





## The Effect of the Nature Education Science Camp on the Middle School Students' Environmental Attitudes and Perceptions<sup>1</sup>

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**Abstract.** In parallel with the rapid increase of environmental problems today, discussions about the effect of this on our daily lives and how to prevent problems have become a priority issue in many countries. In our country, especially in Science Curriculums of 2013 and afterwards, raising science literate individuals with high environmental awareness and sustainable development awareness is among the important topics. The aim of the study carried out in this context is to examine the effects of the out-of-school nature education science camp on the attitudes and perceptions of middle school students towards the environment. One-group experimental design was used in the study. The study was carried out with 28 students in the 6th and 7th grade studying in different public middle schools in the Aegean Region. The study was carried out with the same study group as a ten-day nature education science camp in total, five days in two separate periods. During the study process, theoretical and applied field trainings on basic science subjects and nature art activities were given to the students by field experts. In the study, data were collected with the attitude scale towards the environment and the perception scale towards the environment. Data were collected before, during and after the experimental application of this study. As a result of the analysis of the data collected, it was determined that students' attitudes towards the environment and their perceptions towards the environment improved after experimental application. In this context, it can be said that the nature education science camp is an effective learning method in developing students' attitudes and perceptions towards the environment.

**Keywords:** *Attitude, Perception, Out-of-school learning, Science camp.*

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## Introduction

When we look around us in our daily lives, many of us observe that nature is no longer the same as before, that there is a winter climate in the middle of summer or the opposite situations. We face many environmental problems such as sandstorm, heavy downpours that cause natural disasters, abnormally large hail grains that destroy harvests, acid rains, and turbulent extreme temperatures that are above seasonal normal. When the causes of all these environmental problems are examined, human-induced events and activities such as the unconscious and rapid destruction of Natural Resources, distorted urbanization, the release of factory waste into nature without filtering, and the misuse of cropland are encountered. It can be stated that this is the result of the unconscious behavior of human beings on the point of protecting and sustaining the planet in which they live. According to Bradley, Waliczek and Zajicek (1999), the most important factor affecting these behaviors of individuals is their awareness of the environment and their attitudes towards the environment. Therefore, the most important task of eliminating the existing environmental problems and preventing future environmental problems falls to the people. This can be achieved by informing people about the environment/nature and natural events, raising awareness about the negative effects of environmental problems and their consequences on the life of living and inanimate beings, and taking active roles within this sensitivity. At this point, the importance of environmental education emerges.

Environmental education is the training of individuals who are knowledgeable about all living and inanimate beings in nature and who are sensitive to natural, cultural and historical events by promoting and developing environmental awareness of individuals. The main purpose of environmental education is to inform the individuals who make up the society about environmental problems and to create environmentally sensitive behaviors by developing environmental awareness in individuals (Çabuk and Karacaoğlu, 2003; Özmen, Çetinkaya and Nehir, 2005). It can be said that environmental education can be provided with the science course given in schools. Within the scope of the science course, students are taught about scientific events happening around us (gravity, transformation of substances, etc.) in “Matter and its nature”, “Physical events”, especially “Earth and Universe”, “the Living and life” topics and many subjects such as nature, living and inanimate beings, environmental problems. Educators frequently express the concepts of environment and nature in science education in order to increase the consciousness of people's natural environment. In the framework of lifelong learning, learning to respect the environment, caring about the environment we live in and understanding how to exist with it are among the most important features (Delican and Sönmez, 2017). The state of the environment is closely related to individuals taking care of the environment. However, when we look at the environmental education carried out at the school, it can be said that the students recognize the image of nature, not the nature itself, and learn the information provided to them. For this reason, students' discovery of nature should be provided by their own experiences by touching, hearing and seeing (Sarrafoğlu, 2011). In this context, especially in 2018 Science Curriculum, in-class and out-of-school learning environments should be included in order for students to learn about science subjects meaningfully and permanently, and from informal learning environments (school garden, science centres, museums, planetariums, zoo gardens, botanical gardens, natural environments etc.) have been expressed. Informal science education is education in which various subjects and areas (such as zoo, science centre, etc.) are used outside of school, depending on the science education program or independently (Stocklmayer and Gilbert, 2003). Moreover, informal learning environments provide students with an environment in which they feel more comfortable, enabling them to establish a one-to-one relationship between real objects and science events that exist in nature (Martin, 2004; Pedretti, 2004; Sözer, 2013).

