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Gifted Children And Outdoor Education: How A Short-Term Outdoor Education Influenced The Knowledge And The Nature Perception Of Gifted Students

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Abstract

Outdoor education has many beneficial effects on children's learning and cognitive abilities and their connectedness to nature. This study aims to evaluate the impact of short-term outdoor education on the nature perception and knowledge of gifted students. Thirty gifted students were enrolled in a 7-day outdoor education activity. The camp included science, art, and social activities organized based on specific features of Mt. Erciyes. Three different methods were used for assessment of outcomes. The knowledge test was applied to measure students' newly acquired knowledge. Cognitive mapping was used to assess changes in students' perceptions. Finally, the drawings and stories of students were evaluated to understand how students incorporated knowledge into their daily experiences and especially into their art. Our results show that outdoor education provided many benefits to the gifted students. They developed positive relationships with their environment, gained knowledge and their perceptions of the Mt. Erciyes ecosystem has changed.

Keywords: Short-term outdoor education, gifted-students, nature perception, cognitive mapping

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Özel Yetenekli Çocuklar Ve Açık Hava Eğitimi: Kısa Süreli Açık Hava Eğitiminin Özel Yetenekli Öğrencilerin (Doğa) Algılamalarına Etkisi

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Öz

Bu makale Türkiye'deki özel yetenekli öğrencilerle yapılan disiplinler arası bir doğa eğitimi etkinliğinin araştırma bulgularını sunmaktadır. Araştırmanın teorik çerçevesini açık hava etkinliklerinin özel yetenekli öğrenciler üzerindeki bilişsel ve sosyal etkisi oluşturmaktadır. Çalışmaya 15 ilden 12-14 yaş arası 30 özel yetenekli öğrenci katılmıştır. Erciyes Dağı'nda yedi gün konaklamalı olarak yapılan çalışmada açık havada deneysel öğrenme fırsatları sunan bilim, sanat ve sosyal aktiviteler içeren disiplinler arası 28 farklı etkinlik yapılmıştır. Çalışmada nicel ve nitel yöntemlerin birlikte kullanıldığı karma yöntem tercih edilmiştir. Çalışma verilerinin toplanmasında, öğrenci görüşmeleri, bilişsel haritalama, ön test ve son test, resim çizme ve hikâye yazma gibi farklı teknikler kullanılmıştır. Veri analizinde içerik analizinden yararlanılmıştır. Araştırma sonucunda, özel yetenekli öğrencilerin etkinliklerde öğrendikleri yeni kavram ve fikirleri çizimlerinde, hikâyelerinde başarıyla kullandıkları ve katılımcı öğrencilerin uygulamaya yönelik çevre bilgilerinde artış olduğu görülmüştür. Öğrenciler yapılan etkinliklerden keyif aldıklarını, açık hava uygulamalarının, araştırma ve öğrenme isteklerini artırdığını, kendilerini rahat ve sakin hissetmelerinde yardımcı olduğunu, yeni arkadaşlar edindiklerini, kolay öğrenebildiklerini ve eğitime katılmaktan mutlu olduklarını söylemişlerdir. Araştırma bulgularına göre, açık hava etkinliklerinin öğrenciler üzerindeki bilişsel ve sosyal olumlu etkileri düşünüldüğünde özel yetenekli öğrenci eğitimlerinde daha fazla açık hava etkinliğine yer verilmesi önerilmektedir.

Anahtar Sözcükler: Kısa süreli açık hava eğitimi, özel yetenekli öğrenciler, doğa algısı, bilişsel haritalama

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1. Introduction

Gifted or talented individuals are present in all societies, and it is becoming increasingly important to make the best use of the gifted individuals' abilities (Kaufman and Sternberg, 2008). Galton (1892) conceptualized giftedness as an extremely high and innate talent. They have the ability to understand comprehensively with ease at astonishing speed, to gain knowledge to acquire, maintain, integrate, and develop skills, to eliminate difficulties when confronted in the way of achieving a certain purpose, and to read, and consider alternatives and possibilities (Maker and Nielson, 1996). Gifted individuals in general are emotionally sensitive, have improved feelings of justice, strong feelings, strong sense of humor, strong moral values, and with strong leadership skills (Clark, 2002).

Education programs and activities for gifted children are very important, yet challenging to create (VanTassel-Baska, 2005). One difficulty of organizing education programs for gifted students is keeping children's attention and one way to provide that is to keep gifted children challenged and engaged (Fish and Bailei, 2018; Pfouts and Schultz, 2003). Outdoor education is considered one of the best models for keeping children challenged and engaged. When learning outdoors students participate in a variety of challenges. Due to their asynchronous development, gifted students need to be supported for their social, emotional, and personal development outside the classroom as well as in the classroom (Borders et al., 2014). Therefore, outdoor education can have positive effects on students' personal development and school success (Durlak et al., 2011). According to Gray and Birrell (2015), the higher academic success attained by children in many Scandinavian countries, such as Finland, Denmark, Norway and Sweden, in the International Student Assessment Program (PISA), is an indicator of the effectiveness of outdoor education. A well-designed outdoor education model can help gifted students to socially adapt to each other and a world of non-gifted peers and adults (Fish and Bailei, 2018; Pfouts and Schultz, 2003). Outdoor education also provides an efficient environment for strengthening the relationship of children with nature and developing positive attitude towards the environment (Dowdell et al., 2011; Ee and Ong, 2014; Maller and Townsend, 2006).

Short-term outdoor education camps are popular all over the world as a way of stimulating students' abilities for observing and understanding nature, enhancing critical thinking, and problem solving skills by providing an environment where students can observe, experience, and evaluate different subjects. These camps are also very popular in Turkey and have been undertaken for many years with different target groups. Most camps are short-term camps (max. 10 days) and are conducted in a novel environment. The camps are organized over a major science or technology topic and supported with social activities. In these camps, transferring information to the target groups in a comprehensible manner is mostly managed by supporting the information with techniques of visualizing, interacting, and experiencing. In addition, the camps aim to show that scientific facts and concepts in different fields are intertwined with everyday life, making science education more entertaining. In the trainings, participants are encouraged not only to convey as much information as possible, but also to increase their sense of curiosity, research, and learning aspirations by recognizing simple scientific facts with their own practices (Özdemir, 2010). However, the outcomes from these camps are not usually properly measured, raising the question of how effective these camps are in terms of increasing students' knowledge and nature perception. Evaluation of outcomes is also not a straightforward process, as participants experiences can differ greatly.

