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## **Nature Perception Scale For Children: A Validity And Reliability Study**

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### ABSTRACT

The primary aim of this research is to develop a valid and reliable scale that identifies primary school students' perceptions of nature. The participants consist of primary school students studying in 14 different cities across 7 regions of Turkey during the first semester of the 2021-2022 academic year. In line with the research purpose, the literature has been reviewed regarding scale development process, and a pool of 75 items has been created. 13 of those items have been removed in accordance with field experts' opinions. The draft form with the remaining 62 items has been administered to 643 students studying in different provinces. As a result of the analyses applied to the draft scale, a 24-item scale composed of a single factor has been produced. Exploratory factor analysis, confirmatory factor analysis, item discrimination analysis, and Cronbach's Alpha coefficient calculations have been performed using data from 333 students. Test-retest reliability data have been collected from 170 students whereas criterion validity data have been gathered from 140 students. Data analysis has been completed using SPSS 25.0 and AMOS 24.0 statistical package programs. The Nature Perception Scale for Children has been determined as a valid and reliable tool that can be used to elicit primary school students' perceptions of nature.

**Keywords:** Nature, children, perception of nature, nature education

### INTRODUCTION

Humankind, like all living beings, is an extension of nature. Every human born into the world is open to experiences and ready to integrate with nature. Children also learn about life within their natural and social environment (Carter, 2017). A child's mind makes use of two elements when creating its first schemas. The first is the life s/he experiences (McVee, Dunsmore, & Gavelek, 2005), and the second – according to the bio-ecological theory – is observing the reactions of individuals to the events in the close or distant social environment (Bronfenbrenner, 2005; Bronfenbrenner & Ceci, 1994). Children's perception of nature is also related to how they create the "nature" scheme in their minds. For example, a child may see nature as a relaxing and peaceful environment through her/his experiences and observing other people around her/him whilst another child may describe nature as a place containing challenges, where one can face various hazards if s/he is alone. In terms of predicting the future of nature, children's perception of nature is an important issue among educators, public institutions, and nature volunteers. Therefore, children's perception of nature has been investigated in different countries with a variety of age groups ranging from preschool to higher education. In a thesis study describing preschool children's perception of nature in Turkey, children mostly drew rainbows and human figures when they were told to draw a painting about nature, and they stated that nature included all the colors (Mol, 2019). Similarly, in another study, animate (human-animal-plant) and inanimate (natural-humane) constituents were drawn by preschool children who were asked to draw a picture of nature, and nature was depicted with aesthetic and emotional expressions such as "a beautiful, bright, fragrant, loving place; source of life" (Köşker, 2019). In a study conducted in Australia to determine the factors that affect the nature perceptions of 6 or 7-year-old children, the researcher revealed that children's perception of nature was shaped by their interaction with media, children's books, and the education they receive (Keliher, 1997). In a comparative study investigating two groups of students aged 5 to 7 in Australia and Singapore, interviews were conducted with both students and teachers to train them about environmental awareness and sustainability. The research findings showed that the ecological awareness of the student group in Singapore was lower than that of those in Australia at the beginning. However, following the training given to both groups, each gained awareness about the environment and its sustainability (Anderson & Tate, 2014).

The findings of a study conducted with 4<sup>th</sup> graders in Florida indicated that children's communication with nature included several aspects such as "enjoying nature, empathy towards living beings, sense of uniqueness, and sense of responsibility". According to the research, children who lived and grew up in touch with nature harboured more positive feelings towards nature and were more conscious of nature compared to children living in the city (Cheng & Monroe, 2012). In a study conducted through the photo-projective method at a park in Malaysia with 17 children aged 7 to 11, the aim was to identify the children's preferences regarding the natural environment. Those 17 children, who were taken to the park, were asked to take a photograph of what best expresses the natural environment in their opinion, and interviews were conducted on those photographs. The children classified the concept of natural environment, from the most frequent to the least, as trees and plants, water elements, fauna, natural and artificial environments, and park activities (Mahidin & Maulan, 2012). In a study conducted by Burgess and Smith (2011), children's perceptions of nature centered upon living beings. Similarly, as a result of nature education given in a summer camp in Turkey, children listed animate things but did not consider inanimate things as part of nature (Yardımcı, 2009). In addition, another study conducted with 15 children who participated in a nature camp revealed that interactions with nature had a positive and direct effect on naturalistic intelligence (Ceylan, 2019).

