Chapter 2

# The Effect of an Environmental Education Program Module Based on Nature Experience on the Environmental Awareness of Preschool Children

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**Abstract**

This study investigates the impact of a nature experience-based environmental education module program on preschool children's environmental awareness. A mixed-methods design was employed, incorporating a case study as the qualitative component and a one-group pretest–posttest experimental design as the quantitative component. The study group consisted of ten children (four girls and six boys) aged 60–72 months, enrolled in a kindergarten and previously not received any formal environmental education. The program was implemented over nine weeks, with weekly one-day sessions conducted in a designated forest area. Data were collected through a semi-structured interview form developed by the researcher and the Children's Environmental Scale developed by Koçak Tümer and Temel (2021). Qualitative data were analyzed using content analysis, while quantitative data were examined using a paired-samples t-test to compare pretest and posttest results. The findings revealed that, following participation in the program, children demonstrated increased knowledge and awareness regarding concepts such as the environment, environmental pollution, environmental protection, living beings, and recycling. Moreover, the posttest mean scores were found to be significantly higher than the pretest mean scores. These results indicate that the nature experience-based environmental education program positively influenced preschool children's environmental awareness, suggesting

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that nature-based learning activities can effectively foster environmental consciousness in early childhood education.

In an era where children are increasingly disconnected from nature and tend to perceive the environment as an abstract concept, there is a pressing need for experiential learning environments that enable direct interaction with nature and nurture both environmental affection and awareness. Therefore, environmental education should extend beyond classroom walls, providing children with opportunities to explore, experience, and appreciate their surroundings. The nature-loving child of today will become the environmentally responsible adult of tomorrow, thereby laying the foundation for a sustainable future.

## 1. Introduction

Nature has held an important place in human life throughout all ages. However, humankind has often perceived nature as an inexhaustible resource and has exploited all living and non-living elements of the natural environment without hesitation. With the increasing human population, urbanization, and industrialization, the extent of environmental damage has grown, and environmental problems have become more visible (Bozkurt & Cansüngü-Koray, 2002). As environmental problems intensify, societies are increasingly affected by them (Baykal & Baykal, 2008). While environmental problems diminish current quality of life, they simultaneously threaten the living conditions of future generations. As the impacts of environmental degradation have become more apparent, human concerns have increased, and various solutions have begun to be proposed. In this context, environmental declarations and conventions have been signed, and environmental conferences have been organized.

For previous generations, outdoor experiences were not considered a significant issue, as children naturally spent most of their time outdoors. "However, children today are unable to spend sufficient time in nature. It has been shown that children of today are approximately 40% less active than children thirty years ago" (Civelek & Uyanık, 2021, p. 251). Early childhood experiences shape future attitudes; therefore, a child who grows up interacting with trees, animals, and soil develops a sense of affinity toward nature later in life. Froebel emphasized that children should grow up in close contact with nature. Conversely, Rousseau (1762, as cited in Akagündüz, 2005) argued that correcting improper behaviors acquired during early childhood becomes increasingly difficult in later years. In this regard, nature-based experiential activities provide an opportunity for children to engage closely with nature and strengthen their connection with

it. Early environmental education stimulates children's curiosity toward nature and the environment (Gülay & Önder, 2011). This curiosity helps children understand the environment, develop environmental awareness, and sustain environmentally responsible behaviors throughout their lives. The earlier environmental education begins, the sooner correct environmental behaviors develop and the sooner these behaviors yield positive outcomes (Grodzinska-Jurczak et al., 2006). For this reason, developing children's understanding of nature and the environment should be an integral part of preschool education. Monroe et al. argued that effective environmental education is possible only through close contact with nature (Monroe et al., 2013, as cited in Ahi & Alisinanoğlu, 2016). Learning about the environment through direct experience in nature is more effective than learning about it through screens or from teachers.

In line with these considerations, the central problem addressed in this study is: What is the effect of nature-based environmental education on preschool children's environmental awareness? From this main problem, the following sub-problems were identified:

* Does a nature-based environmental education program have a significant effect on preschool children's environmental awareness?

* Do children's views on the concepts of environment, environmental protection, environmental pollution, and recycling change after the nature-based environmental education program?

### 1.1. Nature-Based Environmental Education and Environmental

The environment encompasses all elements that influence human life, while humans constitute one of the most significant factors affecting the environment. Gore (1993) defines the human–environment relationship as follows: "To believe that we are separate from nature is to misunderstand our place in the natural cycle of life and to fail to comprehend the natural processes that affect us and that we, in turn, affect" (p. 156).

