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Developing a Literacy Scale for Renewable Energy Resources and Identifying the Literacy Levels of Pre-Service Science Teachers

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Abstract

This study aims to develop a valid and reliable literacy scale for renewable energy resources to identify the literacy levels of pre-service teachers for renewable energy resources and to reveal the literacy levels of pre-service science teachers for renewable energy resources. The survey model was used in the research. With the study, a 20 item 3 points Likert type Literacy Scale for Renewable Energy Resources consisting of two sub-dimensions was developed. The internal consistency coefficient of the first sub-dimension of the scale was .94 and the internal consistency coefficient of the second sub-dimension was .88, and the overall internal consistency coefficient of the scale was .91. After the scale was developed, it was administered to pre-service science teachers. It was found that pre-service science teachers got an average score of 22.82 from the scale, which can score at most 40. The results showed that the literacy level of pre-service science teachers towards renewable energy resources was at a medium level.

INTRODUCTION

In order to survive, a person places their life on very different internal and external balances that depend on each other. Perhaps the most important of such balances is the balance that a human has with their environment, which has been going on since existence. In other words, humans and the environment have been in an ongoing interaction for millions of years, and it is not possible to think of the environment outside of humans and independently of human activities. Therefore, human beings and all of their activities affect the environment and environmental resources and cause their destruction. With the transition from the living conditions that are determined by nature, to activities that are determined by humans, the most rapidly destroyed environmental resources are the non-renewable energy resources.

Today, rapid population growth, industrialization and technological developments cause an increase in the requirement for energy resources. A significant part of the worldwide energy production is provided by non-renewable energy sources consisting of fossil fuels. However, the fact that fossil fuels will be depleted in the near future, causing serious global damages by releasing CO_2 and greenhouse gases to the environment, and the encouragement of environmentally-friendly advanced and innovative technologies in accordance with the Kyoto Protocol drive people to renewable energy resources (Fırat, Sepetçioğlu, & Kiraz, 2012; Boz, 2020). Renewable energy sources are defined as clean and sustainable energy that is equal to the energy consumed from the energy source or can renew itself faster than the depletion rate

of the resource and that does not run out even though they are used (Yakıncı & Kök, 2017; MEB, 2018a). These resources are classified as solar energy, biomass energy, hydrogen energy, hydraulic energy, wave energy, geothermal energy and wind energy (Sülükçüler, 2018). A review of the literature reveals that public acceptance of environmentally-friendly energy sources such as solar, wind, hydroelectric, geothermal and biomass energy is an important factor (Wüstenhagen, Wolsink, & Bürer, 2007). However, incomplete or incorrect information about energy and energy resources in individuals appears as an obstacle in their search for solutions to environmental events such as global warming and in their choice of energy use (Akitsu, Ishihara, Okumura, & Yamasue, 2017; Demirbağ, 2019). According to Bodzin, Fu, Peffer and Kulo (2013), many research results reveal that individuals have an incomplete understanding of energy consumption habits and a lack of conceptual knowledge about non-renewable and renewable energy sources. Accordingly, concepts related to energy and energy resources should be included in the national curricula of countries (Bodzin, 2012). In our country, science (MEB, 2018b), biology (MEB, 2018c), geography (MEB, 2018d) and chemistry (MEB, 2018e) curricula include topics such as renewable energy sources, sustainable development, energy-saving, and the relationship of natural resources with the economy. The inclusion of the determined subjects in the curriculum is of great importance, especially in terms of environmental awareness and energy literacy. Because, in order to use natural resources in a sustainable and economical way, to transfer them to future generations, to raise awareness and consciousness about renewable energy sources, and to create sustainable environmental awareness, individuals who grow up should be environmentally and energy literate individuals.

Partnership for 21st Century Learning (P21) project, which is a strategic education project, explains the skills that individuals are expected to acquire in the 21st century. This project also includes energy literacy among the main topics of 21st century skills, and it is seen that global and environmental literacy skills are also among the skills and competencies that an individual should have. Global environmental literacy includes utilizing 21st century skills to understand and solve global issues. In addition, it is defined as skills and competencies such as knowing the environmental conditions related to air, climate, soil, energy and water; understanding the impact of the resource consumption rate of the society and the population growth on nature; taking individual and social measures for environmental problems (Gelen, 2017; Taşlıbeyaz, 2019; Boz, 2020).

