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The Effect of Summer Environmental Education Program (SEEP) on Elementary School Students' Environmental Literacy

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The purpose of this study was to assess the effects of Summer Environmental Education Program (SEEP) on elementary school students' environmental knowledge, affect, skills and behavior which are the main components of environmental literacy. The sample consisted of 45 students (25 males, 20 females) studying in 4th through 8th grades and living in Orphanage in Antalya. Various data collection instruments (e.g. Environmental Knowledge Test, Affective Disposition toward Environment Scale, Children's Responsible Environmental Behavior Scale and Scientific Process Skill for the Environmental Test) were used for assessing students' different outcomes prior to and after SEEP. The open-ended responses were subjected to content analysis whilst the remaining data were subjected to statistical analysis (e.g. repeated t-test). The results revealed that students' environmental knowledge, environmental sensitivity, intention, environmental attitudes and responsible environmental behaviors significantly increased after intervention. Even though students' "cognitive skills" and "saving behavior" increased from pre-test to post-test, these increases were not statistically significant.

Keywords: environmental education, environmental literacy, elementary school students

INTRODUCTION

Human being's careless and intensive activities in natural areas and their ways of increasing life quality result in emergence of some environmental problems and issues (Tung, Huang and Kawata, 2002; Palmer, 1998).A more threatening aspect is the unawareness of the influence of the human being on their environment (Erdogan, 2009). Developing conscious and responsible individualsis needed for dealing with such problems, and thus for a sustainable environment and quality of life. This could only be realized through education, more specifically environmental education (EE). Environmental education grew out of movement in the early 1900s

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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 develop positive behavior toward environment since then. These initial attempts and further efforts (e.g. Tbilisi conference and Belgrade Charters)contributed to the development of the field of EE. A review of substantial studies indicated that the major outcome of EE is to develop environmentally literate citizenry (Roth, 1992; Simmons, 1995; Stapp et al. 1969).Harvey (1977) conducted an extensive review of literature to conceptualize EE and concluded that the expected outcome of EE is "*developing environmentally literate citizenry*" or "*environmental literacy*" (p.67). Roth (1992) further elaborated the definition of environmental literacy (EL) and referred that EL draws on four major strands; *Knowledge, Skills, Affect* (environmental sensitivity, attitudes and values) and *Behavior* (personal investment and responsibility, and active involvement). Developing such individuals is not that much easy, so combined and continuous efforts are needed for this process.

Classroom instruction may contribute to, but may sometimes not be sufficient to increase environmental knowledge of the children, develop environmental awareness and sense of responsibility (Erentay & Erdogan, 2009) and thus EL (Erdogan, 2009). In this regard, out-of class activities which mainly involve field trips, site visits and so on enable the pupils to communicate with the nature directly and to comprehend the various aspects of the nature (Palmberg & Kuru, 2000). Outdoors is much effective settings for addressing to learn about environmental issues (Martin, 2003). Outdoor education activities also provide in-depth understanding to grasp the relationship between living and non-living things, and also cause and effect relationship within the nature (Erdogan et al, 2010). Furthermore, participation in field trips, outdoor and nature-related activities could enhance participants' appreciation of nature, conservation behaviors (Bogner, 2002; Sia, Hungerford and Tomera, 1985), knowledge of environmental issues, environmental responsibility and sensitivity, and also action skills (Palmberg & Kuru, 2000). This is because of the fact that the more the people engage in environmental activities and outdoor education programs, the more they feel interconnected with the nature which results in more tendencies to protect the environment. This is in line with the claims of Bogner (1998) indicating that EE programs provided first-hand experiences and participatory interaction. Thus, outdoor education as an informal method of teaching and learning provides the pupils first-hands observation and direct experiences (Erdogan & Erentay, 2009;L ee, 1984). Field studies which are undertaken out-of-class provides the most effective way to study and learn about the environmental issues (Neal, 1994) and increase curiosity. 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.

Although huge amount of literature on outdoor education is available abroad, this field is in the beginning level and very limited number of studies has been observed in Turkish literature. A review of existing studies on environmental education in non-traditional settings (Erdogan, Bahar & Usak, 2012) referring to outdoor and nature education revealed only few studies undertaken in the context of Turkey. Analysis of the selected studies revealed that outdoor education and / or nature and ecology – based environmental education increased students' (in various ages and grades) environmental knowledge, affective tendencies (attitudes, responsibility, intention to act and so on) toward the environment and conservation behavior. Zelezny (1999) previously conducted similar contend analysis of international studies on EE and reported controversial results. Even though significant positive effect on reported environmental behavior was observed in some studies (n=4), no

effect or negative effect was seen in some others (n=5). The other outcome variables were not reported in Zelezny's study. In another study undertaken with pupils of secondary schools aged 11-16, Bogner (2002) reported significant impact of residential outdoor education program on pupils' perception of environment. His study confirmed the necessity of experiences of nature works and familiarity with nature for caring about nature. His other studies showed the positive impact of out-door based activities on students' environmental knowledge and protection behaviors (Bogner, 1998) and environmental protection perceptions (Bogner and Wiseman, 2004).Farmer, Knapp and Benton (2007) reported increase 4th graders' environmental and ecological knowledge and pro-environmental attitudes as a results of long-term EE program. Ballantyne and Packer (2002) observed positive effects of nature experience on 8-17 aged students' environmental knowledge, world view, attitudes and behavior. These all studies are evidenced that nature activities, field trips and interdisciplinary activities out-doors develops participants' knowledge, attitudes and behaviors regarding to the environment and thus environmental literacy.

