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Development of Recycling Attitude Scale

Geri Dönüşüm Tutum Ölçeğinin Geliştirilmesi

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ABSTRACT: The aim of this research is to develop a scale for determining pre-service teachers' attitudes towards recycling. The research was carried out using a quantitative research design. The research was carried out in the education faculties of two state universities located in the east and west of Türkiye. 284 pre-service teachers (62 males, 222 females) who were selected by the easily accessible sampling method participated in the research. During the scale development process, an item pool consisting of 56 statements was created. The draft scale, which was prepared after the expert opinion, was applied to the pre-service teachers. After validity and reliability analysis, three factors with 32 items were obtained, which explained 42.456% of the total variance. The factors were named "Responsibility and Behavior," "Consciousness and Awareness," and "Economic Value", respectively. The Cronbach"s Alpha coefficient was calculated as 0.893 for the "Responsibility and Behavior" factor, 0.785 for the "Consciousness and Awareness" factor, and 0.801 for the "Economic Value" factor. In addition, Cronbach's Alpha was calculated as 0.884 for the overall scale. According to the findings, it can be said that this scale developed in the research is sufficient in terms of validity and reliability. However, in future studies, similar scales with confirmatory factor analysis can be developed and applied to large samples to examine participants' attitudes toward recycling.

Keywords: Recycling, attitude, scale development, pre-service teacher.

ÖZ: Bu araştırmanın amacı öğretmen adaylarının geri dönüşüm konusundaki tutumlarını belirlemeye yönelik bir ölçek geliştirmektir. Araştırma nicel araştırma deseni ile yürütülmüştür. Araştırma, Türkiye'nin doğusunda ve batısında yer alan iki devlet üniversitesinin eğitim fakültelerinde gerçekleştirilmiştir. Araştırmaya kolay ulaşılabilir örnekleme yöntemiyle seçilen 284 (62 erkek, 222 kadın) öğretmen adayı katılmıştır. Ölçek geliştirme sürecinde 56 ifadeden oluşan bir madde havuzu oluşturulmuştur. Uzman örüşü sonrasında hazırlanan taslak ölçek öğretmen adaylarına uygulanmıştır. Geçerlik ve güvenirlik analizleri sonucunda toplam varyansın %42.456'sını açıklayan 32 maddelik 3 faktör elde edilmiştir. Faktörler sırasıyla "Sorumluluk ve Davranış", "Bilinç ve Farkındalık" ve "Ekonomik Değer" olarak adlandırılmıştır. Cronbach's Alpha katsayısı "Sorumluluk ve Davranış" faktörü için .893, "Bilinç ve Farkındalık" faktörü için .785 ve "Ekonomik Değer" faktörü için .801 olarak hesaplanmıştır. Ayrıca ölçeğin geneli için Cronbach's Alpha değeri .884 olarak hesaplanmıştır. Ulaşılan bulgulara göre, araştırmada geliştirilen bu ölçeğin geçerlik ve güvenirlik açısından yeterli olduğu söylenebilir. Bununla beraber gelecek araştırmalarda DFA'nın da yapıldığı benzer ölçekler geliştirilebilir ve ölçek geniş örneklemlere uygulanarak katılımcıların geri dönüşüme yönelik tutumları incelenebilir.

Anahtar kelimeler: Geri dönüşüm, tutum, ölçek geliştirme, öğretmen adayı**.**

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The world population is increasing rapidly. It is estimated that if the rate of population growth continues like this, the world population will reach over 10 billion by the end of the 21st century. Due to the rapidly increasing world population, the requirements for the resources people use are increasing, and people meet the majority of these needs from natural resources. However, natural resources in the world are limited. Therefore, to consume fewer natural resources, the raw materials meet human requirements by recycling (UNEP, 2016). However, recycling is not at the desired level worldwide. Waste and recycling are among the problems the world is facing today. All countries have been making great efforts to reduce the amount of waste and to encourage people to recycle. Various services such as picking up waste from home (door-to-door collection), paying fees to encourage recycling and recycling bins have been implemented for people to acquire habits about recycling. The main purpose of these implementations is to encourage people to recycle (Darby & Obara, 2005; Haj-Salem & Al-Hawari, 2021; Tonglet et al., 2004). However, the tendency of people around the world to recycle remains very low (Haj-Salem & Al-Hawari, 2021). Hence, to enable people to participate in the recycling process actively and to improve recycling behavior, many countries, especially European countries, are aiming to improve their waste management systems and recycle more products (Haj-Salem & Al-Hawari, 2021; Zaikova et al., 2022).

Recycling does not only include the collection of waste and making them useful. Natural resources are also protected through recycling. Because the raw material source is provided by natural resources, in other words, raw materials that cannot be met through recycling are supplied directly from natural sources. Without recycling, natural resources will be further depleted. For example, metal ores are consumed more due to the lack of recycling of metals. Similarly, if plastic products are not recycled, more hydrocarbons and fossil fuels will be used to produce plastic products (Lamma, 2021; Maddox, 1972). Therefore, Recycling provides benefits such as energy saving and the protection of nature for people. For example, recycling paper instead of cutting trees will save energy to cut many trees and protect green nature (Chan & Bishop, 2013). However, today, despite the intense efforts related to recycling, people also produce a large amount of waste. Even in developed countries, this rate is very high (Darby & Obara, 2005; Elgaaied, 2012; Zaikova et al., 2022). Because waste, instead of being recycled, is deposited in dumpsites in cities. Dumpsites are common in many countries around the world, including developed countries. Most of the garbage is collected in dumpsites without being recycled. It has been revealed that there is a high connection between the population density of people and dumpsites. The majority of the population is located 10 kilometers from the dumpsites. There are also a lot of dumpsites in areas where the population lives densely (UNEP, 2016). According to OECD data, the waste generation of countries and the recycling of wastes differ on the basis of countries. However, it has been stated that the consumption and waste production rate has increased depending on the country's economic growth. However, in low-economic countries, the rate of waste collected in open dumps without processing is around 93% (OECD G20, 2021). Comparisons between Türkiye and OECD countries have determined that the collection of waste in landfills is above the average of OECD countries in Türkiye. However, it has a value below that of OECD countries in terms of recycling (OECD, 2021).