Some studies conducted with secondary school and above age group students showed that their perception of nature was shaped by their previous experiences, the education they received, and their external observations. In another study carried out with secondary school students, the students' perceptions of nature were as follows; "exciting, peaceful, informative; self-sacrificing, guiding, colorful, diverse, an indispensable source of life, and a living space" (Çeliker & Akar, 2015). A study conducted with 13/14-year-old students in South Africa identified that students mostly regarded nature as a polluted area where crime and violence were at large due to the adverse events in the country (Adams & Savahl, 2015). In another study focusing on high school and university students in Turkey, nature was described with the following words; "life, art, vivid, freedom, home, forest, green space, oxygen tube, peace, paradise" (Kahyaoğlu & Kırıktaş, 2016). In the light of research conducted with students from different age groups, it is essential to be aware of how children and young people perceive nature so that relevant precautions regarding ecological sustainability can be taken and necessary environmental education can be provided (Clark et al., 2020; Duhn, 2012; Kahrıman Pamuk, 2019).

The necessity of providing environmental education from an early age to ensure ecological sustainability has become a subject that requires countries to gather around a common goal and engage in international solidarity. In the Stockholm Conference held in 1972, the Tbilisi Conference in 1977, and the Thessaloniki Conferences in 1997, relevant suggestions were presented to the participating countries to preserve and improve the environment. As a result of these conferences, environmental education gained an international standard (Doğan, 1998; Hungerford, 1994), and education plans were published on how to integrate interdisciplinary environmental training into the curricula (Birinci, 2013; Gökçe & Dilek, 2021; Ünal & Dımışkı, 1999). Books and training programs were prepared within the scope of "ecological literacy" and environmental education, especially to be used in the trainings of teachers and teacher candidates (Kahrıman Pamuk, 2019; Orr, 1992; Orr et al., 2005).

Ecological literacy is a social awareness education based on sustainable life, and it should be provided by the family in early childhood and by teachers at schools (Özdemir, 2018). In this type of education, besides cognitive competencies, affective factors are also important to create awareness in children, plant seeds of a habit, stimulate sense of responsibility, and to develop creative solutions for the future (Şentürk Barışık & Kurnaz, 2021). In this context, affective variables should be considered to improve children's perceptions of nature so that environmentally sensitive generations can be raised (Sternberg & Grajek, 1984). In addition, while determining the existing perception of nature, children's self-efficacy levels regarding what they can achieve in nature, their expectations and values about nature, the motivation nature adds to them, their anxiety and attitudes, the extent they can observe themselves in nature, and the degree to which their self-perception integrates with nature should be examined in particular. Thus, affective factors and the requirements of the epoch children live in have been taken into consideration while creating the items in the "Nature Perception Scale for Children".

Considering the tendency to move away from nature due to the culture introduced with technology in infancy, and especially considering that the majority of children living in urban areas are at risk of technology addiction, it is very important to raise ecological sensitivity and awareness (Louv, 2008). However, the most significant mistake made while trying to raise natural awareness and naturalism is to draw attention to environmental problems with anxiety-centered motivation (Özdemir, 2018). This type of education can cause "ecophobia" in children (Kahyaoğlu & Yetişir, 2016; Kocalar, 2015; Sobel, 2021). Raising awareness of ecological crisis is not a type of education where environmental concerns are increased and children are expected to find solutions, yet it is developing ecological literacy, and raising natural awareness and naturalism to make people realize the vital importance of nature for sustainable life (Cheng & Monroe, 2012). In addition, it is an undeniable fact that nature perceptions and experiences in childhood lay the groundwork for ecological choices in adulthood (Jensen & Olsen, 2019).

Considering the fact that there are settled ecological attitudes in adulthood, the importance of precautions and ecological education that can be taken at an early age will be better understood. The development of nature perception in children starts from birth as they are a part of nature. The more time children spend in nature with different experiences and the more sensitive parents, teachers, and other adults become towards nature, the more chance children will have to develop their perception of nature. Measuring the perception of nature will unravel how children evaluate the natural environment they live in and will provide a preliminary assessment opportunity that describes the current situation so that relevant precautions can be taken to develop positive attitudes towards nature. The perception of nature can be identified either by quantitative data collection methods such as questionnaires and scales or by qualitative measures such as observations or interview questions. Assessing children's perception of nature with a standard instrument to design the infrastructure of possible future environmental training programs will minimize the errors that can be made by the researcher during the evaluation of the assessment results and will increase the validity and reliability of the assessment process. Within this scope, a standard instrument is needed to determine the level and trajectory of nature perception in children. Considering that the educational level with the highest school enrollment rate is primary education, the development of the "Children's Nature Perception Scale" prepared for primary school children will greatly contribute to the literature about ecological awareness and environmental education.