The study aimed at assessing the effect of SEEP on elementary school students' environmental knowledge, affect, skills and behavior which are the main components of environmental literacy. Following research question guided through the study

Is there any significant effect of SEEP on elementary school students'

- *environmental knowledge?*
- *environmental affect?*
- *environmental related cognitive skills?*
- *responsible environmental behavior?*

It is believed that the results of the study contribute to the development of research on EE in non-traditional setting and to the establishment of trend of such studies. The findings and the activities implemented of the SEEP could help teachers design their courses and extra-curricular studies in relation to the environmental topics.

Context: Antalya Natural Sciences Schools 2011 Project

The data presented here was collected from the project funded by TUBITAK and implemented within the campus of Akdeniz University as two periods in the summer in 2011. First period (June 20th – 24th) was designed for 4th to 5th graders while the second period (June 27th – 30th) was designed for 6th to 8th graders. The general aim of the project was to help the children grasp the notion of interdisciplinary association between the nature and other subjects; e.g. science, art, math, health. The project consisted of six modules such as science, biodiversity, art, sport, drama and psychology (see Figure 1).Many people think that nature is only associated with the biology and ecology, but ignore the other aspects of it; such as aesthetic and spiritual. However, nature should be considered as a place that attracts researchers in the field of biology but also people who is meaning-seeking with feelings and emotions, spirituality and so on (Kossack&Bogner, 2012). This is the reason why Palmer claims that environmental education dealing with natural issue should be interdisciplinary in nature (Palmer, 1998).

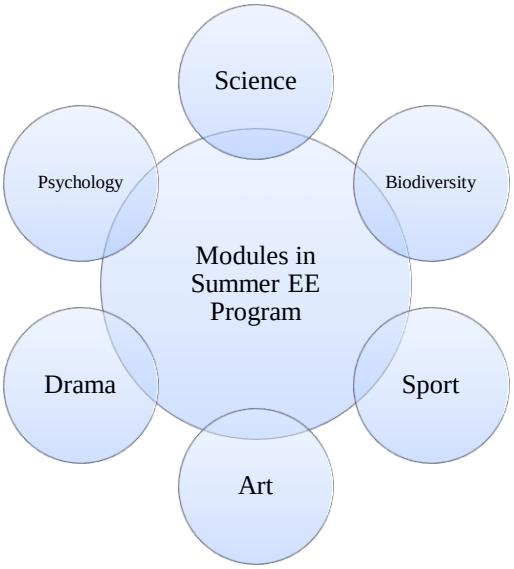

Figure 1. Modules designed in SEEP

For all activities, the students were grouped with 5 -6 to enhance their responsibility to each other and interdependence. Theoretical sessions went hand in hand with the practices sessions. Students were encouraged to be actively involved in all practice-based activities to provide first hand-experiences.

***Science Module*:** This module included further three sub-modules involving activities associated with(a) water, (b) air and (c) soil. For the theory part of the activities, science laboratory was used. For the experiments and related observations, The Campus Lake and its surrounding environment were used for this module. The students were first taken to the laboratory for the theory of water, soil and air monitoring, teaching scientific process skills and the process of hands-on experiments. Later, they were taken to outdoors and grouped with five to six. They were encouraged to take water samples from the Lake and carry out water monitoring experiments (e.g. physical, chemical and biological parameters) making use of easy-to-use-and-found materials. For examining the chemical parameters (pH, nitrate, phosphorus, iron) of the water monitoring, some chemical indicators were used. Students also dug the soil to examine the life under the soil and investigate the ingredients of the soil. They touched the soil and observed the particulars and insects within the soil. Later, 15cmX15cm cardboard was designed with sticky materials and hanged on the tree to catch the pollens and other granules in the air. They hanged the cardboard in different part of the campus and then the students observed and compared the difference on cardboards.

Biodiversity Module: This module was only limited with some selected animals and plants to be observed within the selected areas. This module was further divided into two sub-modules such as (a) flora and (b) fauna. In the flora module, the students were firstly introduced very basic terminology on plants in outdoors and later were taken to the botanical garden for close examination of various species. During this module, the guide introduced a procedure how to collect plants and save them for the scientific purposes (a kind of herbarium). In the fauna module, students were taught how to use binocular and were allowed to watch the birds around the Lake and in the wooded area using binocular. Also, the students visited the farm in the campus to see the farm animals and their living conditions. Furthermore, students were taken to insectarium and animal laboratory in the department of biology to see the variety among the insects and animals.