The issue of energy, which is mostly referred to under the category of environmental literacy, is currently used as a separate term in the form of energy literacy with global climate change, increasing energy requirements and energy consumption gaining importance (Merritt, Bowers, & Rimm Kaufman, 2019). Energy literacy is defined as understanding the nature and the role of energy in the universe and our lives, finding answers to questions about energy with this understanding, solving problems, and making conscious emotional and behavioral choices about energy in daily life (DeWaters & Powers, 2011; Öykün & Abbasoğlu, 2017; Boz, 2020). Energy literacy is also described as having knowledge about the production and consumption of energy, developing alternative resources, using energy resources efficiently and being able to recognize the environmental, social and global effects of energy use (Fah, Hoon, Munting, & Chong, 2012). Energy literacy encompasses not only the understanding of the nature and role of energy in the world and our lives, but also the ability to apply this understanding to answer questions and solve problems (U.S. Department of Energy, 2017). Energy literacy emerges in the literature as a broad concept encompassing three dimensions: knowledge, attitude, and behavior (DeWaters, Qaqish, Graham, & Powers, 2013). A review of the relevant literature reveals that international studies have focused on energy literacy in

recent years, and studies have been conducted with different sample groups in many countries (Fah, Hoon, Munting, & Chong, 2012; Bodzin, Fu, Peffer, & Kulo, 2013; Brounen, Kok, & Quigley, 2013; Chen, Chou, Yen, & Chao, 2015; DeWaters, Qaqish, Graham, & Powers, 2013; Cotton, Miller, Winter, Bailey, & Sterling, 2015; Lee, Lee, Altschuld, & Pan, 2015; Sovaccol & Blyth, 2015; Horst, Harrison, Staddon, & Wood, 2016; Akitsu, Ishihara, Okumura, & Yamasue, 2017). However, it is worth noting that the number of studies on energy literacy in our country is quite limited (Görgülü Arı & Arslan, 2019; Güven, Yakar & Sülün, 2019; Oluk, Şengören & Babadağ, 2019; Boz, 2020). Studies on energy in our country primarily investigate the individuals' knowledge and awareness of, and attitudes towards renewable energy sources (Fırat, Sepetçioğlu, Kiraz, & 2012; Güneş, Alat, & Gözüm, 2013; Bozdoğan & Yiğit, 2014; Aygan & Zengin, 2017; Cebesoy & Karışan, 2017; Cırıt, 2017; Yenice & Tunç, 2018; Balbağ & Balbağ, 2019; Mertoğlu, 2019). However, energy literacy includes the cognitive (knowledge, understanding, skills), affective (sensitivity, attitudes) and behavioral (intention, participation, action) acquisitions of individuals in relation to energy, in addition to knowledge and awareness of, and attitudes towards energy resources (DeWaters & Powers, 2013; Lay, Khoo, Treagust, & Chandrasegaran, 2013). The energy literacy scale developed by DeWaters and Powers (2011) was also developed specifically to evaluate energy literacy in three basic dimensions: cognitive (knowledge), affective (attitudes, values) and behavior. The result of the reviews indicates that there is no study or measurement tool aiming to measure the literacy levels of individuals for renewable energy resources. From this point of view, with this research, it is aimed to develop a literacy scale for renewable energy sources, which is not included in the national and international literature. In particular, it is thought that the scale will contribute to this field for which a measurement tool has not been developed before.