As in our country and in many other countries, the most common of these informal learning areas are science schools, summer schools and camps. These schools and camps improve students' science literacy, positively affect their attitudes towards science and the environment (nature), increase their interest in science, and change and improve their perceptions about the relationship between science, technology, society and environment (Foster and Shiel Rolle, 2011; Knox, Moynihan and Markowitz, 2003). The programs of these schools or camps are very effective on students' learning, especially when they are supported by activities that are unique and part of the science course program in line with the science education objectives (Wulf, Mayhew and Finkelstein, 2010). When these are considered, Science Schools, summer schools and camps in our country are realized with projects supported especially within the scope of "TÜBİTAK 4004-Nature Education and Science Schools" program. The aim of these projects is to bring the knowledge together with the society and to spread it, to give the knowledge to the students in an understandable way through interactive applications. Moreover, the students' knowledge is first shaped by the activities outside the school, such as sightseeing, observation, field studies, experimental activities, educational fun games and education in nature, and then the knowledge is structured in its natural environment by observing and researching like a scientist (Keçeci, Kırbağ Zengin and Alan, 2019). In this way, the projects supported within the scope of TÜBİTAK, 4004 - Nature Education and Science Schools program provide important opportunities for the education and training programs to support Nature-Environment and to bring nature-friendly individuals into society (Avcı, Su Özenir, Kurt and Atik, 2015). These environments, such as science schools, summer schools and camps, allow students to observe and practice, as well as to examine the events and phenomena they encounter in textbooks in their natural environment. Thus, TÜBİTAK, 4004 - Nature Education and Science Schools learning environments have an important impact on students to both increase their knowledge and experience towards science concepts and develop attitudes and skills towards nature. In this context, it is thought that environmental activities and studies should be started at an early age. From the point of view of Middle School, individuals acquire many skills such as problem solving, critical thinking, scientific literacy and lay the foundation for being effective and successful throughout their lives. Therefore, it can be said that it is important to educate individuals with high level of environmental attitudes and perceptions towards the environment at middle school level.

Attitudes towards the environment are defined as feelings such as fear arising from environmental problems, attitudes towards the environment, creating value judgments towards the environment, and learned tendencies that express positive or negative attitudes and thoughts in the form of readiness for the solution of environmental problems (Erten, 2005; Pelstring, 1997). It is emphasized that the interests, motivations and needs of individuals in environmental education practices are not adequately observed (Storksdieck, Ellenbogen and Heimlich, 2005). An individual with a positive attitude towards an object or event tends to act positively towards it, approach it, show closeness, support it and help it, while an individual with a negative attitude towards an object or event tends to criticise it, harm it, be uninterested or distanced from it (Aydın, 2000).

The basis of students' attitudes and behavior towards the environment depends on how they perceive the environment (nature). In the formation and shaping of perceptions, the relationships and experiences that the individual establishes with the world outside his own play an active role. People who make sense of their environment through their experiences take some actions based on their perceptions (Köşker, 2019). In this context, the observations made by the students in their close environment and positive experiences with nature will increase their environmental awareness and knowledge, while also forming the basis of the way they evaluate the world (Fisman, 2005; Kesicioğlu and Alisananoğlu, 2009; Vaske and Kobrin, 2001). This leads to their perception of the environment being positive or negative. In parallel, it can be said that education intertwined with nature, such as science school, summer school or camp, which facilitates close connection with nature and enables

them to have active experiences in Nature, supports the positive development of students' perceptions of the environment.

