duyuşsal Boyut
(3) Çevreye Yönelik Sorumlu Davranışın Yordayıcıları
(4) Çevreye Yönelik Sorumlu Davranışa Bireysel ve Kitlesel Katılım

Simmons (1995) bu boyutları derinlemesine incelemiş ve kendisi çevre okuryazarlığının temel çatısını oluşturan alt boyutları şu şekilde sıralamıştır;

(1) Duyuş
(2) Ekoloji Bilgisi
(3) Sosyo-Politik Bilgi
(4) Çevre Problemleri ve Sorunları Bilgisi
(5) Bilişsel Beceriler
(6) Çevreye Yönelik Sorumlu Davranışın Yordayıcıları

(7) Çevreye Yönelik Sorumlu Davranışlar

Çevreye Yönelik Sorumlu Davranışlar

Tiflis Hükümetlerarası Konferansında (UNESCO, 1978) belirlendiği üzere, çevreye yönelik sorumlu davranışlar gösteren bireyler yetiştirmek çevre eğitiminin temel amaçları arasında gösterilmektedir (Childress ve Wert, 1976; Culen, 2001; Hungerford ve diğerleri, 1980). Geleneksel anlayış ve alanda yapılan ilk araştırmalara bakıldığında bilgi, tutum/farkındalık ve davranış arasında doğrusal bir ilişkinin olduğu görülmektedir (Ramsey and Rickson, 1977). Ancak insan davranışlarının kompleks bir yapıda olması, davranışı etkileyen diğer değişkenler ile arasında olan ikişkinin doğrusal olamayacağını göstermektedir (Fishbein and Ajzen, 1995). Davranış üzerine yapılan araştırmalar da bu durumu destekler niteliktedir (Hines ve diğerleri, 1986/87).

Çevreye yönelik sorumlu davranışlar beş temel alt kategori altında gruplandırılabilir (Hsu, 1997; McBeth ve Volk, 1997). Bu kategoriler şöyledir;

1) Fiziksel Koruma Davranışı (Eco-Management): İnsanların çevre problemlerinin çözümlenmesi ve engellenmesine yönelik direkt olarak yaptıkları davranışlar;
2) Tüketici ve Ekonomi Davranışı (Consumer/Economic Action): İnsanların çevre problemlerinin çözümlenmesi ve engellenmesine yönelik parasal destek veya finansal baskı kullanarak yaptıkları davranışlar;
3) Bireysel ve Toplumsal İkna (Individual and Public Persuasion): İnsanların çevre problemlerinin çözümlenmesi ve engellenmesine yönelik uyarıda bulunma veya gösterdikleri ikna davranışları;
4) Politik Davranış (Political Action): İnsanların çevre problemlerinin çözümlenmesi ve engellenmesine yönelik kullandıkları politik uygulamalar; ve
5) Yasal Davranış (Legal Action): İnsanların çevre problemlerinin çözümlenmesi ve engellenmesine yönelik, bireylerin var olan yasaları desteklemesi veya yeni yasalar önermesine yönelik göstermiş oldukları davranışlar.

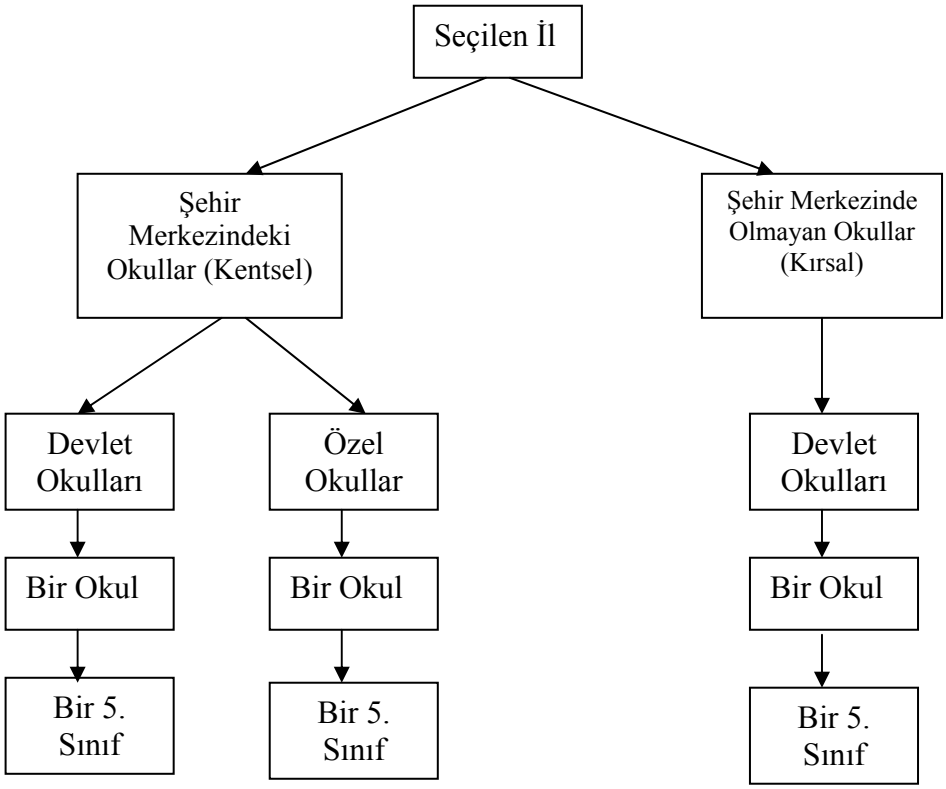
Çevreye yönelik sorumlu davranışlar üzerine yapılan meta-analiz çalışmaları (Dwyer ve diğerleri, 1993; Hines ve diğerleri, 1986/87; Hornik ve diğerleri, 1995; Osbaldiston, 2004), önerilen modeller (Sivek ve Hungerford, 1989/90; Hungerford ve Volk, 1990) ve diğer nitel ve nicel araştırmalar (Barr, 2007; Hsu, 1997) incelendiğinde, bu davranışları etkileyen faktörlerin dört grup altında toplanabileceğini göstermektedir. Bu kategoriler; 1) Kişilik faktörleri (örn: duyarlılık, kontrol odağı, tutum, sorumluluk), 2) Bilişsel faktörler (bilgi ve beceri), 3) Demografik faktörler (örn: yaş, cinsiyet, gelir, eğitim düzeyi) ve 4) Dış faktörler (örn: baskı grupları, dışsal etkiler).