In the literature, various terms such as nature education, nature-based education, outdoor education, environmental education, field-based education, and outside-the-classroom education are often used interchangeably or with similar meanings. Priest (1990) describes outdoor education as experiential learning that activates all senses. In several studies, nature education has been used synonymously with environmental education (Ozaner, 2004; Kalender, 2010). However, Erdoğan (2011) argues that nature education and environmental education are distinct concepts that are often confused with one another. Özdemir (2010) emphasizes that nature-

based environmental education is a unique educational program supported by activities conducted in natural settings, differing from formal environmental education, which does not necessarily require nature-based implementation. While environmental education can be carried out indoors, nature education must take place outdoors—within designated time frames—and it enhances active participation through nature experiences, enabling close observation and understanding of the natural environment. Accordingly, this study employed nature-based environmental education to explore the role of nature experiences in fostering environmental awareness.

Environmental education provided during early childhood is crucial for promoting positive environmental attitudes later in life. Thus, the preschool period is critical for the development of environmental knowledge, awareness, attitudes, and behaviors. As in many domains, direct instruction on environmental issues is often insufficient during early childhood (Chawla & Hart, 1995). A substantial portion of environmental knowledge and awareness is acquired through outdoor, experience-based learning (Gülay Ogelman & Önder, 2011). Learning begins with curiosity, and nature experiences foster curiosity, encouraging exploration and facilitating learning. Nature is in a constant state of change—trees that transform with the seasons, migrating birds, ants building new nests, puddles formed after rain, drying flowers, sprouting plants, and various mushroom species offer children continuous opportunities for observation and discovery. In this sense, nature serves both as a unique educational environment and as a teacher that continually renews itself.

Nature-based environmental education programs enhance children's ability to empathize with nature (Atasoy, 2006). They enable children to develop meaningful experiences related to nature and foster responsible attitudes and behaviors toward the environment. There is a strong relationship between the amount of time children spend in nature and their attitudes toward the natural world. Children who regularly interact with nature tend to develop more positive attitudes toward protecting it.

Experiences in nature allow children to observe ecological balance and encourage behaviors that avoid disrupting natural systems. These experiences help children understand the value of resources, appropriate usage, and the importance of conservation. Encouraging the responsible use of natural resources supports movement toward sustainable living. In 1978, Theimer investigated the factors influencing environmentally conscious behaviors among adults and concluded that the most significant determinant—by far—was childhood experiences in natural environments. The solution to

environmental problems lies in fostering a strong emotional connection to nature, and this bond begins when children physically interact with the earth.

## 2. Methodology

This study employed a mixed-methods research design, incorporating both qualitative and quantitative approaches. Mixed-methods research involves the use of both qualitative and quantitative data within a single study (Creswell, 2005). In this research, an embedded mixed-methods design was preferred, in which quantitative data were supported by qualitative findings.

The qualitative dimension of the study was designed as a case study. In this context, a holistic case study design was adopted to conduct an in-depth examination of the environmental awareness of the participating children.

The quantitative dimension of the study was based on a one-group pretest–posttest experimental design. In this design, the effect of the intervention is examined by comparing the pretest and posttest scores obtained from a single group.

### 2.1. Study Group

The study group consisted of 10 children (4 girls and 6 boys) aged 60–72 months, all of whom were attending an independent preschool. None of the children had previously received environmental education, and all demonstrated normal developmental characteristics. A convenience sampling method, one of the non-random sampling techniques, was used to determine the study group.

### 2.2. Data Collection Tools

To assess preschool children's nature-based environmental awareness, a semi-structured interview form was developed by the researcher. The form was designed to explore children's environmental awareness and consisted of eight open-ended questions addressing the concepts of environment, environmental pollution, environmental protection, conservation of living things, air pollution, water pollution, soil pollution, and recycling.

For quantitative data collection, the "Environmental Scale for Children," developed by Koçak Tümer and Temel (2021), was administered. This scale was designed to measure preschool children's level of environmental awareness and had undergone validity and reliability testing. Necessary permissions for use were obtained from the developers.

### 2.3. Data Collection Process

After obtaining consent from participating children and their families, the semi-structured interview form was administered as a pretest. The qualitative data collection was followed by the administration of the "Environmental Scale for Children" as the quantitative pretest.

The nature-based environmental education program was implemented over a period of nine weeks, consisting of half-day sessions based on planned activities. Following the intervention, the semi-structured interview form and the environmental scale were administered again as posttests.

