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The Effect of Out-of-School Learning Activities on Gifted Students' Affective and Behavioral Tendencies Towards The Environment

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ABSTRACT This study investigates the effect of out-of-school activities on gifted students' affective and behavioral tendencies. Mixed method research with a single group pre and post-test experimental design was used in this study. Twenty-five gifted students from Turkey-İstanbul participated in this study. "Environmental Affect Scale" and "Environmental Behavior Scale" were used, and semi-structured interviews were conducted. Results showed that out-of-school activities positively affected the students' affective and behavioral tendencies toward the environment. It was also found that the awareness of students on environmental problems increased, and they began to produce their solutions to these problems.

Keywords Gifted students, out-of-school learning activities, environmental behaviors, the affective tendency

1. INTRODUCTION

With the developing technology, the viewpoints and expectations of people towards the environment and livable world have changed. The unlimited consumption desire of people causes unplanned use of natural resources. However, preserving natural assets and the atmosphere is the first condition for a livable world (Postel, 1994). The misuse of natural resources that make up the environment brings environmental problems with itself. According to Brown (2000), loss of plant and animal species, decrease in agricultural land per capita, a reduction of groundwater levels, degradation of forests and decrease of forestlands, global warming and the greenhouse effect, population increase, decrease in fish potential in oceans are among the main environmental problems. Although various legislative and technological measures are taken to struggle with environmental problems, they are not problems that can only be solved by technology or law (Erten, 2003). It requires an individual effort that develops with personal awareness. As gifted individuals have the potential to direct the future as leaders in society, as well as their sensitivity to their environment, environmental awareness becomes much more essential for them too. One of the most effective ways of raising individual understanding about the environment is through environmental education (Ardoin, Bowers, & Gaillard, 2020; Ardoin, Bowers, Roth & Holthuis, 2018; White, Eberstein & Scott, 2018) through out-of-school activities (Demirçelik, Karaçetin, & Dadaşer-Çelik, 2022). In the last ten years, The Scientific and Technological Research Council of Türkiye has granted projects within the scope of the "Education in nature and Science Camps / Schools Support Programme". Our study, one of these projects, aims to investigate the effect of out-of-school learning activities on gifted students' affective and behavioral tendencies toward the environment. So, our research question is how out-of-school learning activities affect talented students' affective and behavioral preferences toward the environment.

1.2 Theoretical Background

The traditional thinking in environmental education (EE) has been that we can change behavior by making human beings more knowledgeable about the environment and its associated issues. This thinking has primarily been linked to the assumption that if we make human beings more knowledgeable, they will, in turn, become more aware

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of the environment and its problems and, thus, be more motivated to act toward the environment in more responsible ways. Other traditional ways of thinking have been linked to knowledge and behavior attitudes. Research on EE, unfortunately, does not bear out the validity of these linear models for changing behavior (Hungerford & Volk, 1990). Some researchers suggested new models explain factors influencing behaviors (e.g., Fishbein & Ajzen, 1975; Hines, Hungerford & Tomera, 1987; Dunlap, Van Liere, Mertig & Jones, 2000). In the theory of reasoned action (Fishbein & Ajzen, 1975) and its developed version of planned behavior, behavioral intention to perform actual conduct is the best antecedent of overt behavior. Behavioral intentions (verbal commitment) are the statements of individuals willing to act about environmental issues (Hines, Hungerford & Tomera, 1987). According to the Belgrade Declaration, environmental education, raising awareness, giving knowledge, building behavior, ability, evaluation skills, and participation was aimed, whereas the Tbilisi Declaration aimed to gain consciousness, knowledge, attitude, skills, and participation. Recognizing the environmental issues to eliminate and solve these problems is essential to provide environmental education, which aims to alter the learner's cognitive, affective, and participative knowledge, skills, and behavior (Carleton-Hug & Hug, 2010). In the current study, we studied gifted students because they are more curious about nature and sensitive to the environment, living things, etc., than their peers (Smutny & Von Fremd, 2004). Gifted students are more effective in making observations on environmental-related issues to realize the problems experienced and produce solutions for these problems (Meador, 2003).

