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A Review of Research on Environmental Education in Non-traditional Settings in Turkey, 2000 and 2011

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The purpose of the present study was to collect and analyze the research on environmental education in non-traditional settings in Turkey undertaken with various subjects (e.g. students, graduates and teachers) and published over the years of 2000-2011. For systematic analysis, selected data-bases and journals were scrutinized across five pre-determined criteria. The close examination resulted in 11 studies reporting the effects of the interventions (e.g. hands-on practices, field trip activities) and 4 studies reporting participants' views on the effects of the interventions in general. Field trips, ecology-based nature education programs, nature camps and science education instruction in non-traditional settings were used as educational intervention in the selected studies. Later, these studies were subjected to content analysis to present the trends and to synthesize the common findings of the selected studies. The techniques and instructions used as the intervention in these selected studies were observed to contribute to development of participants' gains associated with knowledge of the environment and nature, perception of nature, environmental affect, responsible environment behaviors and conception and understanding of science.

Keywords: environmental education, non-traditional setting, intervention, content analysis, Turkey

Introduction

People are getting more away from the nature and the environment, and they are mostly learning the nature from the television, documentaries and other types of media (Palmer, 1998) rather than direct observation. Research in the field of Environmental Education (EE) points out that teaching and learning outside the classroom as a part of extracurricular activities or of non-formal educational activities provides opportunities to develop environmental awareness (Erdoğan & Uşak, 2009), environmental consciousness (Yerkes & Haras, 1997; Erdoğan & Mısırlı, 2007) and environmental responsibility (Matthews & Riley, 1995) which all in turn increase in environmental attitudes and motivation to take responsible environmental behaviors (Dresner & Gill, 1994). Several research studies discussed outdoor setting as a better learning environment and effective way for learning (Bogner, 1998; Palmerg & Kuru, 1998; Smeds, Jeronen, Kurppa & Vierraankivi, 2011). In the nationwide study undertaken by Erdoğan (2009), it was found that students' responsible environmental behavior increase as a function of frequency in participating in outdoor settings; e.g. natural areas. Furthermore, recent studies (e.g. Bogner, 2010; Erdoğan, 2011; Erdoğan & Erentay, 2007) indicates that taking the learners outdoors and naturel areas help understand the man-environment relationship and mutual interaction though direct and first hand experiences (e.g. observation) which are important for shaping personal opinions, values and attitudes (Palmerg & Kuru, 2000). Direct nature experiences are well known to develop individuals' environmental awareness and foster related attitudes (Bogner, 2010). In this regard, natu-

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ral areas can be utilized an effective tool and outdoor laboratory to undertake hands-on activities (Erentay & Erdoğan, 2009) which involve the learners in first-hand experiences and observation the man- environment relationship. Hands-on activities do not always require laboratory equipment, rather easy-to-use items, simple set-ups, easily accessible or low-cost materials can be used in these activities. Practical work through science and nature experiences basically support students' hands-on and minds-on engagement in learning process as well as develop scientific knowledge, range of skills and conceptual understanding. People can engage in hands-on experiences in several ways through nature education, ecology-based education, outdoor education, recreational education, conservation education and so on. Even if each of these educations has its own trends and aims, in many of previous studies they are used interchangeable, e.g., outdoor education is perceived as an education undertaken out of border of the class and used as an synonym of nature education, conservation education, experiential education and adventure education (Ford, 1986; Powers, 2004; Schmitt, 2005). In the present study, the term "*environmental education in non-traditional settings*", in broader perspective, is preferred to address outdoor education and ecology-based nature education which refers to education *in*, *for* and *about* the nature. This study is one of the initial attempts to present the trend of the research studies pn EE in non-traditional settings involving various levels of subjects (e.g. students, graduates, teachers).

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, 2010).

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). On the other hand, even though topics associated with the environment have been integrated into the school curricula since the establishment of Turkey in 1923, EE studies in Turkey has recently received greater attention mostly in non-traditional settings. In addition to individual attempts to undertake research on EE in non-formal settings (e.g. Erdoğan & Erentay, 2007; Özdemir, 2007; Özdemir & Uzun, 2006), TUBITAK, one of the biggest national science organizations in Turkey, has encouraged and funded the researchers to carry out practical-based and hands-on science activities, and environmental education in non-formal (so called, out of school) settings through ecology based nature education since 1999 (www.tubitak.gov.tr).

Recent Nature Education Programs

TUBITAK funded about 100 projects in 2011 and about 50 projects in 2010 addressing to naturel sciences and science education. Hands-on practices and field trip activities were the focus of these projects. Due to space limitation, only four of these projects are briefly introduced.

Antalya Doğa Bilimleri Okulu 2011(Antalya Naturel Sciences School 2011): This project has been undertaken in Antalya with 4^{th} to 8^{th} grade students living in Orphanage. The projects constitutes seven sub-divisions to develop an awareness that nature is a base of many disciplines and related with

several disciplines; fauna, flora, waste management, science and water monitoring, nature sport, music and psychology (www.dogabilimleriokulu.com).

Çanakkale ve Yakın Çevresinde Ekoloji 2011(Enology in and nearby Çanakkale 2011): This project has been undertaken in Çanakkale with youth, teachers and public officials in rural areas. This project aims at introducing geological, historical, agrological and biological richness of Çanakkale and also to analyze human-related reasons destroying the nature (www.canakkaleekoloji.net).