Table 1. The modules, themes and activities in SEEP

Modules	Themes	Activities
Science	• Water • Air • Soil	• Water, air and soil monitoring • Laboratory and outdoor experiments
Biodiversity	• Flora • Fauna	• Site visits • Plant collection • Bird watching
Sport	• Nature Sport • Orienteering	• Lecture and presantation
Art	• Music • Drawing & painting • 3D Design	• Composing music for the nature • Drawing nature picture • 3D design using recycling materials • Design and picture exhibition
Drama	-	• Process drama technique • Getting know each other • Nature awareness • Developing observation skills
Psychology	-	• Discussion • Relief in the nature • Games for Group works, Self-expressions, Cooperation, Self-respect and Respect to others

Sport Module: This module further includes two sub-modules; e.g. (a) nature sports and (b) orienteering. The students were firstly taken to theoretical part to get knowledge about the nature sports, first aid in case of injury during nature sports and the techniques to find a way in the natural areas; e.g. wooded area, forest. Later, they were given detailed information about the orienteering techniques to find a way in the nature and taken to botanical garden to do orienteering. Students were grouped in five to six and they performed orienteering activities in the place designed earlier for only this activity.

Art Module: Art module further includes three sub-modules, (a) music, (b) drawing - painting and (c) design.In the music module, the students in a group with five to six composed a music using several Orff instruments by trying to inspire from the voices in nature (e.g. voices of animal – snake, owl, birds; natural events – rain, wind, storm, waves).In the drawing and painting module, the students drew a picture on the subject "I am in the Nature". This study is also repeated at the beginning and at the end of the project. In the design module, the students were encouraged to recycle their waste (e.g. papers, boxes, bottles) during the project. At the last day of the project, the students designed 3D models; e.g. house, castle, robot, using these recycled materials.

***Drama Module*:** This module was utilized for different purposes. Firstly, drama sessions were organized at the very beginning to introduce the participants to each other and also to the educators. Second, process drama technique was planned which included several sessions; theory (learn), practice (do) and exhibition (share). Participants were taken into the story, in which they were encouraged to establish their own green country with flag, name and anthem, and prepare the environmental rules of this country. They took the photographs from the nature, came together and worked on the aspects of their own green country, designed posters and exhibit the works they did during the drama sessions.

Psychology Module: This module was designed to show the participants psychological aspect of the nature where there is a harmony among the living and non-living organisms. During this module to be undertaken at the end of each days of the project, students were taken to the natural settings and encouraged to assess day-time activities and also take part in activities regarded as relief in nature, conflict resolution, coming together and respecting to self, each other and the parts of the natures.

Table 2. Hours spent in each module during SEEP

	How many hours were spent during SEEP?					
	Theory	Hands – on Practice	Activities	Laboratory	Observation / site visits	Total
Science Module	0:50	3	1:30	0:40	0:30	6:30
Biodiversity module	1	1	1	-	3:45	6:45
Sport Module	1		2	-	-	3
Art Module	1	3:45	2	-	-	6:45
Drama Module	-	-	3	-	-	3
Psychology Module	1		2	-	-	3
Total	4:50	7:45	11:30	0:40	4:15	29

As for the time spent, 6:30 hours were dedicated to science module, 6:45 hours to biodiversity module, 3 hours to sport module, 6:45 hours to art module, 3 hours to drama module and 3 hours to psychology module.Even though 3 hours were observed to be dedicated to drama module, since process drama was used within this module, some drama activities were disseminated into other modules in addition to three hours. Of total of 29 hours, the participants were involved in theory session (4:50 hours), practice sessions – hands on practice, outdoor activities and laboratory activities (19:55 hours), and observation and site visits (4:15 hours).

METHOD

This study was designed as one group pretest – posttest without control group design. Even if this type of design is called as weak experimental (Frankel &Wallen, 2003), this study could not be designed considering other types of experimental designs due to the fact that this study was undertaken in summer time and the students were taken into the special program.

Study Group

Participants consisted of 45 elementary school students (25 males, 20 females)who were selected from Antalya Social Services and Child Protection Agency for Antalya Natural Sciences School 2011 project. Students' age average was 11.35 (*SD*=3.18). Of the students, 21 were studying at 4th and 5th grades whereas 24 were studying at 6th to 8th grades. Students were selected to the study based on their voluntariness to take part in the activities.

DATA COLLECTION INSTRUMENTS

Along with demographic personal information form, different data collection instruments were used to assess students' outcomes in different learning domain; cognitive, affective and psychomotor. In the demographic information form, participants were asked to report their gender, age, grade and source of environmental information.