YÖNTEM

Bu çalışma ulusal çaplı bir tarama (survey) çalışmasıdır. Araştırmacılar tarafından geliştirilen ve beş kısımdan oluşan veri toplama aracı, Türkiye'nin 26 ilinden belli kriterlere göre seçilen 78 ilköğretim okunda toplam 2412 beşinci sınıf öğrencisine uygulanmıştır.

Evren ve Örneklem

Bu çalışmanın evrenini Türkiye'de ilköğretim okullarının 5. sınıflarında okuyan tüm öğrenciler oluşturmaktadır. Zaman ve maddi kaynakların etkili kullanılması gerektiğinden evrenden onu temsil edeceği düşünülen sistematik bir örneklem seçilmiştir. Devlet Planlama Teşkilatı tarafından ekonomik gelişim düzeylerine göre belirlenen 26 bölge ve bu bölgelerin her birinden seçilen bir il ve bu illerin her birinden seçilen iki devlet ve bir özel okul ve bu okulların her birinden seçilen bir 5. sınıf çalışmanın örneklemini oluşturmuştur. Bu kriterlere dikkate alarak uygulamanın yapılacak olduğu 26 ilden belirlenen okullar Milli Eğitim Bakanlığı 2007 Devlet Kurumları listesi ve Milli Eğitim Bakanlığı 2007 Özel Kurumlar listesinden rastgele (seçkisiz yöntem) seçilerek belirlenmiştir. Bu örnekleme yaklaşımı ile yaklaşık olarak 2412 öğrenciye ulaşılmıştır. Her bir ilden seçilen öğrenciler şekil 1 de gösterilen kriterlere göre belirlenmiştir.



Şekil 1. Çalışmanın örneklemini oluşturan öğrencilerin seçim süreci

5. sınıf öğrencileri üç temel varsayımı dikkate alınarak seçilmiştir. Araştırmada kullanılacak veri toplama araçları geliştirme sürecinde ilköğretim 4. ve 5. sınıf programlarının kazanımları/hedefleri dikkate alındığından bu programların ulusal çaplı uygulanmaya başlanmış olması önem arz etmektedir. Dolayısı ile ilköğretim 6, 7 ve 8. sınıflarda ilköğretim programlarının uygulaması kademeli olarak yapıldığı ve uygulamanın yapıldığı sene itibari ile 8. sınıflarda pilot uygulama halen devam ettiği için 5. sınıflar daha uygun görülmüştür. Ayrıca Orta Öğretim Giriş Sınavı sürecinde ilköğretim ilk kademe öğrencileri daha bağımsız oldukları ve bu süreçte henüz yer almaya başlamadıkları varsayımı ile bu kademenin daha uygun olduğu düşünülmüştür. Diğer bir parametre ise bu öğrencilerin gelişim düzeyleridir. 5. sınıf öğrencilerinin gelişim düzeyleri açısından somut işlem döneminden soyut işlem dönemine geçtikleri varsayılmakta ve bu çalışma için uygun bir grup oluşturacakları düşünülmektedir.

Bu çalışmada ekonomik gelişmişlik düzeyinin önemli bir değişken olduğu varsayıldığından (Van Liere ve Dunlap, 1980), 7 coğrafik bölge yerine Devlet Planlama Teşkilatı tarafından ekonomik gelişmişlik düzeyine göre ayrılmış 26 alt bölge dikkate alınmıştır. Her bir alt bölgeden en üst düzeyde gelişmişlik gösteren il örneklem kapsamına alınmıştır. Bu seçim, her bir alt bölgenin temsil edilmesi amacını esas almıştır.

Veri Toplama Araçlarının Geliştirilmesi Süreci

Veri toplama araçlarının geliştirilmesi sürecinde, aşağıda detaylı olarak anlatılan altı temel basamak takip edilmiştir.

Basamak – 1; Kavramsal Çerçevenin Oluşturulması

Bu basamakta, dünyadaki profesyonel çevre eğitimi alan yazın (literatür) incelenmiş (örn: Stapp ve diğerleri, 1969; Harvey, 1977; Schmeider, 1977; Unesco, 1977, 1978; Hungerford, Peyton ve Wilke, 1980; Hart, 1981; Iozzi, 1981; Disinger, 1983; Iozzi, 1984; Hines, Hungerford ve Tomera, 1986/87; Hungerford & Volk, 1990; United Nations, 1992; Simmons, 1995; Marcinkowski ve Mrazek, 1996; Volk ve McBeth, 1997; NAAEE, 1999; Hart & Nolan, 1999; Rickinson, 2001) ve anketin muhtemel boyutları ve ankette yer alacak olan muhtemel değişkenler belirlenmiştir.