Gifted students know very different facts about nature and science, understand the concepts they have learned from a scientific perspective deeply (Gould, Weeks & Evans, 2003) and have an insight and understanding in transferring their knowledge from specific points to more general cases (Kopelman, Galasso & Strom, 1977; Ngoi & Vodracek, 2004). As a result of this intense curiosity, interest, and insight, they observe nature very well (Karnes & Riley, 1999), and they identify problems that others may not see (Meador, 2003). Making connections with real-world issues and situations, cultivating higher-order thinking skills, and adopting teaching strategies and learning settings that will stimulate the interest and curiosity of gifted children are thus seen as essential components of learning for gifted students (VanTassel-Baska & Stambaugh, 2006). Moreover, since real-world problems and issues are complicated, open-ended, and contentious, they will satisfy talented students' needs for abstraction, complexity, and depth in their learning process and make them think more critically (Kaplan, 2020; Means & Voss, 1996; Renzulli & Reis, 2014; Reis, Renzulli & Renzulli, 2021).

Enrichment is one of the practical training strategies used in the education of gifted students (Sak, 2010). Content transfer, seminars, conferences, field trips, learning centers, and competitions / Olympics can be examples of enrichment strategies. At this point, out-of-school learning activities (OSLAs) can be essential enrichment opportunities for gifted students. Exposure activities, the initial enrichment activities, aim to familiarize gifted students with different areas of interest and activities such as museum visits, concerts, theaters, university laboratory trips, observations, and studies, visiting scientists working in different fields, etc. OSLAs expose gifted students to educational opportunities that may not be feasible in many typical school environments, and students can increase their content understanding, skills, and academic achievement with these OSLAs (Best, Dickinson, Hugstad-Vaa Leer & Kalina, 2017; Morris, Slater, Fitzgerald, Lummis & Etten, 2021; Shin & Lee, 2012; Young, Young & Ford, 2019).

The OSLA carried out as the first type of enrichment, constitutes the basis of the third type of enrichment, the level of creating self-controlled creative projects and products in the first type of enrichment (Reis & Renzulli, 2009). OSLAs for gifted students during childhood and adolescence significantly impact their career choices and successes (Milgram, 1991; Milgram & Hong, 2010; Super, 1984). Also, OSLA is one of the gifted students' most preferred learning experiences (Aktepe & Aktepe, 2008).

Gifted students are sensitive to the environment around them (Renzulli & Reis, 2014; Schroth & Helfer, 2017), and OSLAs create good opportunities to develop awareness and sensitivity to the environment (Ayaydın, Ün, Acar-Şeşen, Usta-Gezer & Camcı-Erdoğan, 2018; Pfouts & Schultz, 2003). The environment can be used as a context for learning. By integrating it into OSLA, students can enhance different experiences through field trips, community-based tasks, and school ground activities (Kannel-Ray, 2006; So & Chow, 2019; Stevenson, 2007). In Tortop (2007)'s study with 12 gifted students, renewable energy sources were studied with field trips as OSLA. As a result of the survey, there observed a significant increase in the knowledge level of students about renewable energy sources and post-test scores of students in environmental attitude scales. Furthermore, Ceylan (2022) used out-of-school learning environments in a summer program for gifted students. It was found that this program contributed to the student's environmental attitude and cognitive development. Also, Choi et al. (2021) investigated the impact of a STEAM program on the climate literacy of gifted students, and they discovered that both the students' understanding of responsible national and global citizenship and their climate literacy had improved.

When gifted children realize that sustainability or environmental problems threaten their world, they can decide to prevent or struggle with these threats (Schroth &

Helfer, 2017). It can be an individual commitment to conserving the environment or gifted individuals acting as a driving force to activate other parts of society as a leader. Gifted students have complex and interdisciplinary questions by looking at climate change from very different perspectives, similar to those of experts working in this field (Tolppanen & Aksela, 2018), and they can think at a high level to prevent and solve these questions since they are more knowledgeable, critical and creative (Winocur & Maurer, 1991; Clark, 1992; Esen, 2011; Ceylan, 2022).

Therefore, it is essential to know gifted students' affective and behavioral tendencies regarding environmental issues and organize alternative educational programs to develop these features. Previous studies worked on the opinions of gifted students on the environment (Akar & Ahi, 2020; Ceylan & Aslan, 2021; Özarslan, 2022), environmental awareness or sensitivity (Ayaydın, Ün, Acar-Şeşen, Usta-Gezer & Camcı-Erdoğan, 2018; Korkut, 2022; Tanık Önal, 2020); critical/ creative thoughts on ecological issues (Akhan, Çiçek & Kocaağa, 2022); environmental attitudes (Aydın, Coşkun, Kaya & Erdönmez, 2011; Bakar, Avan & Aydınlı, 2018; Sontay, Gökdere & Usta, 2014; Uğulu, 2013; Uğulu, Akkaya & Erkol, 2013).