Doğayı ve Çevreyi Koruma Karakteri Geliştirme Okulu (School for Developing Nature and Environment Protection Character): This project has been undertaken in Isparta with 6^{th} to 13^{th} grade students, their teacher and parents. This project aims to develop environmentally conscious and responsible individuals who demonstrate willingness and develop character to take responsible action for protecting the environment (www.cevrecicocuk.org).

Trabzon'da Doğa Eğitimi (Nature Education in Trabzon): This project has been undertaken in Trabzon with teachers, undergraduate and graduate students. The aim of this project is to teach "how to teach about nature" to others. (www.trabzondadogaegitimi.com)

Close examination of these projects pointed out that these projects provides opportunities the participants to become aware of the cycles in the nature and naturel processes, and also human impact on the nature through making use of observation, experimentation and hands-on activities. Very limited number of research study focused upon and investigated the outcomes of these nature-education programs

Rationale and Purpose

The close look at the literature on EE in Turkey revealed no systematic and careful review of research on EE in non-traditional setting. Erdoğan et al (2009) previously analyzed EE research in traditional settings in Turkey conducted over the years of 1997 to 2007. However, their study only focused on environmental education research including K-8 students and did not cover studies related to EE in others settings in all levels. The absence of this kind of review study encouraged to collect and systematically analyze EE research in non-traditional settings to observe the trends and present synthesis-based common results. The purpose of the present study was to collect and analyze EE in non-traditional settings in Turkey undertaken with various subjects (e.g. students, graduates and teachers) and published over the years of 2000-2011.

Method

Design: *Content Analysis*

Content analysis method was utilized for the review and analysis of the selected studies. As commonly known by definition, content analysis method enables to scrutinize what is and what is not within the written, verbal and visual communication (Frankel and Wallen, 2000; Patton, 2002). Content analysis can be used in two traditions; e.g. method for research design or method for analyzing the data (Elo & Kyngäs, 2007). In the present study, both traditions were employed for designing the study and for analyzing the selected studies.

Criteria for selecting the research studies

Five major criteria were pre-determined to limit the study and better portray the nature education research in Turkey. These criteria were: (1) studies sampling subject in various levels – students, graduates and teachers in Turkey, (2) studies presenting qualitative and quantitative data, (3) studies published as journal article, conference papers and thesis (either master or PhD), (4) studies undertaken over the years 2000 – 2011, and (5) studies involving EE in non-traditional settings.

Sources of research studies

In order to access potentially relevant studies, several sources were consulted. Data bases covering national and international refereed journals were initially listed. Of the data bases, ULAKBIM, ERIC, Scholar-Google and EBSCOHOST were preferred for close examination of the relevant studies. Furthermore, selected conference proceedings (e.g. Hands-on Science Conference– HSci, National Science and Math Education Congress– UFBMEK)

Analysis

Analysis of the selected studies was undertaken in five steps. These steps were (1) conducting a search of determined key words in the selected sources and gathering the studies; (2) developing a coding form, so called article index card; (3) excerpting the relevant information from the studies, (4) constructing table by considering this information, and (5) analyzing, interpreting and summarizing the results.

Search for Studies

In the *first step*, key words determined earlier were investigated within the data bases (ULAKBIM, ERIC and EBSCOHOST), theses databases of Higher Education Council and conference proceedings. Within these data bases, the key words most related to EE in non-traditional settings such as "hands-on practices", "nature education", "ecology based nature studies", "field trips", "outdoor education", "recreation education" and "experiential education" were then searched. Theses available in the web page of Higher Education Council and the full text published in the proceedings of National Science and Mathematics Education Congress and of International Conference on Hands-on Science were also searched across the criteria determined earlier. Furthermore, the researcher publishing studies related to environmental and nature education were contacted and asked to provide studies satisfying the criteria. Substantial efforts and careful search for the studies within these sources resulted in more than 40 research papers. These studies were analyzed with regard to five criteria and some of them were found to be irrelevant, provide insufficient information and did not meet the pre-determined criteria. Consequently, 15 studies which were observed to satisfy all criteria were considered and selected for this investigation. Of the selected studies, 6 were published in national journals and 3 in international journals, 5 appeared in conference proceeding and 1 was unpublished as dissertation.

Developing Coding Form

In the *second step*, a coding form was established for extracting the method (design, sample, sampling, data collection instruments, and data analysis procedures), sample characteristics, hands-on activities and outcomes in the selected studies in the first step. For establishing this coding form, the paper classification form, which was developed by Sözbilir and Kutu (2008) and revised recently by Kızılaslan, Sözbilir and Yaşar (2013), was refined with regard to the aim of the present study (see Table 1). The dimensions of the new coding form utilized for analyzing the selected studies consisted of ten dimensions; e.g. citation of the reference, purpose of the article, variable/outcome assessed, design of the study, sample – sampling, data collection tools, reliability – validity assurance, data analysis, hands-on and field trip activities, and results. This coding form was also discussed within a brain storming session together with four researchers on curriculum and instruction and took its last version.