Sustainability is based on the consumption of natural resources to reach future generations. All the resources in the world are limited and people have difficulties finding resources due to over-consumption. However, nature is excessively destroyed in order to meet the resource requirement. The natural balance is destroyed and nature cannot renew itself. Therefore, countries are developing policies in line with the understanding of sustainability such as protecting resources in a balanced way, reducing waste, increasing recycling, and increasing people's awareness about reducing waste, reusing, and recycling (Phulwani et al., 2020). Furthermore, in order to reduce the effect on and damage to the environment, eco-friendly products have been started to be produced in recent years. Eco-friendly products are products that do not harm the environment or cause minimal damage when they are thrown into the environment (Siddique & Hossain, 2018). These products, which can be biodegradable easily and in a short time in nature, help to protect the environment and nature (Tseng et al., 2018). In this context, there is a trend towards a green economy to protect nature and cause less damage. Green economy is based on reducing carbon emissions, using natural resources effectively, expanding renewable energy sources, recycling, and reducing harm to nature (UNEP, 2023). Therefore, by transitioning to a green economy, governments establish all policies on environmentally friendly and sustainable foundations (Ferrão et al., 2014). With a green economy, socio-economic and environmental improvements are addressed as a whole. In other words, socio-economic developments are addressed holistically with environmental risks (Kumar, 2017; Pahle et al., 2016). Less use of natural resources and increased investments in recycling allow ecosystems to renew themselves. In addition, the green economy allows the development of policies to reduce environmental risks (Kumar, 2017). Because of the destruction of natural resources, economic crises occur throughout the world. Natural resources are the main sources of economies. Recycling reduces the need to allocate financial resources to the purchase and use of raw materials. Recycling not only conserves natural resources but also meets the need for raw materials and provides jobs. (EEA, 2011; Ferrão et al., 2014). However, unless people's environmental awareness and awareness levels are increased, the efforts of governments will not be enough. Therefore, society needs to be aware of the protection of the environment and the sustainable consumption of natural resources. For this reason, researchers have focused on researching the factors that affect individuals' sustainable consumer behavior over 40 years (Antonetti & Maklan, 2014).

Theoretical Background on Recycling Behavior

Researchers have developed various theories to determine the factors that affect people's behavior on consumption, waste, and recycling (Chan & Bishop, 2013). One of the most important theories explaining this situation today is the *theory of planned behavior* (TPB). According to this theory, people's behavior choices are based on *attitude, subjective norms*, and *perceived behavioral control* (Wang et al., 2019). In recent years, the TPB model has been widely preferred to determine the factors that affect recycling and waste-related behaviors. Because it is one of the best models to explain the factors affecting behavior (Wang et al., 2019), another model *norm activation model* (NAM) is proposed by Schwartz (1973). The essence of this model is based on personal norms (Schwartz, 1973). Some researchers try to identify the factors

that affect recycling behavior by integrating different models (integration of NAM–TPB model) (Onwezen et al., 2013). Each model revealed by scholars can help people develop environmentally friendly behaviors (Stern, 2000).

Many factors can affect the choice of behavior. The factors that have a high effect on the individual's environmentally friendly behavior intention constitute the most important factor directing the behavior of individuals. In other words, it is the level of intention to perform the behavior (Ajzen, 1991). The variables in recycling behavior may differ according to the research area. These include beliefs, behaviors, economics, motivation, sense of responsibility, education level, age, gender, and so on. Scholars have been trying to reveal how these variables affect each other (Wang et al., 2019). Because many disciplines (e.g., education, psychology, and economy) are related to recycling, conduct research. Each field is trying to determine the factors that affect recycling behaviors from its own point of view (Hornik et al., 1995). Furthermore, some researchers have tried to explain the link between identity and recycling behavior. The relationship between self-identity and behavioral intention is revealed using the TPB model (Fekadu & Kraft, 2001; Whitmarsh & O'Neill, 2010). When the causes of the factors affecting environmental behaviors are revealed, environmental education will enable people to have environmentally friendly behaviors because the most important aim of environmental education is to improve people's awareness of the use of natural resources in a sustainable way (Torkar & Bogner, 2019). Numerous studies have been conducted to determine attitudes and behaviors toward the environment (Chawla & Cushing, 2007; Cohen, 1993; Elgaaied, 2012; Hsu & Lin, 2015; Passafaro & Livi, 2017; Quoquab et al., 2020; Robinson & Read, 2005; Szczytko et al., 2019; Vilkaite-Vaitone & Jeseviciute-Ufartiene, 2021). However, one of the factors not emphasized by the researchers is the effect of economic concern on environmental behavior. Because the relationship between economic concerns and environmental behavior has not been fully examined, this situation has been mostly addressed in the context of three values (egoistic, altruistic, and biospheric) (Snelgar, 2006; Swami et al., 2010). However, there were not enough scale items related to economic concerns. For example, the scale used by Whitmarsh and O'Neill (2010), items-buying eco-friendly products, saving behavior at home, using renewable energy sources at home, using public transportation, and participating in environmental activities- were included to determine the relationship between identity and pro-environmental behaviors. But only one item- "*Drive economically"*- is related to the economic concern. In the Tonglet et al. (2004) study, the environmental behaviors of individuals regarding recycling were investigated in terms of the *theory of planned behavior* (TPB). The section about situational factors includes one item in terms of economic behavior. Recycling is expressed as a waste of money. Another item- "*Recycling saves money"*- is included in the factor of consequences of recycling. In a similar study, economic concern was measured with the item "*recycling saves energy"* (Davies et al., 2002). To determine the effect of emotional variables on recycling behaviors, items on economic concerns were not included, whereas related to environmental concerns, results of recycling, and municipalities were used (Elgaaied, 2012). In some items used within the personnel norms (e.g., we should protect the environment), recycling action may take place due to both economic and other reasons (Onwezen et al., 2013). A similar situation (e.g., ecological problems are the consequences of my actions) was also used in the study by