The Purpose of Study

In today's world, global environmental problems and energy needs are increasing rapidly. Considering this situation, it is thought that it is of great importance to determine the literacy levels of individuals towards renewable energy resources and the effective use of these resources. Many countries around the world have initiated educational programs on renewable energy technologies and envisioned a review of the methods of teaching for renewable energy (Kandpal & Broman, 2014). This is because the entire population needs to be educated from an early age for a more comprehensive education on sustainable energy and the development of energy literacy (Göcük & Şahin, 2016). It is always the teachers who educate this population. Therefore, it is thought that it is extremely important to identify the literacy levels of teachers and pre-service teachers, who are the teachers of the future, in particular, for renewable energy sources. In this respect, this study aims to develop a valid and reliable literacy scale for renewable energy resources to identify the literacy levels of pre-service teachers for renewable energy resources, and to reveal the literacy levels of pre-service science teachers for renewable energy resources.

METHOD

Study Design

Aiming to develop a literacy scale for renewable energy resources and identify the literacy levels of pre-service science teachers for renewable energy resources, this study was conducted in two stages. The first stage of the study includes the process of developing a scale. The other stage includes the process of identifying the literacy levels of pre-service science teachers for renewable energy resources without any intervention. The second part of the research was therefore conducted with a general survey model, which is a type of

descriptive research. The general survey model aims to reveal the existing situation without any intervention to the past or present situation or events (Karasar, 2014).

Study Group

In the process of developing a literacy scale for renewable energy resources, which is the first stage of the research, a total of 242 pre-service teachers from various branches who were studying at a state university in Ankara in the spring semester of the 2018-2019 academic year were worked with. Such branches were identified as physics education, chemistry education, geography education, elementary education, biology education and science education in accordance with the contents and the target audience of the scale. Considering that the sample size in scale development studies should be at least five times the number of items that are included in the scale (Bryman & Cramer, 2001), it was determined that the size was sufficient. The distribution of the study group based on the department they study in is given in Table 1.

Table 1. Frequency distribution of the study group according to departments

Departments	f	%
Science Education	43	17.77
Biology Education	45	18.59
Chemistry Education	47	19.42
Physics Education	40	16.53
Geography Education	28	11.57
Elementary Education	39	16.12
Total	242	100.00

In the next stage of the research, the scale was applied to a total of 35 junior pre-service science teachers who were studying at the faculty of education of a state university in Ankara in the fall semester of the 2019-2020 academic year to identify their literacy levels of renewable energy resources.

The Process for the Development of the Scale

A review of the literature revealed that there were several valid and reliable scales of attitudes for renewable energy sources (Liarakou, Gavrilakis, & Flouri, 2009; Güneş, Alat, & Gözüm, 2013; Çelikler & Aksan, 2016; Zainudin & Ishak, 2019), a scale of awareness for renewable energy resources (Mutlu, 2016) and a scale of energy literacy (Dewaters, Qaqish, Graham, & Powers, 2013). However, it was identified that there were no scales of literacy for renewable energy resources.

This study was intended to contribute to the literature by developing a literacy scale for renewable energy resources and analyzing the literacy levels of pre-service teachers. In the first stage of the scale development process, various sources were reviewed, renewable energy sources were identified, and items that could identify the literacy levels of pre-service teachers were prepared for each. In this way, a pool of 48 items was created. When preparing the items, care was taken to ensure that all items contain a single case and that they are clear and understandable. The scale was prepared as a 3-point Likert-type scale, including the points of "Yes", "No" and "I don't have an opinion".

Experts were consulted for their opinions to ensure the content validity of the draft scale, which was prepared as a 3-point Likert-type scale with 48 items. The scale was reviewed by two faculty members serving at the science education department and one faculty member

serving at the biology education department for content validity; by one faculty member serving at the assessment and evaluation department for compliance with the assessment and evaluation criteria; and finally, by an expert for compliance with grammar rules and clarity. Language changes were made to the contents of seven items, and three items that did not measure literacy were removed from the draft pool based on the opinions that are received from experts. Thus, a draft scale with 45 items was obtained.

In the next stage, the draft scale was applied to 22 pre-service science teachers who were seniors; the incomprehensible items were revised based on the feedback for the sake of clarity received from the pre-service teachers; and the application time of the scale was determined as 15 minutes.