This study aims to fill this gap by using the example of a nature camp with a group of gifted students. The major research question in this study was how a short-term outdoor education camp can influence gifted students' knowledge, perception, and understanding of a system of interest. We asked three questions:

(1) Did the short-term outdoor camp increase the gifted students' knowledge about the novel environment?

(2) Did the short-term outdoor camp increase the gifted students' perception about the novel environment?

(3) Could students incorporate the new knowledge and perception into their daily lives and to their art?

To answer the first question, the students were given knowledge tests before and after the camp the correct number of answers were compared. To answer the second question the students drew cognitive maps before and after the tests and the results were evaluated using statistical methods. To answer the third question experienced teachers and psychologists evaluated the students' drawings and stories and graded how students incorporated their newly acquired knowledge into their art.

2. Methods

2.1.Participants

In this study, a 7-day outdoor camp was organized with 30 gifted students who were previously identified as gifted in art and cognitive ability areas by the process of the Ministry of National Education in Turkey (MEB, 2016) and are currently enrolled in 18 different "Science and Art Centers" located in 15 cities where they get supportive education in parallel to their formal education in regular schools. Among those who voluntarily applied through the website the selected students were between the ages of 12 and 14 and enrolled in sixth to eight grades, while the gender was almost equally distributed with 16 girls and 14 boys.

Location and the Scope of the Camp

The camp was organized at Mt. Erciyes, a volcanic mountain located in the Central Anatolia Region of Turkey. The mountain and its surrounding area have been identified as an Important Nature Area (ÖDA) (Eken et al., 2006). It provides home to seven ecologically different habitats including a good example of a typical steppe ecosystem and an internationally important wetland ecosystem, Sultan Marshes. The ski center located at the mountain is a home for winter tourism. It has been tried to choose regions that attract the attention of the students and are suitable for conducting different ecological researches.

The educators of the camp were trainers from different academic fields and organizations. The first and the biggest trainer group consisted of teachers working at the schools for the gifted students in Turkey. The second major group of trainers consisted of the researchers from universities with diverse research interests including ecology, water quality, erosion, architecture, etc. The last group of trainers consisted of professionals on mountaineering, music, photography, bird watching, etc.

The camp consisted of day-time (9 am – 17 pm) and night-time (19 – 22 pm) activities. Students participated in 1 to 1.5-hour activities mostly in the outdoor setting during day time and indoor/outdoor activities during night time. The students participated in a range of education activities (provided in Appendix 1) that were created based on Mt. Erciyes and its

physical, ecological, geological, cultural, and socio-economic features. The camp program also included art and social activities including photography, bird watching, model plane construction, etc.

2.2.Data Collection and Analyses

We used different tools for collecting data regarding the knowledge, perceptions, and understandings of students during, before, and after the camp.

The study was based on three major questions; therefore the data were collected targeting for the answers of these questions:

(1) Did the short-term outdoor camp increase the gifted students' knowledge about Mt. Erciyes?

Method: Multiple-choice test

To answer this question, the trainers prepared multiple-choice questions covering the topics in the camp. Among these questions, 20 were selected and students were asked to take an online test both before and after the camp (A sample list of the questions is provided in Appendix 2).

In the computer-based multiple choice tests (Data collection tool 1), a case study pattern including a single group final test model was used. This pattern was described by Fraenkel and Wallen (2000) as experimental testing of a single group and then measuring the dependent variable to see the effect of this experimental application. Quasi-experimental designs are models with high validity in research in the field of education (Cohen et al., 2007).

Scope validity ratios of the test questions were calculated by finding the ratio of the number of experts (N) who responded positively to each question (NG) to half of the total number of experts (Lawshe, 1975). The ratio calculated by the formula KGO = [NG / (N / 2)] - 1 was found to be 0.9.

Data Analysis: Statistical methods were used to analyze computer-based multiple choice tests. In these analyses SPSS 24.0 software was used. Mean and standard deviation were calculated for data characterization and frequency analysis was carried out to understand the distribution of answers. T-test was used to compare the results before and after the camp.

(2) Did the short-term outdoor summer camp increase the gifted students' perception about Mt. Erciyes?

Method: Cognitive Mapping

To answer this question, cognitive mapping methodology (Data collection tool 2) was applied. The aim was to determine the differences in perceptions and understandings of students regarding the Mt. Erciyes and its physical, ecological, geological, cultural, socio-economic features before and after the camp. In the cognitive mapping exercise, we again follow the pattern of Fraenkel and Wallen (2000) where we measure how the cognitive maps of students changed after the camp.

The term cognitive map refers to a causal model made of variables (concepts) and connections. The main assumption of this approach is that individuals have cognitive models that are internal representations of a partially observed world (Bauer, 1975). There are only a few studies that used cognitive mapping in evaluation of education/training activities (Jones et al., 2014). Some other studies used other mapping techniques such as concept mapping (Hay,

2007) and mind mapping (Ismail et al., 2010) for performance evaluation. These studies showed that mapping approaches can support learning and help understand students' metacognitive knowledge (Ismail et al., 2010). They can also be used to identify and determine the quality of learning (Hay, 2007). Applying mapping techniques during and at the end of an education program can show how the activity changed students' understanding and can provide quantitative assessment (Jones et al., 2014).

In this study, the students were asked to draw cognitive maps before and after the camp and we compared how the parameters changed using statistical methods. First, we explained the method to the students with an out of context sample map. Then they were asked an open-ended question. This question was "What are the variables and parameters related to Mt. Erciyes and how do these variables affect each other". After the students listed the variables, they wrote them on a paper and drew a circle around the words and showed the causal connections between these variables. They showed the direction of causal connections with arrows and +/- signs and defined the strength of the relationship as "low, medium and high". We then transferred these statements to numerical values as "+/- 0.25, 0.5, and 1".

