Preparing Attitude Scale to Define Students' Attitudes about Environment, Recycling, Plastic and Plastic Waste*

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Abstract
The aim of this study is to introduce an attitude scale in order to define students' attitudes about environment, recycling, plastics, plastic waste. In this study, 80 attitude sentences according to 5-point Likert-type scale were prepared and applied to 492 students of 6th grade in the Kastamonu city center of Turkey. The scale consists of cognitive, affective, and psychomotor skills domains. After the factor analysis it was found that they have 3, 4 and 5 factors accordingly. After the reliability analysis the alpha values for cognitive, affective and psychomotor scales are .854, .871 and .826 respectively. As a result, it is found that the scale can be used to define cognitive, affective and psychomotor attitudes.

***Keywords*:** Environmental education, environmental attitude scale, plastic waste

Introduction

Environment is the area where all living and non living things interact. Environmental education is the regular studies which enable the human beings to make the interaction easier and thus minimizing the possible problems rising from the interaction.

Energy, environment and recycling should be truly understood by the every section of society (science, policy, education, media and people) for sustainable development and inhabitable environment. And these issues

*This manuscript has been presented at a conference of IX th National Sience and Mathmatics Education, İzmir, Turkey .

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ISSN: 2146-0329
www.iejeegreen.com

should be evaluated within the framework of basic citizenship, which will affect the people's future life more than today and will be a central theme.

In order to deal with environmental problems and/or to minimize them, the most effective way is raising environmentally conscious and sensitive individuals who should be equipped with necessary knowledge to develop positive attitudes for it. Therefore, education presents crucial importance. Otherwise, damages given to environment cannot be prevented. These issues exist in the curriculum of Ministry of Education which enables the students to develop attitudes towards possible positive and negative environmental problems while preparing the individuals for society (Uzun, & Sağlam, 2006).

The interactions of environment and humans cannot be directly revealed. However, they can be revealed by techniques such as observation, survey and interview (Büyüköztürk, 2008). The situations based on human's emotions, thoughts, behaviors are difficult to analyze due to the improbability measure directly and quantitatively. Instead, qualitative methods are used.

In this study an attitude scale was prepared to present what individuals know about the recycling and environment terms, awareness of comparative effectiveness of recycling of different materials, prejudices against plastics, what they feel about the pollution and what kind of behaviors they adopt about the pollution. Moreover, comparisons about the socio-economic conditions are planned to be made in the following sections of the study. By means of conclusive results, some of the problems of environment education can be pointed out clearly and solution ways will be looked for.

There are several developed attitude scales on environmental education. Fraser (1998), has investigated nine different attitude scales and differentiated them. Also, Trapha (1999), has applied NEP scales to the bachelor students who called themselves major in environment. And he found that their attitudes were weak towards this subject. Furthermore, Larijani and Yeshodhara (2008), have compared the teachers of secondary stage primary schools of Iran and India with the Taj Environmental Attitudes Scale. There are also several studies applied in Turkey such as Atasoy, 2005; Kabaş, 2004; Mert, 2006; Özpınar, 2009; Sağır et al., 2008; Sama, 2003, Yıldırım, 2008. However these cited studies are executed in the perspectives of biology. Obviously, the other perspectives of environment are missing. Therefore, our study is complementary to the development of environmental attitude scale in chemistry perspective.

Method

Method of Research

The scale consisting of four parts was prepared in order to measure sixth grade primary school students' attitudes about the recycling, impacts of

plastics and plastic wastes on environment. Cognitive, affective, psychomotor skills domains which are the three dimensions of the term attitude were studied separately. Additionally, socio economic conditions affect the mentioned skill domains.

The universe of the research consists of primary school 6th grade students at the city center of Kastamonu. A school from each administrative street was chosen randomly to represent Kastamonu within the boundaries of city center. 492 students of these schools were included in the study. 247 of them were male (50.2%), 245 of them were female (49.8%).

