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Environmental Perception Scale: A Study of Reliability and Validity

Research Article

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ABSTRACT

This study aims to develop a valid and reliable scale for the environmental perception of university students. The study was carried out in 2018, and a survey model was employed. With the help of the purposive sampling method, the study was conducted with 315 students attending different departments of universities. A draft scale of 56 Items related to environmental perception was formed. The data of the draft scale were created with aspects (such as metaphor/perception) about the concept of environment in Turkey, and the studies performed qualitatively were prepared in the light of expert views. The data obtained from scale implemented were subjected to total item correlation, exploratory and confirmatory factor analyses and reliability analyses. According to the results of analyses, it was seen that the scale was in the form of 32 items and 7 factors, and the variance rate explaining the whole scale was 60.859%, and compliance index values were acceptable and in good agreement. A low and medium level relationship among factors a positive direction was obtained. Cronbach alfa internal consistency reliability coefficient was calculated as 0.930. All in all, it is understood that the environmental perception scale prepared in 5 point Likert scale was valid and reliable according to findings obtained.

Keywords:
Environmental perception, scale, validity and reliability

Introduction

Living organisms and their non-living surroundings exist together in the same environment and are in interaction with each other without being separated (Cansaran & Yıldırım, 2014; Özata Yücel & Özkan, 2014; Yeşilyurt, Gül & Demir, 2013; Jones & Jones, 2002; Çakır, 2001; Odum, 1959). In this interaction, people who try to understand the world and themselves; attempt to make sense of their existence, the universe and everything around them, as far as they believe and know, and to bring a meaningful explanation to what is happening around them (Çopuroğlu, 2003). The perceptions and approaches of the human being, who is

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inseparable with the environment he lives (Sadık, Çakan & Artut, 2011; Gürbüz, Kışoğlu, Alaş & Sülün; 2010), towards the close relationship with the environment he established in his childhood, is very important (Eryılmaz & Kıran, 2017). A person scared of nature and needs to be protected against it as a result of his first experiences, has shown a tendency to take control of nature, to intervene and to change nature by dominating it with the culture and technology he has produced (Özerkmen, 2002; Hançerlioğlu, 1996; transferred by Baylan, 2009). Yet, these tendencies are natural and similar to the other living things, and the fact that humankind is in continual interaction with his environment due to the necessity of life. Nevertheless, he is less dependent on his environment and he can change the conditions, though partly, by his will (Çakır, 2001). The environment and nature are important habitat and source for human beings. Yet human beings have consumed these vital sources and caused environmental degradation (Erten, 2005; Ponmozhi & Krishnakumari, 2017; Yücel et al., 2008). The consequences of this deteriorated balance have caused environmental problems affecting all living beings (Gürbüz & Kışoğlu, 2017). Kormondy (1996) stated that these environmental problems are due to population growth, environmental pollution and increase in living standards and requirements (Çakır, 2001); however, Starr and Taggart (1997) expressed this as a result of logarithmical increase in today's human population, agricultural, medical and industrial revolutions. Schumaher (1995) pointed out that after World War II, the boom in industrial production gave rise to today's environmental problems, and Brown (1997) found that humans have made use of nature in such a way as to exceed the limits of the biological transport capacity, which has caused environmental problems. Theodore Roszak (1972) stated that it was the modern natural science which was responsible for environmental problems; and Skolimovkski (1967) expressed that the main reason for environmental problems was the basis of our scientific worldview and the perceptions of this world view (transferred by Kahyaoğlu & Özgen, 2012).

On the other hand, the scientists searching for the reasons of the environmental pollution stated that, in fact, initially the minds and souls of people were polluted; afterwards, this pollution was reflected the social and biological environment, which led to the environmental pollution (Sülün, 2002). As can be seen, the sources of the environment and the perspectives to these problems are different. Although there are different points of view, it must not be forgotten that leaving a liveable environment for the next generations and all living beings is one of the most important duties for human beings (Uzun & Sağlam, 2005).

Today, it is already known that natural resources have decreased with increasing population, and that environment al problems such as pollution challenges human life (Kaiser, Wolfing & Fuhrer, 1999). People, who are aware of this fact, have started to protect living conditions of the environment, take precautions against the environmental problems and look for solutions (Sönmez & Yerlikaya, 2017; Gürbüz & Kışoğlu, 2011; Larijani & Yeshodhara, 2008). Today, the authorities know that environmental problems can be solved with increased participation of the society and by undertaking responsibilities to be able to cope with them (Simon, 2015); therefore, they allocate a significant part of their budget for the solution of this issue. However, the easiest way to solve this problem is to bring up individuals, who will be able to find fundamental solutions to the environmental problems, produce services for the benefits of mankind, make use of them, and possess environmental information, conscientious and awareness (Erol & Gezer, 2006; DiEnno & Hilton, 2005; Uzun & Sağlam, 2005). The aim of environmental awareness, as many scientists emphasize, is to create environmental information, positive attitudes to the environment and beneficial behaviours for the environment in an individual (Erten, 2005).