When the literature is examined, it is seen that environmental education studies for gifted students are pretty limited. The existing studies are qualitative studies that focus on environmental attitudes and knowledge of gifted students in terms of demographic features such as gender, class level, socio-economic level, etc. However, as Winocur & Maurer (1991) expressed, gifted students will develop higher-order thinking skills and exhibit behaviors to solve environmental problems with their increasing interest of them in global issues as they are educated on topics such as environment, environmental protection, and environmental concerns. For this reason, it is also important to contribute to the positive development of affective and behavioral tendencies for the environment by providing enriched training in out-of-school learning environments to create a livable world.

2. METHOD

This study used a mixed research method with a single-group pre and post-test experimental design. This method is identified by Tashakkori & Creswell (2007) as the diverse research approach as a process in which the researcher collects and analyses data in one research using qualitative and quantitative methods, integrates the findings, and makes inferences by using the results obtained from both sources. Within this context, received data from the quantitative and qualitative data collection tools were analyzed separately, and the findings were discussed together.

2.1 Participants

gifted students, of which 13 are female, and 12 are male, that graduated from 6th grade participated in this study. The criterion sample method was used to select participants. The reason for choosing this sampling method is to identify students following the research aims. Being diagnosed as gifted by Guidance Research Centers of the Ministry of National Education in Turkey, İstanbul, having graduated from the 6th grade, having an interest in the environment, and being voluntary was the study's criterion.

2.2 Data Collection and Data Analysis

Environmental Affect Scale

To determine the influential tendencies of students towards the environment, Environmental Affect Scale developed by Sontay, Gökdere & Usta (2015) was used before and after the treatment. The scale's content and face validity were reviewed by three science educators, one expert on measurement and evaluation, two experts on statistics, six faculty members, and 12 science teachers. It was applied to 258 8th-grade students. While developing this scale, all the objectives of science and technology lessons from 4th grade to 8th grade are considered. There it is considered appropriate for this research. For the reliability of the scale developed by Sontay, Gökdere & Usta (2015), the Cronbach Alpha (α) internal consistency coefficient was calculated, and this value was obtained as .860. The final form of the 5-point Likert scale consists of a total of 15 items under three factors: Environmental Responsibility (α=.867), Environmental Sensitivity (α=.807), and Environmental Perception (α=.784).

Environmental Behavior Scale

To determine the environmental behavioral tendencies of students, Environmental Behavior Scale developed by Sontay, Gökdere & Usta (2015) was used before and after the treatment. The scale's content and face validity were reviewed by three science educators, one expert on measurement and evaluation, two experts on statistics, six faculty members, and 12 science teachers. It was applied to 258 8th-grade students. While developing this scale, all the objectives of science and technology lessons from 4th grade to 8th grade are considered. There it is considered appropriate for this research. For the reliability of the scale developed by Sontay, Gökdere & Usta (2015), the Cronbach Alpha (α) internal consistency coefficient was calculated, and this value was obtained as .773. The final form of the 7-point Likert-type scale is composed of 12 items under three factors Natural Balance Protection Behavior (α=.774), Social Behavior (α=.743), and High-Level Cognitive Behavior (α=.708).

In the analysis of the study's quantitative data, the pre and post-test scores of the students were evaluated using the SPSS 20 package program. The Shapiro-Wilk test was used to determine if the data were suitable for normal

distribution. Since the data was not compatible with the normal distribution, it was decided to use nonparametric statistical techniques to analyze the data. Wilcoxon Signed Ranks Test was used to compare pre-and- post-measurements.

2.2 Qualitative Data Collection Tool and Data Analysis

The study used the semi-structured interview form developed by taking expert opinions as a qualitative data collection tool. While developing the interview form, it aimed to determine the effect of the activities on the environmental sense and behaviors of the gifted students during the training in the out-of-school learning environment. For this purpose, interviews with nine questions regarding students' Affective and behavioral tendencies were done with ten students based on the findings obtained from the quantitative data collection tools. The conversations were recorded during the one-to-one interviews between the researcher and the students, and then the dialogues were written. The analysis of the interviews was done by the descriptive analysis method.

2.3 Treatments

In this research, various activities enriched in an out-of-school learning environment were done towards environmental issues. For six days from 10 a.m. to 4 p.m., these out-of-school activities were held in a university in İstanbul province, an Art and Science Centre, an Arboretum, and a Botanical Garden. During the treatment, students actively participated in practical works, which were summarized in Table 1

3. FINDINGS

3.1 Quantitative Findings

Findings obtained from Environmental Affect Scale

The descriptive statistics of the Environmental Affect Scale showed the mean score of the students before the application increased from 66.76 to 69.04 after the application. Furthermore, the Wilcoxon Signed-Rank Test results presented in Table 2 showed this increase was significant ($z=-2.54$, $p<0.05$).