Preliminary Study

Essay type interviews were made in three predetermined schools to define what students know about the issues. Depending on these interviews, 80 attitude sentences according to 5-point Likert-type scale were prepared. Since environment is the common intersection research area of many disciplines, a group of eight specialists from physics, chemistry, biology, geography and education sciences studied on the sentences. Attitude sentences were modified accordingly to specialists' view. The first practice of the scale was carried for 50 students and the points leading to confusion were determined and resolved. Moreover, new supporting sentences were written for the questions which lower the reliability. In brief, 5-point Likert-type attitude scale was prepared to be practiced with total 74 attitude sentences containing cognitive, affective and psychomotor skills domains.

Reliability of the Attitudes Scales

The data gathered was processed on the SPSS programme. Reliability results for each scale are as follows: for cognitive scale Cronbach's reliability coefficient is .330. The sentence which lowers this value was taken out from the scale. After this operation the value was found as .854 and content consistency was determined as sufficient. The reliability of affective scale was found as .857 and reliability coefficient was increased to .871 by taking out the sentence lowering the reliability. And the reliability value for the psychomotor scale was found as .803 and by taking out the sentence lowering the reliability this value was increased to .826.

Consequently, the sentences lowering the reliability were removed and finally attitude scale consists of 59 attitude sentences.

Findings

The attitude scale was analyzed in three sections; 1- cognitive attitudes about environment, plastics, plastic waste and recycling, 2- affective

attitudes about these issues, 3- psychomotor attitudes. Sentences of attitude were classified by taking three sections and results were analyzed separately as "Environment cognitive scale", "Environment affective scale" and "Environment psychomotor scale".

Results of the Factor Analyses of Cognitive Scale

Table 1.
The results of the factor analysis for environment cognitive scale

Article Number	Load values of factors		
	1. Factor	2. Factor	3. Factor
1	.840		
2	.819		
3	.747		
4	.719		
5	.702		
6	.696		
7	.692		
8	.621		
9	.606		
10	.602		
11	.577		
12	.558		
13	.473		
14		.676	
15		.631	
16		.624	
17		.543	
18		.534	
19		.483	
20			.676
21			.665
22			.597
	26%	11%	8%

Coefficient of Keiser-Meyer-Olkin (KMO) and Barlett Sphericity tests which were made in order to analyze the conformity of significance of factor analysis. Coefficient number was .898 and significance for Barlet test was confirmed as $p<.05$. KMO's values which are higher than .600 are conformed and, the scale is suitable for factor analysis (Büyüköztürk, 2002).

It is seen that cognitive scale consists of three factors after the results of factor analysis. The first factor explains 26% of the total variance. The first 13 items of environment knowledge scale represent the first factor, 14-19 items represent the second factor and 20-22 items represent the third factor.

It was confirmed that load values of the first factor was between .473 and .840, second factor was between .483 and ,676 and third factor was .597 and .676.

After the meaning of contents of the items had been analyzed, the phrasal sentences were given to factors. In the first factor of cognitive scale there are attitude sentences such as "Turning the waste into valuable materials is called recycling", "Recycling leads to save", "Recycling protects the environment" and "Plastics pollute the soil". Therefore, first factor is called recycling and environment problems.

In the second factor of cognitive scale there are attitude sentences such as "The most polluting part of the plastics is that they cover too much space". This factor is generally concerned with plastic waste and the problems they cause. Thus second factor is called the hazardous effect caused by plastics.

Third factor of the cognitive scale consists of sentences such as "Plastics were made of oil" and energy comes when plastics are burned. Therefore third factor is called plastics used as energy resource.

Results of the Factor analysis of the Affective Scale

Table 2.
Results of the Factor analysis of the Environment Affective Scale

Article Number	Load values of factors			
	1. Factor	2. Factor	3. Factor	4. Factor
1	.829			
2	.802			
3	.742			
4	.707			
5	.662			
6	.561			
7	.561			
8		.764		
9		.747		
10		.602		
11		.528		
12			.752	
13			.717	
14			.519	
15				.857
16				.698
17				.679
	23%	13%	12%	11%

The significance for KMO coefficient number .886 and Sphericity test was defined as $p<.05$. The scale is conformed for factor analysis according to the results. As a result of the factor analysis affective scale consists of 4 factors. The first factor explains the 23% of the total variance.