The necessary sensitivity should inevitably be set forth about environmental issues and information, attitudes and behaviours whereby individuals establish relationships with the environment for the protection of the environment should be known quantitatively and qualitatively. In recent years, it has been observed that researchers have prepared various data collection tools in this issue to gather relevant data.

These tools are as follows: Environment Attitude Scale (Uzun, Gilbertson, Keles & Ratinen, 2019; AlMenhali, Khalid & Iyanna, 2018; Artvinli & Demir, 2018; Saraç & Kan, 2015; Ugulu, Şahin & Başlar, 2013; Uzunöz, 2011; Metin, 2010; Milfont & Duckitt, 2010; Uzun & Sağlam, 2006; Maskan, Akkuş & Demir, 2005), and Interest Scale for The Environment (Atli & Uzun; 2016), and Consumer Environmental Awareness Perception Scale (Dikmenli & Konca, 2016), Environmental Ethics Awareness And Attitude Scale (Nikhat & Khan, 2017; Özer & keleş, 2016), Environmental Knowledge Test (Ok & Başlar, 2015), Environmental Literacy Scale (Szczytko, Stevenson, Peterson, Nietfeld & Strnad, 2018; Lloyd-Strovas, Moseley & Arsuffi, 2018; Sontay, Gökdere & Usta, 2015; Özsevgeç, Artun & Özsevgeç, 2010), Environmental Attitude and Awareness Scale (Soydan-Büyüktaşkapu & Öztürk Samur, 2014), Motivation Scale for The Environment (Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998), Environmental Awareness and Environmental Sensitivity Scale (Yeşilyurt, Gül and Demir, 2013), Environmental Behaviour Scale (Goldman, Yavetz, and Pe'er, 2006), and Attitude of Environmental Problems (Güven, 2013), Awareness Scale (Güven & Aydoğdu, 2012), and Environmental Attitude and Information Scale (Leeming, Dwyera & Bracken, 2010), Environmental Education Self-Efficacy Perception Scale (Özlü , Özer Keskin & Gül, 2013; Özdemir, Aydın & Vural, 2009), and Environmental Education Concepts Awareness Scale (Ötün, Artun, Temur & Tozlu, 2017)

It was concluded that valid and reliable data collecting tools in the fields specified above were prepared with these studies conducted together with adults and candidate teachers of preschool, primary school, secondary school and high school. Although the environment seems clear and plain at first glance, it can be said that it has a complex structure when examined (Erol, 2005). Even in the literature presented above, this situation is seen in the diversity of study subjects on environmental issues. It is quite important how the environment, a concept which consists of different components, is perceptually thought by people, and how it is seen, and how it is felt, and how it is known and interpreted. Briefly, it needs to be known how people experience the environment. Every new perception requires the individual's previous experiences to take part in because perception is defined as the process to interpret various stimuli with the effect of previous experiences and to make them meaningful (MEB, 2014). In this study, a scale was designed by carrying out various syntheses and analyses of metamorphic research data having been performed on the environment so far. In other words, we tried to benefit from the experiences of the people about the environment. Therefore, this study aims to develop a valid and reliable scale to get an idea about university students' environmental perceptions.

Method

The survey method was used in this study. Survey research is one of the quantitative research methods which is not experimental and which is performed by using surveys and interview protocols (Christensen, Jhonson & Turner, 2015). A survey method is a research approach aiming to describe a situation of past and present as it is (Karasar, 2005). In this study, thus, it was convenient to utilize the survey method since it aims to develop a valid and reliable scale to determine the perceptions of university students to the environment.

Study Group

The population of the study consisted of the students from Mardin Artuklu University, Ardahan University and Atatürk University in the 2017-2018 academic year. Demographic information of the participants in the study was summarized in Table 1.

Table 1. Demographic informations distribution of the participants

Variables		f	%
Gender	Female	201	63.8
	Male	114	36.2

Department/Program	First and emergency aid	93	29.5
	Science Teaching	86	27.3
	Physical Education and Sports Vocational School	54	17.1
	Medical laboratory and techniques	34	10.8
	Child development and education	24	7.6
	Biology teaching	24	7.6
Having had environment course	Yes	238	75.6
	No	77	24.4
News source about the environment (Except for lesson)	Media	231	73.3
	Books-magazines	32	10.2
	Conversations	34	10.8
	Scientific activities	2	0.6
		Total=315	

When Table 1, showing the demographic informations of the participants, was examined, it can be seen that 63.8% of the participants were women, while 36.2% were men; and that the number of the students attending to first and emergency aid, science teacher department, physical education and sport teaching department, medical laboratory and techniques, and child development and education and biology teaching programs/departments were 29.5%, 27.3%, 17.1%, 10.8%, and 7.6%, respectively. It was seen that while the rate of the students who have had a course on the environment was 75.6% and the rate of the students who have not had the course was 24.4%. However, it was contemplated that the students who answered the question as "No" were of the programs/departments which have not taught this course yet. It can be seen that the rate of the students, who have declared that their information source to be out of class course, was 73.3%, and books and magazines 10.2%, and friends conversations 10.8%, and scientific activities 0.6%.