Data analysis: For analyzing cognitive maps, they were transformed into square adjacency matrices. Graph theory indices (density, indegree, outdegree, complexity, centrality, hierarchy index) were calculated using these matrices (Özesmi and Özesmi 2004). Density, equals to the number of connections divided by the maximum number of connections possible between these variables, was calculated to show how connected or sparse the maps were (Hage and Harary, 1983). Indegree and outdegree can be used to determine whether a variable is a transmitter, receiver variables, or an ordinary variable (Harary et al., 1965). Outdegree is the cumulative strength of the connections exiting the variable and indegree equals to the cumulative strength of the connections entering the variable. When outdegree is positive and indegree is zero, the variable is a transmitter variable. When outdegree is zero and indegree is positive, the variable is a receiver variable. If both of them are positive, the variable is an ordinary variable. A large number of receiver variables show the outcomes and implications of the cognitive maps (Eden et al., 1992). Whereas, large number of transmitter variables indicate a "formal-hierarchical" system (Simon, 1996). The complexity of a cognitive map is the ratio of the number of receiver variables to the number of transmitter variables. Centrality (indegree + outdegree) shows the contribution of a variable in a cognitive map. The hierarchy index (MacDonald, 1983) shows whether a cognitive map is democratic or hierarchical. In a hierarchical cognitive map, the system is controlled by many forcing functions or there are many top-down influences. In a democratic cognitive map, there are less top-down influences. We used standard statistical methods to compare graph theory indices of students before and after the education program. Normality of samples was tested by Shapiro-Wilk tests of normality. As most data series were not normally distributed, we used the Wilcoxon Rank Sum Test to compare maps drawn before and after the program. Social cognitive maps of the students were prepared by augmenting individual cognitive maps and adding them together. This was achieved by summing adjacency matrices produced from cognitive maps of each student. Social cognitive maps are sum of individual maps and they show the perceptions and understandings of the groups (Laszlo et al., 1996). In social maps, we determined the most used and most central variables to understand the shared variables of the student groups.

(3) Could students incorporate the new knowledge and perception into their daily lives and to their art?

Method: Drawing and Story Evaluations

During the camp, the students participated in a drawing - mail art activity (Data collection tool 3) (also known as correspondence art or postal art); a populist art movement centered on sending the drawings of objects, animals, etc. through the postal service on envelopes. In this activity, each student was asked to draw their experiences about the Sultan Marshes and Mt. Erciyes on envelopes.

The students were asked to write stories (Data collection tool 4) about their experiences on Mt. Erciyes to orient them to develop original literature. For this specific exercise students were shown an artistically impressive photograph of Mt. Erciyes and each were asked to write a story (A sample of a student story is provided in Appendix 3).

Data analysis: Students Drawings

Student drawings were independently reviewed by a commission of three experts (visual arts teacher, educational science expert, and psychological counselor). Through the drawings, it was tried to see the reflections of the students' minds, what they think about nature and the relationships they establish between objects (Cherney et al., 2006). The objects used by the students were collected and evaluated under certain themes (Hope, 2008). This technique is commonly used and only valid for topics lacking a specific theoretical basis (Yıldırım and Şimşek, 2011). It was using content analysis after completing the coding, the themes were compared and evaluated.

Data analysis: Students' Stories

The metaphors produced by the students in the story writing activity were examined by the experts (literature teacher, educational science expert and psychological counselor) and the items that the experts were "in consensus" "and "in disagreement" were determined. Here, reliability was calculated using formula determined by Miles and Hubarman (1994) (Reliability = [Consensus / (Consensus + Disagreement]). 100). The experts and the researchers were differentiated in only three categories, and reliability was found as [42 / (42 + 3)]. 100 = 0.93. Morgan (1980) states that metaphors can be used as a tool to inform us about the way individuals understand events and the world. The analysis of the metaphors in the stories of students showed the perception and attitudes of students about the trainings and about Mt. Erciyes.

3. Results

In this study, we evaluated the outcomes from a short-term outdoor education program. By applying different evaluation methods, we seek to answer if (1) short-term outdoor education increased the gifted students' knowledge about the novel environment where the education activity is organized (2) if short-term outdoor education increased the gifted students' perception about the novel environment and (3) if students could incorporate the new knowledge and perception into their daily lives and to their art? Below, we provide the results.

Answer 1: The short-term outdoor education increased the gifted students' knowledge about Mt. Erciyes.

In the computer-based multiple-choice testing which was organized before (pre-test) and after (post-test) the camp, students were asked 20 questions about topics/concepts they would learn during the camp. Average scores before and after the camp are shown in Figure 1.

Each correct answer was five points and the maximum possible score was 100. The average test score before the camp was 57.5 (N = 30, Median = 55, Range of scores = 35-80). After the camp, the average test score was 84 (N = 30, Median = 85, Range of scores = 55-100). There was a significant difference between the test scores before and after the camp (n= 30, paired t-test, p <0.001). The activities had positive effects on the students' knowledge and cognitive abilities.

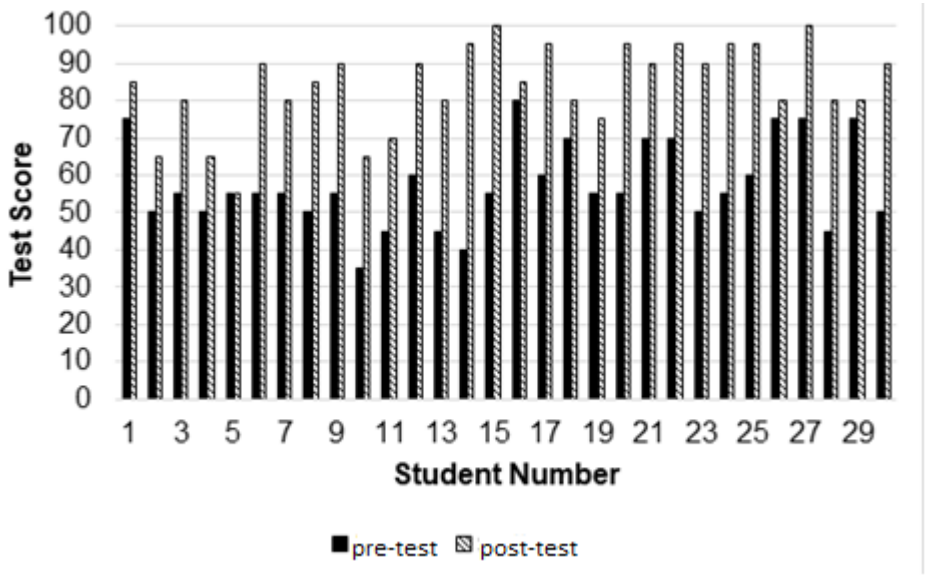

Figure 1. Test scores of students before (pre-test) and after the camp (post-test). Students did significantly better in the last test (paired t-test, n=30, p < 0.001)

Answer 2: The short-term outdoor education increased the gifted students' perception about the novel environment.