The first 7 items represent the first factor, 8-11 items represent the second factor, 12-15 items represent the third factor, and 16-18 items represent the fourth factor.

Load values of the first factor are between .561 and .829, second factor is between .528-.764, third factor is between .590 and .752, and fourth factor is between .679 and .857.

After the analysis of the contents of the items, phrasal sentences were adopted to factors. The first factor of the affective scale consists of the sentences such as "If there was a world without any pollution, it would be better", "plastics thrown away to streets look bad", and "I wish I could live in a cleaner environment". Therefore the first factor was called the desire to live in clean environment.

Second factor of the affective scale consists of sentences such as "It makes me happy when plastic bags are reused", "It would be beneficial for the economy if the plastics were collected and sold", and "it makes me happy to see when the bottles are refilled". Thus second factor was called reuse of the plastics.

The third factor of the affective scale consists of sentences such as "If I see plastic water bottles thrown to road, I get sad". "People avoid giving harm to the environment". "Therefore the third factor is called how plastics affect us".

The fourth factor of the affective scale consists of sentences such as "Reuse of the plastic bottles is harmful to health", "Since the glass bottles aren't cleaned sufficiently; reuse of them is harmful for health". Therefore the fourth factor is called the effect of the reuse of plastic and glass on people's health.

The results of the analysis of environment psychomotor scale

Table 3.
The analysis of environment psychomotor scale

Article Number	Load values of factors				
	1. Factor	2. Factor	3. Factor	4. Factor	5. Factor
1	.744				
2	.735				
3	.676				
4	.672				
5	.658				
6	.617				
7	.609				
8	.585				
9		.822			
10		.797			
11		.712			
12			.863		
13			.842		
14			.631		
15				.750	
16				.710	
17				.662	
18					.761
19					.668
20					.664
	26%	12%	7%	6%	5%

The significance for KMO coefficient number .851 and Sphericity test was defined as $p<.05$. The scale is conformed for factor analysis according to the results. As a result of the factor analysis psychomotor scale consists of 5 factors. The first factor explains the 26% of the total variance.

The first 8 items represent the first factor, 9-11 items represent the second factor, 12-15 items represent the third factor, 16-18 items represent the fourth factor, and 18-20 items represent the fifth factor.

Load values of the first factor are between .585 and .744, second factor is between .712-.822, third factor is between .631 and .863, fourth factor is between .662 and .750, and fifth factor is between .664 and .761.

After the analysis of the contents of the items, phrasal sentences were given to factors. The first factor of the psychomotor scale consists of the sentences such as "I participate the activities about the environment voluntarily", "I buy materials that does not give harm to the environment", and "I do not hesitate to warn somebody throwing plastic bottle away". "Therefore the first factor was called works for protecting environment".

Second factor of the psychomotor scale consists of sentences such as "I collect the plastics at home and if needed, I walk for 30 minutes and I put them in recycle bin". Thus second factor was called use of the recycle bin.

The third factor of the psychomotor scale consists of sentences such as "After using the plastic bottles of water, I throw them away". "Therefore, third factor is called" the desire to throw the garbage away".

The fourth factor of the psychomotor scale consists of sentences such as "After shopping I save the plastic bags to be reused". Therefore the fourth factor is reuse. The fourth factor of the psychomotor scale consists of sentences such as "After shopping I save the plastic bags to be reused". Therefore the fourth factor is called reuse. The fifth factor of the psychomotor scale consists of sentences such as "I put the white material used to protect the white equipment in basket" Therefore, fifth factor is called litter bin.