A purposive sampling was implemented in the study. Purposive sampling strategy, concerning the purpose of the study, provides the scientists with a deep searching facility since, in this method, rich cases are selected in terms of information (Büyüköztürk, Kılıç, Çakmak, Akgün, Karadeniz & Demirel, 2015). While purposive sampling is used, the researchers determine the characteristics of the individuals making up the study population; and they reach the ones who match these features (Christiensen, Jhonson & Turner, 2015). Great care was given to select the participants who were thought to contribute to research most richly and deeply for the environmental perception scale. Therefore, the related curriculums of the study group were examined. In the examination, it was observed that the study group had such courses as "environment and protection", "child and environment" and "environment science".

Development Process of the Scale

The stages that should be followed during the scale development process were as follows: Defining the problem/determining the objective, creating the scale items, referral to expert opinions, pre-application, validity and reliability stages (Erkuş, 2014; Tezbaşaran, 2008; Büyüköztürk, 2005).

Defining the problem/Determining the objective

The objective of this study was to develop a valid and reliable environmental perception scale for university students.

Creating the Scale Items

In line with the aim of the study, the related literature was analyzed. In the literature, several studies carried out qualitatively about environment concept in Turkey (some metaphors/perceptions etc.) were examined. These studies were reached by writing key concepts such as environment, nature, environmental pollution, global warming in the National Research Centre of Higher Education, Tübitak Ulakbim, Google Academic search engine. As the result of research, the studies by the following authors were investigated and benefited: Arık & Yılmaz (2017), Demir (2017), Doğan (2017), Karapınar & Arıbaş (2017), Köseoğlu & Mercan (2017), Akgün, Duruk & Güngörmez (2016), Arslan & Zengin (2016), Esentaş, Güzel, Özbey, Kılınç & Çelebi (2016), Kahyaoğlu & Kırıktaş (2016), Meral, Küçük & Gedik (2016), Özmen & Özdemir (2016), Yılmaz, Bedur, Uysal (2016), Çeliker & Akar (2015), Kahyaoğlu (2015), Kaya (2014), Güven (2014), Ateş & Karatepe (2013), Doğru & Saraç (2013), Yalçınkaya (2013), Yazıcı (2013), Uyanık (2012), Aydın (2011), Aydın & Coşkun (2011), Sadık, Çakan & Artut (2011), Kaya, Coşkun & Aydın (2010).

Referral of expert opinion

Before the expressions in the items pool were given the final draft scale form, the opinions of 2 biologists, 2 educational scientists, 2 science academics, who have had studies in the field, were referred about the draft scale. Initially, 47 items were prepared for the draft scale. Taking the related expert opinions into consideration, 9 new items were added to the scale; as a result, the scale took the shape of a draft scale with 56 items. The prepared draft scale was measured on 5-point Likert type scale (5: Totally Agree, 4: Disagree, 3: Undecided, 2: I don't agree, 1: Never agree).

Implementation of the application

The necessary permissions were obtained from the universities where this study would be conducted in 2017-2018 academic year spring semi term so that the application could be performed. The 25-minute duration was given for the application.

Results

Item Analysis

Item analysis was developed to examine the relationship between the scores received from items taking place in the draft scale which was developed to determine environment perceptions of the university students and the total score of scale. For this, corrected item-total score correlations, one of the item analysis techniques were investigated. In general, it was proposed that item-total correlation should be 0.30 and that the higher items should remain on the scale since they differentiate the individuals very well (Büyüköztürk, 2010). Before exploratory factor analysis, it can be easily seen that except Item 38, all items were over 0.30. Item 38 was eliminated from the scale as it did not meet the criteria.

Table 2. Item-Total Score Correlations of Scale Items

Item No	Item-total correlation	Item No	Item-total correlation	Item No	Item-total correlation	Item No	Item-total correlation
I-1	0.491	**I-15**	0.442	**I-29**	0.466	**I-43**	0.583
I-2	0.489	**I-16**	0.467	**I-30**	0.589	**I-44**	0.504
I-3	0.597	**I-17**	0.641	**I-31**	0.538	**I-45**	0.597
I-4	0.605	**I-18**	0.612	**I-32**	0.381	**I-46**	0.484
I-5	0.575	**I-19**	0.650	**I-33**	0.574	**I-47**	0.541
I-6	0.499	**I-20**	0.532	**I-34**	0.513	**I-48**	0.551
I-7	0.668	**I-21**	0.629	**I-35**	0.442	**I-49**	0.504
I-8	0.602	**I-22**	0.638	**I-36**	0.363	**I-50**	0.574
I-9	0.575	**I-23**	0.599	**I-37**	0.461	**I-51**	0.399
I-10	0.542	**I-24**	0.636	**I-38**	0.198	**I-52**	0.512
I-11	0.550	**I-25**	0.653	**I-39**	0.395	**I-53**	0.486
I-12	0.551	**I-26**	0.503	**I-40**	0.616	**I-54**	0.346
I-13	0.538	**I-27**	0.611	**I-41**	0.583	**I-55**	0.543
I-14	0.522	**I-28**	0.431	**I-42**	0.520	**I-56**	0.391