Environmental Knowledge Test: This test was designed to assess students' knowledge on the basic concepts (e.g. recycling, energy, soil) related to the environment and some disciplines (e.g. sport) related to the nature. There were 22 multiple choice items with four alternatives in the test. Prior to the preparation of the test, the educator taking place in the project were firstly contacted and asked for at least three and four questions for the modules for which they were responsible. Item pool was constructed based on the questions collected from the educators. Later, 22 items were selected by considering the weight of the objectives of the projects in relation to knowledge to be attained in each module. This version of the test was examined by two experts on science and EE with regard to appropriateness and understandability of the items. Based upon the expert suggestions, the test was ready for the administration. The results of the initial administration of the test were subjected to item analysis which resulted in decrease in number of items in the test to 17. Five of the items were found to have low level of (.25) contribution to total variance and excluded from the text. Reliability analysis with the remaining items indicated that KR20 of the test was found .82. Two example questions from the test are as below;

Exp. 1. Which of the following items <u>is not</u> recyclable material?

a) Petroleum b) Plastic c) Aluminum Box d) Paper

Exp. 2. Which of the followings <u>is not</u> the reason of soil pollution?

a) Using agricultural pesticides b) Using controlled natural fertilizer
c) Destruction of the natural areas d) Leaving all household wastes to the land

Affective Disposition toward Environment Scale (ADTES): This scale developed by Erdogan (2009) was used to assess students' affective tendencies related to the environment. This scale includes a total of 14 items on four point Likert type scale (4 – I agree, 1 – I disagree). The scale consists of three dimensions; e.g. Willingness to Act (5 items, Cronbach's alpha (α) =.66), Environmental Attitude (5 items, Cronbach's alpha (α) =.63) and Environmental Sensitivity (4 items, Cronbach's alpha (α) =.58). In the recent administration of this scale to 4th to 8th graders by Erdoğan (2011),Cronbach's alpha reliability coefficient was found .83, .68 and .71 for each sub-dimension respectively. During the administration, the students were required to explain why they selected any of the alternatives for each item.

***Children Responsible Environmental Behavior Questionnaire*:** This questionnaire was designed to assess students' responsible environmental behavior toward the environment. CREBQ includes 12 items on a seven point likert type scale (0 – never, 7- more than five). While preparing this instrument, the items in Children Responsible Environmental Behavior Scale (CREBS) developed by Erdogan, Marcinkowski and Ok (2012) was considered to be item pool and 12 items out of 23 items were selected to include CREBQ. Since the students were living in Orphanage, but not with their families, only 12 items were seen to be appropriate the condition

of this type of students. Explanatory factor analysis (EFA) with Principal Component Analysis (PCA) was conducted the underlying dimensions behind 12 items. First EFA revealed 4 factors with the eigenvalue higher than 1. Scree plot also supported this finding. Second EFA with PCA using Oblique rotation was run for four factors. Four factors explained 78.26% of the total variances. Item numbered 6 loaded on three factors and it was excluded from the questionnaire. Later, the factors were named based on the common characteristics of the items. First factor with five items was named "Physical Protection". Second factor with two items was named "Warning Behavior". Third factor with two items was named "Saving Behavior". The last factor with two items was named "Political Action". Cronbach's alpha reliability coefficient of the dimensions was found .85, .68, .67 and .80 respectively.

Scientific Process Skill for the Environment Test: This test was designed to assess students' knowledge on the scientific process skills (e.g. problem investigation, data collection, data analysis) for solving environmental related issues. Prior to developing the test, scientific process skills to be taught during the science module of SEEP were listed. The items in the test were prepared in line with these listed skills. Two experts on science and EE carefully examined the items and required to make necessary comments. Final version of the test was given by considering the expert opinions. In the earlier form of the test, there were 11 multiple choice items with four alternatives. The statistical analysis over the items revealed that three items' (# 4, 5, 6 and 11) total correlation scores was found to be very low. Since these items' contribution to the total variance was low, they were excluded from the test. Thus, the test consists of 7 items with four alternatives. One of the examples from the text is as below.

The reliability of the test was found to be .54. This score was a little bit low according to Cohen's criteria. This is because of the fact that the number of the items in the test was low and the nature of the items was so diverse.

Exp.1. Students are trying to find the best example to the home-work given as "What are the substances which causes the water pollution"? What could the following experiments / procedures be the best examples to answer the homework given to the students?

a) Melih: He waited three days after putting a teaspoon of sugar to a glass of water
b) Berrin: Washing her hair with shampoo in each two days and observe its effects
c) Derya: Clean the dust on her table in each day
d) Gizem: Watering a potted flower with soapy water during a week.