Table 1 Activities achieved during the treatment

Activity Name	Learning Objectives
• Touching the depiction	To express feelings and individual differences.
• Travel-See-Learn	To examine different breeds of plants in light of the scientific process.
• Finding direction in the ecosystem	To determine direction by finding the traces of direction in nature.
• Secret geometry of nature: Fractal	To realize the smallest detail and the fractal structures in the ecosystem.
• Trekking and the relation between living things	To understand the relationship between biotic and abiotic substances in the ecosystem.
• Why are plants green?	To explain the green color of plants and the importance of the chlorophyll molecule.
• Why does the weather get warm?	To realize the causes of global warming and their impact on the ecosystem.
• Soil and water analysis	To analyze the soil and water.
• Ecosystem=Harmony	To realize the harmonics of nature through music.
• My tree is singing	To improve the musical skills and creativity of gifted students.
• Landscape Art	To make landscape art by using the materials found in nature.
• What has happened-what is happening-what will happen	To be aware of the balance in ecosystems.
• Don Quixote of Belgrade	To understand the environment, explore and understand the importance of the environment through direct interaction with nature.
• Ecological house	To realize the importance of protecting the ecosystem and recycling.
• Hand in hand for a clean world	To explore the relationship between ecosystems and environmental problems such as air, water, and soil pollution.
• What number is your footprint	To realize the ecological responsibilities of individuals.
• Let's be the chain	To explore the interactions between biotic and abiotic factors of ecosystems.
• The language of nature: Mathematics	To integrate mathematics with the ecosystem and understand "Fibonacci Numbers" and the "Golden Ratio".
• Living plants: Resin	To design a product by using dried plants.
• Recycling, packaging wastes, and decay in nature	To evaluate the effects of packaging wastes on nature and living things and comprehend the importance of recycling.

Table 2 Wilcoxon signed ranks test results of environmental affect scale

Pre and Post-tests	N	Mean Rank	Rank Total	z	p
Negative Rank	3	14.33	43	-2.54	0.011
Positive Rank	18	10.44	188		
Equal	4	-	-		

Table 3 Descriptive statistics of sub-factors of environmental affect scale

Factor Name	Measurement	N	Mean	Standard Deviation	Min.	Max.
Environmental Responsibility	Pre-test	25	22.88	3.38	11	25
	Post-test	25	23.20	3.40	10	25
Environmental Awareness	Pre-test	25	21.96	3.91	8	25
	Post-test	25	22.88	4.27	5	25
Environmental Perception	Pre-test	25	21.92	3.86	10	25
	Post-test	25	22.96	4.25	6	25

Table 4 Wilcoxon signed sequence test results of sub-factors for environmental affect scale

Factor Name	Post and pre-tests	N	Mean Rank	Rank Total	z	p
Environmental Responsibility	Negative Rank	3	6.67	20	-1.53	0.127
	Positive Rank	9	6.44	58		
	Equal	13				
Environmental Awareness	Negative Rank	4	7.75	31	-2.18	0.029
	Positive Rank	13	9.38	122		
	Equal	8				
Environmental Perception	Negative Rank	3	8.67	26	-2.19	0.029
	Positive Rank	13	8.46	110		
	Equal	9				

Table 5 Wilcoxon signed ranks test results of environmental behavior scale

Post and Pre-tests	N	Mean Rank	Rank Total	z	p
Negative Rank	6	5.83	35	-3.14	0.002
Positive Rank	17	14.18	241		
Equal	2	-	-		

The descriptive statistics presented in Table 3 showed that the scores of the students obtained from each sub-factor increased compared to the pre-application level. For example, the Wilcoxon Signed-Rank Tests presented in Table 4 showed no statistically significant difference between the pre-and post-test scores for the Environmental Responsibility factor ($z = -1.53$, $p > 0.05$). In contrast, there was a statistically significant difference between the pre-and post-test scores for Environmental awareness ($z = -2.18$, $p < 0.05$) and Environmental Perception ($z = -2.19$, $p < 0.05$) factors.

Findings obtained from Environmental Behavior Scale

The descriptive statistics of the Environmental Behavior Scale showed that the students' mean score before the treatment increased from 46.08 to 53.20 after the application. The results of the Wilcoxon Signed-Rank Tests presented in Table 5 showed that this increase was significant ($z=-3.14$, $p<0.05$).