Data Analysis

The SPSS 21 statistical analysis program was used to analyze the data obtained from the research. Descriptive statistical techniques (mode, median, arithmetic mean, standard deviation) were used to determine the general distribution of the responses of pre-service science teachers for the developed scale and to examine whether the data showed normal distribution. Central tendency (mean, mode and median) and central distribution (standard deviation, skewness and kurtosis) values of the scale scores were reported. In addition, frequency and percentage distributions were used in the analysis of the data.

FINDINGS

Results of the Scale Development

The draft scale, which was prepared in line with the opinions that were obtained from both experts and pre-service teachers, was applied to a total of 242 pre-service teachers who were studying at various departments of the education faculty of a state university in Ankara.

The Kaiser-Meyer-Olkin (KMO) value of the scale was calculated as .88, and it was found through the Bartlett Sphericity test ($p < .05$) that there was a significant difference in the data. Since the fact that the KMO value was greater than .70 and there was a significant difference in the Bartlett Sphericity test was considered as appropriate for factor analysis, it was concluded that factor analysis could be performed on these data (Leech, Barrett, & Morgan, 2005; Tavşancıl, 2010). In the next stage, factor analysis was applied to the scale. With factor analysis, items with a difference of less than 1 among those with a factor load of less than .30, which were simultaneously under multiple factors (M1, M2, M3, M5, M7, M10, M11, M14, M15, M16, M19, M23, M25, M26, M27, M29, M30, M32, M33, M38, M40, M41, M42, M43, M45), were removed from the scale; the analyses were repeated, and the factor load values of 20 items which remained in the final scale, were indicated in Table 2 after the number of factors was identified. Items with factor load values that are below .50 were excluded from the scale. Consequently, it is seen that the factor load values of the items in the literacy scale literacy for renewable energy resources vary between .52 and .90. It is sufficient for the factor load values to be above .30 (Bryman & Cramer, 2001).

Table 2. Distribution of items to factors and their factor loadings

Item Number	Factor 1	Item Number	Factor 2
I21	.89	I31	.90
I22	.88	I35	.85
I20	.87	I36	.80
I17	.86	I39	.78
I6	.84	I4	.69

I9	.84	I24	.62
I8	.81	I18	.60
I13	.80	I12	.57
I44	.70	I28	.52
I34	.62		
I37	.60		

Factors with an eigenvalue that is greater than 1.00 emerged as a result of the analysis of the basic components of the scale and the inclusion of the items with factor loads that are suitable for the desired level in the scale. The eigenvalues of the first two factors are significantly greater than the eigenvalues of the other factors, while the eigenvalues of the factors other than these two factors are close to each other and do not show sharp declines in the scree plot chart. Factors with sharp declines in the chart point to the number of factors (Singh, 2007). With the "scree plot" test of Cattel on such factors (Kline, 1994), the chart in Figure 1 was obtained. For this reason, the scale was accepted to have two factors and the results of these two factors are presented in Table 3.