DATA COLLECTION AND ANALYSIS

All instruments were administrated to the students two times as at the very beginning (pretest) and at the last day (posttest) of the project in the summer time in 2011. It took about 75 minutes to complete all the instruments. The data collected from the students who took part in the first period (20th to 24th June) and the second period (27th June to 1 July) entered to the SPSS program and pooled together. Descriptive statistics for screening the data and examining the missing cases and outliers were firstly undertaken. Since the missing cases lower the 5% of the total response, replaced with mean procedures was used. However, this was not done for the data collected through CREBQ since missing cases were higher than 5% criteria. Later, total score was calculated for each test and further sub-scales. In order to compare pre and posttest scores and to assess students' gain as a function of the SEEP, paired sample t-test procedure was used at the significance level of .05. Due to

the fact that there were no significant difference was observed for any of the dependent variables between first and second period, further analysis were undertaken over the pooled data collected from both periods of the project. As for the qualitative data obtained from ADTES, content analysis procedures were followed. Firstly, the responses to "because ...." statement given after each item in ADTES were taken out of the completed questionnaires and written down in a separate text. Later, these statements were read more than one time to reveal the common codes and themes underlying the students' responses. And then, the codes and themes were reported along with the quotations. In order to protect confidentiality of the participants, students' names were not given. Instead, codes for each student was given after each statement (e.g. St.1, St.2 etc.).

RESULTS

Environmental Knowledge

More than half of the students reported to use information source on the environment as TV (%60), books (%57.8), teachers (%53.3) and internet (%51.1). Students' total correct responses at the post test administration increased substantially in some items and relatively less some others. However, in five items students' total scores decreased. Students knowledge most increased from pretest to posttest on the items associated with living organism, sustainability of the natural resources, activities for healthy life, pH as an water monitoring parameter and forms of water. Students' most increased knowledge was observed to be in the area of nature sport – orienteering (15 point increase).However, some other items (e.g. forest - deforestation, physical parameters – water monitoring), students' knowledge decreased in 4-5 points from pretest to posttest. For the items associated with soil and waste management, students' knowledge decreased one point. Students' most decreased knowledge was observed to be associated with forest – deforestation (6 point decrease). Table 3 summarizes students' corrects responses obtained from pretest - posttest scores.

Students' pretest score (M= 6.73, SD=3.92) and post test score (M=7.96, SD=4.04) on knowledge test were calculated separately [Range=0-17].

As shown in Table 4, pretest – posttest comparison through using paired sample t-test indicated significant results in favor of post test score [t (44) = -2, 674, p<0.05, Cohen's d=0.31]. This result suggests that SEEP significantly increased students' knowledge on the selected nature-related topics with the small effect size (Cohen, 1992).

Environmental Affect

ADTES further included three sub-scales associated with attitude, sensitivity and intention. In order to examine the difference between pretest and posttest scores with regard to these sub-scales, paired sample t-test was run for each. Significant difference was observed for all sub-scales [t (44) = -2.11, p<0.05, Cohen's d=0.41 for environmental attitudes, t (44) = -3.66, p<0.05, Cohen's d=0.64 for environmental sensitivity and t (44) = -2.87, p<0.05, Cohen's d=0.56 for willigness to act]. These significant results indicate that students' attitudes toward the environment ($M_{pretest}$= 19.67; $M_{posttest}$= 21.38), environmental sensitivity for the environment ($M_{pretest}$= 15.52; $M_{posttest}$= 17.93), and willingness to act upon environment problems ($M_{pretest}$= 20.62; $M_{posttest}$= 23.24) were increased after a week-long intervention. Table 5 summarizes students' pretest and posttest total scores gathered from three sub-scales.

Table 3. Students' correct responses in pretest and posttest

	Pre test		Post Test	
Topics	*f*	%	*f*	%
Extinction of the species	32	71.1	35	77.8
Causes to decrease in number of the animals	22	48.9	17	37.8
Energy in food chain	13	28.9	18	40
Soil	28	62.2	27	60
Food chain	18	40	20	44.4
Soil pollution	18	40	21	46.7
Nature sport – orienteering	14	31.1	29	64.4
Recycling	31	68.9	32	71.1
Living organism	20	44.4	27	60
Sustainability – natural resources	13	28.9	22	48.9
Waste management	14	31.1	13	38.9
Physical parameters - water monitoring	19	42.2	15	33.3
Forest – deforestation	19	42.2	13	28.9
Health	14	31.1	24	53.3
pH – water monitoring	3	6.7	17	37.8
Water	11	24.4	21	46.7
Soil – decomposing	14	31.1	20	44.4

Table 4. Pretest and posttest comparison for the score of knowledge test

Test	**Min-Max**	**Mean**	**SD**	**t-test result**
Pretest	0-16	6.73	3.92	t (44) = -2, 674, p<0.05
Posttest	0-14	7.96	4.04	Cohen's d = 0.31

Even though students' affective tendencies toward the environments for each scale were found to be high in the pre-test scores, these scores were observed to be significantly higher in the post test administration. Students' total score obtained from each sub-scale was quite high and close to the maximum total score to be reached.