Analyzing and Charting the Selected Studies

In the *third step*, each selected study was coded usingthe coding form. Downloaded studies were read carefully and then separate coding form was filled out for each study. Further, additional information that provides clarification for the process and outcomes were also taken from the studies and written at the end of the coding form. In the *fourth step*, a table (see Table 2) was created to better portray and compare the information extracted from the studies. This table summarized the research design, sample characteristics and outcome variables.

Table 1. Coding Form for Article Classification*

A. CITATION OF THE REFERENCE

B. PURPOSE OF THE ARTICLE

C. VARIABLES / OUTCOMES ASSESSED

Cognitive	Affective	Psychomotor	Other (any combination)

D. DESIGN OF THE STUDY

( ) Quantitative **( ) Qualitative** **( ) Mixed**

( ) Experimental	**( ) Non-Experimental**	**( ) Interactive**	**( ) Non-Interactive**	**( ) Mixed**
( ) 1.True Exp	( ) 1. Descriptive	( ) 1. Ethnographic	( ) 1. Concept Analysis	( ) 1.Explanatory (Quan / Qual)
( ) 2. Quasi Exp.	( ) 2. Comparative	( ) 2. Phenomenology	( ) 2. Historical Analysis	( ) 2. Exploratory (Qual / Quan)
( ) 3. Weak Exp.	( ) 3. Correlational	( ) 3. Case Study	( ) 3. Other……	( ) 3. Triangulation (Quan + Qual)
( ) 4. Single Subject	( ) 4. Survey	( ) 4. Grounded Theory		
( ) 5. Other……	( ) 5. Other …….	( ) 5. Other……..		

E. SAMPLE / SAMPLING

Sample	**Demographics**	**Sampling**	
		( ) Random Sampling	**( ) Non-Random Sampling**
( ) 1. Elementary Ed. (1-5)	Sample / subject size (n) = ……	( ) 1. Simple Random	( ) 1. Systematic
( ) 2. Elementary Ed. (6-8)	Gender: ……male ……female	( ) 2. Stratified Random	( ) 2. Convenience
( ) 3. Secondary Ed (9-12)	Age: ……..……	( ) 3. Cluster Random	( ) 3. Purposive
( ) 4. Undergraduate	Grade(s) (if students): ……	( ) 4. Two-Stage Random	( ) 4. Other……
( ) 5. Graduate	Fields (if teachers): ……	( ) 5. Other …….	
( ) 6. Teachers	Province: .....…….		
( ) 7.Other…….	Other: ……		

F. DATA COLLECTION TOOL(S)

1……..	Adapted ( ),	Self-Developed ( ),	Developed by others ( )
2……	Adapted ( ),	Self-Developed ( ),	Developed by others ( )
3……..	Adapted ( ),	Self-Developed ( ),	Developed by others ( )

G. RELIABILITY	**VALIDITY**
( ) Cronbach's Alpha	( ) Content Validity
( ) Kudher Richardson KR 21 / KR20	( ) Face Validity
( ) Other……..	( ) Construct Validity
	( ) Criterion Validity / Concurrent – Predictive
	( ) Other……

H. DATA ANALYSIS

QUANTITATIVE DATA ANALYSIS		**QUALITATIVE DATA ANALYSIS**
DESCRIPTIVE	**INFERENTIAL**	( ) Content Analysis
( ) 1. Frequency	( ) 1. Correlation	( ) Descriptive Analysis
( ) 2. Percentage	( ) 2. t-test	( ) Other…….
( ) 3. Mean	( ) 3. ANOVA / ANCOVA	
( ) 4. SD	( ) 4. MANOVA / MANCOVA	
( ) 5. Graphs	( ) 5. Repeated Design Analyses	
( ) 6. Other……..	( ) 6. Regression	
	( ) 7.	
	( ) 8. Non-Parametric Tests	
	( ) 9. Other…….	

I. HANDS-ON ACTIVITIES and FIELD TRIPS

J. RESULTS and more extra information (if needed)

*This form was adapted from Sözbilir & Kutu (2008) and Kızılaslan et al. (2013)

Results

The results of the studies were grouped under four categories; (1) method, (2) sample characteristics, (3) nature of intervention, and (4) outcome variables assessed

Methods of the selected studies

Of the selected studies, quantitative research methods (n=9) were observed in majority. On the other hand, qualitative research design was observed in four studies and mixed design (Qual. + Quan.) was observed in only two studies. More specifically, one group pretest – posttest design (n=5), one group pretest – posttest – follow up design (n=1), pretest – posttest control group design (n=2), post-interview (n=3), pre and post interview (n=1) and descriptive (n=1) were the research design appeared in the selected studies. In other two studies, mixed of qualitative and quantitative research methodologies were employed. Table 2 is designed to comparatively present the methodology of the studies.

Due to the fact that mainly experimental research design (n=8) and qualitative phenomenological design (n=4) was employed in majority, small sample size were preferred. Sample of these selected studies were drawn among the participants who took part in the education in outdoor settings (e.g. nature and/or ecology-based nature education program). In some studies, all participants in these programs were selected as the sample of the research studies. Subjects of these programs were usually selected based on their volunteer based participation, purposefully and conveniently. Random selection was not observed in any of the studies. These samples were drawn from various parts of the society; pre-school students, students enrolled in first cycle (1^{st} to 5^{th} grades) and second cycle (6^{th} to 8^{th}) of elementary education, graduate students (master and PhD), prospective teachers, teachers in various fields and civil representative (see Table 3).