When the related literature is examined, there are some studies on the perceptions of middle school students towards the environment (Akkurt Çağlar, 2017; Çelikbaş, Yalçinkaya and Banoğlu, 2013; Emmons, 1997; Erten, 2003; Karakaya, Ünal, Çimen and Yılmaz, 2018; Kınık Topalsan, Türk and Güler, 2019; Knapp and Poff, 2001; Özdemir, 2010; Özdemir and Uzun, 2006; Pınar and Yakışan, 2017; Ülkeryıldız, Arsan and Alkış, 2009; Varnacı Uzun, 2018; Vaske and Kobrin, 2001; Yardımcı, 2009). When the related studies are examined, it can be said that these studies aim to determine the students' perceptions towards the environment. Moreover, it can be said that in a few studies in the literature, it is aimed to improve the perceptions of students towards the environment. For example, in the studies of Yardımcı (2009), Özdemir and Uzun (2006) and Kınık Topalsan et al. (2019), it was understood that they aimed to determine the perceptions of students towards nature and environment in the nature camps. In this context, it can be said that studies are needed to improve the perceptions of middle school students towards the environment. When the related literature is examined, some studies on the attitudes of middle school students towards the environment were found (Bogner, 1998; Çakır and Aydoğdu, 2016; Erenay, 2013; Hamalosmanoğlu and Güven, 2014; Kals, Schumacher and Montada, 1999; Özgel, 2015; Sağır, Aslan and Cansaran, 2008; Şeker and Sert, 2019; Tezel and Karademir, 2014; Üçüncü and Yılmaz, 2016; Yardımcı, 2009). In these studies conducted, it was tried to determine the attitudes of the participants towards the environment. However, it was understood that several studies were carried out to improve the attitudes of students towards the environment. For example, it has been understood that nature camp supported field trip observation teaching method (Özgel, 2015), environmental education based on interdisciplinary approach (Hamosmanoğlu and Güven, 2014), Out of school nature practices (Erentay, 2013) and nature education project (Tezel and Karademir, 2014) are an experimental study to improve the environmental attitudes of middle school students. In this context, it can be said that there are mostly survey studies in order to determine the attitudes of students towards the environment. However, considering the increasing environmental problems of human origin and considering that we need to be at peace with the environment for our lives, it can be said that experimental studies are needed to improve students' attitudes towards the environment.

It can be said that the funds provided by TÜBİTAK 4004 are the primary activities in our country that support the development of attitudes and perceptions of students by spending time intertwined with informal learning environments. In this context, when the projects supported within the scope of TÜBİTAK 4004 Nature Education and Science Schools Support Program are examined; "Fun Discovery of the Mysterious World" with middle school students (Birinci Konur, Şeyihoğlu, Sezen and Tekbıyık, 2011), "Regional boarding schools think scientifically in the Natural Environment" (Feyzioğlu, Özenoğlu Kiremit, Öztürk Samur and Aladağ, 2012), "I am Learning Summer Science School" (Akay, 2013), "Reflections of Science to Nature" (Balım, Deniz Çeliker, Türkoğuz and Kaçar, 2013), "Little Scholars Science School" (Marulcu, Saylan and Güven, 2014), "Little Scientists Discover Elazığ Hazar Lake Ecosystem" (Keçeci et al., 2019), "I Do Science in Nature!" (Kınık Topalsan et al., 2019), it was understood that projects were carried out with different sample groups. When studies conducted from these projects are examined, determining the opinions of middle school students about these activities after activities such as science camp, summer camp, and nature education (Akay, 2013; Birinci Konur et al., 2011; Buluş Kırıkkaya, Bozkurt and İmalı, 2011; Marulcu et al., 2014; Yıldırım, Atilla and Doğar, 2016). Moreover, these trainings' scientific process skills of students (Balım et al., 2013), their attitudes towards the environment (Keçeci et al., 2019), sensitivity to the environment and environmental pollution (Avcı et al., 2015; Feyzioğlu et al., 2012), their perception and behavior towards their environment (Kınık Topalsan et al., 2019; Özdemir, 2010), studies examining the impact of environmental knowledge and responsible behavior (Erdoğan, 2011) were

found. For example, Balım et al. (2013) found that nature education within the scope of TÜBİTAK supported “Reflections of Science to Nature” projects, in which middle school students actively participate in various science and nature activities, improved their scientific process skills. In another example, Kınık Topalsan et al. (2019) emphasized that the “I Do Science in Nature!” TÜBİTAK 4004 project improved the questioning skills of middle school students in the fields of science, astronomy, art, sports and music. In parallel with this, it can be said that there has been an increase both in terms of quality and quantity in TÜBİTAK- 4004- Nature Education and Science Schools project applications and trainings recently. However, when all these studies are taken into consideration, it can be stated that nature education/science camp projects aimed at improving the attitudes and perceptions of middle school students towards the environment are still not enough in terms of both quality and quantity.