In order to understand students' feelings and thinking behind their positive tendencies toward the environment, their open-ended responses to each item was subjected to content analysis.Students' responses from pretest to posttest become more in-detail. In the pretest administration, the students indicated that they showed apathy and tendency to protect environment due to more ego-centric perceptions (e.g. water and electricity shortage, beauty of the nature). Some of the students insisted their feelings, but some others reported more eco-centric perceptions (e.g. natural balance, living conditions of others – plants and animals) after intervention. Students' eco-centric perceptions were also observable in pre-test administration.

As for ego-centric views, a few students supported the wild animals to be killed since "[these animals] *harmed the people* (St.5; 32; 38; 42)". Some students believed that people should give importance to the nature. In this item they reported the reasons as "*because of our own health* (St.7)"; "*because we are living in this environment* (St.36; 37)". A few of them believed in necessity of careful usage of water and electricity and indicated the reason as "*because we could die due to water shortage* (St. 32)"; "*because depletion of these resources means ending of our life too* (St. 39)".

As for eco-centric views, the students mostly focused upon and give detail opinions for the items associated with "giving importance to the nature, using water and electricity and killing wild animals". The students reported their opposition for since they believed that"*natural balance could be destroyed*(St.13; 17); *these animals have right to survive like others* (St.9; 14);*they are also living things* (St.22; 39);*these*

animals are a part of life cycle (St.16; 35)"; "*… food chain* (St.36)" and "*… nature* (St.30; 33)".

Table 5. Pretest and posttest comparison for the score of sub-scales of affect

Sub-scale	Test	Min-Max	Mean	SD	t-test result
Env. Attitude	Pretest	5-25	19.67	5.27	t (44) = -2.11, p<0.05
	Posttest	11-25	21.38	2.64	Cohen's d = 0.41
Env. Sensitivity	Pretest	4-20	15.52	4.45	t (44) = -3.66, p<0.05
	Posttest	9-20	17.93	2.86	Cohen's d = 0.64
Willingness to act	Pretest	5-25	20.62	5.89	t (44) = -2.87, p<0.05
	Posttest	14-25	23.24	3.14	Cohen's d = 0.56

Table 6. Pretest and posttest comparison for the score of sub-scales of behavior

Sub-scale	Test	Min-Max	Mean	SD	t-test result
Physical Action	Pretest	0-30	21.9	8.8	t (39) = -2.27, p<0.05
	Posttest	5-30	25.97	6.63	Cohen's d = 0.52
Warning Behavior	Pretest	0-12	8.78	3.83	t (41) = -2.56, p<0.05
	Posttest	1-12	10.4	2.66	Cohen's d = 0.59
Saving Behavior	Pretest	0-12	9.27	3.93	t (43) = -1.39, p=.17
	Posttest	1-12	10.25	2.79	
Political Action	Pretest	0-12	6.02	4.59	t(41) = -4.24, p<0.05
	Posttest	0-12	9.05	4.02	Cohen's d =0.70

Some other students' views on their positive tendencies toward the environment were for future generations. These students believed that "[people should give importance to the nature.] *because future generations should live in a clean environment* (St. 22);*because of the comfort of the future generations* (St.35);*because if we ruin the environment, this will be bad for other people* (St. 32). Some others indicated the importance of using water and electricity carefully "*because of future generations* (St. 33)"; "*because we are not alone, we need to think of other animals and living creatures* (St. 34)"; and "*because if we do not use carefully, dry climate and desert will be left to future generations* (St.43)".

Environmental Behavior

The questionnaire used to assess students' responsible environmental behavior further included four sub-scales; physical action, warning behavior, saving behavior and political action. In order to examine the difference between pretest and posttest scores with regard to these sub-scales, paired sample t-test was run for each. As presented in Table 6, except for the sub-scale of saving behavior, pretest posttest comparison was found to be significant for other sub-scales [t (39) = -2.27, p<0.05, Cohen's d=0.52 for physical action, t (41) = -2.56, p<0.05, Cohen's d=0.59 for warning behavior and t(41) = -4.24, p<0.05, Cohen's d=0.7 for political action]. These results suggest that students' responsible environmental behaviors related to physical action ($M_{pretest}$= 21.9; $M_{posttest}$= 25.97), warning behavior ($M_{pretest}$= 8.78; $M_{posttest}$= 10.4) and political action ($M_{pretest}$= 6.02; $M_{posttest}$= 9.05) were increased significantly as a function of SEEP.. Even though students' gain score on saving behavior was higher in the posttest ($M_{pretest}$= 9.27; $M_{posttest}$= 10.25), the increase was not statistically significant [t (43) = -1.39, p=.17].

Scientific Process Skills for Investigating and Solving Environment Issues and Problems

Students pretest score (M=2.36, SD=1.69) and posttest score (M=2.68, SD=1.75) on skill test were calculated separately for comparison. As shown in Table 7, pretest -posttest comparison through using paired sample t-test indicated insignificant result [t (44) = -1.24, p=0.220]. Both of the results suggest that students' gain score on the skill test increased in the posttest, but this increase was not statistically significant. Furthermore, considering the max score to be gathered from the test, students both pretest score and posttest score were very low. None of the students answered all questions as correct in the pretest while only two students' all answers were correct in the post test.