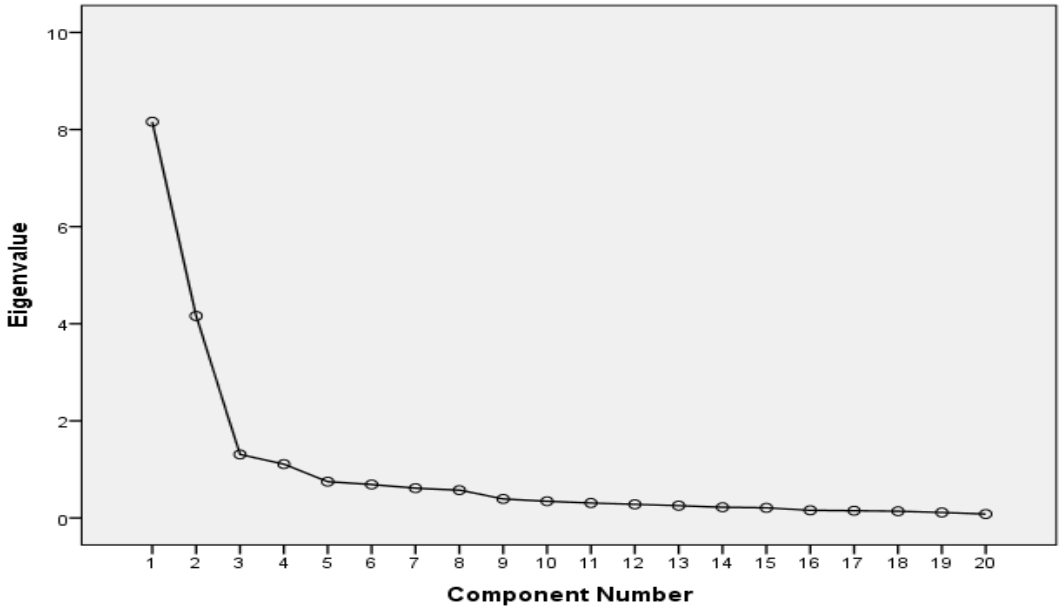

Figure 1. Literacy scale for renewable energy sources scree plot

Table 3. Factor analysis results

Factor	Eigenvalue	% of Variance	Cumulative %
1	8.16	40.80	40.80
2	4.16	20.79	61.59

Following the factor analysis, it was determined that 12 items in the scale were included in the first factor that is referred to as "Literacy in terms of the Types of Energy Resources, while 9 items were included in the second factor that is referred to as "Literacy in terms of Country and Environmental Problems". In addition, the items numbered I8, I13, I18, I21, I31, I34, I37, I39, I44 in the scale were identified as reverse items.

Finally, the internal consistency coefficient (Cronbach alpha) was calculated to determine the reliability of the scale. The internal consistency coefficient of the first and second sub-

dimensions, and the overall internal consistency coefficient of the scale were found to be .94, .88 and .91, respectively.

After the validity and reliability analyses were completed, a scale with two-sub-dimensions, which consists of 20 items, was obtained. The lowest and highest scores that can be received from the scale were identified as 0 and 40, respectively. In determining the cut-off points, the mean value ± 1 Standard deviation statistical approach, which was used by Tabacchi et al. (2020) in the food literacy scale was used to determine the breakpoint for categorizing individuals based on low, medium and high literacy for renewable energy sources. Therefore, one standard deviation below, and 1 standard deviation above the average score, and scores between the two indicate low literacy (scores below 16), high literacy (scores above 33), and medium literacy (scores between 16 and 33, including both), respectively. The scale is presented in the appendix.

After this stage, the scale was applied to junior pre-service science teachers, and their levels of literacy for renewable energy resources were identified.

Descriptive results regarding pre-service science teachers' literacy scale scores

After confirming the validity and reliability of the literacy scale for renewable energy resources (SLRER), the scale was applied to the pre-service science teachers, and the results for the responses of the pre-service teachers to the items in the scale are given in Table 4 and Table 5.

Table 4. Descriptive results regarding pre-service science teachers' literacy scale scores

Scale	N	M	Sd.	Mod	Median	Kurtosis	Skewness
SLRER	35	22.82	2.53	24.00	23.00	-.28	-.28

When the values given in Table 4 are examined, it is observed that the mode median and arithmetic mean have values that are close to each other. In addition, when the kurtosis and skewness values are examined, it is observed that these values are between -2 and +2. In this case, it can be stated that the data show a normal distribution (George & Mallery, 2003). When Table 4 is examined, it is determined that the total average score of the pre-service science teachers for the scale was 22.82. Based on this value, it was concluded that the literacy level of pre-service science teachers for renewable energy resources was medium.

Information on the percentage-frequency distribution of the responses of the pre-service teachers to the items in the scale is provided in Table 5.