When the projects carried out within the scope of the TÜBİTAK 4004 Nature Education and Science Schools project and the studies conducted on the environmental attitudes and perceptions of middle school students are examined, it can be stated that such a research is needed. For this reason, the aim of the study was determined to examine the effects of the out-of-school nature education science camp on the environmental attitudes and perceptions of the middle school students towards the environment. For this purpose, the following questions were sought in the research:

- Is there a significant difference between environmental pre-test, mid-test and post-test attitude scores of middle school students attending out-of-school nature education science camp held within the scope of TÜBİTAK 4004 Nature Education and Science Schools?
- Is there a significant difference between environmental pre-test, mid-test and post-test perception scores of middle school students attending out-of-school nature education science camp held within the scope of TÜBİTAK 4004 Nature Education and Science Schools?

## **Method**

In this study, a single group (weak) experimental design designed according to the pre-test – mid-test – post-test model was used. Single group experimental design is the design in which any intervention is tested by a single group study. In this design, a single group is subjected to experimental application and the dependent variable is measured before and after the application to see the effect of this experimental application (Fraenkel, Wallen and Hyun, 2012). In the study, a design with a control group was not preferred because the nature education science camp effect was the only independent variable investigated.

### **Participants**

This research is part of "Science Practices of Nature with Middle School Students Project" with project number 118B295, supported by TÜBİTAK- 4004- Nature Education and Science Schools Support Program, in scope of the first call of 2018. Within the scope of this project, the participant students of the research have been determined with the purposeful sampling method. For this, "Science Practices of Nature with Middle School Students Project" web page was created. On this website, the “Science Practices of Nature with Middle School Students Project Application Form” has been published and students wishing to apply to the project have been asked to fill in this form. The application form has been announced to students studying in all schools affiliated to İzmir Provincial Directorate of National Education. In this application form, students were asked “Have you ever attended an event like any science camp or nature camp?”, “What do the words Science and Nature mean to you?” “What are your expectations from the activities to be carried out in this project?” etc. questions and expected to answer these questions. In addition, the students were asked to share

their parents' educational status, occupational information and the school, classroom and gender information they are currently studying with the project team. At the end of this process, the answers given by the students and their demographic characteristics were examined. As a result, the selection was made purposeful sampling method among 528 students from 40 different schools who applied. During the selection process, it was paid attention that the selected students have not been involved in a similar project before and that they are not 8th grade students. In line with these criteria, 122 students were eliminated in the application process and a resampling process was made on 406 students. In this process, it is aimed to select the students who give satisfactory answers to the questions managed in the project application form and who may be a part of education when they return to their own schools. One important criterion is to make sure that one student from each school representing the Aegean region middle schools' universe is taken as a participant student of the project. As a result, twenty-eight 6th and 7th grade students were selected as participants in the 2018-2019 academic year from among the 406 students studying in different state or private middle schools in Izmir and applying for the project, with the number of students and the number of boys and girls being equal. As a gender, 14 (50%) of the participants were girls and 14 (50%) were boys.

### **Data collection tools**

Two different data collection tools were used in the research. The first is the attitude scale towards the environment. Environmental attitude scale was developed by Aslan, Sağır and Cansaran (2008). The scale, which is prepared in a five-point Likert type, consists of 24 items in total and has a single-factor structure. Validity and reliability studies of the scale were conducted, and the reliability coefficient was found to be 0.86. Another scale is the perception scale towards the environment. The scale was developed by Özdemir (2010). Environmental perception scale consists of environmental awareness, environmental risk perception and conscious use dimensions. The scale was prepared in triple Likert type and consists of 24 items in total. Cronbach Alpha coefficient  $\alpha$  reliability of the scale was calculated as 0.71.

### **Application process**

"Science Practices of Nature with Middle School Students Project" supported by the "TÜBİTAK- 4004- Nature Education and Science Schools Support Program" as part of the first call of 2018, is designed to enable students to learn by exploring the relationship between science-technology-society-environment and by discovering and experiencing the relationship between science-technology-society-environment by actively participating in various science and nature activities. In this way, it is aimed that the students can transfer the knowledge and experiences they have learned in this activity to daily life, develop positive attitudes towards science and nature and gain a scientific perspective. In addition to this, with the fun experiments and activities in the project, it is aimed to increase the curiosity and interest of the students as well as their perceptions of basic scientific concepts and natural phenomena. It was thought to increase the motivation of science, nature and learning by showing students that science is not just homework and lessons, but science is in life. At the same time, it is another important issue in the project in question that students create interdisciplinary relationships thanks to activities such as illustrating observations and practices, storytelling, and the use of technology.