The attitude scale was prepared which demonstrates primary school students' interaction with environment from several perspectives. It is possible to define students' cognitive, affective and psychomotor attitudes about environment, recycling, plastics, and plastic waste. It should be emphasized that affective skill attitudes which is lack in many similar studies, was accommodated.

Conclusion and Recommendations

Teaching and learning environment is an important issue for sustainable environment. Students who are the basic pillars of society are not only today's citizen but also the citizens of future who are going to shape our future (parents, engineer, politician, teacher, unemployed, etc.).

The attitude scale was introduced to define students' attitudes about environment, recycling, plastics, plastic waste. Firstly, scale was prepared for preliminarily according to experts' views. Then, new sentences were attached to the existing ones which have low reliability. Afterwards, sentences which the students had difficulty understanding were corrected after first practice. 492 students in Kastamonu city center were inquired. Resultantly, the scale consisting of three basic domains of the attitude was prepared.

The education that the students get about the environmental problems is crucial to prevent environmental problems. Therefore, the data gathered from the preparation of the attitude scale demonstrates students' attitudes about the environmental problems. And the results direct the way of environment education.

Affective attitude scale was also included in the study which makes it different from other accompanying studies. The scale may also be applied to high school and university students.

Biographical statement

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APPENDIXA

SEVGİLİ ARKADAŞLAR; BU UYGULAMA BİR ARAŞTIRMA İLE İLGİLİDİR. YAŞANABİLİR BİR ÇEVREYİ AMAÇLAMAKTADIR.
SİZE UYGUN OLAN SEÇENEĞİ İŞARETLEYİNİZ.

	Çevre Bilgi Ölçeği	Tamamen Katılmıyorum	Katılmıyorum	Az Katılıyorum	Katılıyorum	Tamamen Katılıyorum
1	Bu işaret, geri dönüşümü ifade etmektedir.	O	O	O	O	O
2	Geri dönüşüm tasarruf sağlar.	O	O	O	O	O
3	Etrafa saçılmış plastik maddeler bir çevre sorunudur.	O	O	O	O	O
4	Atıkların değerli ürünlere dönüştürülmesine geri dönüşüm denir.	O	O	O	O	O
5	Plastikler toprağı kirletirler.	O	O	O	O	O
6	Geri dönüşüm çevreyi korumayı sağlar.	O	O	O	O	O
7	Plastikler yandığında havayı kirletir.	O	O	O	O	O
8	Plastikler sağlığımızı olumsuz etkiler.	O	O	O	O	O
9	Poşetler plastik maddelerdir.	O	O	O	O	O
10	Plastikler yalıtkandır.	O	O	O	O	O
11	Toprağa karıştırılan cam çevre kirliliğine neden olur.	O	O	O	O	O
12	Modern toplumlarda tüketim artmaktadır.	O	O	O	O	O
13	Toprağa atılan plastikler yüz yılda bozulur.	O	O	O	O	O
14	Plastik maddelerin en kirletici yönü çok yer kaplamalarıdır.	O	O	O	O	O
15	Plastik kullanımının yaygınlaşması, ağaçların daha az kesilmesi anlamına gelir.	O	O	O	O	O
16	Toprağa atılan kâğıt, toprağın verimini arttırır.	O	O	O	O	O
17	Plastikler sıkıştırılarak çöpe atılırsa çevreyi daha az kirletirler.	O	O	O	O	O
18	Yiyecek ve içeceklerin plastik kaplarda saklanması onların bozulmasını önler.	O	O	O	O	O
19	Çevre kirliliği ile ilgili en büyük sorun atıkların çok yer kaplamalarıdır.	O	O	O	O	O
20	Plastik maddeler petrolden üretilir.	O	O	O	O	O
21	Plastikler yakıldığı zaman enerji açığa çıkar.	O	O	O	O	O
22	Plastikler yenilenebilir enerji kaynağı olarak kullanılabilir.	O	O	O	O	O