The descriptive statistics in Table 6 showed that the post-points of students obtained from each subfactor increased compared to the pre-application. The results of the Wilcoxon Signed-Rank Tests presented in Table 7 showed that there was no statistically significant difference between the pre and post-test scores for the "Social Behavior" factor ($z = -1.55$, $p < 0.05$). $p < 0.05$), whereas there was a significant difference between pre and post-test mean scores for "Natural Balance Protective Behavior" ($z=-2.85$, $p<0.05$) and "High-Level Cognitive Behavior" ($z = -2.146$, $p < 0.05$).

3.2 Qualitative Findings

Within the scope of the study, the findings obtained from semi-structured interviews done with ten students by using semi-structured interview forms are summarized below. Within the research, the question *"What comes to your mind when the environmental problem is mentioned?"* was posed to the students to determine their perspectives on

Table 6 Descriptive statistics of subfactors of the environmental behavior scale

Factor Name	Measurement	N	Mean	Standard deviation	Min.	Max.
Natural Balance Protective Behavior	Pre-test	25	12.80	7.59	0	26
	Post-test	25	16.48	9.34	1	30
Social Behavior	Pre-test	25	25.64	4.75	11	30
	Post-test	25	27.08	4.20	14	30
High-Level Cognitive Behavior	Pre-test	25	7.64	4.20	0	12
	Post-test	25	9.64	3.25	0	12

Table 7 Wilcoxon signed sequence test results of subfactors for the environmental behavior scale

Factor Name	Post- and Pre-test	N	Mean Rank	Rank Total	z	p
Natural Balance Protective Behavior	Negative Rank	5	10.10	50.50	-2.85	0.004
	Positive Rank	19	13.13	249.50		
	Equal	1				
Social Behavior	Negative Rank	6	8.33	50.00	-1.55	0.121
	Positive Rank	12	10.08	121.00		
	Equal	7				
High-Level Cognitive Behavior	Negative Rank	5	8.40	42.00	-2.146	0.032
	Positive Rank	14	10.57	148.00		
	Equal	6				

environmental problems. According to the findings obtained from the student's responses, it is determined that the students' express environmental problems as soil, water, and air pollution, destruction of forests, polluting of the environment, global warming, emission of greenhouse gasses and ozone layer depletion, damage to living things, housing, and they think that people are effective factors in the occurrence of these environmental problems. (Table 8).

Direct quotations supported the findings of the research. In this direction, student 6 emphasized many environmental problems using the expression, "*When you say environmental problem, water pollution, air pollution, greenhouse gasses and warming of the earth, soil pollution and damage to plants come to my mind*". Student 4, on the other hand, expressed the environmental problems as human-generated events that harm nature using the expression, "*People throw garbage in nature. So they pollute the environment*". Similarly, student 9 emphasized that environmental problems arise from human behavior using the expression "*Not recycling and throwing garbage in the seas, polluting forests, throwing garbage into the forest, cutting forests*". Student 5 emphasized that the causes of ozone depletion and global climate change, one of the most important environmental problems, are people using the expression "*I think of the ozone layer depletion, the increase in global climate change and the pollution of nature by people with plastics and batteries. Besides, I think of the disappearance of trees, increasing carbon dioxide, and ecosystem degradation*".

To determine their awareness of their responsibilities to prevent environmental problems, the question *"What measures do you take, or do you think about taking to prevent environmental problems?"* was posed. Findings obtained from the answers showed that the students had thoughts such as not polluting the environment, recycling, raising awareness of people, collecting waste oil and waste batteries and giving them to relevant institutions, preventing the release of harmful gasses, using public transportation and protecting the forests as precautions against environmental problems (Table 9).

Table 8 Students' perspectives on environmental problems

Expressions	Participants
Deforestation	S1, S3, S5, S7, S9
Polluting the environment	S4, S5, S8, S9
Global Warming	S1, S3, S5, S6
Greenhouse Gasses	S3, S5, S6, S8
Water Pollution	S6, S7, S9
Damage to Living Things	S1, S2, S7
Air Pollution	S6, S10
Ozone layer depletion	S3, S5
Soil Pollution	S6
Housing	S8

Considering the students' views on the findings obtained from the research, Student 4 emphasized that primarily he would remove the factors that cause environmental pollution as the measures he would take against environmental problems using the expression, "*I*