Basamak – 2; Türkiye'de İlköğretim Düzeyinde Yapılan Çalışmaların Analizi

Türkiye'de ilköğretim düzeyinde 1997 ile 2007 yılları arasında yapılan çevre eğitimine yönelik araştırma çalışmaları tespit edilen belirli kriterlere göre toplanmıştır. Elde edilen 53 araştırma çalışması birinci basamakta belirlenen boyutlara göre analiz edilmiştir. Bu çalışmalarda kullanılan veri toplama araçları madde havuzunun oluşturulmasında önemli bir yer oluşturmuştur.

Basamak – 3; Yeni İlköğretim Programlarında Yer Alan Kazanımların Analizi

Yeni geliştirilen 4. ve 5. Sınıf Fen ve Teknoloji Dersi Öğretim programı, 4. ve 5. Sınıf Sosyal Bilgiler Öğretim programı ve Disipilinlerarası Derslerin Kazınımları ilk

basamakta oluşturulan boyutları ile ilişkilendirilmiş ve bu boyutlara göre analiz edilmiştir. Bunun için çevre okuryazarlığının 6 boyutu ve bu boyutlar ile ilişkili toplam 41 alt boyut oluşturulmuştur. Kazanımların analizi bu 41 alt boyut dikkate alınarak gerçekleştirilmiştir.

Basamak – 4; Madde Havuzunun Oluşturulması ve Anketin Geliştirilmesi

Madde havuzu, analiz edilen 53 araştırma çalışmasında kullanılan anket ve/veya ölçek maddeleri ve öğrenciler ile gerçekleştirilen açık uçlu anket uygulaması sonucunda elde edilen davranış maddeleri dikkate alınarak oluşturulmuştur. Öğretim programındaki kazanımların ağırlıklarına göre maddeler havuzdan alınmış (çekilmiş) ve anket oluşturulmuştur. Bilgi ve duyuşsal alanlar ile ilgili maddeler gerekli görüldüğü yerlerde araştırmacı tarafından yazılmış ve gerekli yerlerde ise madde havuzundan çekilerek kullanılmıştır. Ancak davranış ve beceri boyutuna yönelik yeterince madde bulunamamıştır. Beceri boyutu için sorular araştırmacı tarafından hazırlanmıştır. Davranış ölçeğinin oluşturulması için Denizli, Ankara ve İstanbul'da devlet ve özel okulda okuyan toplam 229 dördüncü ve beşinci sınıf öğrencisine dört tane açık uçlu soru sorulmuştur. Öğrencilerden gelen cevaplar, sıklık (frekans) hesabına göre analiz edilmiş ve en çok tekrar edilen cevaplar davranış maddelerini oluşturmuştur.

Basamak – 5; Uzman Görüşünün Alınması

5 farklı kısımdan oluşan anketin dış geçerliliğinin (kapsam ve yüzey geçerlilikleri) belirlenmesi için çevre eğitimi, fen eğitimi, sosyal bilgiler eğitimi, dil eğitimi ve ölçme değerlendirme alanlarında çalışan toplam 17 uzmanın (akademisyenler, ilköğretim öğretmenleri ve STK çalışanları) isimleri belirlenmiştir. Bu kişiler çalışmaya davet edilmiş ve hazırlanan veri toplama aracını kendileri için hazırlanan anketin boyutlarına göre analiz etmeleri istenmiştir. Uzmanlardan gelen yanıtlara göre ankette bazı cümlelerin yapısı değiştirilmiş ve bazı maddeler ise veri toplama aracından çıkarılmıştır. Ayrıca anket 4. ve 5. sınıflar için okuma kitapları yazan Türkçe uzmanı bir akademisyen tarafından da incelenmiş ve öğrenciler tarafından anlaşılması güç olabileceği düşünülen terimler basitleştirilmiştir.

Basamak – 6; Pilot Uygulama

Bu beş basamak sonrasında hazırlanan *İlköğretim Çevre Okur-Yazarlığı Anketi (İÇOYA)'*nin denenmesi için MEB-EARGED'den izin alınmış ve anket 1 özel okul ve 8 devlet okulu olmak üzere toplam 9 ilköğretim okulunda 673 dördüncü ve beşinci sınıf öğrencisine uygulanmıştır. Daha sonra, pilot uygulaması yapılan anketin alt kısımlarının güvenirlik katsayıları tespit edilmişr, faktör yapıları incelenmiş ve madde analizleri gerçekleştirilmiştir. Ayrıca, aracın son kısmında yer alan beceri testi yeniden düzenlenmiş ve 98 beşinci sınıf öğrencisine pilot uygulama çerçevesinde yeniden uygulanmıştır.

Veri Toplama Araçları

Veri toplama aracı olarak araştırmacılar tarafından beşinci sınıflar için hazırlanan *İlköğretim Çevre Okur-Yazarlığı Anketi (İÇOYA)* kullanılmıştır. Anket genel olarak beş temel bölümden oluşmaktadır. Bu kısımlar aşağıda detaylı bir şekilde anlatılmaktadır.