Structural Validity

In scale development and adaptation studies, the most preferred method to obtain data about the structural validity of a scale is factor analysis. Factor analysis is carried out as Exploratory and Confirmatory Factor Analysis (Seçer, 2017). Exploratory and Confirmatory Factor Analysis was performed to determine the structural validity of data obtained from the draft form of environment perception scale. For structural validity of environment perception scale, examining the concordance of data with factor analysis, obtaining the factors, turning the factors and titling the factors were carried out in four stages (Kalaycı, 2014).

Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis is performed to find out under how many headings the items taking place in a scale tool can be collected and to determine what sort of relation there is between them (Seçer, 2017). While factor analysis is carried out on a scale, first of all, it is necessary to determine whether the data obtained are appropriate for factor analysis. For this purpose, it is essential that the size of sampling in which the scale is implemented be big enough. In factor analysis, it is generally accepted that sampling size should reach 300-500 individuals; and the sampling size should reach 5 or 10 times of individuals of the number of items taking place in a scale (Seçer, 2017). To measure the sufficiency of the sampling used in the studies, Kaiser-Mayer-Olkin (KMO) coefficient, sampling sufficiency and Barlett test, is used (Büyüköztürk, 2005; Metin, 2015). The fact that KMO coefficient is bigger than 0.60 and that Barlett test turns out to be a meaningful show that data are appropriate for factor analysis (Büyüköztürk, 2010).

To develop an environment perception scale, it was seen that the collected data were appropriate for factor analysis. The KMO coefficient of data was obtained as 0.901, and Barlett test Chi-square value was found to be meaningful statistically (X^2= 4580.873; p<0.01). For these resulting data, KMO coefficient can be interpreted to be excellent (Hutcheson & Sofroniou, 1999; transferred by Seçer, 2017; Field, 2002, transferred by Metin, 2015; Leech, Barret Morgan, 2005; Şencan, 2005; Tavşancıl, 2005; transferred by Çokluk, Şekercioğlu & Büyüköztürk, 2014).

In exploratory factor analysis, Principal Component Analysis technique was used in creating factor. In exploratory factor analysis, several criteria were generally taken into account in extracting items that do not measure the same structure. It was necessary to examine the height of the load on the factor in which the items were located. Factor load is the relationship between the factor in which the property is measured through an item (Büyüköztürk, 2010). Item factor load values should be at least 0.30 and above general acceptance (Seçer, 2017). However, some researchers suggest that this value should be 0.40 and 0.45 or higher to produce a stronger structure and scale (Seçer, 2017; Can, 2014; Büyüköztürk, 2010). For the environmental perception scale to have a strong structure, those whose item factor loadings were 0.45 and above were taken into account. It is stated that the substances should have high load value in one factor and low load values in the others. It was suggested that the difference between a factor with a high load value and a load of a second factor should be at least 0.10. However, it is suggested to eliminate items with high load values in more than one factor (Çokluk, Şekercioğlu & Büyüköztürk, 2014; Büyüköztürk, 2010). Factors with an eigenvalue greater than 1 or 1 as factor number criteria were considered as important factors (Büyüköztürk, 2010).

In the first exploratory factor analysis, it was found that the items were collected in 12 factors and the last 2 factors were found to contain at most 1 item. 23 items, which do not provide 0.45 item factor load value criterion, and which are considered to be comorbid items since they take place in more than one factor with less than 0.10, were eliminated and the number was decreased (I4, I10, I15, I19, I20, I21, I22, I24, I25, I26, I28, I32, I33, I37, I38, I39, I43, I48, I49, I50, I54, I55, I56). This process was repeated 4 times in total. Besides, I38 was removed from the scale through item-total correlation. Thus, a total of 24 items was eliminated.

When the factor loads were recalculated, it was seen the items were gathered under 7 factors. Then, Varimax orthogonal rotation technique (Büyüköztürk, 2010) was used so that the items that displayed high relation with one another in each factor could be brought together. With the help of Varimax rotational technique, it was seen that 32 items left in the scale had distributions under 7 factors.