Table 9 Measures students take / will take against environmental problems

Expressions	Participants
Recycling	S1, S2, S3, S4, S5, S8, S10
Keeping Environment Clean	S1, S3, S7, S8, S9
Raising Awareness of People	S2, S6, S8, S9, S10
Using Filters in Factories	S1, S5, S10
Collecting Waste Oil	S1, S4, S10
Using Public Transportation	S6, S8
Protecting Forests	S6, S7
Preventing Exhaust Gasses	S5, S10
Collecting Waste Batteries	S4, S5
Tree Planting	S6
Walking	S6
Cycling	S6
Reuse	S4

take the waste oils to the collection containers, throw the papers and cardboards into the recycling boxes, and again, I throw the waste batteries into the waste battery box". Similarly, Student 7 emphasized that he would avoid behaviors that would harm nature using the expression, "*I do not leave wastewater to the seas, I do not throw garbage in the ground, I do not harm living things, I do not cut trees unnecessarily*". Student 5 stated that he would take precautions against harmful gasses and give importance to recycling using the expression, "*The first measure I would take would be factories. I want to prevent the exhaust gasses of cars and household waste. I would bring new solutions for recycling. I would also try to prevent waste batteries for soil pollution*". Student 6, on the other hand, mentioned the importance of afforestation of the environment and raising awareness of people using the expression, "*Of course, we can plant trees to prevent environmental problems, and we should never leave the water open. Likewise, we should use public transportation, and more than that; we need to influence the masses. A person can influence a mass.*"

Within the research, students' views on the endangered animals are determined, posing the question, *"What do you think is the reason for the extinction of animals? What measures should be taken for this?"* The findings revealed that students think human behaviors and natural conditions are effective in the extinction of animals and that people should be conscious of preventing animal extinction (Table 10).

Looking at the student views regarding the findings in Table 13, Student 2 stated that humans have an impact on the extinction of animals using the expression, "*I know that many of the extinct creatures have disappeared because of humans*". Similarly, Student 9 stated that humans are effective in the extinction of animals through global warming using the expression, "*Endangered animals are mostly becoming extinct by global warming because of people.*" Student 4, on the other hand, emphasized the need to protect endangered animals using the expression "*We have to try to protect endangered creatures. Because if it goes on like this, almost all living things may become extinct. Because of human influence and natural conditions, living things and plants are becoming extinct.*" Again, in this direction, Student 6 stated that the extinction of creatures originates from humans and natural conditions. Their knowledge increased with the project using the expression "*I think that most of the endangered creatures became extinct because of humans and some of them are due to climatic conditions.*" Student 5 stated that humans and natural conditions are effective in the extinction of living things. With the project, their knowledge about protecting endangered creatures has increased using the expression, "*There are two types of endangered creatures—living creatures, such as dinosaurs, which became extinct by natural causes without human influence. I knew about them. In this project, I learned about the creatures that became extinct due to human influence. In the project, we learned how to protect them and what the endangered animals are."*

Table 10 Students' views on the extinction of animals

Expressions	Participants
Human behavior causes it	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
Nature conditions cause it	S4, S5, S6
Should be taken under protection	S2, S3, S4, S5
People should be informed	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
Unauthorized hunting should be prohibited	S2, S8

Table 11 Students' behavior towards people who harm the environment

Expressions	Participants
Warning	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
Raising Awareness	S2, S4, S5, S6, S9, S10
Make Good the Damage	S1

Aiming to determine their behavior towards people who harm the environment, the question *"What would you do when you see a person who acts in his daily life in a way that can harm the environment?"* was posed to the students. The obtained findings showed that the students reacted by warning, raising their awareness of the consequences of their actions in the environment and making their damage good in the environment when they see the people acting in an environmentally damaging way (Table 11).

When the students' direct views on the findings obtained in the study were examined, it was observed that Student 2 emphasized the effect of what he learned in the project on his behavior using the expression, "*I warn that person and try to help him by saying what he did was bad, he should not do it again. I started to warn those who throw garbage in or harm the environment more, thanks to the project*". Student 4 stated that he has become informed about the consequences of the

Table 12 Students' views on recycling

Expressions	Participants
To be able to define/know	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
To Apply	S1, S2, S3, S4, S5, S6, S8, S9, S10
To Consider Important	S2, S4, S5, S6, S7, S8, S9, S10
To Raise Awareness	S2, S7

damage to the environment and that he can provide information, using the expression "*I will warn him, I tell what he is doing is wrong, why it is wrong, and what effect and result will occur if he continues to do it.*". Student 10 emphasized that he would try to raise awareness of people using the expression, "*I ask why you are doing it, and I explain the consequences of this behavior.*". Student 1, on the other hand, stated that he would try to warn the person harming the environment first and then do the damage he caused to the environment good using the expression "*I warn him if he does not listen to the warning, if he throws garbage in the ground, I will throw that garbage to the bin.*"

To determine the students' views on recycling, the questions "*What is recycling? How do you know if a product is suitable for recycling? What are you doing to support recycling?"* were posed. Based on the obtained findings, it was determined that the students knew what recycling is. Furthermore, during the project, they realized the importance of the materials that can be recycled and the recycling processes (Table 12).