Bölüm 1- Kişisel bilgi formu

Bu bölüm, öğrenciler ile ilgili sosyo demografik ve diğer kişisel bilgileri belirlemeye yönelik hazırlanmıştır. Bu kısımda toplam 11 soru yer almaktadır. Cinsiyet, okul türü, anaokuluna gidip gitmeme, anne ve babanın eğitim düzeyi, ailenin toplam gelir düzeyi ve yaşanılan yer değişkenlerine ek olarak öğrencilere çevre ile ilgili bilgileri ne kadar merak ettikleri, çevre ile ilgili bilgileri hangi kaynaklardan elde ettikleri, doğal alanlara hangi sıklıkla gittikleri ve ailelerinin çevre sorunlarına yönelik duyarlılık gösterip göstermedikleri bu kısımda sorulan sorulardır.

Bölüm 2 – Çevre Bilgisi Testi

Bu kısımdaki sorular çevre okuryazarlığının çevre bilgisi boyutu ile ilişkili üç alt boyutu dikkate alınarak hazırlamıştır. Bu alt boyutlar şöyledir; (1) Ekoloji ve Doğa Tarihi Bilgisi, (2) Çevre Problemi ve Sorunları ile İlgili Bilgi ve (3) Çevre ile ilgili

Sosyo-Politik-Ekonomik Bilgi. Çevre Bilgisi Testinde 19 çoktan seçmeli ve 3 doğru yanlış sorusu olmak üzere toplam 22 soru yer almaktadır.

Kısım 3 – Çevreye Yönelik Duyuşsal Eğilimler Ölçeği

Bu ölçek 5. sınıf ilköğretim öğrencilerinin çevre ile ilgili hislerini (duyuşsal eğilimlerini) belirlemek için hazırlanmıştır. Bu kısımda 4'lü skaladan (kesinlikle katılmıyorum, katılmıyorum, katılıyorum ve kesinlikle katılıyorum) oluşan toplam 20 madde yer almaktadır. Bu anket ile öğrencilerin çevreye yönelik geliştirdikleri değerler, çevre duyarlılıkları, çevreye yönelik tutumları, kontrol odakları, çevreye yönelik sorumlulukları ve çevre korumaya gönüllü katılmayı isteyip istemedikleri (niyet) ölçülmeye çalışılmıştır.

Kısım 4 – Çevreye Yönelik Sorumlu Davranış Ölçeği

Bu ölçek 4 alt kısım ve yedili likertten (hiç, bir, iki, üç, dört, beş ve beşten fazla) oluşan toplam 28 davranış sözcüğünden oluşmaktadır. Fiziksel Koruma Davranışı alt kısmında 10 madde, Tüketim ve Ekonomi Davranışı alt kısmında 6 madde, Kişisel ve Genel İkna Davranışı alt kısmında 6 madde ve Politik Davranış alt kısmında 6 madde yer almaktadır. Öğrencilerden bu kısımlarda yer alan her bir davranışı son bir yıl içerisinde kaç kez yaptıkları (tekrarladıkları) sorulmuştur.

Kısım 5 – Problem Belirleme ve Problem Çözme Becerileri Testi

Bu kısımda yer alan iki soru verilen bir çevre problemi ile ilgili öğrencilerin problem belirleme ve bu problemi değerlendirme (çözme) becerilerini ölçmek için hazırlanmıştır. Ayrıca bu test, öğrencilerin bir çevre sorununun çözümü ile ilgili takip edecekleri bilimsel süreç becerilerini ve çözüme yönelik gösterecekleri davranışları da belirlemeyi amaçlamaktadır. Bu testte bir durum verilmiş ve bu durum ile ilgili olarak öğrencilere iki soru sorulmuştur. Bu alanda yer alan bilimsel süreç becerileri şöyledir; problemi tanımlama, gözlem yapma, veri toplama, deney düzeneği hazırlama ve deney yapma, verileri kaydetme, yorumlama ve sunma.

Veri Toplama Araçlarının Geçerlik ve Güvenirlik Çalışması

Çalışmada kullanılan veri toplama aracı 673 dördüncü (n = 322) ve beşinci (n = 351) sınıf öğrencisine pilot uygulama çerçevesinde uygulanmış ve elde edilen veriler SPSS paket programına girilmiştir. *Çevre Bilgisi Testi*'nde yer alan 19 çoktan seçmeli sorudan elde edilen verilerin güvenirliği KR21 (Kudher Richardson) formülü yardımı ile hesaplanmıştır. Bu analize göre Çevre Bilgisi Testi'nin geçerliği .69 olarak bulunmuştur. Beceri Testinde yer alan eşleştirme sorusu için KR21 kullanılmış ve bu testing güvenirliği .59 olarak bulunmuştur. *Çevreye Yönelik Duyuşsal Eğilimler Ölçeği*'nden elde edilen veriler SPSS güvenirlik analizine tabi tutulmuş ve Cronbach's alpha güvenirlik katsayısı .88 olarak bulunmuştur. Çevreye Yönelik Sorumlu Davranış Ölçeği'nin literatür ve 229 öğrenciden elde edilen veriler ışığında 4 temel alt-boyuttan oluştuğu gözlemlenmiştir. Bu alt boyutlardan elde edilen verilerin güvenirliği SPSS güvenirlik analizi kullanılarak hesaplanmıştır. *Fiziksel Koruma Davranışı* alt boyutunun güvenirliği .80, *Tüketim ve Ekonomi Davranışı* alt boyutunun güvenirliği .60, *Kişisel ve Genel İkna Davranışı* alt boyutunun güvenirliği .79 ve *Politik Davranış* alt boyutunun güvenirliği .91 olarak bulunmuştur.