Table 5. Percentage and frequency distribution of pre-service teachers' responses to the scale

	Yes		I don't have an opinion		No	
Scale Items	%	f	%	f	%	f
Item 4	51.4	18	25.7	9	22.9	8
Item 6	82.9	29	11.4	4	5.7	2
Item 8	-	-	2.9	1	97.1	34
Item 9	57.1	20	31.4	11	11.4	4
Item 12	68.6	24	14.3	5	17.1	6
Item 13	17.1	6	20.0	7	62.9	22
Item 17	85.7	30	14.3	5	-	-
Item 18	5.7	2	20.0	7	74.3	26
Item 20	91.4	32	5.7	2	2.9	1

Item 21	-	-	22.9	8	77.1	27
Item 22	75.3	26	25.7	9	-	-
Item 24	85.7	30	5.7	2	8.6	3
Item 28	77.1	27	17.1	6	5.7	2
Item 31	8.6	3	8.6	3	82.9	29
Item 34	68.6	24	17.1	6	14.3	5
Item 35	74.3	26	17.1	6	8.6	3
Item 36	85.7	30	8.6	3	5.7	2
Item 37	20.0	7	17.1	6	62.9	22
Item 39	11.4	4	17.1	6	71.4	25
Item 44	14.3	5	20.0	7	65.7	23

When the data obtained from Table 5 are examined, it is seen that the distribution of the responses of the pre-service science teachers to the scale varies according to the items. However, the responses that are given to four items stand out. First of all, almost all the pre-service teachers responded as no to the item, “Fossil fuels are renewable energy sources because they are formed as a result of natural processes”. Likewise, there were no pre-service teachers who responded “No” to the item, “Geothermal energy is formed by the heat accumulated in the depths of the earth’s crust as hot water, steam and gases”. Once again, no response of “No” was received from the pre-service teachers for the item, “Hydroelectric energy is obtained as a result of the difference in potential energy that water has”. Finally, a majority of the pre-service teachers responded “No” to the statement “Coal, oil and natural gas are some of the renewable energy resources”. According to the mentioned situations, it was seen that the pre-service teachers mostly had correct information about the mentioned items.

CONCLUSION, DISCUSSION AND SUGGESTIONS

In this research, a valid and reliable scale that aims to measure the literacy level of pre-service teachers for renewable energy resources was first developed. A review of the studies where a measurement tool on the subject was developed, revealed that there was only one study where an energy literacy scale was developed (Dewaters, Qaqish, Graham, & Powers, 2013). However, as emphasized before, no other measurement tools to measure the level of literacy for renewable energy sources were found in the literature.

The developed literacy scale for renewable energy resources was then applied to pre-service science teachers, whose literacy levels for renewable energy resources were examined. While the responses of the pre-service science teachers to the items in the scale differ based on the items, it was concluded that the literacy levels of the pre-service teachers for renewable energy sources were at a medium level. In most of the undergraduate programs, there is no course in which only renewable energy resources are explained, the importance of these resources is emphasized for a long time and literacy education is given for these resources. However, in the content of environmental courses, the subject of renewable energy sources is mentioned. It is thought that this is the reason why the literacy levels of the candidates for renewable energy sources are at a medium level. Although there are no studies in the literature, which directly measure the literacy levels of pre-service teachers for renewable energy resources, there are study results which show that pre-service teachers have a medium-level, positive attitude towards, and also a medium-level awareness for renewable energy resources. For example, in their study, Emlik (2017) concluded that the attitudes of pre-service teachers towards renewable energy resources were at a medium level. Similarly, in both the studies conducted by Bilen, Özel, and Sürücü (2013) and Akçöltekin and Doğan

(2013), it was observed that the attitudes of the pre-service teachers towards renewable energy were positive. However, both studies concluded that the pre-service teachers did not have sufficient knowledge about renewable energy sources. As a result of the study conducted by Tiftikçi (2014), it was observed that the renewable energy awareness levels of the students of science faculties and education faculties were at a medium level. Similarly, the study conducted by Yenice and Tunç (2018) found that the awareness of pre-service science teachers for environmental problems was at a positive level, while their attitudes towards renewable energy resources were close to a positive level.