## **METHOD**

### **Research Method**

This research is a scale development study. Accordingly, a method to determine the validity and reliability of the Children's Nature Perception Scale was employed. The research was carried out through a method that is in line with scientific research methods related to revealing the validity and reliability of a scale.

### **The Participants**

The study group was determined by the convenience sampling method, taking the time and appropriate conditions into account. The convenience sampling method is the selection of a situation that is easily accessible for a researcher. For this reason, the researchers chose the students they could easily reach (Yıldırım & Şimşek, 2008).

In the study, more than one study group was used for different processes. Firstly, Primary school 1st-4th grade in the cities of Konya and Manisa. A total of 40 students, 5 children at each grade level, were included in the study group. The expressions determined during the field scanning process were explained to these students and they were asked to suggest similar expressions. In this way, the students took part in the process. Secondly, at the stage of checking the intelligibility of the items created by the students, primary school 1st-4th grades, total of 40 students, 5 of whom were at each grade level, were included in the study group. The third study group is the study group included in the research for testing and item analysis. Information about this group is given below.

The population of the research consists of primary school students studying in the 1st, 2nd, 3rd, 4th grades in Turkey. The sample of the research consists of primary school students studying in the 1st, 2nd, 3rd, 4th grades in Turkey, which can be accessed online. In the selection of students who will participate in the research, students will be selected from primary school 1st-4th grades. The criteria were to be at grade level, to be able to read and write fluently, to be able to answer a scale online on a computer, phone or tablet on their own, and to have their family allowed to participate in this research.

The teachers of these students were reached first, and the students were reached through the teachers. In primary schools in Turkey, each classroom has a digital communication group (Whatsapp, Telegram, etc.). First of all, the research ethics report and official permission documents were sent to the teachers. Thus, the teachers reached the families and informed them about their children's participation in this study, sent the Parent Consent Form and obtained permission. Then, the teachers shared the online link of the scale used in this research in these digital environments; In the classroom environment or under the supervision of their families, the students participated in the research by expressing their opinions from this link. Thus, the sample group consisted of 643 primary school students who answered the data collection tool. The distribution of the students constituting the sample group according to various personal variables is given in Table 1.

Students whose details can be accessed online constitute the research universe. The research sample, on the other hand, consist of students residing in various provinces of Turkey and participating in the data collection process voluntarily. Thereby, the sample is composed of 643 primary school students who responded to the data collection tool. The distribution of the students based on various personal variables is provided in Table 1.

**Table 1: Demographic information for students**

Options		1	2	3	4				Total
		Female	Male						
Gender	n	312	331						643
	%	48	52						100
		Government	Foundation						
School type	n	10	4						14
	%	71	29						100
		First Class	Second Class	Third Class	Forth Class				
Class Level	n	153	160	170	160				643
	%	24	25	26	25				100
		Mediterranean	Eastern Anatolia	Aegean	Southeastern Anatolia	Central Anatolia	Black Sea	Marmara Region	
Region of residence in the process	n	2	2	2	2	2	2	2	14
	%	14,28	14,28	14,28	14,28	14,28	14,28	14,28	100

As can be seen in Table 1, the majority of the students are studying in public schools. Among the students participating in the study, the male and female ratios are close to each other. The number of students studying in the second and fourth grades is equal to each other. In general, importance was given to the approximate number of students on a class basis. Turkey is a country consisting of seven different regions. With the foresight that regional differences would occur, student participation from each region was ensured.

### Developing the Scale

While preparing the "Nature Perception Scale for Children", the steps of scale development were followed. The literature on children's perception of nature was reviewed to determine the qualifications students are supposed to bear for a desired perception of nature. Within this scope, relevant studies carried out both in Turkey and abroad were examined, and expressions that could be used in the scale were identified. After receiving expert opinions on the item expressions, the intelligibility of the formed items by the students was checked. In this context, items from grades 1-4 were read to students and they were asked what they understood from these items. Doğa bilincinin formal bir şekilde sunulduğu yer olan eğitim kurumları; okullardır. Primary school is the earliest period in which the perception of nature in children begins to form and it will be possible to measure it. Since the scale is predicted to be understandable by primary school children studying in the 1st, 2nd, 3rd, and 4th grades of primary school, it was found that it would be appropriate to work with this age group.