Cognitive maps were prepared before and after the camp and analyzed the maps by converting them to square matrices. Graph theory indices were calculated and social maps were prepared and compared (Table 1) statistically using the Wilcoxon test. Significant increases were detected in the number of variables ($p<0.05$), number of connections ($p< 0.05$) and variables/connections ratio ($p<0.05$) in the maps prepared after the camp. These results show that the students developed a more complex view of the system after the camp and therefore they defined the systems with more variables and connections. The values of other graph theory indices were not significantly different ($p>0.05$) in the maps prepared before and after the camp.

Table 1. The graph theory indices of the cognitive maps before and after the camp (Avg: average; SS: standard deviation; Min: minimum; Max: Maximum)

	Before the Camp				After the Camp			
Graph Theory Indices	Avg	SS	Min	Max	Avg	SS	Min	Max
No. of Variables	7.28	2.34	3	12	8.97	3.27	4	17
No. of Receiver Variables	2.38	1.52	0	5	2.77	2.05	0	7
No. of Transmitter Variables	2.28	1.41	0	5	2.67	1.88	0	8
No. of Ordinary Variables	2.62	2.05	0	7	3.53	2.32	0	9
No. of Connections	11.45	6.03	2	26	15.30	7.04	3	30
Connections/Variables	1.52	0.57	0.67	3.25	1.77	0.72	0.75	3.50
Complexity	1.10	1.14	0	4	1.24	1.31	0	6

Density	0.26	0.11	0.122	0.55	0.28	0.20	0.066	1
Hierarchy	0.69	0.68	0.018	1.33	1.11	1.46	0.009	2.858

The variables that are most mentioned in the cognitive maps indicate the variables that are shared by all students (Özesmi and Özesmi, 2004). Three most mentioned variables in the social cognitive map of the students before the camp were "snow", "winter sports", and "cable car" (Table 2). Three most mentioned variables after the camp were "ground squirrel", "snow", and "tourism". The most interesting result is the appearance of the variable "ground squirrel" as the most mentioned variable in the cognitive maps drawn after the camp. Before the camp, the students used a more general word "animal" to mention about the fauna of the Mt. Erciyes. The camp included activities about the Ground Squirrel, which most probably lead to the appearance of "Ground Squirrel" instead of "animal" in the after-camp maps. In the most mentioned 15 variables in the after-camp maps, we see some new concepts such as "steppe", "Sultan Marshes", and "erosion". Before the camp, Mt. Erciyes was mostly conceptualized as a winter sports center as the maps of students had variables like "winter sports" and "mountaineering" and other similar variables (i.e. snow, cable car, tourism, camping, etc.). After the camp, environmental and ecological characteristics of Mt. Erciyes also appeared in the cognitive maps.

Table 2. The most mentioned variables in social cognitive maps before and after the camp

No	Before the Camp	After the Camp
1	Snow	Ground squirrel
2	Winter Sports	Snow
3	Cable car	Tourism
4	Mountain/Mountaineering	Cold
5	Tourism	Winter Sports
6	Winter	Steppe
7	Hotel	Mountain
8	Elevation	Cable car
9	Animal	Peak
10	Inactive Volcanic Mountain	Hotel
11	Capital	Sultan Marshes
12	Camp	Economics
13	Water	Mountain/Mountaineering
14	Holiday	Erosion
15	Insect	Erciyes

The most important variables in the cognitive maps can be determined by looking at centrality values (Özesmi and Özesmi, 2004) (Table 3). The most central variable defined by the students before the camp was winter sports. Winter sports was affected more by the other variables than its effect on them (indegree > outdegree). This result shows that Mt. Erciyes was kept as being conceptualized as a winter sport center and all other variables were mentioned in relation to this characteristic. The second and the third most important (central) variables were snow and tourism. The cognitive maps prepared after the camp show that the most central

variable was tourism. Similar to the before-camp maps, indegree was greater than outdegree. It seems that students developed an understanding of the different features of the Mt. Erciyes after the camp and focused on tourism potential. "Steppe", "Sultan Marshes", "ground squirrel" and "erosion" also appeared as variables with higher centrality values.

Table 3. The most central variables in social cognitive maps before and after the camp (n=29, Centrality>0.34)

Before the Camp				**After the Camp**			
Variables	**Centrality**	**Indegree**	**Outdegree**	**Variables**	**Centrality**	**Indegree**	Outdegree
Winter sports	1.70	1.03	0.67	Tourism	1.98	1.44	0.54
Snow	1.22	0.33	0.89	Snow	1.66	0.57	1.09
Tourism	1.05	0.73	0.32	Mountain	1.20	0.42	0.78
Mountain/ Mountaineering	0.63	0.37	0.26	Cold	1.19	0.46	0.73
Cable car	0.60	0.25	0.35	Winter Sports	1.19	0.84	0.35
Cold	0.56	0.31	0.25	Erciyes	1.11	0.15	0.96
Capital	0.55	0.41	0.14	Peak	0.98	0.28	0.70
Altitude	0.48	0.05	0.43	Ground Squirrel	0.83	0.68	0.15
Hotel	0.48	0.36	0.12	Steppe	0.69	0.28	0.42
Tourist	0.45	0.20	0.25	Sultan Marshes	0.61	0.33	0.28
People	0.42	0.18	0.24	Kayseri	0.60	0.20	0.40
Social Media Sharing	0.41	0.41	0.00	Hotel	0.53	0.27	0.27
Holiday	0.38	0.19	0.19	Cable car	0.50	0.18	0.33
Mt. Erciyes and Surroundings	0.34	0.05	0.29	Mountain/ Mountaineering	0.43	0.38	0.04
Inactive Volcanic Mountain	0.34	0.11	0.22	Erosion	0.42	0.23	0.18