When direct quotations supported the research findings, Student 1 described recycling and gave an example of searching and classifying materials at the source using the expression *Recycling is the contribution to the environment by reusing materials that can be reused. I use the recycle bin and the trash bin separately. Throw the plastics in the plastic box, the glass in the glass box.*". Student 3 emphasized the importance of recycling and that it will contribute to protecting the environment using the expression, "*Recycle is converting the used materials into new materials and objects. For example, if I recycle paper, I protect trees from damage, and trees are not cut because I recycle this paper. For example, if I recycle plastic from the soil, pollution in the soil decreases.*". Student 4 stated that he is recycling and sorting at the source. The project contributed to his ideas of recycling using the expression *Recycling is the steps taken to make a used material reusable. For example, I collect the waste batteries and throw them in the battery boxes, collect the papers and throw them in the recycling bins. Then, I throw the appropriate materials in the glass, etc., sections in the recycling bins. As I learned that nature and the environment are essential, I realized that we need to recycle more."* Student 10 stated that he contributed to recycling at school and that it is necessary to cooperate to protect the environment using the expression, "*It is the recycling of something we see as waste…. I am trying to sort the waste in our school. I produce new items by making designs from waste materials at home. I think that the environment is not just us, everyone has an idea about it, and with a common idea, it will be easier to protect our environment.*"

The thoughts of the students who received extensive education during the project about this process were determined, posing the question, *"What are the things you did not know about the environment before, and what you learned with this project you participated in? How did the project contribute to you?"* The answers given by the students were classified as affective, cognitive, and behavioral. The students stated that the project increased their awareness and sensitivity toward the environment, and they grasped the importance of the environment and became conscious of the project. The findings revealed that the students learned about the environment and environmental problems, recycling, endangered animals, the integrity of nature and art, measures to be taken for the environment, resin, the golden

Table 13 Students' Views on the contribution of the project

	Expressions	Participants
Affective	Sensitivity	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
	Awareness	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
	Awakening	S3, S6, S9, S7
	The importance of the environment	S2, S4, S8, S9, S10
	Recycle	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
Cognitive	Endangered Animals	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
	General environmental problems	S1, S3, S5, S9, S10
	Damages to the environment	S5, S7, S8, S10
	Integration of nature and art	S2, S6, S8
	Measures to be taken for the environment	S2, S3, S8, S5
	Resin	S9
	Golden Rate	S2
	Organic Wastes	S10
Behavioral	Behaving Careful	S1, S3, S4, S5, S6, S7, S8, S9, S10
	Recycling	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10
	Raising Awareness	S2, S3, S6, S7, S8, S9

ratio, and organic wastes. Besides, it was observed that the students stated that the project process contributed to them being more careful with the environment, contributing to recycling, and raising people's awareness (Table 13).

Looking at the students' direct views on the findings of the research, Student 2 stated that with the project, he saw many things he did not see before, understood environmental pollution, and realized what he could do for the environment using the expression "*The project helped me to see many things I have not seen in my life, to understand how bad environmental pollution is, and to be aware of the things I can do for the environment and the world.*" Similarly, Student 8 emphasized that with the project, he learned how important the environment is and how to protect the background using the expression, "*I think the environment is a precious thing given to us. If we protect it, it will contribute to us; if we do not, it will be harmful. We learned with the project that we should protect this and what we can do."* Student 5 emphasized that they gained knowledge-making applications in the project. In addition to developing their awareness, they transformed what they learned into behavior using the expression, "*I mean, people are conscious about the environment, but they don't apply them. They do not prefer to apply much. We learned by applying this in this project. As our awareness has improved, we have also come to apply them."*

Similarly, Student 9 emphasized that he did not consider many environmental aspects before the project. Still, this situation changed after the project said, "*Yes, it was effective. For example, before the project, I would not consider most things about nature. After the project, I started to remember more.*" Student 7, on the other hand, stated that he had become more conscious about the environment using the expression, "*Yes, I've become more conscious when I learned in the project how long a garbage we dumped stays in the soil.*" The students stated that they gained a lot of information from the project. Accordingly, Student 1 emphasized that he gained new knowledge and learned how much packaging wastes harm the environment using the expression, "*We learned about new tree species, new animal species. We learned about the food chain. Sir, we also learned how much damage plastics do when they are thrown in nature, soil, and water.*" Student 8 stated that he realized how much they harmed the environment and that it is needed to raise people's awareness to protect the background using the expression, " *I have learned about endangered animals, how things we do in the environmental damage the environment. Now I learned that we need to protect the environment more, that is, we need to look after it, and this will develop by reaching different people starting from our family*." Student 6 stated that he saw the traces of art and mathematics in nature using the expression, "*I saw that there was art in the environment. For example, I realized that geometry and mathematics can be in a leaf.*"