This project was carried out in the same sample as a nature education science camp for five days and a total of ten days in two different periods. In the project process, theoretical and practical field trainings were given to the students by the field experts (faculty members) on the basic science subjects (formation of the shadow, etc.), the Earth and the Universe topic (I explore the earth, etc.) and nature art activities (imagination garden etc.). Throughout the process, activities such as creative drama works, art workshop practices and sports activities were held with students. In order to

evaluate the project and observe the change in students, the applications of the measurement tools were carried out by applying the pre-tests on the first day of the first semester of the project, the mid-tests on the last day, and the post-tests on the last day of the second term. Examples of the activities and application times applied during the project are given in Table 1.

Table 1.  
Project activity program

Term of the project	Activity Name	Activity Content	Activity Duration (Minutes)
First term of the project	Innovative Light Experiments in Science Education	Activities related to light and its properties, which is one of the basic concepts of astronomy science	90
	Finding density of some natural stones with digital technology	Finding density of natural stones with Arduino open-ended coding program	90
	Finding the liquidity of some plant extracts with digital technology	Activity with plants collected from nature with Arduino open-ended coding program	90
	I discover two living and reptiles	Examine to two living and reptiles	90
	I am Creating My Own Herbarium!	Creating a herbarium from materials collected in the national park	90
Second term of the project	How Shade Is Formed	Fun optical experiments over shadow formation	90
	Paper Making Workshop	Artistic activity of paper making from plant waste	90
	Know the GROUND You Stand On	Activities related to features such as earthquakes, landslides, rocks, mines	90
	Environmental Pollution Workshop	Environmental pollution with creative drama	90
	I Discover the Earth	Earth's layers model	90
	This is My Ground	Activities about geology, geophysical minerals	90
	How Do We Find Our Way In Nature?	Direction finding methods in nature	90

Attention was paid to the fact that the activities in the project are suitable for the developmental characteristics of the students, related to daily life, and that they can learn through practices effectively in their natural environment. Activities such as art, science and nature in the project were supported with different teaching methods (drama, play, trip-observation, experiment) and multi-faceted development of students was provided.

### Data analysis

The pre-test, mid-test, and post-test average scores of the participants' "perception scale towards the environment" (kurtosis value -0.217 and skewness value 0.438) and "the attitude scale towards the environment" (kurtosis value 7.572 and skewness value 1.778) did not show a normal

distribution. However, as the number of participants was below thirty, the Wilcoxon Z test, which is one of the nonparametric tests, was used to determine the difference between the groups in the analysis of the data.

## Results

In this study, an answer was sought for the questions of "Is there a significant difference between middle school students' attitude points towards the environment before, in the middle and after the science camp of nature education?" and "Is there a significant difference between middle school students' environmental perception scores before, middle and after the out-of-school nature education science camp?". In this context, the pre-test, mid-test and post-test scores collected from the experimental group were analyzed and the findings reached as a result of the analysis are presented in this section.

### Result on environmental attitude scale

In this study, the answer to the question "Is there a significant difference between middle school students' attitude points towards the environment before, in the middle and after the science camp of nature education?" was sought. In this context, the pre-test, mid-test and post-test scores of the attitudes towards the environment collected from the experimental group were analyzed and the findings reached as a result of the analysis are included in this section.

Table 2 presents the negative and positive ranks of the students' points and the Wilcoxon Signed Ranks test analysis results from the "Environmental Attitude Scale" applied to the project participant student group before and in the middle of the experimental application.

Table 2.

Wilcoxon Signed Ranks Test results regarding the comparison of students' pre-test and mid-test results towards their environment

Mid-test – pre-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	8	9.38	75.00	2.356	.018*
Positive Rank	17	14.71	250.00		
Ties	3				

\* The difference is significant since  $p < .05$ .