We developed the condensed social cognitive maps of students before and after the camp (Figure 2). In the condensation, total number of variables, which were 211 and 269 before and after the camp respectively, were gathered into 7 condensed variable groups, which denote different features of Mt. Erciyes: Cultural Features, Social Features, Natural Features, Economical Features, Climatic Features, Camp Activities (Figure 2). The complexity of the after-camp condensed social map was higher, and the connections between variables in after-camp maps were higher number and much stronger. One of the major differences was in how tourism and natural features were connected; after the camp, the connection from Natural Features to Tourism got stronger, showing that the students' appreciation of the natural features and their tourism potential increased. Also, the connection from Tourism to Economical Features got stronger, showing that the students started to understand the unique features of Mt. Erciyes and their economic potential. Some negative connections also appeared between variables in the after-camp map. The strongest negative connection was from Economical Features to Natural Features; the students defined some economic activities on Mt. Erciyes as having negative influence on the natural mountain ecosystem. Finally a strong negative connection from Climatic Features to Economical Features was recorded, implying that

students considered changes in climatic factors (i.e. decline in snow cover and skiing) as a difficulty in economic activities.

The analyses of cognitive maps of students before and after the camp showed that the students' perception of Mt. Erciyes changed due to the camp activities. The students used the concepts presented in the activities in their maps, defined more variables related to Mt. Erciyes and drew more connections.

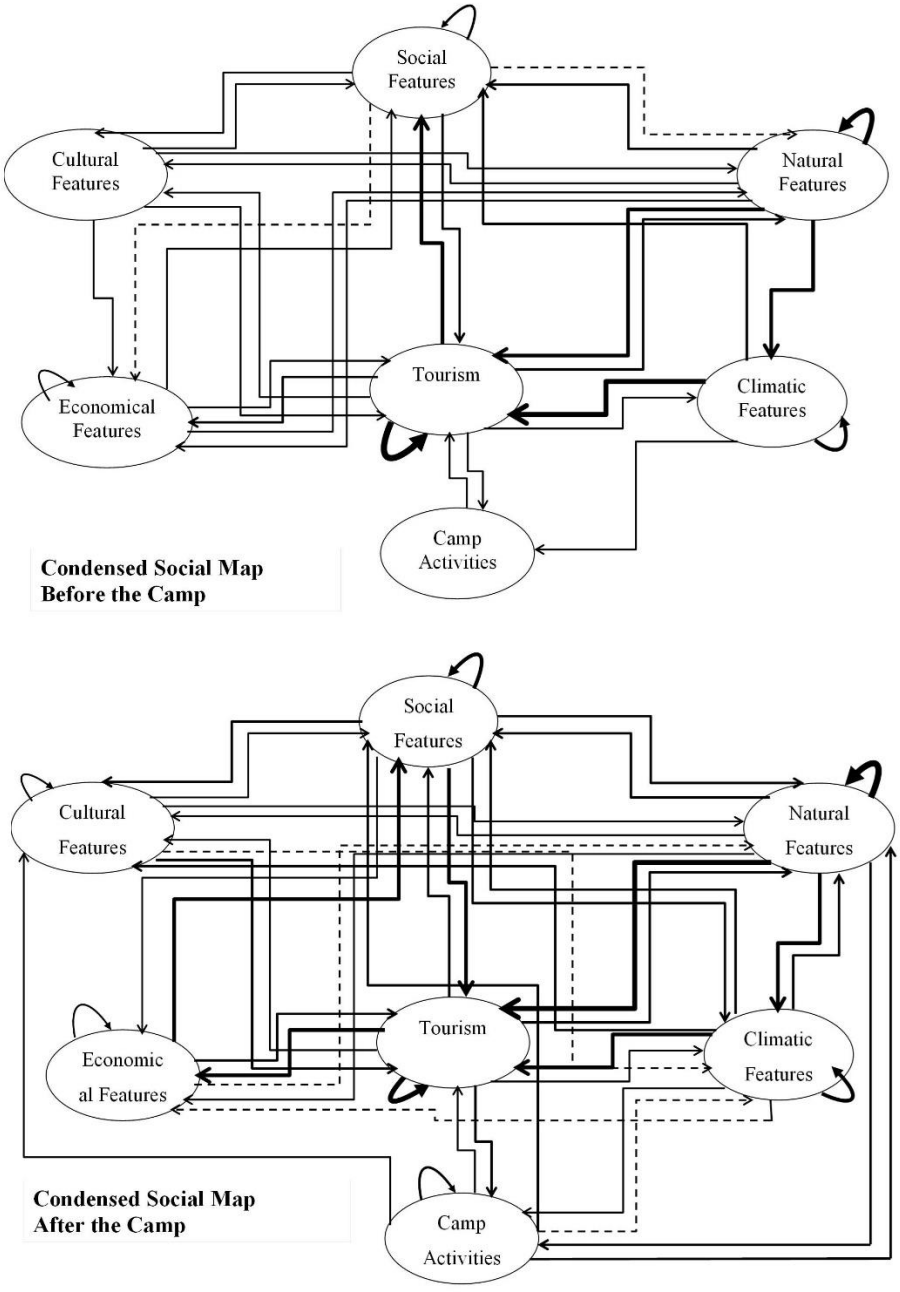

Figure 2. The condensed social maps were prepared based on individual cognitive maps drawn before and after the camp. The lines get thicker as the strength of the relationships increases. Dotted lines show negative and straight lines show positive relationships.

Answer 3: The students incorporated the new knowledge and perception into their stories and to their art.

Evaluation of Children's Stories: According to the qualitative findings obtained in the study, the gifted students produced 42 valid metaphors about Mt. Erciyes (Table 4). These metaphors were grouped under two conceptual categories; environmental and social factors. The environmental factors had 22 metaphors and social factors had 20.