Veri toplama aracının geçerlik çalışması 17 uzman (akademisyenler, ilköğretim öğretmenleri ve STK çalışanları) ile birlikte yapılmıştır. Uzmanlara veri toplama aracının kapsam ve yüzey olarak örneklem grubuna uygunluğu sorulmuştur. Uzmanlar için hazırlanan ankette, bunlara ek olarak anketteki maddelerin cinsiyet ayrımcılığına, kültürel ve etnik ayrımcılığa neden olacak herhangi bir maddednin olup olmadığı ve uygulamanın nasıl olması gerekliliği gibi sorular sorulmuştur. Uzmanlar ayrımcılığa neden olabilecek herhangi bir maddenin bulunmadığını belirtmişlerdir. Bazı uzmanlar anketin tek oturumda bazı uzmanlar ise anketin iki oturumda uygulanmasının uygun olacağını söylemişlerdir. Pilot uygulama anketin tek oturumda ve 45 dakika içinde etkin bir şekilde doldurulduğunu göstermiştir. Ayrıca anket bir Türkçe uzmanı ve ölçme-değerlendirme uzmanı tarafından da incelenmiştir.

BULGULAR

Araştırma sorularına yönelik veri analizini gerçekleştirmeden önce, kayıp veri ve uç noktaların tespiti için veriler üzerinde betimsel analiz uygulanmıştır. %10 dan az kayıp veri içeren değişkenler için ortalama ile yer değiştirme (replace with mean) yöntemi kullanılmıştır (Hair ve diğerleri, 2006). Diğer yandan uç noktaların tespiti için veriler standardize edilmiş ve [-4, +4] aralığı dışında kalan kişiler uç nokta olarak kabul edilmiş (Hair ve diğerleri, 2006) ve ileri anlizler için dikkate alınmamıştır. Bu durumda olan 2 kişi veri setinden çıkarılmıştır. İleri analizler, 2410 kişiden elde edilen veriler ile gerçekleştirilmiştir.

Öğrencilerin %56'sı çevre il ilgili bilgiler konusunda merak duymasına karşın, bu öğrencilerin ancak %17.2'si boş zamanlarında sık sık doğa ile ilgili etkinliklere (örn: piknik, kamp ve balık tutma) katılmaktadır. Öğrenciler çevre ile ilgili bilgileri okul, aile fertleri, internet, televizyon, kitap, gazete, dergi ve ansiklopedilerden elde etmektedirler. Ayrıca, öğrencilerin %75'inden çoğu kendi aile fertlerinden herhangi birinin (%59.4 – anne, %51.8 – baba, ve %29 – kardeşler) çevre problemleri konusunda kaygı duyduğunu ve üzüldüğünü ifade etmiştir.

Öğrencilerin Çevre Bilgisi Testi'ne verdikleri yanıtlar dikkate alındığında, öğrencilerin %75'inden fazlasının 22 sorudan 11'ini doğru olarak yanıtladıkları, %50 ile %75'inin 8 soruyu doğru olarak yanıtladıkları görülmektedir. Sadece 14 öğrenci ise tüm soruları doğru olarak yanıtlamıştır. Öğrencilerin Çevreye Yönelik Duyuşsal Eğilimler Ölçeğine verdikleri yanıtlar incelendiğinde, öğrencilerin çevre davranışı gösterme konusundaki istek düzeylerinin (M = 17.09, SD = 3.39, Ranj = 5-20), çevreye yönelik tutumlarının (M = 18.04, SD = 3.54, Ranj=5-20) ve çevre duyarlılık düzeylerinin (M = 12.68, SD = 2.63, Ranj = 4-16) oldukça yüksek olduğu görülmektedir. Diğer yandan öğrencilerin çevreye yönelik sorumlu davranışlarını ölçen maddeler incelendiğinde, öğrencilerin %50'sinden fazlasının çevre problemlerin önlenmesi için hiç bir politik davranış göstermedikleri görülmektedir. Diğer yandan öğrenciler son bir yıl içinde çevre problemlerinin önlenmesi ve

engellenmesine yönelik olarak, yüksek düzeyde fiziksel koruma davranışı (*M* = 26.51, *SD* = 6.98, Ranj = 0-36), orta düzeyde tüketici ve ekonomi davranışı (*M* = 21.44, *SD* = 6.91, Ranj = 0-30), ve düşük düzeyde bireysel ve toplumsal ikna davranışı göstermişlerdir (*M* = 22.14, *SD* = 11.77, Ranj = 0-48). Öğrencilerden sadece 120'si kendilerine verilen bir çevre probleminin ortaya çıkarılmasına yönelik süreçleri doğru olarak sıralamıştır. 2019 öğrenci ise kendilerine verilen çevre probleminin çözümüne yönelik en az bir çözüm önerisi belirtmiştir. Öğrencilerin çözüm önerileri üç davranış kategorisi altında gruplandırılmıştır; fiziksel koruma davranışı, ikna davranışı ve politik davranış.