Antonetti and Maklan (2014). In recent study by Zaikova et al. (2022), the effects of economic incentives on recycling behavior have begun to be included in the *theory of planned behavior* (TPB) as a variable. As a result of the research, in this case different countries (Russia and Finland) were compared, it was determined that economic incentives did not have an effect on "*waste source-separation intention"*. But Wang et al. (2019) pointed out that economic motivation has an effect on recycling behavior.

Many studies have been conducted using similar scales. Various items related to economic concerns are as follows;

Table 1

Items Used in terms of Economic Concerns

Recycling saves energy	(Davies et al., 2002; Schoeman & Rampedi, 2022; Tonglet et al., 2004; Vining & Ebreo, 1992)
Recycling saves money	(Schoeman & Rampedi, 2022; Tonglet et al., 2004)
Drive economically	(Whitmarsh & O'Neill, 2010)
Recycling programmes are a waste of money	(Tonglet et al., 2004)
Monetary benefit in waste sorting	(Zaikova et al., 2022)
Reduced waste collection fees when I sort the waste	(Zaikova et al., 2022)
Refund of the cost of packaging (for example, plastic bottles) if I recycle it	(Zaikova et al., 2022)
Wash and reuse dishcloths rather than buying them new	(Barr, 2007)
Waste separation can help the country to reduce pollution control costs, we should do it	(Xu et al., 2017)
Humans have the right to modify the natural environment to suit their needs	(Vining & Ebreo, 1992)
Plants and animals exist primarily to be used by humans	(Vining & Ebreo, 1992)

As reviewed in the literature given above, it has been determined that the economic concerns in the recycling behavior scales are not under-represented. Although there were no economic concerns in the scales used by the researchers, some items were included in relation to the economic concerns (Davies et al., 2002; Tonglet et al., 2004; Whitmarsh & O'Neill, 2010; Xu et al., 2017; Zaikova et al., 2022). However, Wang et al. (2019) and Zaikova et al. (2022) examined the effect of the economic variables on recycling behavior is examined in terms of economic motivation and incentives. It is important to develop scales that include economic variables. Because people are destroying nature in order to gain more profit, many reasons, such as over-consumption of natural resources, destruction of biodiversity, and conversion of forest areas into agricultural lands, are the behaviors that people do in order to live more economically. However, it is possible to eliminate these negative behaviors, first of all, with education. Environmental education enables students to take an active role in environmental issues in the formal education process. In fact, environmental education aims to increase the

knowledge of students and to develop responsible behavior (Chawla & Cushing, 2007). In the Belgrade Charter (1975), the objectives of environmental education are grouped under 6 headings (*awareness, knowledge, attitude, skills, evaluation ability*, and *participation*). It is emphasized as the objectives aimed to be gained by students in the education process (UNESCO-UNEP, 1975). At this point, teachers, who are the most important part of education, have great duties. In this respect, it is another important point of this research to develop a scale by referring to the opinions of prospective teachers who will be teachers in the future. Therefore, the aim of this research is to develop a scale for determining pre-service teachers' attitudes towards recycling.

Method

This section includes the research method, research group, ethical processes, scale development process, and measures for validity and reliability.

Research Design

Since this research aims to develop a scale, it can be said that it is based on a quantitative research design. The concept of scale essentially shows the mathematical qualities of measurement results (Gül & Sözbilir, 2015). It is also used in many fields of behavioural sciences, such as education and psychology, to collect information in terms of the targeted person or persons, system, subject, or content (Yurdugül, 2005).

Research Group

The investigation was conducted in the education faculties of two state universities located in the east and west of Türkiye. A total of 284 prospective teachers (62 males, 222 females) participated in the research, and convenience sampling was used as a sampling method. In addition, since both factor analysis and structural equation modeling are analysis types that require large samples, as well as to increase the power of the analytical model tested, the sample size was tried to be large (MacCallum et al., 1999). Thus, according to Bryman and Cramer (2001), the number of samples was determined according to the rule that "the sample must be at least five times the number of items in the scale." In order to perform the study, the data was collected in the 2022-2023 academic year. In the data collection process, the participation of teacher candidates on a voluntary basis was ensured. In addition, the personal information of the participants was not asked when filling out the scales, and the applications were carried out based on confidentiality. The demographic characteristics of the participants included in the study are presented in Table 2.