Table 4. The distribution of metaphors in the stories with the subject Mt. Erciyes

Metaphor Categories	f (%)	Metaphors	f (%)
Environmental Factors	235 (59)	Erciyes (33), ground squirrel (22), peak (19), huge mountain (18), stateliness (17), ski (15), altitude (15), cable car (13), fog (10), vetch (10), icecap (9), cloud (8), rock (8), fireplace (7), torch (6), star (6), Tekir Plateau (6), soil (5), sky (4), marshes (2), bird (1), tree (1),	22 (52.3)
Social Factors	163 (41)	Tourism (25), friendship (20), happiness (15), love (14), responsibility (10), courage (9), sucuk (Turkish sausage) (8), pastrami (8), cıvıklı (local pizza with ground meat) (8), torch (8), dream (7), honesty (6), trust (5), respect (4), tolerance (4), hope (4), memory (3), coffee (2), heart (2), hotel (1),	20 (47.7)

Evaluation of Children's Mail-Art Drawings: The experts in the project team evaluated students' mail-art drawings. Table 5 provides the themes, their codes used by the students, and their frequency values. The drawings of students included themes about animals, Mt. Erciyes and Sultan Marshes. The evaluations showed that the activities in the camp were well reflected in the drawings. In their drawings, students mostly emphasized the objects they remembered or thought about the most (Figure 3). Therefore, it can be concluded that mail art had a positive effect on students' artistic and social development.

Table 5. The themes used in students' drawings and their frequencies.

Themes	Codes	Frequency
Animals	Ground squirrel, duck, horse, great white pelican, owl, turtle.	16
Mt. Erciyes	Snow, cloud, hills, peak, tree, sun, cable car	13
Sultan Marshes	Marshes, lake, sandal, wooden bridge, bird watching tower	13

Figure 3. Examples from students' drawings

4. Discussion

This study aimed to measure the impact of an intensive outdoor summer camp, designed specifically for gifted students, on the knowledge level and the perception of the students. After 30 gifted students participated in 40 different activities in different disciplines, knowledge and perception test were applied. The results showed that the designed education program was effective in terms of increasing their knowledge and perception of the novel environment, Mt. Erciyes.

4.1. Why outdoor education?

Indoor and outdoor education and their influence on learning and cognitive abilities is a subject that has long been discussed. Many studies compared indoor and outdoor education types. Some claim that students get greater connectedness with nature (Zylstra et al., 2014) and they are more inclined to make decisions that support the environment. Others concentrate on how outdoor environment stimulates critical thinking, problem solving, and deeper understanding of concepts (Cronin-Jones, 2000). Many conclude that as the environment has more complexity the students' knowledge gets more complex (Harvey, 1989; Manzanal et al., 1999), whereas some others discuss that the value of outdoor education changes direction when the environment is novel; in a familiar environment student concentrate more on the subject and in a novel environment they are more distracted. Also some concentrate on the length of the education stating that as the outdoor education becomes more regular and long term, its impacts are more significant (Dresner & Gill, 1994). However, outdoor education also has many benefits when targeted for different groups of students, especially for gifted students.

In this study, multidisciplinary, practical, and observation-based activities in an outdoor environment with expert instructors in the program enabled students to develop free thinking, decision-making and problem-solving skills in a natural environment by observing, experiencing, touching, and sharing. Through the activities, they had the opportunity to observe that there was "*a different life outside the class walls*" in the words of Payne (1985). According to Carrier (2009), and through questioning learning approaches, students had the opportunity to be interested in research by learning, questioning in different fields, conducting experiments and researches, taking responsibility, structuring their knowledge and getting to know the natural environment closely. Thomas (2010) pointed out the feature of student mobility in non-school learning activities that saves students from monotony. Dillon et al. (2006) stated that out-of-school activities can be remembered by students for years. Shanely (2006) and Lakin (2006) state that out-of-school education is aimed at increasing the knowledge of the individual's world and developing positive attitudes and behaviors.

In the education program students had the opportunity to recognize and perceive nature in the natural, historical, and cultural structure of Mt. Erciyes. They also had chance to observe the interaction of other living creatures and civilizations that have lived in the region from past to present, to be individuals with high environmental sensitivity and awareness. Braund and Reiss (2006) stated that the students were more excited and their desire to learn increased in the places they saw for the first time. Tsai (2006) stated that activities outside the classroom using five senses on real objects have an impact on students in identifying relationships between objects or events.

4.2. How was the outdoor education organized according to the needs of gifted students?

Gifted students constitute a very easy and also very difficult group of students due to their abilities. Renzulli and Reis (2014) proposed an Enrichment Triad Model in the training of gifted students, which includes general exploratory activities, group training activities, and individual and small group investigations of real-world problems. Outdoor education camp organized in this study included individual and group activities where scientists or teachers who have advanced training in their fields acted as instructors for investigation of real-world problems. Therefore, the camp fulfills different aspects of the Enrichment Triad Model.

The characteristic of instructors was an important component of the learning process. A previous study (Mills, 2003) showed that effective teachers for gifted students "prefer abstract themes and concepts, are open and flexible, and value logical analysis and objectivity". These are the major characteristics a scientist may have. Another important factor in the learning of gifted students was the topic and how challenging it was. According to Taber (2007), the topic should be challenging, i.e., it should be hard enough for gifted students to be attained with help, rather than achievable unaided. In this camp, scientists/teachers who are experts in their fields prepared the courses and the activities they taught. The core program included scientific activities together with social supporting activities. The scientific topics were advance topics, i.e., higher than the level in regular schools. The scientists created their experimental setups, and transferred them interactively, enabling students to express themselves. According to the results of the coginitive mapping, the most striking parameter that was not found in the first test but appeared in the second test is the one related to the ground squirrel. Before the camp, the students had no prior knowledge of this species. The scientists explained their methods in the field and allowed the students to interact with the squirrels. After the observations, they gave an outdoor talk on the biology of the ground squirrel and how climate change influenced their

winter hibernation. Even though the information given was at scientific level, it had the highest impact on students' perception. Also, during this camp, new parameters related to the nature were also added into the cognitive maps of the students. Steppe, the Sultan Marshes, and erosion can be given as examples to these parameters.