When the findings in Table 2 are examined, it is seen that there is a significant difference between the pre-test and mid-test scores of the students in the project "Attitude Scale towards the Environment" ( $Z = 2.356$ ;  $p = .018 < .05$ ). The mean of the negative ranks of the students' scores from the attitude scale was 9.38, the mean of the positive ranks was 14.71, the sum of the negative ranks was 75.00 and the sum of the positive ranks was 250.00. When the sum of ranks of the difference scores are taken into consideration, it is seen that this observed difference is in favor of the positive ranks, in other words, the test score means of the students. In this context, it can be said that out-of-school nature education science camps help students develop their attitudes towards the environment, that is, they develop positive attitudes towards the environment.



Table 3 shows the results of the Wilcoxon Signed Ranks test analysis according to the scores obtained from the students' "Environmental attitude scale" in the middle of and during the experimental application process.

Table 3.

Wilcoxon Signed Ranks Test results regarding the comparison of students' attitudes towards the mid-test and post-test

Post-test – Mid-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	10	10.55	105.50	2.008	.045*
Positive Rank	17	16.03	272.50		
Ties	1				

\* The difference is significant since  $p < .05$ .

When Table 3 is analyzed, it is understood that there is a significant difference between the mid-test and post-test "Attitude Scale towards Environment" scores of the students who participated in the project ( $Z = 2.008$ ;  $p = .045 < .05$ ). While the mean of negative rankings of the scores that students got from the attitude scale is 10.55, the mean of positive ranks is 16.08. On the other hand, the sum of the negative ranks of the students was 105.50 and the sum of the positive ranks was 272.50. It can be stated that this difference observed in this context is in positive order, in other words, in favor of students' post-test scores. It can be said that there is a statistically significant difference between the students' environmental attitude post-tests and mid-tests. This can be stated that out-of-school nature education science camps enable students to develop a positive attitude towards the environment.

The results of the Wilcoxon Signed Ranks test analysis of the scores that the students got from the "Environmental Attitude Scale" before and after the experimental application are as in Table 4.

Table 4.

Wilcoxon Signed Ranks Test results regarding the comparison of students' pre-test and post-test environmental attitudes

Post-test – Pre-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	6	7.42	44.50	3.612	.000*
Positive Rank	22	16.43	361.50		
Ties	0				

\* The difference is significant since  $p < .05$ .

When the findings in Table 4 are analyzed, it is determined that there is a significant difference between the pre-test and post-test scores of the participant students' Environmental attitude scale ( $Z = 3.612$ ;  $p = .000 < .05$ ). The mean of the negative ranks of the students' scores from the attitude scale was 7.42 and the mean of the positive ranks was 16.43. Considering the sum of ranks of difference points, it can be said that this observed difference is in favor of positive ranks, that is, post-test points. In this context, it can be stated that long-term out-of-school nature education science camps help students develop their attitudes towards the environment, that is, they develop positive attitudes towards the environment.

## Result on environmental perception scale

In this study, the answer to the question "Is there a significant difference between middle school students' perception scores about the environment before, in the middle and after the out-of-school nature education science camp?" was sought. In this context, the perception pre-test, mid-test and post-test scores for the environment collected from the experimental group were analyzed and the findings reached as a result of the analysis are presented in this section.

The results of the Wilcoxon Signed Ranks test analysis are given in Table 5 according to the scores received by the students from the "Perception Scale towards the Environment" applied to the project participant student group before and in the middle of the experimental application.

Table 5.

Wilcoxon Signed Ranks Test results for the comparison of students' pre-test - mid-test environmental perceptions

Mid-test – Pre-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	7	10.50	73.50	2.463	.143*
Positive Rank	14	11.25	157.50		
Ties	7				

\* The difference is significant since  $p < .05$ .

According to the findings in Table 5, it was understood that there was no significant difference between the pre-test and mid-test scores of the students' perception scale towards the environment ( $Z = 2.463$ ;  $p = .143 > .05$ ). The mean of the negative ranks of the students' scores from the perception scale was determined as 10.50 and the mean of the positive ranks was 11.25. In addition, while the sum of the students' negative ranks was 73.50, the sum of the positive ranks was 157.50. It is seen that there is no change between these differences observed in the study that will lead to a statistically significant difference. In this context, it can be stated that out-of-school nature education science camps partially improved students' perceptions about the environment, but this did not cause a statistically effective increase.