Table 3. Rotated Component Matrix

Factor1		**Factor2**		**Factor3**		**Factor4**		**Factor5**		**Factor6**		**Factor7**	
Item No	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**
I-12	0.726	**I-2**	0.729	**I-45**	0.762	**I-30**	0.717	**I-41**	0.739	**I-36**	0.814	**I-51**	0.761
I-11	0.714	**I-1**	0.707	**I-44**	0.677	**I-29**	0.705	**I-40**	0.730	**I-35**	0.775	**I-53**	0.661
I-17	0.685	**I-3**	0.669	**I-46**	0.617	**I-31**	0.683	**I-42**	0.605	**I-34**	0.652	**I-52**	0.638
I-14	0.657	**I-8**	0.649	**I-47**	0.607	**I-27**	0.503						
I-18	0.654	**I-5**	0.618										
I-23	0.609	**I-7**	0.577										

Factor1		Factor2		Factor3		Factor4		Factor5		Factor6		Factor7	
Item No	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**	**Item No**	**Factor Load Value**
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I-11	0.714	**I-1**	0.707	**I-44**	0.677	**I-29**	0.705	**I-40**	0.730	**I-35**	0.775	**I-53**	0.661
I-17	0.685	**I-3**	0.669	**I-46**	0.617	**I-31**	0.683	**I-42**	0.605	**I-34**	0.652	**I-52**	0.638
I-13	0.605	**I-9**	0.500										
I-16	0.604												

When the data obtained from the rotational component matrix were analysed, it was seen that the factor load values of the 8 items in factor 1 were between 0.726 and 0.604, the items in factor 2 were between 7 items and the factor loadings were between 0.726 and 0.500 and factor load values between 0.762 and 0.607, 4 items in factor 4 between 0.717 and 0.503, 3 items in factor 5 were between 0.739 and 0.605, and between 3.814 and 0.652 of 3 items in factor 6, factor 3 items taking place in factor 7 load values were between 0.761 and 0.638. It was observed that the item load values of all factors met the recommended 0.45 criteria.

Table 4. Variance Explanation Percentages of Factors

Factors	**Eigenvalues**	**Variance Percentage**	**Total Variance Percentage**
Factor1	10.211	13.374	13.374
Factor 2	2.885	9.974	23.348
Factor 3	1.731	9.111	32.458
Factor 4	1.549	7.795	40.253
Factor 5	1.428	7.068	47.321
Factor 6	1.187	6.802	54.124
Factor 7	1.092	6.735	60.859

As a result of Varimax rotation, which was applied to the scale, in 7 factored structure, consisting of a total of 32 items whose eigenvalue were bigger than 1, it was explained that Factor 1 Total Variance was 13.374%, Factor 2 Total Variance was 9.974%, Factor 3 Total Variance was 9.111%, Factor 4 Total Variance was 7.795%, Factor 5 Total Variance was 7.068%, Factor 6 Total Variance was 6.802% and Factor 7 Total Variance was 6.735%. With the help of the obtained 7 factors, it was explained that total variance was 60.859%. The fact that total variance is 30% and above that is explained is an acceptable result (Büyüköztürk, 2010).

Reliability Study

Cronbach Alpha coefficient was calculated to find out the reliability of the scale.

Table 5. Cronbach Alpha Coefficient

Factor	Cronbach Alpha Coefficient	Total Scale
Factor 1	0.874	
Factor 2	0.867	
Factor 3	0.775	
Factor 4	0.769	0.930
Factor 5	0.802	
Factor 6	0.765	
Factor 7	0.709	

Cronbach Alpha Coefficient of developed environment perception scale was found 0.874 for Factor 1, and 0.867 for Factor 2, and 0.775 for Factor 3, and 0.769 for Factor 4, and 0.802 for Factor 5, and 0.765 for Factor 6 and 0.709 for Factor 7; and for all the scale 0.930. It is accepted to be sufficient that the Cronbach Alpha coefficient is 0.70 and above this value (Chistiensen, Johnson &Turner, 2015; Büyüköztürk, 2011; Tekindal, 2009).

In the developed environment perception scale, the fact that the Cronbach Alfa coefficients were above the recommended values showed that the scale had very high reliability.

Table 6. Correlation Coefficient Analysis Results between Factors

		F1	F2	F3	F4	F5	F6	F7
F1	r	1						
	p							
F2	r	0.681**	1					
	p	0.000						
F3	r	0.515**	0.530**	1				
	p	0.000	0.000					
F4	r	0.544*	0.616**	0.536*	1			
	p	0.000	0.000	0.000				
F5	r	0.434*	0.553**	0.527*	0.499*			
	p	0.000	0.000	0.000	0.000			
F6	r	0.260*	0.301**	0.234*	0.344*	1		
	p	0.000	0.000	0.000	0.000			
F7	r	0.335*	0.320**	0.396*	0.377*	0.384**	1	1
	p	0.000	0.000	0.000	0.000	0.000		

**. Correlation is significant at the 0.01 level (2-tailed).

Pearson correlation coefficient was used to examine the relationship between the sub-dimensions of the perception scale. An absolute value of correlation coefficient between was interpreted 0.70-1.00 as a high-level relationship, between 0.69-0.30 as a medium-level relationship, 0.29-0.00 as a low-level of relationship (Büyüköztürk, 2010). When these criteria were taken into consideration, while there was a weak relation in positive direction between F1 and F6 ($r=0.260$, $p<0.05$) and F3 and F6 ($r=0.234$; $p<0.05$), between all other factors, it was observed that there was a medium level positive direction relation. This result can be interpreted such that the scale factors were positively related to each other.