Öğrencilerin her bir boyuttan aldıkları puanlarların temel bir çarpan ile çarpıldıktan sonra elde edilen puanların toplanması sonucunda öğrencilerin çevre okuryazarlık puanları elde edilmiştir. Betimsel analiz sonucunda, öğrencilerin orta düzeyde çevre okuryazarlığı gösterdiği belirlenmiştir (*M* = 149, *SD* = 26.19, Ranj = 15-240). Öğrencilerin %64.1'i orta düzey çevre okuryazarlığına sahipken sadece 22 öğrenci düşük düzeyde çevre okuryazarlığa sahiptir.

5. sınıf öğrencilerin çevreye yönelik sorumlu davranışlarını etkileyen faktörler ve etki değerleri söyledir; okul türü (kısmi η^2=.007), okul öncesi eğitimi alma (kısmi η^2=.002), anne eğitim düzeyi (kısmi η^2=.007), baba eğitim düzeyi (kısmi η^2=.012), ikamet (kısmi η^2=.008), doğa deneyimi (kısmi η^2=.046), çevre bilgisine yönelik merak (kısmi η^2=.048), annenin çevre kaygısı (kısmi η^2=.023), babanın çevre kaygısı (kısmi η^2=.031) ve kardeşlerin çevre kaygısı (kısmi η^2=.014). Ancak, cinsiyetin ve ailenin gelir düzeyinin öğrencilerin çevreye yönelik sorumlu davranışları üzerinde herhangi bir etkisi yoktur. Diğer yandan, çevre bilgisi, çevre koruma davranışlarına katılmada gönüllük, bilişsel beceriler, çevreye yönelik tutum ve çevre duyarlılığı değişkenlerinin tümü birden çevreye yönelik sorumlu davranışlar değişkenindeki varyansın %12'sini açıklamaktadır.

TARTIŞMA

Çevre okuryazarlığı ile ilgili alan yazın incelendiğinde, ülke genelinde yapılan üç çalışma ile karşılaşılmaktadır. Bu araştırmalar 3, 7 ve 10 sınıf öğrenciler ile Güney Kore'de (Shin ve diğerleri, 2005), 6 ve 12. sınıf öğrenciler ile Israil'de (Negev ve diğerleri, 2006) ve 6 ve 8. sınıf öğrenciler ile Amerika'da (McBeth ve diğerleri, 2008) gerçekleştirilmiştir. Buradaki araştırma, bu araştırmaların dördüncüsü niteliğindedir. Tüm bu ülke geneli çevre okuryazarlığı değerlendirme çalışmalarında benzer boyutlar kullanılmış ve Simmons (2005)'in çevre okuryazarlığı boyutları dikkate alınmıştır. Yapılan istatistiksel analizler, Kore, Israil ve Amerika'da gerçekleştirilen araştırmaların sonuçları ile buradaki bulguların büyük oranda paralellik gösterdiğini ortaya koymaktadır. 5. sınıf Türk öğrenciler orta düzeyde çevre okuryazarlık düzeyine sahiptirler. Bu bulguya paralel olarak, 2008 yılında 6. ve 8. sınıf Amerikan öğrencileri ile yapılan araştırmada da bu öğrencilerin çevre okuryazarlık düzeyi orta düzeyde bulunmuştur. Ancak Kore ve Israil'de yapılan araştırmalarda çevre okuryazarlık puanları hesaplanmamış, sadece öğrencilerin her bir alt boyuttan aldıkları puanlar rapor edilmiştir.

Buradaki araştırma sonucunda elde edilen 5. sınıf öğrencilerin yüksek düzeydeki bilgi düzeyleri, Türk öğrenciler ile yapılan diğer bir çok araştırma bulguları (Alkış, 2006; Armağan, 2006; Bacanak ve diğerleri, 2004; Balcı ve diğerleri, 2006; Bozkurt ve Aydoğdu, 2004; Gökdere, 2005) ile örtüşmemektedir. Bu araştırmanın geniş bir kalıtımcı ile gerçekleştirilmesi, veri toplama aracında yer alan madde ve soruların 4. ve 5. sınıf öğretim programları dikkate alınarak hazırlanması (belirtke tablosu) ve öğrencilerin çevre ile ilgili temel bilgilerinin ölçülmesi bu farkın nedenleri arasında olabilir. Öğrenciler çevre ile ilgili bilgilerini okul, medya ve kendi ailelerinden elde ettiklerini belirtmişlerdir. Çevre eğitimi alan yazın incelendiğinde bu buyguyu destekleyen bir çok araştırma (Chan, 1996; Huang ve Yore, 2003; Kaya ve Turan, 2005) bulmak mümkündür. Öğrencilerin yarısından çoğu çevre ile ilgili konularda bilgi edinme konusunda duyduklarını ve boş zamanlarında doğal ortamlarda vakit geçirdiklerini belirtmişlerdir. Öğrencilerin bilgi düzeylerinin yüksek olması, onların

yüksek merak duygularının olması ve doğal ortamlarda bulunmaları ile de açılanabilir.