### 2.4. Nature-Based Environmental Education Program

The primary aim of the nature-based environmental education program was to enhance children's environmental awareness and promote positive attitudes and behaviors toward the environment. The program was developed through a review of the literature related to "environment," "environmental education," and "nature experience," and was modeled after the Minik TEMA program and the Ministry of National Education (MoNE) Preschool Activity Book. It was aligned with the cognitive, language, social-emotional, motor, and self-care developmental goals and indicators of the MoNE 2013 Preschool Education Program.

The program was planned as a nine-week process. The researcher identified nine themes and included one theme each week. Each week, an activity plan was implemented, and all activity plans were designed as a half-day learning plan. The activity plans generally included a starting point for the day, free time, two main activities, and a final evaluation. Each activity plan included free time activities, allowing children to spend time freely in nature, play in nature, and explore nature on their own. The implementation process involved implementing the researcher's weekly theme and activities planned to align with that theme in a designated forest area. The researcher's role during the implementation process was to implement environmental activities based on nature experiences and to guide the children during this implementation.

*Table 1. Environmental education activity production based on nature experience*

| Weeks | | |
|---|---|---|
| **1** | Getting to Know the Forest | Activity 1: Forest Rules<br>Activity 2: Forest Walk |
| **2** | Getting to Know the Plants | Activity 3: Tree Snatching<br>Activity 4: Colors of the Forest |
| **3** | Getting to Know the Animals | Activity 5: Feeding the Birds<br>Activity 6: Where Are the Insects? |
| **4** | Getting to Know the Soil | Activity 7: What Hide in the Soil<br>Activity 8: What is Erosion? |
| **5** | Clean Soil | Activity 9: What Dissolves in the Soil<br>Activity 10: Composting |
| **6** | Clean Air | Activity 11: Where is the Air?<br>Activity 12: What Does a Tiny Sapling Want? |
| **7** | Clean Water | Activity 13: Is This Water Clean?<br>Activity 14: Rope Bridge |
| **8** | Recycling | Activity 15: What is Recycling?<br>Activity 16: What Can You Make from Wood? |
| **9** | Sustainability | Activity 17: Making Natural Paint<br>Activity 18: Making Stick Men |

### 2.5. Data Analysis

The qualitative data consisted of interview transcripts. Content analysis was employed to analyze these data in detail. All audio-recorded interviews were transcribed verbatim. The researcher checked the accuracy of the transcripts by re-listening and re-reading them. Once accuracy was ensured, coding began. Codes were generated after multiple readings, compared for similarities and differences, and organized into themes.

To determine whether pretest and posttest scores followed a normal distribution, the Shapiro–Wilk test was conducted. Since the scores showed normal distribution, a paired-samples t-test was used to examine whether the difference between pretest and posttest scores was statistically significant. The KR-20 internal consistency coefficient was calculated for the reliability of the scale.

## 3. Findings

### 3.1. Children's Definitions of the Environment

Two of the children were unable to provide a meaningful response to the question "What is the environment?". As shown in Table 2, the children's answers to the question "What is the environment?" were categorized as "Botanical elements," "Forest/Nature," "Habitat," "Animal elements,"

"A place that should be clean," and "Aesthetic," respectively. In the initial interview responses, the most frequently mentioned themes were Botanical elements and Forest/Nature.

***Table 2. Children's Responses to "What is the Environment?" Before the Activities***

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| ENVIRONMENT | Forest/ Nature | 4 | *S2 "Environment forest means"*<br>*S8 "Our nature means."*<br>*S9 "For example forests."*<br>*S10 "Forest, animals lived in place."* |
| | Plant Elements | 5 | *S2 "Trees means."*<br>*S4 "Lawn means."*<br>*S6 "Garden."*<br>*S7 "Bushes coming. Trees coming. Trees provide us with oxygen gives."*<br>*S9 "Nature It means. Trees means."* |
| | Habitat | 3 | *S5 "We live in place. It means world."*<br>*S8 "So the weather to take for outside to travel."*<br>*S10 "People picnic like can do."* |
| | Animal Elements | 2 | *S9 "About animals One place."*<br>*S10 "Animals lived in place."* |
| | Place that needs to be clean | 1 | *S2 "The World clean to be, to the world rubbish not to throw away."* |
| | Aesthetic | 1 | *S6 "People will look after One place. View."* |

Table 3. The answers given by the growing children to the question "What is the environment?" in the last interview constituted the codes "Habitat", "Forest/Nature", "Plant elements", "Animal elements", "Place that needs to be clean" and "Aesthetics".