Table 2

Demographic Characteristics of the Participants

Participants	Gender	1st grade	2nd grade	3rd grade	4th grade	Total
University 1	Male	6 (17.1%)	4 (21.1%)	6 (12.8%)	10 (27.8%)	26 (19.0%)
	Female	29 (82.9%)	15 (78.9%)	41 (87.2%)	26 (72.2%)	111 (81.0%)
University 2	Male	-	16 (20.0%)	6 (17.1%)	14 (46.7%)	36 (24.5%)
	Female	2 (1.8%)	64 (57.7%)	29 (26.1%)	16 (14.4%)	111 (75.5%)

As seen in Table 2, the study includes sample groups from two different universities. Of the participants in the first group, 111 (81.0%) were female and 26 (19.0%) were male. Of the participants in the second group, 111 (75.5%) were female and 36 (24.5%) were male.

Ethical Procedures

All procedures were confirmed by researchers in accordance with the ethical standards of Ataturk University (date: 21.03.2023, reference no: E-56785782-050.02.04-2300106373).

The Development Process of the Scale

The principles suggested by Karakoç and Dönmez (2014) were taken into consideration during the scale development process. According to Karakoç and Dönmez (2014), if a new scale is to be developed, the following steps should be followed: (1) Conducting a literature review on the subject. (2) To determine the format for the measurement method and create an item pool accordingly. (3) To seek expert comment for the item pool, thus assessing content and face validity. (4) Make a trial application. (5) After the trial application, validity and reliability analysis of the scale and creating the final form of the scale. The development process of the scale is presented below.

On the other hand, according to DeVellis and Thorpe (2021), the items to be prepared at this stage should reflect the concept (phenomenon) being researched. For this reason, each item must comply with the structure of the implicit variable. In other words, the items written should not go beyond the conceptual framework established in the first step. It can create an item pool with inductive (asking open-ended questions to the target audience) and deductive methods (literature review) (Evci & Aylar, 2017). Since a limited sample was reached in this research and voluntary participation was ensured, an item pool was created only by the deductive method.

For the scale, the relevant literature was previously examined and an item pool containing 58 statements was created. The statements in the item pool were examined in terms of language, comprehensibility and content by four academicians, one of whom is an expert in science education and three of whom are experts in biology education. After the opinions of experts, two expressions that were not understandable or thought to be similar were discarded from the item pool. Thus, the number of items was reduced to 56, and then it was decided to perform 5-point Likert-type scoring in line with the evaluation criteria of the scale items in the literature (Shure & Spivack, 1982). The 5-point Likert scale consists of these points: (1) Strongly Disagree; (2) Disagree; (3) Partially Agree; (4) Agree; (5) Strongly Agree. Thus, the draft scale was made ready for implementation.

Validity and Reliability Measures

The scales whose reliability and validity have been tested and found to be sufficient will provide valid data for the person applying the scale (Ercan & Kan, 2004). For this reason, the validity and reliability of the scale developed in the study were tested.

In determining the validity of the measurement tool, content validity, criterion validity, construct validity and face validity are checked (Ercan & Kan, 2004). On the

other hand, the content validity of a scale can be examined in two ways: logically and statistically (Ercan & Kan, 2004). In this study, the content validity and face validity of the scale were ensured logically by examining the literature and consulting four academicians, one of whom is an expert in science education and three of whom are experts in biology education. Criterion validity examines the future or current relationship between the scores obtained from the scale and the determined criterion in order to determine the effectiveness of the scale. Since there is no similar scale in the literature that includes all the dimensions of this scale, criterion validity was not examined in this research. Factor analysis was performed for the construct validity of the test. Although different methods such as norm-referenced test, test-retest method, parallel-forms method and methods of interval consistency were used in the reliability studies of the scale (Ercan & Kan, 2004), in this research, the reliability of the scale was tested by calculating the Cronbach Alpha Reliability Coefficient, one of the internal consistency methods.

Data were collected simultaneously for each grade in the classroom under the supervision of a teacher. Before answering the measurement tool, students were informed about the purpose of the study and it was stated that their personal information would be kept confidential by the researchers.

In the study, it was also considered to ensure external validity in determining the number of samples. According to Büyüköztürk et al. (2013), one of the factors affecting external validity is the sampling effect. In other words, people selected from a limited area are unlikely to represent people elsewhere. In this case, the result applies to the individuals included in the research. Therefore, the study tried to increase external validity by including teacher candidates from two universities in the east and west of Türkiye.

Results

Preliminary Analysis and Validity Studies

To ensure the validity of the draft scale, the content, face, and construct validity were used. As stated before, the items in the scale for content and face validity were submitted to the opinions of four experts, and a draft scale of 56 items was prepared. Furthermore, to construct the validity of the scale, factor analysis was performed. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) techniques are widely used in scale adaptation or development processes for construct validity. If there is no known relationship between the scale items, EFA is recommended. On the contrary, if a tested relationship, specified factors and items grouped under them are detected, CFA is recommended (Bandalos & Finney, 2010; Büyüköztürk, 2002). In this study, since there was no theoretical information among the scale items, that is, it was not known exactly how many factors there were among the items and which items measured which factors, only EFA was performed. Additionally, the literature states that CFA should be carried out with a different sample (Fabrigar et al., 1999). CFA could not be performed due to the study's insufficient sample size. SPSS 20.0 was used for all analyses.