Table 7. Pretest and posttest comparison for the score of skill test

Test	**Min-Max**	**Mean**	**SD**	**t-test result**
Pretest	0-6	2.35	1.69	t (44) = -1.24, p=0.220
Posttest	0-7	2.68	1.75	

CONCLUSION AND DISCUSSION

The study was undertaken with 45 pupils who attended SEEP. Repeated measures t-test results revealed that SEEP significantly increased pupils' environmental knowledge (Cohen's d = 0.31), environmental attitudes (Cohen's d = 0.41), environmental sensitivity (Cohen's d = 0.64), willingness to act on environmental problems (Cohen's d = 0.56), physical action (Cohen's d = 0.52), warning behavior (Cohen's d = 0.59) and political action (Cohen's d = 0.7) from pre-test to post test. However, even though posttest scores were observed to be higher than pretest scores, no significant effect was observed for the dimensions of saving behavior and scientific process skills. According to the Cohen's criteria (Cohen, 1992), the observed significant effect was small for environmental knowledge and medium for other dimensions.

Increased awareness and environmental knowledge is necessary for developing action skills (Palmberg & Kuru, 2000) and thus take responsible environmental action (Dresner & Gill, 1994). Environmental awareness could be a moderating variable which contribute to the development of environmental knowledge, attitudes, sense of responsibility and thus to behave responsibly (Korhonen & Lappalainen, 2004) which is the ultimate outcome of EE (Hungerford & Volk, 1984). Disinger (1998), in this sense, indicated the importance of outdoor activities to develop environmental awareness and increase environmental knowledge. Classroom instruction itself may not be sufficient to develop such knowledge. Further extracurricular activities such as field trips and outdoor activities could fill the gap (Erdogan & Uşak, 2009). The present study is one of the good examples of these claims. In general, students' knowledge of environment, problems and issues increased significantly after one week intervention, but the effect size of the intervention is small. The longer the intervention the higher the effect size could be. Analysis of the individual items in knowledge test indicated that the frequency of correct answer for 12 items increased from pretest to posttest. However, frequency for some items remained much or less same or decreased a little bit. These could be due to the fact that some of the items (e.g. forest deforestation) were given very little attention during the intervention or (e.g. water monitoring parameters) required more experiments and much more time to understand. Similar findings were also observed in previous studies. Martin (2003) reported statistically significant effect of outdoor activities on 5th graders' environmental knowledge. Lisowski and

Disinger (1991) found the effectiveness of field-practices in assisting students' understanding of selected ecological concept. Erdogan (2011) also found increased post-test scores on environmental knowledge, but the effect of intervention was not significant.

Outdoor education activities facilitate the development of affective domain (Crompton & Sellar, 1981). Matthew and Riler (1995) seem to support this claim and add that involvement in outdoor activities stimulates environmental attitudes of individuals which might bring about environmental responsibility. Difference between pretest and posttest scores for each sub-component of Affect was statistically significant and in favor of post-test scores. Significant increase in affective tendencies from pretest to posttest scores refers that SEEP they attended contributed to increase in students' affective tendencies and apathetic views. This difference was also observed in students' open-ended responses given to each items in the scale. Students believed in the importance of protecting the environment due to sustainability of the resources for the future generations. Most of them reported to change their life habits by using the electricity and the water less. Students' conception of the environment changed to some extend from ego-centric to eco-centric after intervention. Even though the present study indicated students' significantly increased affective tendencies (attitudes, sensitivity and willingness to act) toward the environment as a function of one week environmental education program, Tung et al. (2002) reported that much more times should be spent to observe changes in the affective realm. This could be necessary for assuring the stability and retention of such attainments. The findings of the study in relation to environmental affect are in line with the literature to much extend. Mittelstaedt, Sanker and Vanderveer (1999) examined the effect of week-long experiential program in the Edge of Appalachia Summer School of 9 to 12 aged children's environmental attitudes and awareness. They reported increased positive attitude toward the environment after one week program at camp. In other study, Erdogan (2011) reported increased, but not significant change in 8th to 13th aged pupils' environmental sensitivity and willingness to act after 12 days long summer ecology-based nature education program.