As for data collection instrument, various types of data collection tool were used and also more than one tool was used in many of the studies. Questionnaires (n=8), interview schedule (n=8), scale (n=5), achievement test (n=5), and other types of instrument; e.g. picture form, field trip and perception test, observation form, open-ended questions, working sheet and story writing were utilized for gathering data. Even though some of these instruments were developed by other researchers and adapted into Turkish, researchers tended to develop their own instruments (self-developed instruments) specifically for their own study. It is unfortunate to report that instrument development process, validity and reliability assurance were not reported in some of the studies.

SPSS was most commonly used statistical program in all of the quantitative students. Mostly descriptive and relatively less inferential statistic procedures were performed in the analyzed studies. Descriptive statistics often included frequency (*f*), percentage (%), mean (M) and standard deviation (SD) whereas inferential statistics included t-test (mainly paired t-test), ANOVA, ANCOVA and MANOVA. On the other hand, interview transcripts, observation notes, pictures and responses to open-ended questions were analyzed by making use of content analysis technique.

Demographics of the subjects

Not much detailed information for the subjects was given in the studies; only demographics related to sex, age, income, grade (for students) and fields (for teachers and graduates) were reported. Demographics presented in the studies were preferably used for describing the sample characteristics. In only one study (Özdemir & Uzun, 2006), kindergarten students' family income was reported to examine the impact of this variable. Sample size (ranging from n=6 to n=91) of the selected studies was relative small.

Table 2. Methodological description of the selected studies

Author(s) and date	Research Design	Research Subject	Intervention	Variable / Outcome assessed
Özdemir & Uzun (2006)	Pretest – Posttest Control Group Design	23 pre-school students	Green Class Model applied in 4 weeks	Environmental perception
Erdoğan & Mısırlı (2007)	Qualitative research design (post-interview)	10 graduate students	10 days Ecology-Based nature education program	General view on nature education program
Erdoğan & Erentay (2007)	One Group Pretest – Posttest Design	21 students in fifth grade	Series of field trips and hands-on experiments in *first* year of Unique and Universal Project	Knowledge, attitude and reported env. behaviors regarding endangered species and threatened environments
Erdoğan, Erentay, Barss & Nechita (2008)	One Group Pretest – Posttest Design	16 students in fifth to sixth grade in Turkey 40 students in first to sixth grade in Bulgaria 22 students in fifth to sixth grade in Romania 11 students insixth to seventh grade in USA	Series of field trips and hands-on experiments in *second* year of Unique and Universal Project	Knowledge, attitude and reported env. behaviors regarding endangered species and threatened environments
Güler (2009)	Qualitative research design (pre- and post- interview)	18 teachers in various fields, 3 biologist and 3 research assistant	12 days Ecology-Based nature education program	General view on nature education program
Köksal, Erdoğan, Aydemir & Armağan (2009)	Qualitative research design (post-interview)	6 graduates in various fields	10 days Ecology-Based nature education program	General view on nature education program
Yardımcı, (2009)	Mixed design (Quantitative and Qualitative Design)	24 students in fourth and fifth grades	7 days Activity-based nature education program	Perception of nature

Table 2. Continued

Author(s) and date	Research Design	Research Subject	Intervention	Variable / Outcome assessed
Erdoğan et al. (2010)	One Group Pretest – Posttest Design	41 students in Turkey, 13 students in Romania, and 6 students in USA in 4^{th} to 8^{th} grades	Series of field trips and hands-on experiments in the selected regions	Knowledge, attitude and reported env. behaviors regarding endangered species and threatened environments
Özdemir (2010)	One Group Pretest – Posttest Design	20 students in sixth and seventh grades	8 weeks nature based environmental education program	Environmental perception Observed env. behavior
Keleş, Uzun & Uzun (2010)	One Group Pretest – Posttest – Follow Up Design	25 prospective teachers in various fields	10 days ecology-Based nature education program	Environmental thinking Environmental consciousness Environmental attitude Reported env. behavior
Oğuroğlu, Alkan & Gündoğdu (2010)	Descriptive	91 teachers in various field	Nature education in protected areas in four period	Environmental knowledge Environmental perception
Pekmez, Yılmaz & Kahveci (2010)	Pretest – Posttest Control Group Design	50 students in fifth grade	8 weeks science education in outdoor settings	Understanding of nature of science
Erdoğan (2011)	One Group Pretest – Posttest Design	64 elementary school students in fourth to eight grade	12 days ecology-Based nature education program	Environmental knowledge Environmental attitude Environmental sensitivity Intention to act Reported env. behavior

Table 2. Continued

Author(s) and date	**Research Design**	**Research Subject**	**Intervention**	**Variable / Outcome assessed**
Meydan (2011)	Qualitative research design (post interview)	13 graduate students, 15 teachers in various fields and 1civil society organization representative.	12 day ecology-based nature education program	Understanding human-nature relationship
Metin & Leblebicioğlu (2011)	Mixed design (Quantitative and Qualitative Design	24 students in 6th and 7th grades	10 day activity-based nature education program / Science Camp	Conception of science, Understanding of nature of science

Sample size was “10 and lower” in two studies, sample size was “more than 10 to 50” in nine studies and sample size was “more than 50” in four studies. Number and category / grade of the subjects were summarized in Table 3.