Before performing the analyses, the data were examined in terms of missing values and no missing data was found. On the other hand, kurtosis and skewness

coefficients were calculated in order to evaluate the normality assumptions. According to the analysis results, the kurtosis value was calculated as 1.07, while the skewness value was calculated as -.29. According to Leech et al. (2005), if the distribution is normal, the skewness and kurtosis coefficients should be between -1 and 1. It is stated that if the skewness coefficient is between -1 and 1, the kurtosis coefficient may be between -2 and 2, and if the kurtosis coefficient is between -1 and 1, the skewness coefficient may be between -2 and 2. Therefore, these findings showed that the data set met normal distribution assumptions.

Item Analysis

In the item analysis stage, the corrected item-total correlations were calculated. In the literature, these values are accepted as the measure of the effect of each item on the scale. Additionally, if the item-total correlation value is less than 0.25 or negative, it is recommended that it be removed from the scale (Gul, 2017). Accordingly, 10 items (I11, I13, I34, I40, I41, I43, I44, I50, I52, I55) was eliminated from the scale. After this stage, the number of remaining items was reduced to 46 (Table 3).

Table 3

The Corrected Item-Total Correlations of the Items in the Scale

Item	Item-total correlation	*t*	Item	Item-total correlation	*t*	Item	Item-total correlation	*t*
I1	0.355	-6.559	I20	0.480	-8.465	I39	0.420	-6.535
I2	0.282	-4.914	I21	0.355	-7.030	**I40**	**0.203**	-3.502
I3	0.308	-4.633	I22	0.508	-10.863	**I41**	**0.123**	-3.453
I4	0.436	-6.319	I23	0.551	-10.528	I42	0.502	-8.126
I5	0.309	-4.764	I24	0.333	-5.493	**I43**	**0.056**	-1.401*
I6	0.351	-4.529	I25	0.523	-8.655	**I44**	**-0.099**	1.270*
I7	0.320	-5.738	I26	0.293	-4.781	I45	0.315	-5.131
I8	0.464	-5.798	I27	0.496	-7.862	I46	0.501	-9.025
I9	0.461	-5.783	I28	0.327	-6.417	I47	0.293	-4.602
I10	0.419	-5.197	I29	0.563	-9.734	I48	0.271	-4.897
I11	**0.131**	-2.552	I30	0.366	-6.691	I49	0.503	-9.278
I12	0.518	-7.856	I31	0.467	-8.213	**I50**	**-0.336**	4.593
I13	**0.180**	-2.975	I32	0.445	-7.611	I51	0.534	-10.451
I14	0.432	-7.392	I33	0.338	-6.643	**I52**	**0.163**	-3.536
I15	0.523	-9.969	**I34**	**0.074**	-1.933*	I53	0.464	-7.516
I16	0.494	-9.744	I35	0.410	-6.910	I54	0.528	-8.030
I17	0.444	-7.581	I36	0.428	-9.283	**I55**	**0.125**	-2.574
I18	0.431	-7.354	I37	0.451	-9.685	I56	0.441	-6.131
I19	0.475	-8.358	I38	0.536	-9.868			