In the following step (Carpenter, 2018; DeVellis & Thorpe, 2021), a 75-item-pool compatible with children's comprehension and linguistic levels was created with due consideration of affective characteristics that shape children's perception of nature. The experimental form, consisting of 75 items, was submitted to two experts of Educational Sciences and one expert of Natural Sciences, all of whom were knowledgeable in the subject area and were informed about the research. Relevant feedback from the experts were reflected onto the draft scale for further modifications. A 3-point rating was employed to determine expert opinions. In the draft form, experts were expected to choose one of the options; "Appropriate", "Partially Appropriate" and "Not Appropriate" for each item. By collapsing all the expert forms on a single sheet, the number of experts was determined for the approval of possible options for each item. In this process – in line with expert opinions – the content validity of the items was determined by the content validity ratio developed by Veneziano and Hooper (1997; cited in Yurdagül, 2005). The ratio in question was calculated by subtracting 1 from the ratio of experts who affirmed each item to the total number of experts. For the content validity indices of the items, the number of experts and the values of the obtained content validity ratio were determined. Items with a content validity ratio of less than 0.80 were excluded from the study. For some items, changes were made to increase their clarity in line with the calculations of the content validity ratios. Following these changes, a draft form consisting of 62 items was created. Participants were expected to express their own perceptions on a 3-point Likert-type scale ranging across "agree", "indecisive", and "disagree".

After completing the item pool, a pilot study was conducted to determine the clarity of the scale items and the average time to complete the scale. The pilot study was carried out with a total of 40 children (10 from each grade – 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup>) from a mixed group living in rural and urban areas. In the pilot study, the practitioners read each item one by one to the children and asked them what they understood. Items that were

observed to be poorly understood were edited. The scale form was applied after selecting the sample. As a result of the statistical analyses, the validity and reliability of the "Nature Perception Scale for Children" were determined.

### Data Collection

During the implementation of the research in the field, the following works and procedures were carried out; The data were collected by the researchers in the first semester of the 2021-2022 academic year. The data collection process started with an explanatory e-mail containing the research ethics report and official permission documents of the research to the teachers working in primary schools for the application of the trial form created. Thus, the teachers were able to inform the families and sent the Parent Consent Form to obtain permission from the parents to participate in the research. The teachers, who shared the online link of the scale by reaching the parents who filled out the parent consent form, allowed the students to express their opinions in the classroom or in the company of the family. In the second stage, there is a study group consisting of a total of 40 students with 5 students at each grade level to control the intelligibility of the items. At this stage, the items were presented to the students' opinions and their views on how they made sense of it were taken. After this stage, the items were arranged and the final version of the scale was created. The third study group was included in the study from different provinces in seven regions of Turkey for test and item analysis. The response time of the scale is approximately 20-30 minutes.

### Statistical Analysis of Data

The construct validity of the Nature Perception Scale for Children was determined by applying exploratory and confirmatory factor analyses. The discrimination level of the items was determined by item analysis. The reliability level of the scale was determined by calculating the Cronbach Alpha and test-retest reliability coefficients. The relations between the scores obtained from the scale and the 'Attitudes Towards Environment Scale' developed by Peker (2020) were examined to determine the criterion validity of the scale. Exploratory factor analysis, confirmatory factor analysis, item discrimination analysis, and Cronbach's Alpha coefficient calculations were performed using data from 333 students. Test-retest reliability data were collected from 170 students whereas criterion validity data were gathered from 140 students. Data analysis was performed using SPSS 25.0 and AMOS 24.0 statistical package programs.

## RESULTS

### Exploratory Factor Analysis Results

Exploratory factor analysis was applied to explore the factor structure of the Nature Perception Scale for Children. In factor analysis, the Kaiser-Meyer-Olkin (KMO) test is performed to check the suitability of the data structure in terms of sample size. A large KMO value means that each variable in the scale will be perfectly predicted by other variables (Cokluk, Şekercioğlu, & Büyüköztürk, 2010). The data set cannot be factored for  $KMO \leq 0.5$  (Field, 2013). KMO value in terms of sample size is as follows:

- a) Weak between 0,50-0,60
- b) Poor between 0,60-0,70
- c) Average between 0,70-0,80
- d) Average between 0,80-0,90
- e) Perfect above 0,90 (Tavşancıl, 2005).