***Table 3. Children's Responses to "What is the Environment?" After the Activities***

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| ENVIRONMENT | Forest/ Nature | 6 | *S2 "Environment forest means."*<br>*S4 "Environment nature means."*<br>*S8 "Our nature."*<br>*S10 "Environment It is nature. Forest, nature well forest is coming."*<br>*S9 "Nature, Nature animals is friendly."*<br>*S7 "Clean air, beautiful air trees breath takes."* |
| | Plant Elements | 5 | *S5 "There are fruits and trees."*<br>*S7 "Bad weather trees breath takes."*<br>*S8 "There are flowers too."*<br>*S9 "Trees, leaves, flowers."*<br>*S10 "Trees there is."* |
| | Animal Elements | 5 | *S5 "Animals live well.and animals damage Don't let him see."*<br>*S7 "Birds house of giraffes house. environment to animals respect to give and to love"*<br>*S8 "There animals lives. Dog cat live."*<br>*S9 "Nature animals is friendly."*<br>*S10 "Animals, trees there is."* |
| | Place that needs to be clean | 5 | *S2 "Environment It is clean. The environment not to pollute."*<br>*S5 "And the world trashy absence necessary."*<br>*S6 "Dumps to collect, not to give off a bad smell."*<br>*S7 "In humans rubbish if he throws Animals eat too. That 's why rubbish Let's not throw it away."*<br>*S8 "And people outside when it comes out rubbish He throws and we collect."* |
| | Habitat | 5 | *S1 "Environment for example our workplace, our homes."*<br>*S3 "For example Turhal means there Beautiful things okay, game park, playground They have their places."*<br>*S4 "Environment children will play One It is the place. Children income plays."*<br>*S5 "Environment World means. People is place."*<br>*S6 "So people One family's children will play One place for example parks It's happening."*<br>*S8 "Very big One place. Everywhere There are children in the houses. interest there games They play."* |
| | Aesthetic | 1 | *S3 "Environment Beautiful One is something."* |

The number of responses given in the final interview was generally similar. In the final interview, the children's responses varied considerably, and they responded to multiple codes. The code " Place that needs to be clean " showed the largest increase in response numbers between the first and last interviews. Comparing the number of responses from the first and

last interviews, there was an increase in the number of responses for the majority of the codes. In the first interview, the number of responses for the plant elements code was 5, while the number of responses for animal elements was 2. In the final interview, the children included plant and animal elements (n=5) at equal levels.

### 3.2. Factors That Pollute the Environment

When Table 4 is examined, it is seen that all children responded "Garbage" to the question "What pollutes the environment?" in the interview. Other codes generated from the children's responses are "Dust/soil/mud," "Recyclable Waste," "Organic Waste," "Animals," and "Smoke."

***Table 4. Children's Responses to "What Pollutes the Environment?" Before the Activities***

| **Theme** | **Codes** n | | **Sample Expressions** |
|---|---|---|---|
| ENVIRONMENTAL POLLUTION | Trash | 10 | *S2 "Garbage, biscuits garbage, water bottle, ice cream garbage, lemonade garbage."*<br>*S3 "Garbage inside One things when it spills gets dirty."*<br>*S4 "Garbage throw, for example garbage they overthrow."*<br>*There is garbage everywhere if we throw gets dirty."*<br>*S8 "Garbage. And people Sometimes rubbish throw away " can pollute."* |
| | Dust / soil / mud | 5 | *S3 "Soil. Soils when it dries."*<br>*S4 "Soil. Soil in our hands If we take it, it will scatter everywhere and dust It is possible."*<br>*S10 "Mud"* |
| | Recyclabe Waste | 5 | *S7 "Paper"*<br>*S9 "Bottles, plastic well"*<br>*S10 "The bottle is broken windows."* |
| | Organic Waste | 3 | *S7 "Banana peels, apples, potatoes shell"*<br>*S8 "Throwing food on the floor"*<br>*S9 "Leaves"* |
| | Animals | 1 | *S5 "Chickens pollutes. poop what he did for."* |
| | Smoke | 1 | *S4 "Smoke also pollutes. Houses smoke etc."* |

In the final interview, the children were given five codes: "Garbage," "Recyclable Waste," "Smoke," "Dust/soil/mud," and "Chemical Waste." As in the first interview, all children responded with garbage. While the "Organic Waste" code from the first interview was not present in the final interview, the code for "Chemical Waste," which was among the codes from the first interview, was present. This code referred to children's pesticides and batteries.