* $p>.05$

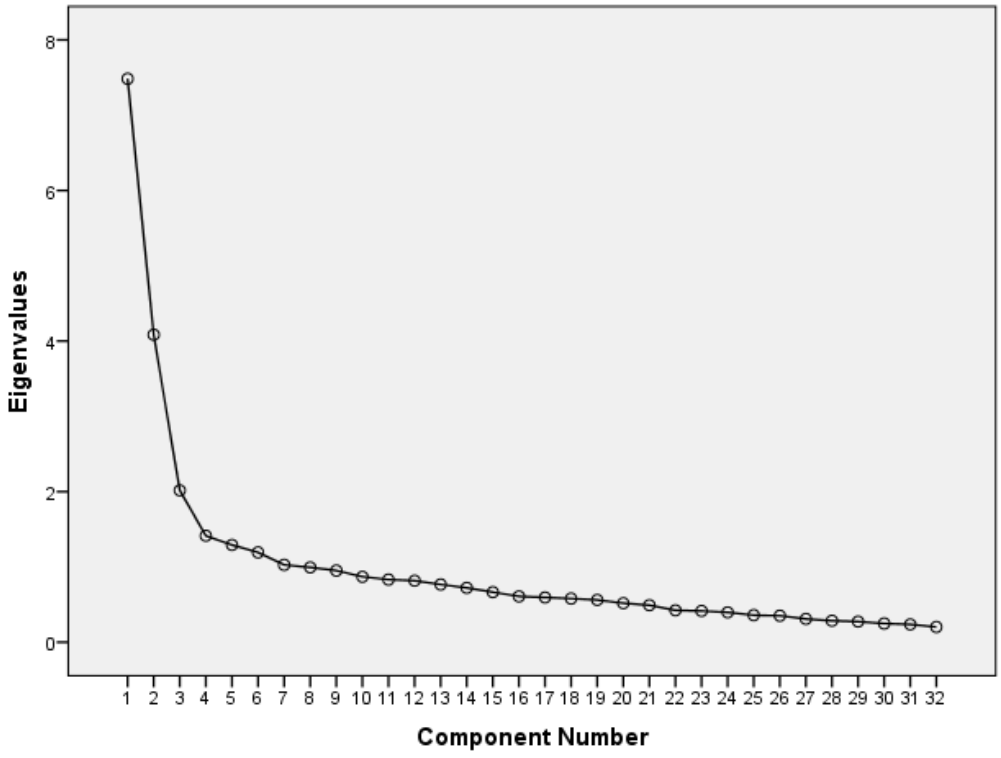
Factor Analysis

After item analysis, Exploratory Factor Analysis (EFA) was performed for the construct validity of the scale. In factor analysis, it is necessary to test the suitability of the data for factor analysis. In addition, Bartlett's test of sphericity, which is an indicator of the multivariate normal distribution of the data, is expected to be significant. As a result of the preliminary analysis, the KMO sample fit coefficient was .876 (>.60), and for Bartlett's test of sphericity was $\chi 2$=5669.095 (p<.05). These findings showed that the data was suitable for performing exploratory factor analysis.

Principal component analysis was used as a factorization technique in EFA. However, in determining the number of factors, and the factors with an eigenvalue greater than one were considered. The varimax rotation technique was used to interpret the factors. Factor loads are known as the correlation value between the item and the structure in the scale (Kocaman & Cumaoğlu, 2014). Accordingly, items with a factor load value below 0.30 were removed from the scale in analysis. Another criterion considered in item elimination is the removal of items that fall under more than one factor and differ less than 0.10 from the scale (Kocaman & Cumaoğlu, 2014). Accordingly, nine items (I2, I17, I25, I28, I29, I35, I37, I39 and I54) were removed from the scale in the first factor analysis. After ongoing analysis, three factors whose eigenvalues were greater than one were obtained, which explained 42.456% of the total variance (Table 4). Additionally, a scree plot was also made (Figure 1). It refers to a factor between two points on the scree plot graph (Büyüköztürk, 2002).

Figure 1

Scree Plot Graphic



When Figure 1 is examined, the 3-factor structure is clearly seen.

Table 4

The Results of EFA

		Rotated component matrix		
Item no	Items	Factor 1	Factor 2	Factor 3
I20	I pay attention to buying eco-friendly products.	0.778		
I19	I collect the garbage I see while walking.	0.753		
I21	I pay attention to whether there is an eco-friendly statement on the packaging.	0.734		
I23	I encourage people to recycle.	0.716		
I24	I actively participate in local or global activities related to recycling and waste.	0.697		
I16	I separate waste according to recycling types.	0.653		
I33	I collect the garbage I see and throw it in the trash to set an example for those around me.	0.644		
I32	I do not take the trash that other people throw on the ground and throw it in the trash.	0.637		
I22	News about recycling on TV or radio intrigues me.	0.637		
I15	I throw waste into recycling bins.	0.619		
I18	I warn those who throw garbage on the ground.	0.568		
I14	I know which waste goes into which color waste bin.	0.542		
I30	I try to throw the waste I see around me in the trash.	0.482		
I8	Throwing cigarette butts on the street does not pose an environmental problem.		0.746	
I10	Liquid oils become harmless after use in food, so there is no need for recycling.		0.696	
I9	There is no harm in pouring the waste oil into the sink.		0.694	
I12	Recycling is the responsibility of the municipality. Therefore, we do not need to make an effort to recycle waste.		0.659	
I6	Wastes thrown into water resources such as rivers, lakes and seas do not pose a danger to humans.		0.602	
I7	Reusing a product has no environmental benefit.		0.520	
I3	Recycling helps protect nature.		0.475	
I1	I am aware of the importance of recycling.		0.458	
I4	Biodiversity can be protected by recycling.		0.432	
I5	There is no relationship between sustainable development and recycling.		0.387	
I49	Recycling should only be done for expensive and valuable products.			0.760
I51	People can use natural resources to generate more income.			0.754

I46	It makes more sense to buy a new product instead of the expenses incurred in the recycling process.			0.718
I42	Recycling has no economic benefit. Therefore, there is no need for recycling.			0.626
I45	Recycling process wastes money.			0.583
I48	Due to the cost of the waste in the recycling process, it should be disposed of away from settlements.			0.557
I53	Recycling helps conserve resources.			0.515
I47	Recycling is a costly process.			0.459
I26	I throw away an old product and buy a new one.			0.435
Eigen value (Total=13.585%)		5.817	3.920	3.848
Explained variance (Total=42.456%)		18.179	12.251	12.026

As shown in Table 4, the scale, which includes 32 items and under three factors, were named "Responsibility and Behavior (Factor 1)", "Consciousness and Awareness (Factor 2)" and "Economic Value (Factor 3)", respectively. These items explain about 42.5% of the total variance. Furthermore, the load values of Factor 1, which includes 13 items, are between 0.778 and 0.482. The item loadings of Factor 2, which includes 10 items, are between 0.746 and 0.387. The item loadings of the last factor, which is called Factor 3, are between 0.760 and 0.435.

In the research, correlations between the subscales formed after the factor analysis were examined (Table 5).

Table 5

The Pearson Correlations among Subscales

	Factor 1	Factor 2	Factor 3
Factor 1	1	0.324**	0.210**
Factor 2	0.324**	1	0.468**
Factor 3	0.210**	0.324**	0.324**

**p<.001

Table 5 shows that the relationships between the subscales are all positively related.