Table 3. Distribution of Sample to the Selected Studies

Selected studies	Kindergarten	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade	Univ. Student	Graduate	Teacher	Others
Özdemir & Uzun (2006)	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Erdoğan & Mısırlı, (2007)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-
Erdoğan & Erentay (2007)	-	-	-	-	-	27	-	-	-	-	-	-	-	-	-	-	-
Erdoğan et al. (2008)	-	-	-	-	-			89		-	-	-	-	-	-	-	-
Güler (2009)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	6
Köksal et al. (2009)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-
Yardımcı (2009)	-	-	-	-	24		-	-	-	-	-	-	-	-	-	-	-
Erdoğan et al (2010)	-	-	-	-			60			-	-	-	-	-	-	-	-
Özdemir (2010)	-	-	-	-	-	-	-	20		-	-	-	-	-	-	-	-
Keleş et al (2010)	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	-	-
Oğuroğlu et al. (2010)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91	-
Pekmez et al. (2010)	-	-	-	-	-	50	-	-	-	-	-	-	-	-	-	-	-
Meydan (2010)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	15	1
Erdoğan (2011)	-	-	-	-			64			-	-	-	-	-	-	-	-
Metin & Leblebicioğlu (2011)	-	-	-	-	-	-	24		-	-	-	-	-	-	-	-	-

Revealed in Table 3, elementary school students (e.g. mostly fifth graders) were selected as the subjects in seven studies. Graduates (master and PhD students) and teachers (in various level and fields) were the subjects of three studies. Kindergarten students and university students (prospective teachers) were only observed in one study. In two studies, other group (e.g. biologist and civil representative) of people in the society was selected. Unfortunately, students in 1st to 3rd grade in first cycle of elementary education, 9th to 12th grades in secondary education and those enrolled in various departments in higher education were not observed as subjects in any of the selected studies.

Nature of Intervention

Even if all selected studies was not designed as experimental, each targeted participants’ attainments (e.g. knowledge, perception, attitude, behavior) as a result of educational intervention *for* the nature, *about* the nature and/or *within* the nature. Selected studies aimed to assess the effects of ecology-based nature education program (e.g., Erdoğan & Mısırlı, 2007; Güler, 2009; Köksal et al., 2009; Erdoğan, 2010; Keleş, et al., 2010; Meydan, 2010; Oğuroğlu et al., 2010) and activity- based nature and science camp (e.g. Yardımcı, 2009; Mertin & Leblebicioğlu, 2011) funded by TUBITAK, self-developed education program (e.g. Özdemir & Uzun, 2006; Özdemir, 2010;

Pekmez et al., 2010) and projects (e.g. Erdoğan & Erentay, 2007; Erdoğan, Erentay, Barss, et al., 2008; Erdoğan, Erentay, Aydoğan et al. 2010). Ecology-based nature education program reported and assessed in the selected studies were Nature Education in Kackar Mountain National Park and Its Surrounding (July – August, 2004), Nature Education in Kure and Ilgaz Mountain National Park (July – August, 2005), Ecology Based Environmental Education Program in İğneada, Edirne (July, 2008), Three in one: Nature, Science and Children Summer Science Camp Project – I, Bolu (june - July, 2008), Nature Training in Protected Naturel Areas in Isparta, Basayas Natural Sciences Kamp - I, Ankara (July, 2008) and Nature Education in Ihlara Valley, Aksaray (July, 2009). Self – developed education program observed in three studies were Green Class Model in 4 weeks, Nature-based environmental education program in 8 weeks and science education in outdoor setting in 8 weeks. The projects assessed in three studies were first and second year of Unique and Universal (U&U) Project involving children in Turkey, Bulgaria, Romania and the USA, and Save Our Species (S.O.S) Project both involving students in Turkey, Romania and the USA. Both projects involved in series of field trips and hands-on experiments in one semester.

Nature was perceived different in different studies. For example, nature was seen as an educational tool (e.g. Pekmez et al., 2010) or a place to be understood (e.g. Özdemir, 2010) or a place to be protected (e.g. Erdoğan & Erentay, 2007). Various hands-on practices and field trips were reported in the analyzed studies. As for hands-on practices, germination, water monitoring and water monitoring experimentation (e.g. pH, iron, oxygen, phosphate, heat, azote), art design using recyclable materials, plant pressing, collection of plants for herbarium and collection of insects for insectarium, construction of barometer, camping and archaeological excavation were undertaken during the educational programs designed in the analyzed studies. Additionally, hands-on practices were performed during the field trips in some studies, and in some others these practices were supported by field trips. Field trips were organized to various places [national park (e.g. Gölcük Tabiat Parkı, Yazılı Kanyon), forest, arboretum (e.g. Kovada Çayı Arbeoretumu), lake (e.g. Mogan ve Eymir Gölü, Tuz Gölü), mountain (e.g. Hasan Mountain), damp (e.g. Mamasın Barajı), plain (e.g. Aksaray Ovası), the regions for cultural examination (e.g. Acemhöyük, Taşpınar), liquid waste treatment plant, recycle center and thermic plant] to present first hand experiences and better understand man-nature relationships and to explore the cycles in the natural settings. Furthermore, series of observations were done during the field trips to better portray the fields examined (e.g. waste observation; bird, butterfly, tree and plant observation; sky observation; geological structures). In some other studies, series of observations were also done for data collection to support their findings in the hands on practices (e.g. examination of physical and biological parameter of the lake – color and heat of the lake; living organism around the Lake, e.g. frog, butterfly, bird, soil and plant).