*Table 5. Children's Responses to "What Pollutes the Environment?" After the Activities*

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| ENVIRONMENTAL POLLUTION | Trash | 10 | *S2 "Garbage if we throw becomes dirty."*<br>*S4 "People to our world rubbish when you throw."*<br>*S6 "Garbage for example People rubbish if he throws gets dirty."*<br>*S7 "Garbage And unnecessary things pollutes."* |
| | Recyclable Waste | 9 | *S7 "Plates, paper, plastics, napkins, bags, glass"*<br>*S8 "Plastics, boxes"*<br>*S10 "Plastic bottles, glass bottles."* |
| | Smoke | 5 | *S4 "Smoke is everywhere like this covered from houses from cars."*<br>*S5 "Cars smoke pollutes. Smoking smoke pollutes."*<br>*S7 "The car engine (…) smoke It turns out either " behind his back."* |
| | Abiotic Elements Dust / soil / mud | 2 | *S1 "Soil, mud"*<br>*S2 "Mud if we throw stone if we throw and water if we pour mud It is possible becomes dirty ."* |
| | Chemical Waste | 2 | *S9 "Plants bad maker drugs"*<br>*S4 "Finished batteries when you throw the environment is also very filthy " It's happening "* |

While five children mentioned the code "Recyclable Waste" in the first interview, this number increased to nine in the last interview. Similarly, the number of "Smoke" responses from one child in the first interview increased to five in the last interview. Furthermore, while five children in the first interview stated that dust, soil, and mud pollute the environment, in the last interview, only two children believed that dust, soil, and mud pollute the environment. The decrease in the number of responses related to this code indicates a shift in children's perceptions of the environmental pollution caused by soil and mud

### 3.3. Ways to Protect the Environment

The first interview codes for the question "What can we do to protect our environment?" were " We should clean," "We must not pollute," " We should protect plants," " We should plant plants," " We should protect animals," and " We should recycle." The most common response in this theme was for the code " We should clean." Children believed that to protect our environment, We should clean it the most.

***Table 6. Children's Responses to "How Can We Protect the Environment?" Before the Activities***

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| ENVIRONMENTAL PROTECTION | We should clean | 6 | *S1 "We must clean the garbage everywhere, wherever it is dirty."*<br>*S3 "We need to wash our environment (…)."*<br>*S8 "We have to clean it. We have to collect and throw away the garbage."*<br>*S9 "We must clean up nature. We'll each take a broom and clean up all the garbage."* |
| | We should not pollute | 4 | *S2 "We have to throw it into nature, throw it in the trash, or if we cannot throw it away, we have to give it to uncles."*<br>*S6 "We should not throw garbage, otherwise everywhere will get dirty."*<br>*S7 "I throw garbage in the trash, I never throw it on the ground."* |
| | We should protect Plants | 1 | *S9 "We can water the environment. Trees, grass, (…)."* |
| | We should plant plants | 1 | *S3 "We should always plant flowers."* |
| | We should protect Animals | 1 | *S9 "We can give water to the environment. (…), to animals."* |
| | We should Recycle | 1 | *S5 "We need to throw it in the recycling bin."* |

The final interview responses included 10 codes: "We Shouldn't Pollute," "We Should Clean," "We Should Protect Plants," "We Should Protect Animals," "We Shouldn't Recycle," "We Should Protect Our Air," "We Should Protect Our Water," "We Should Plant Plants," "We Should Compost," and "We Should Prevent Fires." The code with the highest number of responses under this theme was "We Shouldn't Pollute."