Öğrencilerin yüksek düzeyde çevreye yönelik duyuşsal eğilim ve ilgi göstermeleri, kendilerini doğanın bir parçası olarak görmeleri (Bonnett ve Williams, 1988) ve doğaya yönelik güçlü bir empatiye sahip olmaları ile açıklanabilir. Alan yazında yer alan bir çok araştırma (Alp, 2005; Erdoğan & Erentay, 2007; Tuncer ve diğerleri, 2004; Yılmaz ve diğerleri, 2004) öğrencilerin çevreye yönelik yüksek düzeyde duyusşal eğilim gösterdiğini ortaya koymaktadır. Diğer yanda öğrencilerin çevre problemlerinin belirlenmesi ve çözüm üretilmesi konusundaki beceri düzeyleri ile çevreye yönelik sorumlu davranış düzeyleri orta düzeyde bulunmuştur. Öğrencilerin zamanlarının büyük bir kısmını okulda geçirdikleri varsayılırsa, öğrencilerin beceri ve davranışlarının orta düzeyde hatta düşük düzeye yakın olması, okullarda beceri ve davranış geliştirmeye yönelik verilen öğretimin ve okul içi/okul dışı etkinliklerin beceri ve davranış geliştirmekten çok çevre ile ilgili temel bilgilerin verilmesi şeklinde açıklanabilir. Buna ek olarak, yapılan diğer araştırmalar, beceri ile ilgili öğretimin yetersiz olmasının nedenlerini sınıfların kalabalık olması, ekipman yetersizliği, zaman sınırlaması (Ercan, 1996) ve öğretmenlerin beceri öğretimi ile ilgili yeterli düzeyde bilgilerinin olmaması (Kırıkkale ve Tanrıverdi, 2006) gibi nedenler ile açıklamaktadırlar.

Okul türü öğrencilerin çevreye yönelik sorumlu davranışlarını etkileyen faktörlerden bir tanesidir. Özel okuldaki öğrencilerin soumlu davranışlarının devet okullarındaki öğrencilerden daha yüksek olması, özel okulların finansal ve alt yapı bakımından kendi öğrencilerine daha çok imkanlar sunması ve bu okullardaki etkinliklerin ve öğretimin niteliği ve uygulanan öğretim programından (Kuhlemeier ve dierleri, 1999) kaynaklanabilir. Ayrıca okul öncesi eğitimi alan öğrencilerin sorumlu davranışları okul öncesi eğitimi almayan öğrencilerden daha yüksek bulunmuştur. Okul öncesi öğretim programlarında yer alan çevre ile ilgili konular ve etkinlikler bu konuda öğrencilere sorumlu davarnışlar kazandırmış olabilir. Anne ve babanın eğitim düzeyleri kendi çocuklarının çevreye yönelik sorumlu davranışlar gösterme

konusunda katkı sağlamaktadır. Bu durum eğitim düzeyi yüksek ailelerin çevre ile bilgi, deneyim ve davranışlarını kendi çocukları ile daha çok paylaştığı ile açıklanabilir. Buna paralel olarak, anne, baba ve kardeşlerin çevre problemleri konusundaki endişe duymaları, öğrencileri de etkilemekte ve aileleri çevre konusunda endişe duyan öğrencilerin çevreye yönelik sorumlu davranışlarının daha yüksek olduğu görülmektedir. Diğer yandan çevre ile ilgili merak duyan ve boş zamanlarını doğal ortamlarda geçiren öğrenciler çevreye yönelik daha yüksek oranda sorumlu davranışlar göstermektedirler. Erdoğan ve Mısırlı (2007) öğrencilerin merak duygularının ve doğa ile ilgili etkinliklere katılmalarının bu öğrencilerin sorumluluk duygularını geliştirdiğini ve sorumlu davranışlar göstermeya daha yatkın olduğunu belirtmiştir. Ayrıca, Matthews and Riley (1995) çevreye yönelik sorumluluk duygusunun ancak doğal ortamlardaki etkinliklere katılarak gerçekleşebileceğini belirtmektedir.

Öğrencilerin çevreye yönelik sorumlu davranışlar ile bilişsel becerileri ve çevreye yönelik tutumları arasında anlamlı, fakat negatif bir ilişki bulunmuştur. Öğrencilerin çevreye yönelik tutumlarının yüksek, ancak çevreye yönelik sorumlu davranışlarının orta düzeyde olması, bu ilişkinin negatif çıkmasının bir nedeni olabilir. Diğer bir neden öğrencilerin davranışlarının arkasındaki engeller olabilir. Örneğin, geri dönüşüm kutusunun ulaşılabilir olmamasından dolayı, öğrencilerin geri dönüşümün önemine inanmasına rağmen geri-dönüşüm davranışı göstermemeleridir. Ayrıca, öğrencilerin kendinelerine model olarak aldıkları öğretmenler, anne-baba ve akranların çevreye yönelik sorumlu davranışlar göstermiyor olması da öğrencilerin davranışlarını etkileyebilir. Tüm bunlara ek olarak öğrencilerin veri toplama aracında yer alan maddeleri, tam olarak kendilerini yansıtmayıp, sosyal eğilim doğrultusunda cevap vermiş olmaları bu negatif ilişkinin bir nedeni olabilir. Ayrıca davranış-tutum ve davranış-beceri arasındaki negatif ilişknin bir nedeni de tutum ve beceri maddelerinin davranış belirlemeye yönelik olmamasıdır. Beceri testinde sadece bir soruda (açık-uçlu soru) öğrencilerin problem çözümüne yönelik görüşleri alınmıştır.