Reliability Analysis

In the research, the reliability of the overall scale and its three factors were determined by calculating Cronbach's Alpha coefficient. According to the findings, this value (α) was 0.893 for the "Responsibility and Behavior" factor, 0.785 for the "Consciousness and Awareness" factor and 0.801 for the "Economic Value" factor. Moreover, Cronbach's Alpha was calculated as 0.884 for the overall scale. As Özdamar (2004) stated, coefficients 0.60 and greater indicate *good reliability* and high consistency among scale items. In this context, scale and its factors are quite reliable. The final form of the scale is in Appendix 1.

Discussion and Conclusion

Recycling practices are increasing significantly due to the necessity of solving environmental problems that have reached extreme levels today. For this reason, research on related factors affecting recycling has gained momentum in recent years (Momoh & Oladebeye, 2010; Šorytė & Pakalniškienė, 2021; Tam et al., 2018). When the literature on recycling is examined, it shows that although attitudes toward recycling play an important role in recycling and environmental education, valid and reliable measurement tools are limited in determining students' attitudes (Ugulu, 2015). In this research, an attitude scale was developed to determine the attitudes of pre-service teachers toward recycling. The scale development process was basically performed in four stages (item pool, item analyses, EFA, and reliability analyses). Firstly, an item pool, which includes 56 items, was created based on examining the literature and according to expert opinions. Item analyses were made on the collected data, and then a three-factor, "Responsibility and Behavior," "Consciousness and Awareness," and "Economic Value" was obtained.

In the literature, in the field of social sciences, the variance explained according to EFA results is expected to be between 0.40 and 0.60 for structures with more than one factor (Çokluk et al., 2012; Türkan & Çeliköz, 2018). In the research, the explained variance of the scale was determined as 42.456%. Therefore, according to the EFA results, it was determined that the variance ratio explained by the items collected under three factors provided the desired variance ratio.

According to the EFA results, the difference between the load values of the items on different factors is expected to be over 0.10 (Can, 2013). According to the research findings, it was understood that the factor loadings of the items in the scale varied between 0.387 and 0.778 and that the items in the final version of the scale were not loaded on different factors. It is emphasized that the item load values in the scale should be above 0.30 (Çokluk et al., 2012) or above 0.32 (Tabachnick & Fidell, 2007). On the other hand, it can be said that the model, which consists of 32 items and three factors, was suitable both theoretically and statistically because these results obtained with EFA provide evidence that the scale has construct validity. The Cronbach Alpha internal consistency coefficients calculated within the scope of reliability studies showed that the scale was reliable. Accordingly, 13 items were collected in Factor 1 (Responsibility and Behavior), nine items in Factor 2 (Consciousness and Awareness), and Factor 3 (Economic Value). Therefore, the minimum score that can be obtained from the whole scale is 32, whereas the maximum score is 160.

When the findings obtained in the study are evaluated, it can be said that this scale, which is developed to determine the attitudes of teacher candidates toward recycling, has appropriate qualifications. Considering the cognitive, affective and behavioral dimensions of attitudes, it is thought that this structure, which is revealed by the developed scale, has features belonging to each sub-dimension of attitude and will help researchers in measuring these features. In addition, when the scales developed for recycling in the literature were examined, factors similar to or different from the scale in this research were determined. For example, in the "belief" factor determined in the scale development study conducted by Karatekin (2013), items were collected in a manner similar to the "consciousness and awareness" factor in our study. Again, the "interest and sensitivity" and "initiative and participation" factors are similar to the

"responsibility and behavior" factors in our study. Moreover, in the scale development study conducted by Avan et al. (2011), items were collected in the "environment-information" factor, similar to the "consciousness and awareness" factor in our study. Again, the "environment-emotion" and "environment-behavior" factors are similar to the "responsibility and behavior" factors in our study. In another study conducted by Taştepe (2017), an attitude scale was developed to determine the cognitive, affective, and behavioral attitudes of high school students regarding the reduction, reuse and recycling of packaging waste. As a result of the analysis, it was determined that the 10-item final scale had a two-factor structure, namely "Giving Emotional Reactions" and "Exhibiting Awareness and Appropriate Behavior," and explained 57.955% of the total variance. It can be said that these dimensions are partially similar to the "Responsibility and Behavior" and "Consciousness and Awareness" dimensions in our research.

On the other hand, unlike these studies, the "economic value" factor developed in our research can be considered as a new dimension that contributes to the literature. In addition, although the development studies of this scale were made with pre-service teachers, it is appropriate to measure the attitudes of university students from all branches.

Implications

The scale developed in the research has some limitations as well as its contributions to the literature. At this point, it seems appropriate to make the following recommendations for future research:

- By conducting similar scale development studies with different sample groups, different dimensions can be determined from the literature and this research.

- Although this research was conducted with teacher candidates in the education faculties of two universities, the number of samples remained a little low due to the online data collection process and the collection of data through voluntary participation. Hence, confirmatory factor analysis (CFA) was not performed. In factor analysis studies, CFA is performed to test the fit of the model after EFA. However, CFA needs to be performed with the data collected from a different sample. Due to the insufficient sample size in this study, CFA analysis could not be performed. Therefore, it is recommended that CFA analysis be performed in future research.

- Due to the lack of sample, the attitudes of teacher candidates towards recycling could not be measured. Therefore, in future studies, this scale can be applied to prospective teachers to examine their attitudes toward recycling and compare them in terms of different variables.

- Since the subject of recycling is very popular with the developing technology today, it always has an important news value for the media. In addition, the way the media organs handle the issue is extremely important, and sometimes, it can bring more harm than good (Uzbay, 2009). For this reason, it is suggested that the "effect of media" factor should be added to the scales that determine attitudes towards recycling.