***Table 7. Children's Responses to "How Can We Protect the Environment?" After the Activities***

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| ENVIRONMENTAL PROTECTION | We should not pollute | 6 | *S1 "We should not pollute, we should collect what we pollute, otherwise our environment will be polluted and bad.*<br>*S4: "We need to stop them together with our parents. We tell people not to throw them."*<br>*S5 "We need to take good care of our environment and our world. It is not okay to pollute everywhere with garbage."*<br>*S9 "We should take care, not pollute."* |
| | We should clean | 4 | *S4 "That 's why we need to clean the nature and the environment."*<br>*S6 "Collecting the garbage, (..) cleaning the house and outside."*<br>*S8 "We must clean up the garbage"* |
| | We should recycle | 5 | *S2 "We should also recycle plastics."*<br>*S5 "We need to throw it in the recycling bin."*<br>*S10 "We can recycle. For example, you will recycle the water bottle."* |
| | We should protect plants | 3 | *S5 "And it should be grassy, We should not mistreat the grass."*<br>*S7 "Trees should not be cut down because trees breathe."*<br>*S9 "We should water the flowers."* |
| | We should protect animals | 2 | *S10 "We must build homes for animals"*<br>*S4 "For example, when they throw gum, birds come and stick it in their beaks and they cannot eat, so they die."* |
| | We should protect our air | 2 | *S8 "Factories should operate without smoke."*<br>*S10 "Not installing exhaust engines in cars"* |
| | We should protect our waters | 2 | *S5 "If the water is cut off, we will be left without water. We should not waste too much water."*<br>*S9 "We should not pollute the water, we should take good care of it"* |
| | We should plant | 1 | *S3 "We should plant a lot of flowers because it looks very beautiful."* |
| | We should compost | 1 | *S8 "We should bury the peels of the fruits so that the soil is healthy."* |
| | We should prevent fires | 1 | *S8 "We should not throw away bottles and glass because they can sometimes burn with the heat of the sun and cause fire."* |

When comparing the data from the first and last interviews, there was a decrease in the number of responses to the code " We should clean" while there was an increase in the number of responses to the code " We should not pollute." Before the implementation, there was only one response to the code " We should recycle," but after the implementation, five children stated that we should recycle to protect our environment. In the first interview, there was only one response to the code " We should protect plants," while

in the last interview, there were three responses. In the final interview, the codes " We should protect our air," "We must protect our water," " We should prevent fires," and " We should compost," which were not included in the first interview, were added.

### 3.4. Children's Understanding of Recycling

In the first interview, one of the children could not provide a meaningful answer to the question, "What is recycling?" The children's definitions of recycling were coded as "Turning into Something New," "Throwing Garbage in the Trash," and "Putting It in a Different Box."

***Table 8. Responses to "What Comes to Mind When You Hear 'Recycling'?" Before the Activities***

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| RECYCLE | Producing something new | 6 | *S2 "Toy cars sometimes breaks back transformation goes. For example wrinkled paper If I find it back transformation I can throw it, then it back " it transforms."*<br>*S4 "Them back transforming well back " He gives us bottles and papers."*<br>*S5 "Garbage again bottle to do. In recycling melted down and reused transformation " it's happening."*<br>*S6 "Garbage back transformation to the box We throw away. Recycle We empty again we throw (…) they give us new paper like " gives."*<br>*S8 "Some things One in the box or else to something put back transformation We take it. For example One empty paper We distorted One thing we drew that back pure white " is coming."*<br>*S10 "Papers thrown, irons thrown away, glasses It is thrown away. It is also thrown away by the garbage collectors. Then he takes it They melt metal they transform ."* |
| | Throwing trash in the bin | 2 | *S3 "Garbage trash throw to the ground like not to throw away."*<br>*S7 "Garbage means. In the trash when you throw rubbish car is coming " is taking."* |
| | Put in a different box | 1 | *S9 "For example This bottle, chocolate garbage. Them Another One to something We put later back transformation men It's coming but I don't know To where " they are taking away. "* |

In the final interview, the codes " Producing something new" and " Throwing trash in the bin " were created for the question "What is recycling?" The majority of children defined recycling as producing and transforming something new.

***Table 9. Responses to "What Comes to Mind When You Hear 'Recycling'?" After the Activities***

| Theme | Codes | n | Sample Expressions |
|---|---|---|---|
| RECYCLE | Producing something new | 9 | S1 "We threw things They take by truck They take away And They renew. Paper, plastic, cardboard.<br>S2 "Recycling plastics to the new thing to transform. For example bottles, paper."<br>S4 "Our environment to protect for old our belongings back transformation We throw it away. Then we take it back. turns into again our use for."<br>S5 "We throw away our garbage waste box again We throw away our bottles. back transformation from the box take again We do it to school too again This " We are bringing."<br>S6 "It is paper box, bottle box, glass box, cardboard box, bottle box. Because all mixes them. back Transformers again They are doing to the factory " they are taking away."<br>S7 "Recycling to the machine expense glass It happens, flower It's okay. It's clean. whether back we will take it glass, flower " It will happen, we will package it."<br>S8 "So the bottle produce paper produce cardboard produce, bag to produce."<br>S9 "In the trash we shouldn't throw it away back transformation we must throw it back let it be glass etc. Recycling if we throw our nature protected let it be."<br>S10 "Plastic bottles, metals again renew They can. Glass bottles They can do it. I waste I won't throw it away just nowhere back transformation " I'll throw it." |
| | Trash bin | 1 | S3 "In the box put. When finished rubbish " we will put it." |

However, in their statements, S4 and S9 stated that recycling is important for the environment, unlike the first interview. S4 said, "We recycle our old items to protect our environment. Then they are recycled so we can use them again." S9 said, "We shouldn't throw them in the trash; we should recycle them so they can be returned, like cups. If we recycle, our nature will be protected."