	Çevre Duygu Ölçeği	Tamamen Katılmıyorum	Katılmıyorum	Az Katılıyorum	Katılıyorum	Tamamen Katılıyorum
1	Temiz bir çevrede yaşamak isterdim.	0	0	0	0	0
2	Çevreyi kirletmek kötü bir davranıştır.	0	0	0	0	0
3	Orman yangınları ülke açısından kötüdür.	0	0	0	0	0
4	Çevreye zarar vermekten kaçınırım.	0	0	0	0	0
5	Çevrenin hiç kirlenmediği bir dünya olsa iyi olurdu.	0	0	0	0	0
6	Sokağa atılmış plastikler görüntü açısından kötü duruyor.	0	0	0	0	0
7	Plastiklerin evlerden toplanıp geri dönüştürülmesi iyi olurdu.	0	0	0	0	0
8	Plastik poşetlerin yeniden kullanıldığını görmek beni sevindiriyor.	0	0	0	0	0
9	Plastik su şişelerinin tekrar doldurulabilmesi beni sevindiriyor.	0	0	0	0	0
10	Plastik oyuncakların bozulduğunda çöpe atılması beni üzüyor.	0	0	0	0	0
11	Plastikler toplanıp satılsaydı ekonomik açıdan yararlı olurdu.	0	0	0	0	0
12	Yol kenarına atılmış plastik su şişelerini görsem üzülürüm.	0	0	0	0	0
13	Plastik poşetlerin etrafta uçuşuyor olması beni üzüyor.	0	0	0	0	0
14	İnsanlar çevreye zarar vermekten kaçınırlar.	0	0	0	0	0
15	Cam şişelerin tekrar tekrar kullanılması sağlığa zararlıdır.	0	0	0	0	0
16	Plastik şişelerin tekrar tekrar kullanılması sağlığa zararlıdır.	0	0	0	0	0
17	Cam şişeler yeterince temizlenemediği için tekrar kullanımı sağlığa zararlıdır.	0	0	0	0	0

SOSYO- EKONOMIK DURUM OLÇEGI

1	Cinsiyetiniz:	A) Erkek B) Kız
2	Ailenizin yaşadığı yer:	A) Müstakil Ev B) Apartman C) Site
3	Ailenizin aylık gelir durumunu:	A)1000 TL den az B)1001-2000 TL C)2001 TL ve üstü
4	Ailenizde çalışan sayısı:	A)Kimse çalışmıyor B)1 kişi C) 2 kişi D) 3 kişi E) 3'ten fazla kişi
5	Annenizin öğrenim:	A) Okur-yazar değil. B) İlkokul mezunu C)Ortaokul mezunu D) Lise mezunu E)Üniversite mezunu
6	Babanızın öğrenim durumunu:	A) Okur-yazar değil. B) İlkokul mezunu C)Ortaokul mezunu D) Lise mezunu E)Üniversite mezunu
7	Ailenizdeki birey sayısı (siz dahil):	A)2 kişi B)3 kişi C)4-5 kişi D)6 veya daha fazla
8	Oturduğunuz evin ısıtma sistemi:	A) Soba B)Kombi C) Merkezi kalorifer sistemi D) Kat kaloriferi sistemi
9	Babanızın mesleği:	A) İşçi D) Doktor B) Çiftçi E) Öğretmen, Öğretim Görevlisi C)Memur F) Serbest meslek G)İşsiz
10	Annenizin mesleği:	A) İşçi D) Doktor B) Ev hanımı E) Öğretmen, Öğretim Görevlisi C)Memur F) Serbest meslek
11	Fen ve teknoloji öğretmeninizin cinsiyeti:	A) Erkek B) Kız
12	5. sınıf Fen ve Teknoloji dersi notunuz:	A) 1 B)2 C) 3 D) 4 E) 5
13	Okulunuz saatleri dışında başka bir yerden dersleriniz ile ilgili yardım alıyor musunuz?	A)Dershane B)Özel ders C)Okul kursu D)Almıyorum E)Diğer(...)