The KMO value was calculated as 0.84. According to this value, the data structure was sufficient for factor analysis. The suitability of the data for factor analysis is determined by the Barlett Sphericity test. This test determines whether there is a statistically significant difference between the true correlation matrix indicating relations among the items and the unit matrix. If the p value of this test is below 0.05, it shows that the matrix indicating the relations among the items is different from the unit matrix without the relations (Can, 2018). When the test results applied for factor analysis were evaluated, the chi-square value was determined to be significant (Barlett Sphericity ( $\chi^2(136) = 1567.28; p < 0.001$ )). This result showed that the data were suitable for factor analysis. Factor analysis was carried out by applying the Principal Components Analysis method. Six factors with eigenvalue greater than 1 were formed. In the line graph formed as a result of the factor analysis, the first point was determined as the cut-off point, and the trajectory decreased significantly after this point. Accordingly, the single-factor structure was found appropriate and the scale items were forced to a single factor in the next analysis. The factors with the items were clarified by applying the Varimax vertical rotation method. A value of 0.40 was determined as the cut-off point for factor loads (Comrey & Lee, 1992). Items with low factor load (i1, i2, i3, i5, i6, i7, i10, i11, i12, i14, i15, i17, i18, i1, i20, i21, i22, i23, i24, i25, i26, i27, i29, i30, i33, i36, i3, i41, i42, i44, i53, i56, i58, i59, i60, i61, i62) were excluded from the scale. As a result of repeated analyses, 24 items remained in the scale. The factor loads of the items are shown in Table 1.

**Table 1. Factor Loads of Children's Nature Perception Scale Items**

Item no.	Factor load	MOV*	DMTK**	Self value	Explained variance (%)	Cronbach Alfa
Da34	0,68	0,46	0,61	8,84	33,99	0,91
Da46	0,67	0,46	0,58			
Da45	0,65	0,42	0,48			
Da28	0,64	0,40	0,58			
Da37	0,63	0,39	0,54			
Da38	0,62	0,39	0,58			
Da40	0,61	0,38	0,55			
Da57	0,61	0,37	0,53			
Da55	0,60	0,36	0,54			
Da31	0,60	0,36	0,56			
Da47	0,60	0,36	0,60			
Da52	0,60	0,36	0,57			
Da32	0,58	0,33	0,52			
Da8	0,57	0,33	0,52			
Da51	0,56	0,32	0,51			
Da35	0,56	0,31	0,50			
Da54	0,55	0,31	0,51			
Da43	0,55	0,31	0,52			
Da48	0,55	0,30	0,54			
Da13	0,55	0,30	0,51			
Da49	0,54	0,29	0,51			
Da50	0,54	0,29	0,52			
Da16	0,53	0,28	0,50			
Da4	0,53	0,28	0,49			

\*ICV= Item Co-variance, \*\*CI= Corrected Item – Total Correlation

As a result of the exploratory factor analysis, the factor loads of the items in the scale were between 0.53 and 0.68. The single factor structure explained 33.99% of the total variance. It is considered sufficient when the variance explained in single-factor scales is 30% or more (Büyüköztürk, 2007). The total item correlation coefficients of the items ranged from 0.49 to 0.61.

### Confirmatory Factor Analysis Results

According to the results of the exploratory factor analysis, the Nature Perception Scale for Children has a single factor structure. Confirmatory factor analysis was applied to determine the level of agreement between the single-factor structure of the scale and the obtained data. Analysis was carried out using the Maximum Likelihood Estimation method. By examining the modification index values, correlation arrows were added between the error values of some items (Figure 1). This way, better fit values were obtained. The fit values calculated for the single factor model are given in Table 2.

**Table 2. Calculated Fit Values**

Criterion	Good Balance	Acceptable Balance	Obtained Values	Source
$(\chi^2/sd)$	$\leq 3$	$\leq 4-5$	2,25	Byrne, 1989
RMSEA	$\leq 0,05$	0,06-0,08	0,06	Browne ve Cudeck, 1993
SRMR	$\leq 0,05$	0,06-0,08	0,05	
GFI	$\geq 0,90$	0,85-0,90	0,89	Tanaka and Huba, 1985; Jöreskog ve Sörbom, 1984
AGFI	$\geq 0,90$	0,80-0,90	0,85	
CFI	$\geq 0,95$	0,90-0,94	0,90	Bollen, 1989
TLI	$\geq 0,95$	0,90-0,94	0,90	
IFI	$\geq 0,95$	0,90-0,94	0,90	

Table 2 displays that, based on the calculated fit value, the single-factor structure of the Children's Perception of Nature Scale is compatible with the available data on the whole at an acceptable level. This result indicated that

the single-factor structure of the scale was confirmed. The tested single factor model is shown in Figure 1. All the path coefficients shown in the model are statistically significant at the  $p < 0.001$  level (Table 3).