The answers given to the items in the scale were examined. It was found that the pre-service teachers generally had high levels of literacy for the items in the "Literacy in terms of the Types of Energy Resources" dimension of the scale. However, it was observed that many pre-service teachers had higher levels of literacy, particularly for solar, wind, geothermal and hydroelectric energy compared to other renewable energy resources. The reason for this situation is that our country is in an extremely favorable position, especially in terms of hydraulic, geothermal, wind and solar energy potentials. Turkey uses energy sources such as hydraulic, wind, solar and geothermal more than other renewable energy sources to meet its electricity needs. In this respect, it is thought that pre-service teachers have a high level of literacy, especially for these resources. This situation is exactly in line with the results of the research conducted by Zyadin et al. (2014). Zyadin et al. (2014) found in their study that teachers have more knowledge about renewable energy resources such as solar, wind and geothermal energy, in particular, compared to other energy resources. Similarly, in the study conducted by Cebesoy and Karışan (2017), it was found that pre-service science teachers had more information about solar, wind, geothermal and hydroelectric energy and biomass than other types of energy, which are hydrogen and wave energy. However, unlike the findings of this study, the studies conducted by Çelik (2017) and Cırıt (2017) found that the pre-service science teachers did not have sufficient knowledge about the concept of renewable energy and energy resources, and the candidates could not distinguish between renewable and non-renewable energy resources. A review of the responses in Table 5 revealed that pre-service teachers were able to distinguish between renewable and non-renewable energy sources, and most of them did not view fossil fuels such as coal, oil and natural gas as renewable energy resources. However, in contrast to this, the study conducted by Saraç and Bedir (2014) concluded that some teachers lacked knowledge of renewable energy and were confused about the concepts in relation to renewable and non-renewable energy resources.

When the responses given by the pre-service teachers to the items related to the "Literacy in terms of Country and Environmental Problems" dimension of the scale were examined, the responses given to a few items, in particular, were noteworthy. Almost all the pre-service teachers viewed renewable energy resources as more environmentally friendly than fossil fuels, and thought that the use of such resources was of great importance in preventing the greenhouse effect and global warming. It is thought that pre-service teachers see renewable energy sources as more environmentally friendly than fossil fuels because of the environmental education they have received. Pre-service teachers take various environmental courses during their undergraduate education. The content of these courses includes topics such as environmental pollution, causes and consequences of environmental problems. Pre-service teachers who take these courses during their undergraduate education learn that one of the biggest causes of environmental problems is the increase in the use of fossil fuels. With the increase in population and industrialization, there is an increase in the use of fossil fuels and therefore carbon emissions. This results in the greenhouse effect and global warming. In line with the education they received, pre-service teachers establish this connection between

fossil fuels and the greenhouse effect/global warming and see renewable energy sources as more environmentally friendly. A review of the literature reveals that the studies on the subject support this result. In their study, Perez-Lombard, Ortiz, and Pout (2008) mentioned issues such as energy use, depletion of energy resources, thinning of the ozone layer, global warming and climate change in a rapidly developing world, and emphasized that studies should be carried out for the effective use of renewable energy. The results of the study conducted by Cebesoy and Karışan (2017) revealed that pre-service teachers view renewable energy as a permanent solution. It was seen that the pre-service teachers explained the reason for this thought as the fact that such resources cannot be depleted and they are harmless to the environment. In another study conducted by Bozdoğan and Yiğit (2014), it was concluded that pre-service teachers who were studying in various branches, support energy generation types, and view renewable energy resources as environmentally-friendly resources that do not harm the environment and human health. Likewise, the study conducted by Çelikler, Aksan, and Yılmaz (2017) found that students were aware that renewable energy resources were environmentally friendly. However, contrary to the results of this study, the study conducted by Halder, Havu-Nuutinen, Pietarinen, Zyadin, and Pelkonen (2014) concluded that science teachers did not have enough information about the effects of renewable energy resources on the environment, even though they had an acceptable level of knowledge about such resources. Again, one of the items in the table, which stand out, is the view of the vast majority of the pre-service teachers, indicating the lack of awareness on renewable energy resources as one of the reasons for their low level of use. Similarly, the study conducted by Kaldellis, Kapsali and Katsanou (2012) in Greece found that the public had a positive attitude on renewable energy, as their knowledge on it increased. In the literature, it is also emphasized that the public acceptance of environmentally-friendly energy resources is an important factor and that incomplete or incorrect information about energy and energy resources in individuals is an obstacle for them to seek solutions to environmental events such as global warming, and prefer to use appropriate energy (Wüstenhagen, Wolsink, & Bürer, 2007; Jennings, 2009; Kilinç, Stanisstreet, & Boyes, 2009; Akitsu, Ishihara, Okumura, & Yamasue, 2017; Demirbağ, 2019).