S7's response in the first interview, "It means garbage. When you throw it in the trash, a garbage truck comes and picks it up," changed to "It goes into the recycling machine and becomes cups or flowers. It comes back clean and then becomes cups or flowers and is packaged" in the last interview. While S1's response in the first interview, "We come back and go back," did not provide a meaningful answer about the concept of recycling, his response in the last interview, "They take the things we throw away, take them away by truck and renew them," suggests that he has gained knowledge and awareness about recycling.

### 3.5. Quantitative Findings

To assess the impact of nature-based environmental education activities on preschool children's environmental awareness, the Shapiro-Wilk test was conducted to examine the normal distribution of the data before the test to examine the significance of the difference between the pre-test and post-test scores. The results of the analysis are presented in Table 10.

***Table 10. Results of normality tests***

| | Shapiro-Wilk | | |
|---|---|---|---|
| | Statistics | SD | p |
| Pre-test | 0.868 | 10 | 0.094 |
| Post-test | 0.897 | 10 | 0.201 |

***p <0.05***

An examination of Table 4.22 indicates that the pretest and posttest scores have a normal distribution according to both normality tests, indicating that parametric tests can be used. Therefore, to assess the impact of nature-based environmental education activities on preschool children's environmental awareness, a dependent-samples t-test was conducted to examine the significance of the difference between the pretest and posttest scores. The results of the analysis are presented in Table 11.

***Table 11. Dependent sample t-test results for the significance of the difference between pre-test and post-test scores***

| Environmental Awareness Levels | Measurements | n | Average | Ss | SD | t | p |
|---|---|---|---|---|---|---|---|
| | Pre- Test | 10 | 12.88 | 2.29 | 9 | -8,204 | ,000 |
| | Post-Test | 10 | 19.30 | 1.18 | | | |

****p<.001***

When Table 11 is examined, according to the dependent sample t-test result conducted to evaluate the effect of environmental education activities based on environmental nature experience applied to children for eight weeks on the environmental awareness of preschool children, it was concluded that the post-test mean scores of the children (X= 19.30) were significantly higher than the pre-test mean scores (X= 12.88) ($t = -8.204$, $p < .001$).

## 4. Discussion

### 4.1. Environment

The findings of this study demonstrate that preschool children most frequently defined the concept of the environment in terms of forests, nature, and plant-based elements, both before and after the intervention. Their perception of the environment largely revolved around green spaces. This aligns with the findings of Atabek-Yiğit et al. (2019), who similarly reported that children most commonly identified the environment with trees, flowers, and green areas. Likewise, Sahimi (2012) and Gür (2022) found that children tended to associate the environment with open, natural spaces.

Following the intervention, children more frequently incorporated animal-related elements into their definitions of the environment. Moreover, they increasingly described the environment as a living space, indicating an expanded and more integrated understanding. Before the intervention, some children perceived the environment as something separate from humans—an external place that humans visit. After the nature-based experiences, however, children began to recognize the environment as a system in which humans play an active role. This suggests that the educational program helped children move from a detached observer perspective to an understanding of humans as integral components of the environment.

Although children frequently identified living and natural elements, their references to non-living components were limited. This indicates an incomplete understanding of the environment as an interconnected system comprising both living and non-living elements. Çetin and Badem (2015) similarly found that primary school students tended to perceive the environment as a place rather than a system of interconnected biotic and abiotic components.

In the pre-intervention phase, some children were unable to define the environment meaningfully, whereas in the post-intervention phase, all children were able to articulate a definition—often with greater elaboration and specificity. Notably, many children added that the environment is "a place that should be clean," indicating increased awareness of environmental responsibility. This finding supports the conclusion that nature-based environmental activities contribute meaningfully to children's understanding of environmental concepts and the importance of maintaining environmental cleanliness.