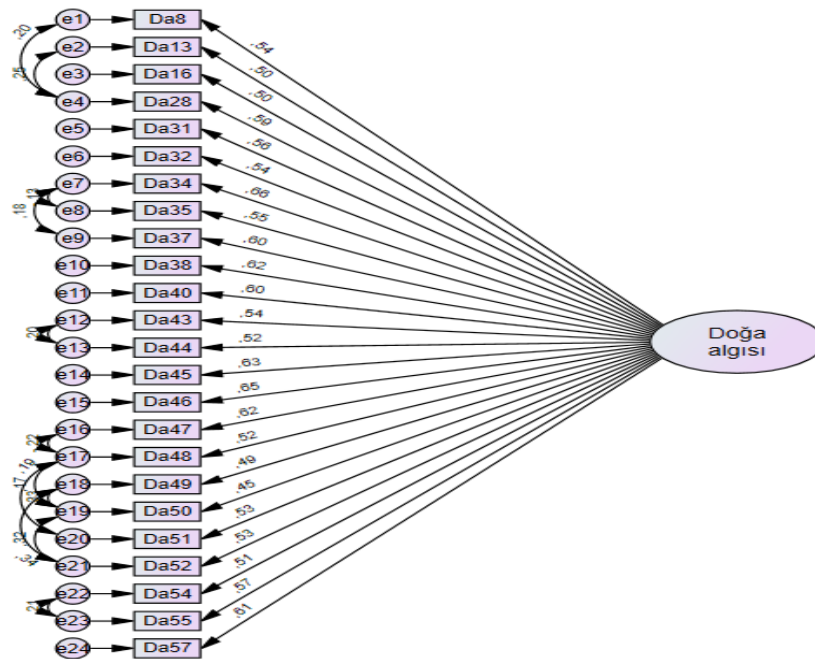


Figure 1. Confirmatory Factor Analysis Diagram, Chi-square=515.46; Sd=229;  $p < 0.001$

Cronbach's Alpha coefficients were calculated to determine the reliability of the Nature Perception Scale for Children. Values between 0.60-0.80 indicate that the scale is quite reliable, and values between 0.81-1.00 indicate that the scale is highly reliable (Özdamar, 2004). The alpha coefficient calculated for the scale is 0.91. The coefficient showed that the reliability of the scale based on internal consistency was at a high level.

Table 3. The Values Obtained as a Result of Confirmatory Factor Analysis

			$\beta$	SH	t
Da8	<---	Da	0,54		
Da13	<---	Da	0,51	0,16	7,51***
Da16	<---	Da	0,50	0,15	7,53***
Da28	<---	Da	0,59	0,12	9,38***
Da31	<---	Da	0,56	0,14	8,08***
Da32	<---	Da	0,54	0,11	7,94***
Da34	<---	Da	0,66	0,12	9,00***
Da35	<---	Da	0,55	0,11	7,33***
Da37	<---	Da	0,60	0,12	8,49***
Da38	<---	Da	0,62	0,14	8,70***
Da40	<---	Da	0,60	0,11	8,49***
Da43	<---	Da	0,54	0,16	7,91***
Da44	<---	Da	0,52	0,16	6,99***
Da45	<---	Da	0,63	0,12	8,77***
Da46	<---	Da	0,65	0,11	8,91***
Da47	<---	Da	0,62	0,11	8,65***
Da48	<---	Da	0,52	0,14	7,66***
Da49	<---	Da	0,49	0,15	7,30***
Da50	<---	Da	0,45	0,15	6,85***
Da51	<---	Da	0,53	0,14	7,74***
Da52	<---	Da	0,53	0,16	7,78***
Da54	<---	Da	0,51	0,13	7,60***
Da55	<---	Da	0,58	0,14	8,25***
Da57	<---	Da	0,61	0,12	8,57***

\*\*\* $p < 0,001$



### Differential Validity Analysis Results

The scores obtained from the scale were ordered from highest to lowest to determine the differential validity of the scale. In the next step, the highest-scoring participants (27%) were assigned as the upper group and the lowest scoring participants (27%) as the lower group. The mean scores of the groups from each of the scale items were compared by applying the independent samples t-test (Table 4).