The participants of the programs were also encouraged to collect data using different data collection tools (e.g. questionnaire and interview) from various sources. These data were used for cross-checking with the results obtained through hands-on practices. For example, the participants calculated their own footprint scores to reveal their impact on the naturel environment. In one study, the participants prepared a poster to disseminate the findings that reached to others. Microscope was also used in some studies for data collection.

Outcome Variables

Considering outcome variables assessed in the selected studied, five main themes were appeared, such as (1) Knowledge and awareness of environment / nature, (2) Environmental perception / perception of the nature, (3) Environmental affect, (4) Environmental behavior, and (5) Science-related outcomes.

Environmental Knowledge and Awareness

Participants' knowledge in general and in the specific dimensions (e.g. Lake, plants) of the environment was reported in the selected studies. The studies using experimental research design explicitly indicated that participants' knowledge and awareness of the environment in general increased over pretest to posttest administration. For example, Özdemir (2010) reported 6th and 7th graders' significantly increased environmental awareness when comparing pretest score with posttest score. Despite the fact that Erdoğan (2011) reported elementary school students' increased environmental knowledge as a result of intervention including ecology based hands-on practices and field trips, this increase was not statistically significant. In other studies designed qualitatively using interview schedule(s) revealed participants' increased knowledge and awareness. The participants of designed educational programs reported that they developed awareness on dual relationship between man and the nature, and their responsibility to take action to protect the environment (Erdoğan & Mısırlı, 2007), other living organism to have right to survive and necessity of protecting environment (Meydan, 2011). More specifically, the students who took a part in the field trip to the Lake and surroundings reported their increased knowledge on biological, physical and chemical parameters of watershed areas and the species around the Lake (Erentay & Erdoğan, 2006; Erdoğan & Erentay, 2007; Erdoğan et al, 2008; Erdoğan et al., 2010).

Perception of Environment / Nature

Participants' perception of the environment was assessed in four studies. All of these studies revealed the contribution of the intervention including ecology and nature based hands on practices on development of environmental perception. Özdemir and Uzun (2006) reported statistically significant increase of pre-school students' perception of the environment as a result of "Green Class Model". In the other study, Özdemir (2010) found that nature-based environmental education program significantly increased sixth and seventh grade students' environmental perception. Similarly, the study designed based on training program in the protected areas revealed that teachers' reported chance in their nature perception (Oğurlu et al., 2010). Yardımcı (2009) also indicated development of children's conception of nature as a result of activity based nature education in science camp.

Environmental Affect

The outcome variables of environmental attitude, sensitivity, consciousness and intention to act were grouped under the theme of environmental affect. Participants' attitudes and consciousness regarding the environment were observed to significantly increase after nature education project including hands-on practices and field trips (Keleş, Uzun & Uzun, 2010). On the other hand, even though an increase in participants' attitude at the post administration was observed, this increase was not statistically significant in some others (Erentay & Erdoğan 2006; Erdoğan & Erentay, 2007; Erdoğan, 2011) and not assessed in terms of statistical significance (Erdogan et al., 2010). Environmental sensitivity and intention to act were assessed in one study (Erdoğan, 2011); but, despite higher score in posttest administration, the difference from pre-test to post-test scores in terms of sensitivity and intention to act was not found statistically significant.

Environmental Behavior

Types of behaviors the participants had demonstrated prior to the nature education program and would start to demonstrate after hands-on practices and fields trips within the nature education program were descriptively reported in 4 studies (Erentay & Erdoğan 2006; Erdoğan & Erentay, 2007; Erdoğan et al., 2008; Erdoğan et al, 2010). In the projects of "Unique and Universal (U&U)" and "Save Our Species (SOS)", 4th to 8th graders' types of behaviors related to protection of endangered species and threatened environment were more related to physical behaviors (e.g. collecting garbage, planting, giving food to the animals). At the end of these projects, students started to demonstrate persuasion (e.g. persuading friends and family member to collect the garbage, giving information to others) and warning (e.g. warning the ones who spilled their garbage into the Lake) as well as physical type of behaviors.

The effects of nature education program on students' environmental behavior were also assessed in other three experimental studies. Keleş et al. (2010) and Erdoğan (2011) reported statistically significant impact of ecology based nature education program on development of responsible environmental behavior. Özdemir (2010) did observe students' environmental behavior during nature-based environmental education program and realized that students' behaviors related to keeping clean, saving, participation in environmental protection and warning were increased as a function of the education program.

Science-related outcomes

In two studies, nature was assumed to be instructional tool for achieving science-related outcomes, e.g. *conception of science* and *nature of science*. Pekmez et al (2010) found that learning science in outdoor setting developed 5th graders' understanding of nature of science. Similarly, Metin and Leblebicioğlu (2011) reported that the science camp undertaken outdoor setting improved 6th and 7th graders' conception of science. The students who came to the science camp with superficial understanding of science turned into more specific perspective and detailed expression for science definition. Furthermore, science camp also developed students' understanding of the process of science.