As a result, it is thought that this scale will be an effective data collection tool in determining the attitudes of teacher candidates towards recycling. In this context, the use of the scale by researchers is thought to be an effective tool in revealing the views of samples with different views on recycling, which is of great importance not only in our country but also all over the world, and its use is recommended.

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Statement of Responsibility

All authors contributed to the study. Initial conceptualization, drafting of the original manuscript, and methodology were carried out by the first and second authors. Data collection was carried out by all authors.

Conflicts of Interest

The authors have no competing interests to declare that are relevant to the content of this article.

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Appendix

Note. There is no need to get permission from the authors to use the scale.

Sayın öğretmen adayı,

Bu ankette size geri dönüşüme yönelik tutumlarınızı belirlemek üzere çeşitli sorular sorulmaktadır. Lütfen her cümleyi dikkatle okuduktan sonra, size uygun gelen seçeneği mutlaka işaretleyiniz. Unutmayın Doğru ya da Yanlış cevap yoktur. Sorulara içtenlikle cevap vermenizi rica ederiz. Katkılarınızdan dolayı teşekkür ederiz.

Demografik bilgiler **1.** Cinsiyetiniz: O Kadın O Erkek **2.** Sınıfınız: O 1. Sınıf O 2. Sınıf O 3. Sınıf O 4. sınıf	**Kesinlikle Katılmıyorum**	**Katılmıyorum**	**Biraz Katılıyorum**	**Katılıyorum**	**Tamamen Katılıyorum**
Sorumluluk ve Davranış					
1. Çevre dostu ürünler almaya özen gösteririm.	1	2	3	4	5
2. Yürüyüş yaparken gördüğüm çöpleri toplarım.	1	2	3	4	5
3. Ambalajların üzerinde çevre dostu ibaresi olup olmadığına dikkat ederim.	1	2	3	4	5
4. İnsanları geri dönüşüm yapmaya teşvik ederim.	1	2	3	4	5
5. Geri dönüşüm ve atık ile ilgili yerel veya küresel faaliyetlere aktif olarak katılırım.	1	2	3	4	5
6. Atıkları geri dönüşüm türlerine göre ayırırım.	1	2	3	4	5
7. Çevremdekilere örnek olmak için gördüğüm çöpleri toplayıp çöp kutusuna atarım.	1	2	3	4	5
8. Diğer insanların yere attığı çöpleri alıp çöp kutusuna atmam.*	1	2	3	4	5
9. Televizyon veya radyoda geri dönüşümle ilgili haberler ilgimi çeker.	1	2	3	4	5
10. Atıkları geri dönüşüm kutularına atıyorum.	1	2	3	4	5
11. Yere çöp atanları uyarıyorum.	1	2	3	4	5
12. Hangi atığın hangi renk atık kutusuna atılacağını biliyorum.	1	2	3	4	5
13. Çevremde gördüğüm atıkları çöpe atmaya çalışırım.	1	2	3	4	5
Bilinç ve Farkındalık					
14. Sokağa izmarit atmak çevresel bir problem oluşturmaz.*	1	2	3	4	5
15. Sıvı yağlar yemeklerde kullandıktan sonra zararsız hale gelir, bu nedenle geri dönüşüme gerek yoktur.*	1	2	3	4	5
16. Atık yağın lavaboya dökülmesinde bir sakınca yoktur.*	1	2	3	4	5
17. Geri dönüşüm belediyenin sorumluluğundadır. Bu nedenle atıkları geri dönüştürmek için çaba göstermemize gerek yoktur.*	1	2	3	4	5
18. Nehir, göl, deniz gibi su kaynaklarına atılan atıklar insanlar için tehlike oluşturmaz.*	1	2	3	4	5
19. Bir ürünün yeniden kullanımının çevresel bir faydası yoktur.*	1	2	3	4	5
20. Geri dönüşüm doğanın korunmasına yardımcı olur.	1	2	3	4	5
21. Geri dönüşümün öneminin farkındayım.	1	2	3	4	5
22. Biyoçeşitlilik geri dönüşümle korunabilir.	1	2	3	4	5
23. Sürdürülebilir kalkınma ve geri dönüşüm arasında bir ilişki yoktur.*	1	2	3	4	5
Ekonomik Değer					
24. Geri dönüşüm sadece pahalı ve değerli ürünler için yapılmalıdır.*	1	2	3	4	5
25. İnsanlar daha fazla gelir elde edebilmek için doğal kaynakları kullanabilir.*	1	2	3	4	5
26. Geri dönüşüm sürecinde yapılan masraflar yerine yeni bir ürün almak daha mantıklıdır.*	1	2	3	4	5
27. Geri dönüşümün ekonomik bir faydası yoktur. Bu nedenle geri dönüşüme gerek yoktur.*	1	2	3	4	5
28. Geri dönüşüm işlemi para israfına neden olur.*	1	2	3	4	5
29. Atıkların geri dönüşüm sürecindeki maliyetinden dolayı yerleşim yerlerinden uzağa atılmalıdır.*	1	2	3	4	5
30. Geri dönüşüm, kaynakların korunmasına yardımcı olur.	1	2	3	4	5
31. Geri dönüşüm maliyetli bir süreçtir.*	1	2	3	4	5
32. Eski bir ürünü hemen atıp yenisini alırım.*	1	2	3	4	5

* Olumsuz kodlanan ifadeler