**Table 4. Mean Scores, Standard Deviations, and Independent Samples t-test Results of the Lower and Upper Groups**

Item No	Lower Group (n=90)		Upper Group (n=90)		t
	Ort	Ss	Ort	Ss	
Da4	2,56	0,50	2,91	0,29	5,71***
Da8	2,69	0,47	2,98	0,15	5,59***
Da13	2,43	0,50	2,97	0,18	9,69***
Da16	2,51	0,50	2,94	0,23	7,50***
Da28	2,62	0,49	2,97	0,18	6,30***
Da31	2,63	0,49	2,96	0,21	5,80***
Da32	2,74	0,44	2,99	0,11	5,27***
Da34	2,72	0,45	2,99	0,11	5,44***
Da35	2,75	0,44	2,98	0,15	4,73***
Da37	2,76	0,43	2,98	0,15	4,56***
Da38	2,62	0,49	2,96	0,21	5,98***
Da40	2,75	0,44	2,97	0,18	4,39***
Da43	2,47	0,50	2,96	0,21	8,44***
Da45	2,70	0,46	2,99	0,11	5,77***
Da46	2,78	0,42	2,97	0,18	3,86***
Da47	2,75	0,44	2,98	0,15	4,73***
Da48	2,56	0,50	2,97	0,18	7,20***
Da49	2,52	0,50	2,94	0,23	7,31***
Da50	2,53	0,50	2,93	0,25	6,82***
Da51	2,53	0,50	2,99	0,11	8,50***
Da52	2,45	0,50	2,92	0,27	7,88***
Da54	2,66	0,48	2,96	0,21	5,45***
Da55	2,61	0,49	2,98	0,15	6,81***
Da57	2,74	0,44	2,98	0,15	4,90***

\*\*\*p<0,001

The table shows that the mean scores obtained from the scale items show a statistically significant difference between the upper and lower group (p<0.001). The mean scores of the upper group for each of the scale items are significantly higher than those of the lower group. These results indicated that each of the 24 items on the scale was distinctive.

### Test-Retest Reliability Results

The Children's Nature Perception Scale was administered to the same group twice with an interval of two weeks. Then, correlation coefficients were calculated between the scores obtained from these two implementations. The obtained correlation coefficients were accepted as reliability indicators. The high correlation coefficients calculated as a result of the Test- retest method showed that there was a stability between the scores obtained from the two implementations (Tavşancıl, 2005). The calculated correlation coefficients are given in Table 5.

**Table 5. Pearson Correlation Coefficients of the Relations Between the First and Last Implementation Scores**

Test	Implementation	N	Ort	Ss	r
Relevance	First implementation	170	41,53	1,14	0,78**
	Last implementation	170	41,18	2,48	

\*\* p<0,01

Table 5 displays that the mean scores obtained from the first (Mean=41.53; Sd=1.14) and the last (Mean=41.18; Sd=2.48) implementations are quite close to each other despite the certain time interval between them. There is a high level of positive correlation between the first and last implementation scores (r=0.78; p<0.01). The calculated correlation coefficient shows that the scale has a consistent structure.

### Criterion Validity Study Results

A criterion validity study was carried out to ensure the external validity of the Nature Perception Scale for Children and to determine the degree that it serves its purpose. Children's Nature Perception Scale and Environmental Attitude Scale (Peker, 2020) were administered to the participants in a single session. In the next step, the relation between the scores was calculated and examined (Table 6).

**Table 6. Pearson Correlation Coefficients of the Relations Between the Scores of the Nature Perception Scale for Children and Environmental Attitude Scale**

Variables		Attitude towards the environment
Nature perception	r	0,57**
	p	0,00
	N	140

\*\* p<0,01

The table shows that there is a moderately positive correlation between the nature perception scores and the environmental attitude scores (r=0,57 p<0,01). As the scores of children's nature perception increase, positive attitudes towards the environment also increase. The results revealed that the external validity of the Nature Perception Scale for Children was established and that it served its purpose.

### CONCLUSIONS AND SUGGESTIONS

This study aimed to develop a standard assessment tool to determine the nature perceptions of primary school students. The construct validity of the scale was determined by the exploratory and confirmatory factor analyses. The distinctiveness level of the scale items was determined by item analysis, and the reliability was measured with Cronbach Alpha and test-retest. The criterion validity was examined by comparing the scores obtained from the Environmental Attitude Scale (Peker, 2020) and from the Children's Nature Perception Scale. The findings indicated that the items of the scale had highly distinctive features and that this scale is reliable, highly stable, and valid.