Social activities in the study were organized by the experts in their fields. Detailed information was given before every activity and scientific infrastructure and cause-effect relationships were emphasized. For example, the activity related to mountaineering is explained in detail by the mountaineers, student camps were created, supported by social activities such as fire burning during the camp and night walking.

The results showed that both social and scientific activities were almost equally represented in the students' cognitive maps. The experiences in the camp were added to children's memories and they will most probably remember it as an environment where they both learned, had fun, and reflected on their arts. For all these reasons, the education has been very successful, and the attention of gifted students who are a very difficult group of students was kept focused on the camp activities, and the students were satisfied with the program. These findings show that although the students had a lot of fun by focusing on winter sports, tourism and snow, they were also able to learn about the ecosystem and nature of the region. Our students stated that they would remember the Anatolian ground squirrel (*Spermophilus xanthoprymnus*) and Mt. Erciyes wildlife as an experience and a beautiful memory that they will remember throughout their lives.

4.3.Evaluation Methods

Both qualitative and quantitative data were used to evaluate the outcomes of the activities from different perspectives. Multiple choice test and cognitive maps pointed to significant changes in knowledge and understanding level of the students. In cognitive mapping, both the number of parameters and the strengths of connections among parameters had increased. Through the mail art activity, the students reflected the newly acquired information into their pictures.

For measuring knowledge, a multiple-choice test, a reliable method for the evaluation of learning outcomes, was used. It showed an increase in the knowledge of the students. However, another statistical method was needed to measure the conceptualized information. Hay (2007) argues that mapping approaches can be used to get deep, surface, and non-learning outcomes of teaching. In this study, cognitive mapping provided a general representation of how students' conceptualization of the system changed. Getting information from the stories and drawings of the students, which was achieved by evaluation of experts, were also helpful for understanding students' perception. This study showed that mapping approaches, such as cognitive mapping, can be used as another method to support evaluation of learning outcomes.

4.4. Were students aware of their own learning process? Students' Self Evaluations

In this part of the study, the assessment of students' learning by the experts will be evaluated. Just as important as the expert evaluation of the learning outcomes is the student's awareness on how he/she is acquiring new information. During the camp, every evening each student was given a daily evaluation form to evaluate their daily activities. Each of their responses were evaluated according to their scientific perspectives, scientific and creative thinking skills and the development of understanding and knowledge. In their comments, students mentioned about their experiences, the most interesting activities and how they will use the information they get from the camp (Appendix 4). The daily self-evaluation forms

showed that the students also believed that they learnt many things and they were satisfied with the activities. 100 % of students stated that they learnt many new subject during the activities, that they accomplished all the tasks during the activities and that they had a face-to-face communication with the educators. 90% of the students stated that they created a portfolio during this camp and they worked in harmony with other students. The fact that students enjoyed and successfully completed all activities shows that they are appropriate for the levels of the education program. This education program has qualifications that can be applied in education of other gifted students.

4.5. Limitations of this study

This study was conducted with a group of gifted students. This study could be conducted with a group of general education students to show the differences in learning styles and outcomes of two groups. Measurements were taken just before and after the camp. Measuring the effects of these tests and cognitive mapping studies in the longer term was not possible within the scope of the study.

5. CONCLUSIONS

In this study, the effect of a short-term outdoor camp was evaluated. Outdoor education is recommended for gifted students for keeping their attention on the topic. The focus of the camp was to evaluate the change in the knowledge and perceptions of students.

Cognitive map was used as a measurement tool for the changes in students' perceptions. This study also shows that a method such as cognitive mapping allows statistically measuring the impact on students' perceptions. The evaluation of student pictures and stories is also compatible with cognitive mapping results.

In addition, there is no study that reveals the effect of these short-term camps, which are constantly being organized in Turkey, on students. We show that students, who spend their budget each year and participate in many trainings, are positively affected both in terms of knowledge and perception. It is important to show this publication as an example in other applications so that similar educational activities continue to be supported.

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References

Bauer, V. (1975). *Simulation, evaluation and conflict analysis in urban planning, m. m. baldwin, portraits of complexity: Applications of systems methodologies to societal problems*. Columbus, OH, USA: Batelle Institute, 179-92.

Braund, M. & Reiss, M. (2006). Towards a more authentic science curriculum: The contribution of out-of-school learning. *International Journal of Science Education, 28*(12), 1373-1388.

Borders, C., Woodley, S., & Moore, E. (2014). Inclusion and giftedness, *Gifted Education: Current Perspectives and Issues* (Advances in Special Education), 26, 127-146.

Carrier, S. J. (2009). The effects of outdoor science lessons with elementary school students on preservice teachers'self-efficacy. *Journal of Elementary Science Education, 21*(2), 35-48.

Cherney, I. D., Seiwert, C., Dickey, T. M., & Flichtbeil, J. D. (2006). Children's drawings: A mirror to their minds. *Educational Psychology*, 26, 127-142.

Clark, B. (2002). *Growing up gifted. Developing the potential of children at home and at school*. (5th ed.). Upper Saddle River, New Jersey: Prentice Hall.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education*. New York: Taylor and Francis

Cronin-Jones, L. (2000). The effectiveness of schoolyards as sites for elementary science instruction. *School Science and Mathematics 100*(4), 203-212.

Dillon J., Rickinson, M., Teamey, K., Morris, M., Choi, M. Y., Sanders, D. & Benefield, P. (2006). The value of outdoor learning: evidence from research in the UK and elsewhere. *School Science Review, 87*(320), 107-111.

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011), The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development*, 82, 405-432

Dowdell, K., Gray, T., & Malone, K. (2011). Nature and its influence on Children's outdoor play. *Australian Journal of Outdoor Education, 15*(2), 24–35.

Dresner, M., & Gill, M. (1994). Environmental education at summer camp. *Journal of Environmental Education, 25*(3), 35–42.

Eden, C., Ackerman, F., & Cropper, S. (1992). The analysis of cause maps, *Journal of Management Studies*, 29, 309-23.