Table 6 shows the results of the Wilcoxon Signed Ranks test analysis of the data obtained from the "Perception scale for the environment" applied to the project participant student group in the middle (during) and after the experimental application.

Table 6.

Wilcoxon Signed Ranks Test results for comparing students' perceptions of the mid-test – post-test to the environment

Post-test – Mid-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	6	12.42	74.50	2.936	.053*
Positive Rank	17	11.85	201.50		
Ties	5				

\* The difference is significant since  $p < .05$ .

When Table 6 is examined, it is determined that there is no statistically significant difference between the "Perception Scale for Environment" mid-test and post-test scores of the students participating in the project ( $Z = 2.936$ ;  $p = .053 > .05$ ). While the mean of the negative ranks of the students received from the perception scale was 12.42, the mean of the positive ranks was found to

be 11.85. In this context, it can be said that out-of-school nature education science camps improve students' environmental perceptions, in part, positively.

The results of the Wilcoxon Signed Ranks test analysis according to the scores of the students on the "Perception Scale for the Environment" before and after the experimental application are as in Table 7.

Table 7.

Wilcoxon Signed Ranks Test results for the comparison of students' pre-test and post-test perceptions about the environment

Post-test – Pre-test	N	Mean Rank	Sum of Ranks	Z	p
Negative Rank	6	11.25	67.50	2.562	.010*
Positive Rank	19	13.55	257.50		
Ties	3				

\* The difference is significant since  $p < .05$ .

When Table 7 is examined, it is determined that there is a significant difference between the students' environmental perception scale pre-test and post-test scores ( $Z = 2.562$ ;  $p = .010 < .05$ ). The mean of the negative ranks of the students' scores from the perception scale was determined as 11.25 and the mean of the positive ranks was 13.55. However, according to the findings, the sum of the negative ranks was 67.50 and the sum of the positive ranks was 257.50. Considering the rank totals of the difference scores, it is observed that this observed difference is in favor of the positive ranks, in other words, the post-test scores of the students. In this context, it can be said that long-term out-of-school nature education science camps help students improve their environmental perceptions.

## Discussion and Conclusion

In this study, the effects of out-of-school nature education science camps on the attitudes and perceptions of middle school students towards the environment were investigated. In this context, it was concluded that there was a statistically significant difference between pre-test and mid-test scores, between mid-test and post-test scores and between pre-test and post-test scores in terms of the attitudes of Middle School students involved in the project regarding the environment. This shows that out-of-school nature education science camp education is an effective method to improve students' attitudes towards the environment. In this context, it can be said that the results obtained from this study are in line with the related literature. In this context, Özdemir (2010), Tezel and Karademir (2014), Avcı et al., (2015), Özgel, Aydoğdu and Yıldırım (2018), Keçeci et al. (2019), Kınık Topalsan et al. (2019) found that trainings such as nature camp and field trip in TÜBİTAK 4004 supported projects improve middle school students' attitudes towards the environment. Ballantyne and Packer (2002) and Brody and Hall (2002) stated that applied nature education positively changed and improved students' attitudes and behaviour towards the environment. Palmberg and Kuru (2000) have implemented different environmental education programs (field trips, hiking, camping and adventure activities), and found that experiences in nature improve students' self-esteem, especially their desire to participate in future extra-school activities and that they exhibited more social behaviours and moral judgments, having strong and empathetic relationships with nature. Pereira, Pinho, Lopes, Antunes, Abrantes and Goncalves (2006) emphasized that as a result of their nature and environmental education applied activities with middle school students in a nature park in Portugal, students realized that there was a large flora distribution in the park. They stated that in

the same activity process, students tried to eliminate substances that harm or pollute the park and that they showed a positive attitude towards the environment. DiEnno and Hilton (2005) state that field trips in environmental education have an important effect on developing a positive attitude towards the environment. Moreover, Erten (2003, 2005), Farmer, Knapp and Benton (2007) and Ozaner (2004) emphasized in their studies that environmental education becomes easier to transform the knowledge gained when it is carried out in nature with field studies and enables them to develop positive attitudes towards the environment. Similarly, Avci et al. (2015) stated that the projects supported within the scope of TÜBİTAK, 4004 - Nature Education and Science Schools offer important opportunities in terms of eliminating the deficiencies of the nature education and environment and bringing nature-friendly individuals into society. In this context, it can be said that application-based environmental education where students can interact directly with nature enables them to better understand science issues such as living-inanimate beings, food and matter cycles, ecosystems, science-society-environment relationship, Earth and Universe. It can also be stated that after the trainings carried out in nature, the environment is a whole and that the students realize that they are also a part of this whole, so that every damage to the environment is actually a damage to their own future. In this way, it can be thought that students are more familiar with nature, become more sensitive to our nature values and develop positive attitudes towards the environment.