Naming the factors

As a result of exploratory factor analysis and reliability analysis, 32 items collected in 7 factors were examined and named as follows: Factor 1: Perception of Environment Overview (PEO); factor 2: Environment Education perception (EEP); Factor 3: Environment Protection Perception (EPP); Factor 4: Environment Issue Perception (EIP); Factor 5: Environment Awareness Responsibility Perception (EARP); Factor 6: Environmental Problems Sensory Perception (EPSP); facto 7: Environment-Friendly Activities Perception (EFAP).

First Level Confirmatory Factor Analysis

Confirmatory factor analysis is based on testing a model or structure that was previously determined by exploratory factor analysis in scale development and adaptation process (Seçer, 2017). Confirmatory factor analysis is an advanced technique based on testing of theories about latent variables (Çokluk, Şekercioğlu & Büyüköztürk, 2014). The first level confirmatory factor analysis was performed for the model consisting of 7 latent variables (PEO, EEP, EPP, EIP, EARP, EPSP, EFAP), and 32 observed variables, which were initially determined on the original scale for the confirmatory factor analysis of the environmental perception scale.

Table 7. Model Compliance Indexes

Compliance Indexes	Excellent Compliance	Acceptable Compliance	Model	Compliance Interpretation
RMSEA	Between 0.000 and <0.50	Between =0.50 and =0.80	0.054	Acceptable Fit
RMR	Between 0.000 and<0.50	Between =0.50 and =0.80	0.055	Acceptable Fit
IFI	=.95 and over	=.90 and over	**0.97**	Acceptable Fit
NNFI	=.95 and over	=.90 and over	**0.97**	Acceptable Fit
NFI	=.95 and over	=.90 and over	0.95	Acceptable Fit
CFI	=.97 and over	=.95 and over	**0.97**	Acceptable Fit
GFI	=.90 and over	=.85 and over	0.90	Acceptable Fit
AGFI	=.90 and over	=.85 and over	0.86	Acceptable Fit
$\chi 2$/df	Should be smaller than $\chi 2$/sd= 3		**1.309**	Acceptable Fit

(Schumacher and Lomax, 2004; transferred by Seçer, 2017)

As can be seen in Table 7, when the model compliance index values of the first level confirmatory factor analysis were examined, it was seen that the obtained values were [302 (sd, N) = 850.31; 443, 315), X2 / sd = 1.309, RMSEA = 0.054, S-RMR = 0.055, GFI = 0.90, AGFI = 0.86, NFI = 0.95, NNFI = 0.97, IFI = 0.97 and CFI =

0.97. According to this result, if the ratio of the chi-square to the degree of freedom is =2 / df /2 =, it appears to be the perfect compliance (Tabachnick and Fidell, 2001; transferred by Çokluk, Şekercioğlu and Büyüköztürk, 2014). Moreover, it was found that IFI, NNFI and CFI values demonstrated excellent compliance, and RMSEA, RMR, NNFI, NFI, GFI and AGFI values displayed acceptable compliance.

Based on data, the model compliance of 32 items and 7-factor structure of the environmental perception scale was tested; and it was observed that the model was generally confirmed. The t-values of the path diagram of the first level confirmatory factor analysis were given in Figure 1.