The environmental problems we face today and the rapid depletion of non-renewable energy resources, particularly fossil fuels, have drawn the attention of all the countries in the world to renewable energy resources. In this context, individuals who make up the societies should gain literacy for renewable energy resources to understand them, gain an awareness of and attitude towards this issue, and make conscious decisions in the selection of energy resources. In this respect, identifying and improving the literacy levels of teachers and pre-service teachers, who are the educators of the future societies, for renewable energy resources is considered to be quite important. In light of this information, studies for identifying the literacy levels of teachers and pre-service teachers who serve/study in various branches, for renewable energy resources can be conducted as future research.

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APPENDIX

YENİLENEBİLİR ENERJİ KAYNAKLARINA YÖNELİK OKURYAZARLIK ÖLÇEĞİ			
İfadeler	**Evet**	**Fikrim Yok**	**Hayır**
4. Yenilenebilir enerji kaynaklarının kullanımı ülkenin enerjide dışa bağımlılığını azaltır.			
6. Dünyanın temel enerji kaynağını oluşturan güneş, aynı zamanda en önemli yenilenebilir enerji kaynağıdır.			
8. Fosil yakıtlar doğal süreçler sonucu oluştuğu için yenilenebilir enerji kaynaklarıdır.			
9. Biyokütle enerjisi doğada yaşamını sürdüren hayvan ve bitkilerin atıkları ile üretilen enerji çeşididir.			
12. Doğayı korumak için yalnızca yenilenebilir enerji kaynaklarının kullanılması yeterli değildir.			
13. Dalga enerjisi yenilenemez bir enerji çeşididir.			
17. Jeotermal enerji, yer kabuğunun derinliklerinde birikmiş olan ısının yüzeye sıcak su, buhar ve gazlar olarak çıkması ile oluşur.			
18. Yenilenebilir enerji kaynaklarının kullanımı çok büyük maliyetler gerektirdiği için devamlı kullanılması çevre için daha zararlıdır.			

20. Rüzgâr enerjisi elektrik enerjisinin temin edilmesinde kullanılır.			
21. Kömür, petrol, doğalgaz yenilenebilir olan enerji kaynaklarından bazılarıdır.			
22. Hidroelektrik enerji suyun sahip olduğu potansiyel enerji farkı sonucu elde edilir.			
24. Yenilenebilir enerji kaynaklarının kullanımı sera etkisi ve küresel ısınmanın önlenmesinde büyük önem taşır.			
28. Fosil yakıtlar insan, hayvan ve sanayi tesislerinin istismarı sonucu yakın gelecekte tamamen tükenme tehlikesi ile karşı karşıyadır.			
31. Yenilenebilir enerji kaynaklarının kullanılması ülke ekonomisine katkı sağlamaz.			
34. Jeotermal kaynaklardan biyokütle enerjisi elde edilir.			
35. Çevre kirliliğini önlemede yalnızca bir ülkenin yenilenebilir enerji kaynaklarını kullanması yeterli değildir.			
36. Yenilenebilir enerji kaynaklarının az kullanılmasının nedenlerinden biri de bu konudaki bilinçsizliktir.			
37. Artan enerji talebini karşılayabilmek için fosil yakıtların kullanımına ağırlık verilmelidir.			
39. Yenilenebilir enerji kaynaklarının kullanımı doğal kaynakların daha hızlı tükenmesine neden olur.			
44. Nükleer enerji de bir çeşit yenilenebilir enerji kaynağıdır.			

Note: 8, 13, 18, 21, 31, 34, 37, 39, 44 are reverse items.