Another aim of this research is to examine the effects of out-of-school nature education science camps conducted within the scope of TÜBİTAK- 4004- Nature Education and Science Schools Support Program on the perceptions of middle school students towards the environment. In this context, when the findings obtained from the environmental perception scale applied before, during and after the experimental application are examined, the perceptions of the middle school students participating in the project regarding the environment are not statistically different between the pre-test and mid-test scores, and the mid-test and post-test scores, but there was a statistically significant difference between the post-test and pre-test scores. When the mid-test and post-test scores are considered, although they are not statistically significant, ( $p=0.053$ ,  $p>.05$ ) it can be stated that there is an important level of increase. In fact, this result from the study is not surprising. Because more concepts such as perception and belief are a dynamic process that involves the stages of individuals receiving, choosing, interpreting, arranging and making sense of information through the sensory organs as a result of the events going on around them. This requires students or individuals to observe their environment for a while, establish long-term contacts with nature and interact with them, in other words. Therefore, as in this project, students' perceptions cannot be expected to change in a short time. However, it is not impossible for students to change their perceptions towards the environment. This situation allows the students to spend a long time in the out-of-school nature education science camp education (for example, in 10 days-different time periods) and to transfer the knowledge and experience they have gained there to their lives; and as a result, it may be possible to re-test their perceptions (for example, as in pre-test and post-test). In this context, it can be said that the results obtained from this study are in line with the related literature. As an example, Kınık Topalsan et al., (2019) reached the conclusion that the five-day education they carried out within the scope of the "I Do Science in Nature" project, which is carried out within the scope of TÜBİTAK 4004 Nature Education and Science Schools, positively improves the perceptions of middle school students towards the environment. Similarly, Yardımcı (2009) emphasized that as a result of the Summer Science Camp activity-based nature education project carried out within the scope of TÜBİTAK 4004 Nature Education and Science Schools, students can associate people with nature at a higher level. Özdemir (2010) stated that the environmental awareness and environmental risk perceptions of primary education students increased in a single-group experimental study in which the environmental education program based on nature education examined the perceptions of elementary school students towards their environment. Erdoğan (2011) stated that as a result of the ecology-based nature education project supported by TÜBİTAK, the

nature education program contributed statistically to the environmentally responsible behaviors of its students but did not make a statistically significant difference to environmental knowledge and affective tendency. Erten (2003), on the other hand, found that as a result of applied environmental education with 5th grade students in primary education, students' knowledge about their environment increased, they gained environmentally friendly behaviors and their negative perceptions towards their future changed from pessimism to optimism. As a result of their studies, Storksdieck et al. (2005) and Bogner and Wiseman (2004) stated that out-of-school environmental education positively changed students' environmental knowledge, attitudes and behaviors, and there was a close relationship between students' environmental experiences and educational experiences. In the light of this information, it can be said that applied trainings intertwined with nature have an important place in shaping and developing students' perceptions of the environment. In addition, it can be thought that such an education increases the environmental awareness of the students, it provides a more conscious approach to all living and inanimate beings in the nature, especially to itself, and contributes to the development of a responsible citizen behavior sensitive to environmental problems.

Considering the results obtained from this project, it may be recommended to teach the science lesson and therefore the subjects in the field of "living and life" learning in the natural environment as far as possible in order to prevent increasing environmental problems, to overcome existing problems and to raise environmentally aware generations. As Ballantyne and Packer (2002) and Güven (2011) said, environmental education carried out within the school can be supported by free environmental education practices based on nature experience in order to develop students' environmental awareness, attitudes and behaviors and to perform them in a permanent, abstract-to-material and daily life-related manner. For this reason, activities such as summer science camp, nature education, science centre, museum trip can be organized so that students can spend their free time with science and engage in educational activities.

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