The KMO test was applied during the exploratory factor analysis to determine the factor structure of the scale. As a result, the KMO value was found to be 0.84. This value showed that the data structure was sufficient for factor analysis (Erkuş, 2019). In addition, the Barlett Sphericity test was administered to determine the suitability of the data for factor analysis. Based on the results (Barlett Sphericity ( $\chi^2(136) = 1567,28$ ; p<0,001), the data of the scale were suitable for factor analysis (Seçer, 2018). Factor analysis was carried out by using Principal Components Analysis upon meeting the necessary eligibility conditions for factor analysis. Initially, six different eigenvalue factors emerged. However, when the line graph created during factor analysis was examined, there was a cut-off from the first point and a downward trajectory after the cut-off. For this reason, a single factor structure was deemed eligible, and the scale items were analyzed within the single factor limit in the subsequent analysis. Accordingly, items with low factor loading were eliminated. In the next analysis, 24 items remained for the scale, which is a reasonable level for scale studies to be applied to children. As a result of the exploratory factor analysis, the single-factor structure explained 33.99% of the collected variance. Since it is sufficient for the variance explained in single-factor scales to be 30% or more according to Büyüköztürk (2007), the validity of the scale was ensured within the scope of single factor structure.

Confirmatory factor analysis was applied via the Maximum Likelihood Estimation method to determine to what extent the single-factor structure of the Children's Nature Perception Scale overlapped with the data collected

from the participants. The compatibility value of the data in terms of single-factor structure was at an acceptable level (Erkuş, 2019).

In the item analysis applied for discriminant validity, the participants with the lowest scores formed the lower group of 27%, and the participants with the highest scores formed the upper group of 27%. The t-test results for all the items showed that the mean score of the upper group was significantly higher than that of the lower group. This result indicates that 24 items in the scale are distinctive.

Cronbach's Alpha coefficient and test-retest methods were applied to determine the reliability of the Nature Perception Scale for Children. Since the Cronbach Alpha coefficients were in the range of 0.81-1.00, the scale was considered highly reliable (Özdamar, 2004). The alpha coefficient calculated for the scale is 0.91, which shows that the reliability of this tool in terms of internal consistency is high. In the repeated test-retest, evaluation was made according to the reference range of Pearson correlation coefficients (Tavşancıl, 2005). Since there was a high positive correlation between the scores obtained from the two implementations conducted with a two-week interval, the scale was found to have a consistent structure.

One of the methods used to ensure criterion validity is to examine different scale types addressing the same subject together with the newly developed scale (Seçer, 2018). In this study, the Environmental Attitude Scale (Peker, 2020) was examined to ensure the external validity of the scale and to determine to what extent it serves its purpose of use. In this context, both scales were administered to the participants in the same session. The scores obtained from the scales were examined in terms of Pearson correlation coefficients. Accordingly, there was a moderately positive correlation between the two scales ( $r=0.57$   $p<0.01$ ). The positive attitudes towards the environment increased in direct proportion to the increase in the nature perception scores of children, which proves that the Children's Nature Perception Scale has an external validity and is suitable for the purpose of its use.

As a conclusion, Children's Nature Perception Scale, whose validity and reliability have been ensured, is an assessment tool to determine children's perception of nature. The validity and reliability of this tool can be tested with different samples. Children's Nature Perception Scale can be the basis for different instruments to be developed to determine nature perceptions of different age groups.

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#### Children's Nature Perception Scale

		Agree	Indecisive	Disagree
4.	We can be inspired by nature to produce many gadgets/tools in our daily life.			
8.	I know that if necessary, precautions are taken, we can be protected from the harms of natural disasters.			
13.	I think that all living beings go through similar processes throughout their lives.			
16.	I like to research the growing conditions (temperature, environment, etc.) of plants.			
28.	I wonder how night and day occur.			
31.	I believe that as long as we are in harmony with nature, it will be beneficial to humanity.			
32.	I believe that every being in nature has the right to live.			
34.	I want to protect nature so that all living beings can have a healthy life.			
35.	I like taking a walk-in nature.			
37.	I like to go to zoos to get to know different kinds of animals.			
38.	I like watching nature while traveling.			
40.	I would like to learn more about nature from my elders on nature trips.			
43.	I like songs that describe nature.			
45.	I like playing in nature with my friends.			
46.	It is fun to spend time in nature.			
47.	Spending time in nature gives me energy.			
48.	I like to take a walk-in nature in my spare time.			
49.	Nature is a place where I can express myself.			
50.	The work we do in nature allows me to express my feelings.			
51.	I think that spending time in nature relaxes me when I feel tired in my daily life.			

52.	My experiences in nature allow me to discover my individual characteristics.			
54.	The information I learn about nature at school is useful in my daily life.			
55.	My knowledge of nature conservation will be useful throughout my school life.			
57.	I think that I can learn new information by examining nature.			