Ee, J., & Ong, C. W. (2014) Which social emotional competencies are enhanced at a social emotional learning camp? *Journal of Adventure Education and Outdoor Learning, 14*(1), 24-41, http://doi.org/10.1080/14729679.2012.761945

Eken G., Bozdoğan, M., İsfendiyaroğulları, S., Kılıç, T. D., & Lise, Y. (Editors). (2006). Turkey's Key Biodiversity Areas . Nature Association. Ankara

Fish, L. A., & Bailie, P. E. (2018). Getting gifted kids outdoors: Tips for a summer of play. *National Association for Gifted Children*, 5-9.

Fraenkel, J. R., & Wallen, N. E. (2000). How to design and evaluate research in education. McGraw-Hill.

Galton, F. (1892). *Hereditary genius* (2nd ed.). London: Macmillan.

Gray, T., & Birrell, C. (2015). Touched by the earth: A place-based outdoorlearning programme incorporating the arts. *Journal of Adventure Education and Outdoor Learning, 15*(4), 330–349.

Hage, P., & Harary, F. (1983). Structural models in anthropology. New York, NY, USA: Oxford University Press.

Harary, F., Norman, R. Z., & Cartwright, D. (1965). *Structural Models: An introduction to the theory of directed graphs*. New York, NY, USA: John Wiley & Sons.

Harvey, M. R. 1989. Children's experiences with vegegation. *Children's Environment Quarterly, 6*(1), 36-43.

Hay D. B. (2007). Using concept maps to measure deep, surface and non-learning outcomes, *Studies in Higher Education, 32*(1), 39-57.

Ismail, M. N., Ngah, N. A., Umar, I. N. (2010). The effects of mind mapping with cooperative learning on programming performance, problem solving skill and metacognitive knowledge among computer science students, *Journal of Educational Computing Research, 42*(1), 35-61.

Jones, M., Van Kessel, G., Swisher, L., Beckstead, J. & Edwards, I. (2014). Cognitive maps and the structure of observed learning outcome assessment of physiotherapy students' ethical reasoning knowledge, *Assessment & Evaluation in Higher Education, 39*(1), 1-20.

Kaufman, S. B., & Sternberg, R. J. (2008). *Conceptions of giftedness*. In S. I. Pfeiffer (Ed.), Handbook of giftedness in children: Psychoeducational theory, research and best practices (pp. 71-91). New York: Springer.

Lakin, L. (2006). Science beyond the classroom. *Journal of Biological Education, 40*(2), 88-90.

Lawshe, C. H. (1975). A Quantitative approach to content validity, *Personnel Psychology, 28*, 563-575.

Laszlo, E., Artigiani, R., Combs, A., & Csanyi, V. (1996). *Changing Visions, Human Cognitive Maps, Past, Present, and Future*. Westport, CT, USA: Praeger.

Maker, C., & Nielson, A. (1996). *Curriculum development and teaching strategies for gifted learners*. Austin: TX: Pro-Ed.

MacDonald, N. (1983). *Trees and networks in biological models*. New York, NY, USA: John Wiley & Sons.

Maller, C., & Townsend, M. (2006) Children's mental health and wellbeing and hands-on contact with nature. *International Journal of Learning, 12*(4), 359-372.

Manzanal R. F., Barreiro, L. M. R., & Jimenez, M. C. (1999). Relationship between ecology fieldwork and student attitudes toward environmental protection. *Journal of Research in Science Teaching, 36*(4), 431-453.

MEB (Turkey Ministry of Education). (2016). Directive on science and art centers. Retrieved from, http://orgm.meb.gov.tr

Miles, M, B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded Sourcebook.* (2nd ed). Thousand Oaks, CA: Sage

Mills, C. (2003). Characteristics of Effective Teachers of Gifted Students: Teacher Background and Personality Styles of Students. *Gifted Child Quarterly, 47*(4), 272-281.

Morgan, G. (1980). Paradigms, metaphors, and puzzle solving in organization theory, *Administrative Science Quarterly, 25*(4), 605-622.

Özesmi, U., & Özesmi, S. (2004). Ecological models based on people's knowledge: A multi-step fuzzy cognitive mapping approach, *Ecological Modelling, 176*, 43-64.

Özdemir, O. (2010). The effects of nature-based environmental education on environmental perception and behavior of primary school students. *Pamukkale University Journal of Education, 27*, 125-138.

Payne, M. R. (1985). *Using the outdoors to teach science: a resourge guide for elementary and middle school teachers*. National institute of education (ED): Wasington, DC.

Pfouts, B. R., & Schultz, R. A. (2003). The benefits of outdoor learning centers for young gifted learners. *Gifted Child Today*, *26*(1), 56-63

Renzulli, J. S., & Reis, S. M. (1994). Research related to the Schoolwide Enrichment Triad model. *Gifted Child Quarterly*, *38*(1), 7-20.

Shanely, S. D. (2006). Towards an understanding of an outdoor education program: Listening to participants' stories. PhD Thesis, University of Florida, USA.

Simon, H.A. (1996). *The Sciences of the artificial*. Cambridge, UK: The MIT Press.

Van Tassel-Baska, J. (2005). *Acceleration Strategies for Teaching Gifted Learners*. Waco, TX Prufrock Press Inc.

Taber, K. S. (2007). Science education for gifted learners? In K. S. Taber (Ed.), Science Education for Gifted Learners (pp. 1-14). London: Routledge.Taylor et al., 1998

Thomas, G. (2010). Facilitator, teacher, or leader? Managing conflicting roles in outdoor education. *Journal of Experiential Education, 32*(3), 239–254.

Tsai, J. T. (2006). The identification of the components for an outdoor education curriculum in Taiwan. PhD Thesis, Indiana University, USA.

Yildirim, A., & Simsek, H. (2011). *Qualitative research methods in social sciences* (8th ed.). Ankara: Seckin

Zylstra, M J., Knight, A. T., Esler, K. J. & Le Grande, L. L. L. (2014). Connectedness as a core conservation concern: An Interdiciplinary Review of Theory and a call for Practice. *Springer Science Reviews*, 2, 119-143.