Behavior is a complex phenomenon which could not be explained with linear association of some variables (knowledge, attitude and so on). In the present study, except one (saving behavior), pupils' behaviors in each sub-scale of Responsible Environmental Behavior (REB)measure were observed to be significantly higher after week long program. For behavioral change, one week may not be enough, but as it was shown in the study, the significant improvement was observed. This mainly could be due to the fact that the program they involved so intense and they mostly benefited from the activities. The activities; e.g. recycling, designing 3D materials using recyclable materials, water monitoring and observation of the man-nature relationship throughout the program were useful to develop such behavior of the participants. On the other hand, students' saving behavior increased from pre-test to posttest, but the change was not statistically significant. The pupils in the study were from Orphanage don't buy their goods and these are mostly provided by the visitors to their home or by the government. Since all goods provided to them without any money, they may not develop saving behavior. The items in relation to saving behaviors asked to the participants were about saving the water and electricity. Thus, much more time (or longer intervention may be needed) should be spent to develop pupils' such behavior. Students' increased REB after outdoor education or EE in non-traditional settings were also observed in previous studies. In his pretest posttest without control group design study, Özdemir (2010) reported 6th - 7th graders' increased environmental awareness, positive attitudes and also responsible environmental behavior after 8 week intervention (nature based EE program). In other study, Kruse and Card (2004) assessed 10 to 18 aged nature camp

participants' conservation knowledge, attitude and behavior before (pretest), immediately after (posttest) and one month later (delayed posttest) the camp and found increased change in reported knowledge, attitude and behavior regarding the conservation. In the analysis of the research on EE non-traditional settings (Erdogan, Bahar & Usak, 2013), participants' reported REB was observed to be higher after EE program. In two other national studies, it was reported the benefits of direct experiences in the natural settings to the development of sense of responsibility, environmental awareness (Negev, Sagy, Tal, Salzberg & Garb, 2006) and REB (Erdogan, 2009).

Even though students' posttest scores was higher than those in pretest, the difference was not that much high and statistically significant. The items in the test mostly addresses to the skills associated with issue analysis, variable and research question, data collection and analysis, and solving environmental issues and problems. Those skills could only be developed if the students are taken into the research journey including experiments, observation and so on. During the program, there were outdoor activities involving experiments and series of observations, but their time was limited and the individual students could do only one experiment and observe the others. This little improvement in such variable suggests that much more time should be spent out-side for observation and the students were allowed to carry out more experiments by their own so that they could experience with whole process of experimentation in more than one time. The outdoor setting and direct experience in the nature is significant for the students to observe the cause-effect relationship. In this regard, Eaton (2000) found that when compared with in-class activities, outdoor learning experiences were observed to be more effective for cognitive skills. Development of cognitive skills; especially action skills, facilitates the increase in REB. Several experimental studies (Culen & Volk, 2000; Ramsey & Hungerford, 1989; Ramsey, 1993) with various subjects are the evidence of this claim.

Since the design of the study was one group pretest posttest without control group which is called as weak experimental study, some issues controlled the threats to the internal validity. The duration of the program was short and during this short period, no maturation was observed and the participants was not exposed to any other environmental related information rather than SEEP.

SUGGESTIONS

The presents study is the indication of positive and significant contribution of outdoor education program to development of environmental knowledge, affect and REB. Out-of-school learning settings (e.g. forest, lake, nature museum, zoo, natural parks) could be seen as the good places to understand the ecological concepts and natural phenomenon better. During the education in such settings, the students could directly observe the nature, its dimensions and cause-effect relationship among these dimensions. In this regard, these places could be seen as the open laboratories where the students could see, touch, hear, feel and thus experience the nature as a whole in its place. For these reasons, the activities designed in informal learning settings could be considered as the complimentary to traditional classes. The benefits of classroom instruction are not ignored, but it is not enough by itself. Carrying out field trips to and implementing EE activities in such settings could develop students' learning in cognitive, affective and psychomotor domains. Thus, teachers should take their students to natural areas as extra-curricular activities and to have the children understand the concepts and phenomenon they learn in the class. These activities provide the students with opportunities to study deeply in environmental topics and issues (Neal, 1994) and are effective in increasing

environmental awareness (Palmberg & Kuru, 2000; Howe & Disinger, 1988). If the teachers have no chance to take their students out-of school (due to some procedures – restriction, school rules, heavy work-load, family permission and so on), they could encourage students to participate in summer EE programs and other EE programs in zoo, natural and national parks.

This study is limited with the data collected from 45 4th to 8th graders participating in one week EE program. The study indicated significant results on knowledge, affect and behavior, but not skills. Such study to be designed to reflect different aspect of EE should be extended to other settings (forest, natural parks and so on) and conducted with large group of people in various part of the society. This study is a good example of the contribution of EE program in informal settings to its participants in relation to various aspect of environmental literacy. In the present study, a week long program was designed and implemented due to limited permission obtained from the Orphanage where the participants are living. Even though the program was short, significant findings were reached. However, it is well known that the longer the participants experience with the different aspects of nature and some phenomenon occurred in the nature, the more their knowledge, affect, behavior and skill are stable. Thus, further researchers in the field of EE are suggested to plan, design and implement longer EE programs to observe the longer effect of such program on the participants. Most of the findings in the present study are quantitative in nature. The studies addressing to "Why" and "How" questions should also be undertaken so that the reasons and performance behind the empirical scores could be understood. Qualitative studies could provide more in-depth understanding and insights about the benefits of such programs.

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