4. RESULT AND DISCUSSION

Based on the quantitative and qualitative findings obtained in the study, it was found that environmental education enriched with OSLA had positive effects on the affective and behavioral tendencies of gifted students towards the environment and ecological problems. As pre-mean scores of the Environmental Affect Scale were examined, it was found that the ecological awareness tendencies of gifted students were higher from the beginning. Besides, there was a statistically significant increase in their environmental awareness with the experiences they gained during the OSLA six days. Because gifted students attend lots of OSLAs during the study process (see Table 1), and these activities create good opportunities to experience nature (Kannel-Ray, 2006; So & Chow, 2019; Stevenson, 2007) and have the effect of developing awareness of the environment (Ayaydın, Ün, Acar-Şeşen, Usta-Gezer & Camcı-Erdoğan, 2018; Pfouts & Schultz, 2003). However, there was no significant change in sub-dimensions of the Environmental Responsibility factor, and there was a significant increase in the Environmental Sensitivity and Environmental Perception factors before and after the treatment. As pre and post-test scores of the Environmental Behavior Scale were examined, it was found that there was a statistically significant difference between them. It was also found that there was a substantial increase in the sub-dimensions of Natural Balance Protection Behavior and High-Level Cognitive Behavior factors and non-significant increases in Social Behavior factors. These outcomes can be considered as the results of the training. Semi-structured interviews for a better understanding of quantitative data, it was obtained that the awareness of gifted students towards environmental problems increased with enriched environmental education.

Students performed many activities in the botanical garden, greenhouse, and forest (see Table 2). During these activities, students were not only provided with the academic knowledge but also to discover the rhythm of nature, recognize the creatures living in the heart, and realize that these creatures are essential for sustainable life and nature is mathematics. Besides, students who realized environmental problems produced their solutions to these problems (Qualitative and quantitative data also supported this situation); because real-world problems and issues satisfy gifted students' needs for abstraction, complexity, and depth in their learning and make them think more critically, creative as a problem solver (Kaplan, 2020; Reis, Renzulli & Renzulli, 2021). Students, who increased their environmental sensitivity and perceptions, said that the education given to them greatly affected realizing ecological problems. Because gifted students are already sensitive to environmental issues and with training, they can be more sensitive and become effective solution producers for environmental issues (Ayaydın, Ün, Acar-

Şeşen, Usta-Gezer & Camcı-Erdoğan, 2018; Ceylan 2022; Esen 2011; Schroth & Helfer, 2017; Winocur & Maurer, 1991). And OSLEs increase gifted students' content understanding (Best, Dickinson, Hugstad-Vaa Leer & Kalina, 2017; Morris, Slater, Fitzgerald, Lummis & Etten, 2021; Young, Young & Ford, 2019). The qualitative data found that the experimental practices in the education process were effective in providing this understanding and awareness. The students who showed a significant increase in the Natural Balance Protection Behavior dimension stated that their education effectively exhibited these behaviors, which supports the quantitative findings. Students especially said they show behaviors such as recycling, raising public awareness, using public transportation, protecting forests, and not polluting the environment. It was also obtained that the activities in Table 2, such as touching the depiction, trekking, why the weather warmed up, soil and water analysis, ecosystem, my tree is singing, what's happened-what is happening- what will happen, what number is your footprint and recycling, packaging waste and decay activities in nature were effective in gaining consciousness. It was found that gifted students became aware of the extinct animals during their education and learned what they needed to do individually and socially to protect them. Students began to examine what was happening in the environment differently. They were also informed about what they should do when they face a situation that causes environmental problems and start to use them in their own lives. In addition to this, they gained experience about how and why recycling is done, what the order of nature is, the extinction of living things, and how the natural balance between living things and other creatures and non-living things are established, and these gains provided a positive development in their environmental sensitivity and behavior

5. CONCLUSION

Based on the findings obtained from the study, it is clear that the training achieved in out-of-school learning environments about environmental issues contributed not only to academic knowledge but also educated individuals who protect and respect the environment they live in as a member of society. The background should be realized by being experienced one-to-one in out-of-school learning environments. Studies should be increased and extended for a long time to become aware of the domain. So, it is possible to raise equipped individuals for a livable world

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