Others

Apart from the themes presented above, Keleş et al., (2010) also assessed whether teachers' thinking of the environment changed as a function of nature education program. They found that teachers' thinking of the environment did not change after nature education program.

Discussion

The study reported the collection and analysis of 15 research studies undertaken during years of 2000-2011 assessing the research on environmental education in nontraditional settings in Turkey considering pre-determined criteria in the selected sources. Current literature suggests that this study seems to be one of initial attempts that systematically collect and analyze the research on the EE in nontraditional settings in Turkey. In general, synthesis of the results of the selected studies pointed out that the intervention, e.g. the science and nature camps, ecology-based nature education programs and fields trips, observed in these selected studies contributed to development of participants' gains associated with knowledge, perception, affect, behaviors regarding the environment, and understanding of science.

Design of the studies: One group pretest and posttest experimental research design was observed to be commonly preferred in many of the selected studies. This could be due to the fact that the science / nature camps and ecology–based environmental and nature education programs considered to be intervention was undertaken without control group. The researchers only focused upon the treatment effect without comparing with control group since there was no. This research design was called us weak experimental design which may not show the real effects of intervention on students' gains, and the researcher may not assess the effectiveness of intervention without comparing with control groups because outside factors may interfere with the results and do not control all threats to internal validity (Frankel & Wallen, 2000). However, in nearly all of these research studies, the researchers kept the intervention short (seven to eleven days) or took the participants to the boarding program in the pension or hotel. These strategies could have overcome some of the extraneous impacts on students' gains. In relation to time of the intervention to be best practice, there is no consensus in the literature. For example, Bogner (1998) compared one-day intervention and five-day intervention of the outdoor ecology education and found that five-day intervention had impact students' knowledge, attitudes and behaviors related to the environment. Furthermore, the participants were also observed and interviewed during the program to triangulate the pretest and posttest results, and to overcome the threats to internal validity. In some other research studies, the researchers would prefer to use research design (e.g. phenomenology and case study) within the qualitative paradigm. The researchers in these studies sought to collect in-depth understanding and deeper insight on participants' gains in the education program they attended. Even though no statistical analyses and results were reported, the observation notes and interview transcripts were subjected to content analyses which showed participants' gains.

Methodological issues in the empirical studies have long been closely scrutinized in many of the review studies. Lewis (1981-82) concluded that research design of EE studies were generally weak. Leeming et al. (1993), in their analysis of 34 EE studies, found that several studies they analyzed used weak design and some others ignored to report details regarding research procedures. Furthermore, in her review of EE research, Zelenzy (1999) reported that many of the studies she reviewed had methodological weaknesses and produced spurious findings. Most recently, analysis of 53 EE studies in Turkey (Erdoğan, 2009) revealed that some studies did not report research methodology appropriately and validity and reliability assurance. Similar methodological problems were also observed in the selected studies in sample of the present study and this brings a new discussion on methodology in EE studies.

Out of 15 studies, those who enrolled in environmental education program funded by TÜBİTAK were assessed in ten studies. Even though this analysis covers the research studies undertaken during the years of 2000 to 2011, the studies were observed to be done after 2006 and mostly in 2010-2011. This increase in more recent years may come along with curriculum development reform in Turkey after 2005 and emphasis given to outdoor learning environments and learning by doing in the new curricula (MEB, 2005). Furthermore, TUBITAK started a program called "Scientific Environmental Education in National Parks" in 1999 and extended the program to more national parks in following years. In the year, 2004, the environmental education program was started to be realized in four national parks (Ozaner, 2004; Ozaner & Yalçın, 2001). Environmental education and ecology-based nature education programs have been performed in and expanded to other outdoor settings (e.g. universities, village) as well as in national parks in following years. For example, TUBITAK supported about 50 projects in 2010 and about 100 projects in 2011 addressing to naturel sciences and science education outdoor settings (see for more detail www.tubitak.gov.tr). The increase in number of the projects supported / funded in last two years could have also influenced on the increase in research studies.

In most of the selected studies, the participants were mostly assessed across paper-pencil tests (e.g. scale, questionnaire) along with interview schedule and observation notes. Parallel to this finding, in the review of research on science education in Turkey indicated that the most common (more than 60%) data collection tools used was paper pencil test (Sözbilir & Kutu, 2008). Similarly, in other review of research on EE in Turkey (Erdogan et al, 2009), meta-analysis on responsible environmental behavior (Hines et al., 86/87) and on educational intervention improving environmental behaviors (Zelezny, 1999) revealed that most common instruments were self-reported tools, e.g. paper-pencil tests.

Subjects (participants) of the studies: Close examination of sampling procedures employed in the analyzed research revealed that participants were selected to EE program in nontraditional settings based mainly on their convenience and voluntariness to take part in the program. In many of the selected research, all participants of EE program were selected for the subjects whereas in few of the researches, subjects were conveniently selected among the participants of the program. The representativeness of the findings to other settings seems to be limited due to low sample size (e.g. ranging from 6 to 91) and sampling procedures.