### 4.2. Environmental Pollution

Before and after the intervention, all children identified trash as the primary environmental problem. Similar findings were reported by Yılmaz et al. (2016) and Erten (2003), who found that children commonly associated environmental problems with litter.

Half of the children initially stated that dust/soil/mud pollute the environment, reflecting an egocentric misconception—equating what dirties the child with what dirties the environment. Preschool children's developmental stage, characterized by egocentric thinking, may explain this association. After the intervention, however, the frequency of this misconception decreased markedly. This shift may be attributed to the hands-on activities encouraging children to touch soil and engage with natural materials, helping them understand that soil and mud are natural components of the environment and not pollutants unless misused.

Children demonstrated a substantial increase in identifying recyclable waste as a factor in environmental pollution after the program. This suggests that the intervention improved their ability to differentiate between ordinary trash and recyclable materials. Furthermore, children began mentioning chemical waste—including pesticides and batteries—for the first time, reflecting a broadened and more accurate understanding of environmental hazards.

These findings echo those of Gray et al. (2016), who reported that environmental education enhanced children's ability to identify more complex and specific environmental issues, such as water and soil pollution or deforestation.

Before the intervention, children focused almost exclusively on land pollution, with little awareness of air or water pollution. This pattern was similarly observed by Saz et al. (2020) and Yurttaş (2023). After the nature-based program, children increasingly recognized air pollution as an environmental issue, particularly citing smoke emissions. However, awareness of noise pollution remained absent—likely because noise pollution was not directly addressed in the program's thematic activities.

### 4.3. Environmental Protection

Both before and after the intervention, children most frequently stated that protecting the environment required not polluting it or cleaning it. Before the intervention, children emphasized cleaning; after the intervention, they more strongly emphasized prevention—an important conceptual shift.

This indicates an improved understanding that preventing pollution is more effective than cleaning it afterward.

Children also noted the importance of watering plants, planting new ones, helping animals, and recycling. Kanat et al. (2023) reported similar findings, where children emphasized avoiding pollution and caring for living things as means of environmental protection.

After the intervention, children provided more detailed and diversified responses, including references to air protection, water conservation, composting, and forest fire prevention. Before the intervention, only one child mentioned recycling, while after the program, half of the children emphasized its importance—consistent with findings by Akbayrak and Kuru-Turaşlı (2017).

These results suggest that the program effectively increased children's environmental awareness, particularly regarding littering, conservation of living things, and recycling. However, children still lacked a fully integrated understanding of the environment as a system encompassing air, water, soil, and sound.

Children frequently recognized the critical role of humans in environmental degradation and protection. Similar findings indicating children's awareness of human–environment interactions have been reported by İstanbullu (2008), Atabek-Yiğit et al. (2019), and Ayvacı et al. (2021).

### 4.4. Recycling

Children initially described recycling primarily as "creating something new," while some confused recycling with "throwing things into the trash." This indicates an underdeveloped ability to distinguish between recyclable waste and general waste. After the intervention, nearly all children accurately defined recycling as converting waste materials into new products.

Children also expanded their understanding of recyclable materials, increasingly identifying paper, cardboard, glass, plastics, metal, and batteries. These findings are consistent with Çimen and Yılmaz (2012), who reported that children commonly associated recycling with reprocessing paper and plastic products.

Before the intervention, children displayed a limited understanding of recycling, similar to the findings of Ada and Erdaş-Kartal (2020), who noted that younger preschool children often equated recycling with general waste disposal. After the intervention, however, children demonstrated substantial

improvements in distinguishing recyclable materials and understanding the process and purpose of recycling.

Overall, the evidence suggests that nature-based activities significantly strengthened children's conceptual and practical knowledge of recycling.

## 5. Conclusion

This study examined the impact of nature-based environmental education on preschool children's environmental awareness. Both qualitative and quantitative findings indicate that the nature-based environmental education program significantly improved children's environmental awareness levels. The results also show that children's conceptual understanding, attitudes, and perspectives regarding environmental issues improved across multiple domains—including environmental definitions, pollution, protection, and recycling.

These findings suggest that nature-based educational experiences can be effectively incorporated into preschool education to enhance children's environmental awareness. Moreover, the results demonstrate that an abstract concept such as environmental awareness can be meaningfully developed through hands-on, experiential, nature-centered learning.

For future research, it is recommended that studies:

* Examine the effects of such programs on children's environmental knowledge, attitudes, and behaviors;

* Extend the duration and scope of environmental education programs;

* Explore the perspectives of parents and teachers on nature-based environmental education

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