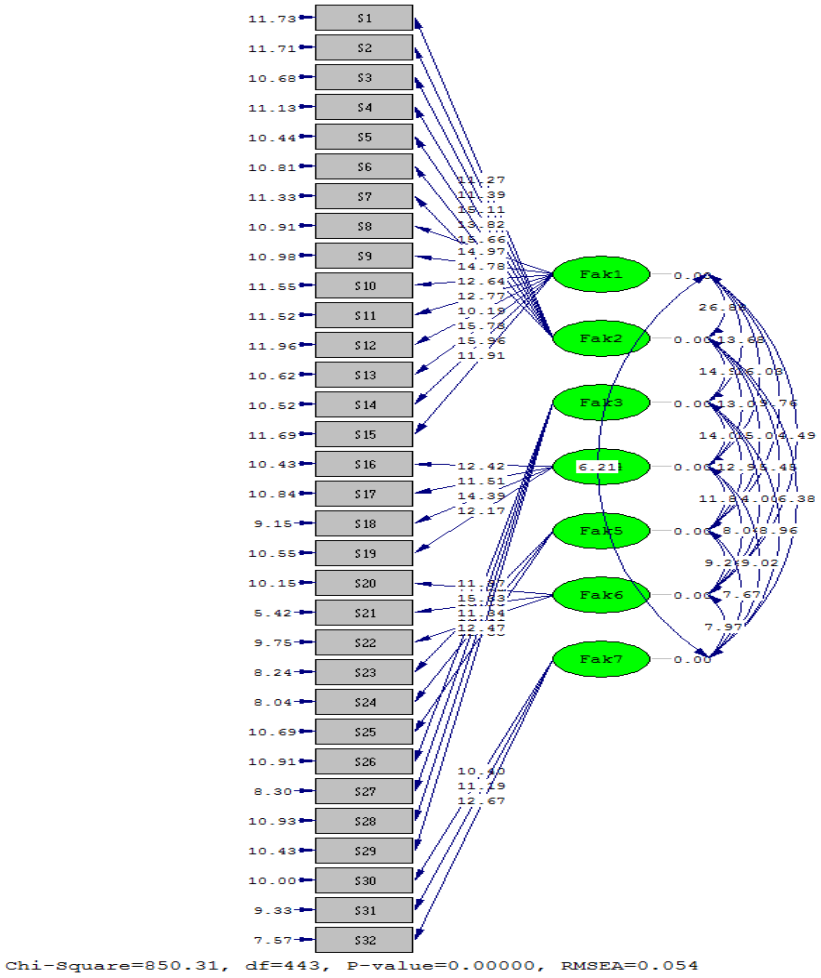

Figure 1. Environmental Perception Scale Path Diagram

Results and Discussion

This study was conducted to develop a valid and reliable scale for environmental perception. The literature was gone through in line with the aim of the study. In the literature review carried out, some metaphorical/perceptional studies and some qualitative studies carried out on environment concept in Turkey were examined. These studies were reached through the National Research Centre for Higher Education, Tübitak Ulakbim, Google Academic Search Engine. The item pool was created by examining related studies. The designed 47-item draft scale was submitted for expert opinion. Together with the feedbacks from the experts, the necessary arrangements were conducted; and 9 more items were added to the scale. The study was performed through survey method in 2018. While the sampling was determined, by examining some curricula of undergraduate and pre-graduate education, in the curriculum of any course in the field of science teaching, biology teaching, physical education and sports college, child development and education, first and

emergency assistance, medical laboratories and techniques programs were selected for sample students. When the demographic characteristics of the selected sampling were examined, it is possible to say that the group consisted of people who know and recognize the environmental issues, are interested in them, and investigate them (Table: 1). After the necessary permissions were taken, the applied scale was subjected to the suggested analysis processes for scale developing studies. The scale items were analysed through item-total correlation, and an item was eliminated considering at least 0.3 item correlation criteria for each one (Table: 2).

In factor creation for the perception scale, Principal Component Analysis technique was used. In the analysis which was conducted, the fact that the value of the items in which the items is in the range of 0.45 and higher is considered to be a good scale to be selected. Besides, the suggestion that the difference between a factor with a high load value and a load of a second factor is at least 0.10 is also considered. To reveal the number of factors, the factors whose eigenvalues are 1 and bigger than 1 were taken into account as important factors.

The environmental perception scale was performed with the participation of 315 students. It is seen that this number is within the clearance which is between 300 and 500, the sampling size suggested for scale development studies in the literature. Furthermore, sampling adequacy analyses were carried out through Kaiser-Mayer-Olkin (KMO) coefficient and Barlett test. The KMO coefficient of the scale was obtained as 0.901, and it was observed that Barlett test Chi-square value was meaningful statistically (X^2= 4580.873; $p<0.01$). These results can be interpreted as KMO coefficient being excellent.

In the first exploratory factor analysis, it was seen that the items were collected in 12 factors, and under the last 2 factors, there was only 1 factor at most. Factors were decreased by eliminating 23 factors which did not provide 0.45 criterion, ıtem factor load value, and which were evaluated as comorbid items since they took place in more than one factor with less than 0.10. This process was applied four times in total. Also, I38 was discarded from the scale with the help of item-total correlation. Hence, 24 items were eliminated.

As a result, it was observed that 32 items left with environment perception scale were gathered under 7 factors. Afterwards, to bring the items exhibiting high relations with one another in each factor together, Varimax Vertical Rotation Technique was used.

When the data obtained from rotated component matrix were examined, it was seen that 8 items, 7 items, 4 items, 4 items, 3 items, 3 items and 3 items were gathered in PEO, EEP, EPP, EIP, EARP, EPSP, and EFAP factors, respectively. Also, in all factors, it was seen that item load values had valued at least between 0.500 and 0.814 (Table: 3).

As a result of Varimax rotation applied to the scale, the total variance of PEO factor whose eigenvalue is bigger than 1 and with 7 factors is of 13.374%, and EEP factor is of 9.974%, and EPP factor is of 9.111%, and EIP factor is of 7.795%, and EARP factor is of 7.068%, and EPSP factor is of 6.802%, and EFAP factor is of 6.735%. The total variance is explained to be 60.859% with the help of 7 factors.

It was found that the Cronbach Alpha Coefficient of the developed environment perception scale changed between 0.709 and 0.930. The fact that the Cronbach Alpha Coefficient had a value over 0.70 with all suggested factors shows that the perception scale is a reliable one (Table: 5).

When Pearson Correlation Coefficient for environment perception is examined, a weak relationship in a positive direction was found with PEO, EPSP, EPP and EFAP factors, while there emerged a medium level relation in positive direction between all other factors. This result can be interpreted that the factors in the scale have relations in a positive direction between each other (Table: 6).