ÖNERİLER

Bu araştırmanın, gerek eğitim politika ve uygulamalarına yönelik, gerekse ilderide bu alanda yapılacak araştırmalara yönelik bir çok çıkarımı vardır. Bu araştırmada elde edilen bulgular ışığında ortaya konulan önerilerden bazıları aşığıdaki gibidir;

Politika ve Uygulamalar ile ilgili;

1) Eğitim ve öğretim planlanırken bireysel farklılıklar dikkate alınmalıdır.
2) Özel okullardaki öğretmenler kullandıkları okul içi ve dışı etkinlikleri devlet okullarındaki öğretmenler ile paylaşmalıdır.
3) Aileler, çocuklarının okul öncesi eğitimi almaları konusunda teşvik edilmelidir.
4) Finansal alt yapı konusunda sıkıntı yaşayan okullar, kendi okul bahçelerinde prototip bir ekolojik alan oluşturabilirler.
5) Devlet okullarında maliyeti az olan çevre ile ilgili okul içi ve dışı etkimlikler gerçekleştirilebilir.
6) Okul koridorları çevre ile ilgili bilgilerin öğrencilerin tümüne ulaştırılması için bir araç olarak kullanılabilir (örn: poster asmak).
7) Çevre okuryazarı ve çevreye yönelik sorumlu davranış gösteren öğrenciler yetiştirmek okul misyon ve vizyon çalışmalarına eklenmelidir.
8) Çevre ile ilgili okul içi ve dışı etkinliklerin sayısı ve niteliği arttırılmalıdır.
9) Öğrencilerin derse ve çevre etkinliklerine yönelik ilgi ve merakının arttırılması için ilginç ve çarpıcı örnekler planlanmalı ve uygulanmalıdır.
10) Hizmet öncesi ve hizmet sonrası eğitimlerde çevre ile ilgili konulara daha çok yer verilmelidir. Örneğin, çevre eğitimi ile ilgili bir dersin hizmet öncesi öğretim programlarına eklenmesi gibi.
11) Çevre ile ilgili bilgilere medyada (yazılı ve görsel medya) daha çok yer verilmelidir.
12) Ailelerin çevre ile ilgili planlanacak yetişkin eğitim ve sürekli eğitim programlarına katılmaları teşvik edilmelidir.

13) Aileler çocuklarını boş zamanlarında (hafta sonu..vb.) doğal alanlara götürmeleri için teşvik edilmelidir.

İleride yapılacak araştırma çalışmaları ile ilgili;

14) 5 sınıflar ile gerçekleştirilen bu araştırma, ilköğretim ikinci kademesi, ortaöğretim kademesi ve yüksek öğrenim kademesinde yer alan diğer öğrenciler için de planlanmalıdır.
15) Bu araştırma için kullanılan çevre okuryazarlığı alt boyutları Türk kültür ve bağlamına göre yeniden revize edilmelidir.
16) Öğrencilerin çevreye yönelik davranışlarını açıklaması muhtemel faktörlerin (örn: kültürel, sosyal, sosyo-demografik) dikkate alınacağı bir araştırma planlanmalıdır.
17) Öğrencilerin vermiş oldukları yanıtların nedenlerini araştıran bir nitel araştırma planlanmalıdır.

APPENDIX J

CURRICULUM VITAE

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EDUCATION

Degree	Institution	Year of Graduation
PhD on MS	Middle East Technical University, Educational Sciences	2009
BS	Dokuz Eylul University, Science Education	2001
High School	Ödemiş High School	1997

WORK EXPERIENCE

Year	Place	Enrollment
2002 - 2009	METU, Department of Educational Sciences	Research Assistant
2006 - 2007	Florida Institude of Technology, Department of Science and Math. Education, U.S.	Visiting Scholar

SELECTED PUBLICATIONS

Erdoğan, M., & Ok, A. (2008). Environmental literacy assessment of Turkish children: The effects of background variables. In I. H. Mirici, M.M. Arslan, B.A. Ataç, and I. Kovalcikova (Eds.) *Creating a Global Culture of Peace: Strategies for Curriculum Development and Implementation, Vol.1* (pp. 214-227). Antalya: Anıttepe Publishing.

Erdoğan, M., Erentay, N., Barss, M., & Nechita, A. (2008). Students' awareness of endangered species and threatened environments: A comparative case-study. *International Journal of Hands-on Science, 1*(2), 46-53.

Erdoğan, M., Usak, M., & Aydin, H. (2008). Investigating prospective teachers' satisfaction with social services and facilities in Turkish universities. *Journal of Baltic Science Education, 7*(1), 17-26.

Aypay, A., Erdoğan, M., & Sözer, M.A. (2007). The variation among schools on classroom practices in science based on TIMSS-1999 in Turkey. *Journal of Research in Science Teaching, 44*(10), 1417-1435.

Erdoğan, M. (2007). Yeni geliştirilen dördüncü ve beşinci sınıf fen ve teknoloji dersi öğretim programının analizi: Nitel bir çalışma. *Gazi Universitesi, Türk Eğitim Bilimleri Dergisi, 5*(1), 221-259.

Erdoğan, M., & Mısırlı, A. (2007). Graduate students' perspectives on the human-environment relationship. *Journal of Turkish Science Education, 4*(2), 21-30.

Erdoğan, M., & Ok, A. (2006). *The roles of environmental non-governmental organization in Adult Education: Turkish case.* In Nikos P. Terzis (Ed.), *Lifelong Learning in the Balkans: Vol. 6.* (pp. 323-335). Greece: Publishing House Kyriakidis Brothers s.a.