Even though variety of individuals (e.g. kindergarten children, elementary school, high school and university students, teachers, society representatives and biologist) in the society were the target groups of the selected studies, elementary school students (4^{th} to 8^{th} grades) were mostly targeted in more than half of the studies. On the other hand, those in other grades (1^{st} to 3^{rd} grade and 9^{th} to 12^{th} grade) and undergraduate departments did not receive any attention and never considered in the selected studies. Similar trend was also observed in the content analysis of EE research in Turkey undertaken during the years of 1997 - 2007 in that 49% of the studies involved 6^{th} to 8^{th} graders and 30% involved in 4^{th} to 5^{th} graders (Erdoğan et al., 2009). Demographics were only presented for describing the subject characteristics in the studies rather than examining their possible effects on the outcomes, except one study (Özdemir & Uzun, 2006).

Intervention; Nature is a tool / setting to convey an understanding the relationship between human and the environment, and also explore the cycles in the naturel environments. The content analysis of the selected studies revealed that researchers considered the nature to be a context in three ways; (1) as the subject to be investigated; (2) as the place to be protected and (3) as an instructional tool for science education. This categorization brings in mind the definition of EE done by Lucas (1980/81) in that the misunderstanding for EE program can be overcome by designing the goals as being "in, about or for the environment, or any combination of these classifications. Lucas further discussed that "education about the environment, which is concerned with providing cognitive understanding including the development of skills necessary to obtain this understanding, and education for the environment, which is directed to environmental preservation or improvement for particular purposes, are characterized by their aims; education in the environment" (p. 33). However, as discussed by Jickling and Spork (2006), EE has been accepted in "education *for* the environment" paradigm by many researchers (e.g. Greenall, Linke etc.), but even though this paradigm has been long discussed in the literature, this was seen as slogan for EE movement (Gough, 1997). In their discussion paper, Jickling and Spork (2006) come to the conclusion that even though "education for the environment" has been used for best describing the EE, this could be misunderstood in some areas when its literal meaning is consider. They further believe in using "in, about and for the environment" to be a socially constructed framework for general thinking about EE. Thus, researches to be carried out and outdoor ecology education to be undertaken "in, about and for the environment" could enable to assess EE program from the general perspective.

Outcomes assessed: EE in non-traditional settings as educational intervention, e.g. field trips, ecology based nature education program, science camps, were observed to be effective for

improving environmental knowledge, affect, environmental behavior, and also understanding of nature and NOS. Similar results have already been observed in previous research studies (e.g. Dresner & Gill, 1994; Ramsey, 1993). It has been revealed in the selected studies that accumulation of knowledge is acknowledged through learner-centered approach and learning by doing within field trips, hands-on experiments, nature camps, ecology based nature education program and such. In this regard, Bogner (1998) claimed that transfer of the knowledge should not be target of such interventions. Leeming, Dwyer, Porter and Cobern (1993) reviewed 34 EE studies and their critical review of the outcome research on EE revealed mixed effect of out-of-class programs (e.g. field trips, camp program) on attitude, knowledge and behavior. Zelezny (1999) did meta-analysis of 18 studies to examine the effectiveness of intervention (e.g. camp, action instruction) in improving environmental behavior. She observed increase in environmental behaviors as a function of educational intervention, but all of the intervention did not result in statistically significant gain scores. Along with the results of the selected studies, the previous research points out that intervention could have impact on increase in students' gain in relation to environmental-related knowledge, attitude, skills and behaviors; but this increase might not be statistically significant all the time due to the fact that sample size may be small to obtain statistical significant; sample may show high variance because of heterogeneity of the participants; and instruments may not be in line with the content of the intervention which results in lack of content validity.

Suggestions

The results of the selected studies indicated the impact of EE in non-traditional settings on individuals' gain in various areas; e.g. knowledge, affect, skills and behavior. More research studies to be designed as pretest – posttest with control is needed to observe the exact effects of the intervention and to get purified from the outsider effects. Traditional instruction or classroom environment could be selected as control group across the outdoor settings. This will help observe whether the outdoor settings are more successful context than the classroom environments or indoors to significantly increase in knowledge, skills, affect, behavior and so on. It may be quite hard to understand the interdisciplinary nature of EE (Palmer, 1998) in the classroom environment, but will be quite easier to grasp this notion through outdoors using first hands-experiences and observation the cause-effect relationship in the nature.

Analysis of the selected (reached) studies sometimes revealed controversial results especially for the dimensions of affect and behavior. Even though gain score was observed to increase in some of the studies, this increase was not statistically significant. This may possible be due to performing statistical analysis over the data collected low sample size. In this sense, more research studies with high sample size are needed.

This study has some limitation with regard to its methodology. First, as a result of careful analysis of EE undertaken within the context of Turkey, only 15 studies were accessed or found to be related with pre-determined criteria. Even though all reported increased (even if not significant) knowledge, attitude and behavior as a results of EE program, they do not have equal quality when considering the research methodology. This can only be solved when the pre-determined criteria were set as more specific; e.g. similar / same sample characteristics, similar research methodology – experimental and so on. Second, in some studies, reliability and validity evidences were not reported or not assured. These studies should have been excluded from the analysis to provide more trustworthy results. In the present study, this could not be done due the fact that number of the studies on EE in non-traditional settings is quite limited and in the infancy level yet in Turkey. When the number of research in the field increased, a criterion "studies assuring

the validity and reliability evidences" should be considered while selecting the studies into the analysis.

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Appendix

Selected Research for Analyzing in this Study

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