Besides, for confirmatory factor analysis, primary level confirmatory factor analysis was carried out for the model composed of 7 hidden variables (PEO, EEP, EPP, EIP, EARP, EPSP, and EFAP) and 32 observable

variables which were initially determined in original scale in the study. When compliance index values about primary confirmatory factor analysis were examined, it was found out that the obtained compliance index values were [χ2 (sd, N)=850.31; 443. 315), χ2/sd=1.309, RMSEA=0.054, RMR=0.055, GFI=0.90, AGFI=0.86, NFI=0.95, NNFI=0.97, IFI=0.97 and CFI=0.97. According to this result, it was found that (χ2/df), IFI, NNFI and CFI, the ratio of Chi-square value to the degree of freedom showed excellent compliance; and RMSEA, RMR, NNFI, NFI, GFI and AGFI values showed acceptable compliance (Table:7). Consequently, it is seen that the environment perception scale is a valid and reliable scale to be used in revealing the perceptions of university students about the environment. This scale, with various adaptations, can be utilized for other individuals in formal or informal processes out of university by considering their characteristics.

ANNEX 1 – ENVIRONMENT PERCEPTION SCALE

Ek1- ÇEVRE ALGISI ÖLÇEĞİ

		Totally Agree	Agree	Undecided	Disagree	Never Agree
	Perception of Environment Overview (PEO)					
1	Environment protection is an asset that should be cared for. Çevre korunması, özen gösterilmesi gereken bir varlıktır.					
2	The environment is our life/living area. Çevre, hayat/ yaşam alanımızdır.					
3	Environmental sensitivity is an indicator of development. Çevresel duyarlılık gelişmişlik göstergesidir.					
4	The environment is the expression of happiness and welfare. Çevre, mutluluğun ve huzurun ifadesidir.					
5	The environment is our means of living. Çevre, geçim kaynağımızdır.					
6	Environment affects our future. Çevre, geleceğimizi etki eder.					
7	The environment is the expression of dignity value. Çevre, kıymetin/değerin ifadesidir					
8	The environment is the expression of beauty. Çevre, güzelliğin ifadesidir.					
	Environment Education Perception (EEP)					
9	Environment education should be compulsory. Çevre eğitimi zorunlu olmalıdır.					
10	Environment education makes us feel presence of environmental problems. Çevre eğitimi çevresel sorunlarının varlığını hissettirir.					
11	Environment Education is universal. Çevre eğitimi evrenseldir.					
12	Environment education is a continuous and constant process. Çevre eğitimi sürekli ve daimi bir süreçtir.					
13	Environment education creates sensitivity about the environment Çevre eğitimi çevre konusunda duyarlılık oluşturur.					
14	Environment education is a need. Çevre eğitimi ihtiyaçtır.					
15	Environment education creates awareness Çevre eğitimi farkındalık yaratır					
	Environment Protection Perception (EPP)					
16	Plants/trees should be planted to protect the environment. Çevreyi korumak için bitki/ağaç dikilmelidir.					

17	It is a must to take precautions for environment protection. Çevre sorunları için önlemlerin alınması gereklidir.
18	Food resources should be consumed Consciously. Gıda kaynakları bilinçli tüketilmelidir.
19	Environment education increases economical behaviours. Çevre eğitimi tasarruflu davranışları artırır.
	Environment Issues Perception (EIP)
20	Noise is environmental pollution. Gürültü bir çevre kirliliğidir.
21	Extinction of forests is an environmental problem. Ormanların yok olması çevre sorunudur.
22	Drought is an environmental problem. Kuraklık bir çevre sorunudur.
23	Extreme use of natural resources leads to environment problems. Doğal kaynakların aşırı kullanımı çevre sorunlarını oluşturur.
	Environment Awareness Responsibility Perception (EARP)
24	Educators increase awareness about environmental issues. Eğitimciler çevre konularına farkındalığı arttırır.
25	Various institutions, foundations and units can attract attention on environmental issues. Çeşitli kurum, kuruluşlar ve birimler çevre konularına dikkat çekebilirler.
26	Legal regulations create awareness about environmental issues. Yasal düzenlemeler çevre konularına farkındalık oluşturur.
	Problems of Sensory Perception (EPSP)
27	Environmental problems create fear in me. Çevre sorunları bende korku oluşturur.
28	Environmental problems create regret in me. Çevre sorunları bende pişmanlıklar oluşturur.
29	Environmental problems create a feeling of guilt in me. Çevre sorunları bende suçluluk oluşturur.
	Environment-Friendly Activities Perception (EFAP)
30	Sportive activities increase environmental conscientious and awareness. Sportif faaliyetler çevresel bilinç ve farkındalığı arttırır.
31	Performing travels to nature increase environmental conscientious. Doğa gezilerinin yapılması çevre bilincini artırır.
32	Artistic activities increase awareness about environmental issues. Sanatsal etkinlikler, çevre konularına farkındalığı artırır.

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