Necmettin Erbakan Üniversitesi
Ahmet Keleşoğlu Eğitim Fakültesi Dergisi (AKEF)
Journal of Ahmet Keleşoğlu Education Faculty
DOI: 10.38151/akef.65

Cilt: 5 Sayı:2 Yıl: 2023 | Araştırma Makalesi / Research Article | E-ISSN: 2687- 1750

The Opinions of Eighth Grade Students on Renewable Energy Sources in their Environment: A Local Perspective

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Article Info

Article History
Received: 08.05.2023
Accepted: 21.09.2023
Published: 30.09.2023

Keywords:
Renewable Energy Sources,
Opinion,
Middle School Students,
Local Issues

ABSTRACT

Renewable and local energy sources have great importance in meeting the energy needs of individuals. Students' opinions on renewable energy sources (RES) in the environment they live in are considered important as they will be decision-makers in the future. The current study is aimed at determining the opinions of eighth grade students about RES in their environment. In this research, phenomenology design from the qualitative research method was used. 31 eighth-grade students participated in the study in the 2021-2022 school year from Gaziantep's Nizip district. The participating students were determined by using convenience sampling, which is one of the purposive sampling methods. The research, in which a semi-structured interview form was used, was analyzed according to content analysis. The findings revealed that, according to the participants, the most used renewable energy in their environment is solar energy. The students' answers about the characteristics of RES showed that they have knowledge about this subject. However, their giving only solar, wind, and hydroelectric energies as examples of RES shows that their opinions on this subject are limited. The students' answers about the positive effects of RES on the environment showed that their awareness is high. However, it was revealed that the participants did not have enough awareness about this issue when the negative effects of RES were examined. Given both the local and global importance of energy-related issues, it is recommended to discuss the characteristics specific to different regions in future research.

Sekizinci Sınıf Öğrencilerinin Çevrelerindeki Yenilenebilir Enerji Kaynaklarına Yönelik Görüşleri: Yerel Bir Bakış Açısı

Makale Bilgileri

Makale Geçmişi
Geliş: 08.05.2023
Kabul: 21.09.2023
Yayın: 30.09.2023

Anahtar Kelimeler:

Yenilenebilir Enerji Kaynakları,
Görüş,
Ortaokul Öğrencileri,
Yerel Konular

ÖZ

Bireylerin enerji ihtiyaçlarının karşılanmasında yenilenebilir ve yerel enerji kaynakları büyük önem taşımaktadır. Öğrencilerin yaşadıkları çevredeki yenilenebilir enerji kaynaklarına (YEK) ilişkin görüşleri, geleceğin karar vericileri olarak önemsenmektedir. Bu çalışmada, sekizinci sınıf öğrencilerinin yaşadıkları çevredeki YEK'lere ilişkin görüşlerinin belirlenmesi amaçlanmıştır. Çalışma fenomenoloji (olgubilim) yöntemine göre tasarlanmıştır. Çalışmaya 2021-2022 eğitim öğretim yılında Gaziantep'in Nizip ilçesinden 31 sekizinci sınıf öğrencisi katılmıştır. Katılımcı öğrenciler amaçlı örnekleme yöntemlerinden kolay ulaşılabilir model kullanılarak belirlenmiştir. Yarı yapılandırılmış görüşme formu kullanılan araştırma içerik analizine göre analiz edilmiştir. Bulgular, katılımcıların çevrelerinde en çok kullanılan yenilenebilir enerjinin güneş enerjisi olduğunu ortaya koymuştur. Ancak YEK'e sadece güneş, rüzgâr ve hidroelektrik enerjileri örnek olarak vermeleri, bu konudaki görüşlerinin sınırlı olduğunu göstermektedir. Öğrencilerin YEK'in çevre üzerindeki olumlu etkilerine ilişkin cevapları, farkındalıklarının yüksek olduğunu göstermiştir. Ancak YEK'in olumsuz etkileri hakkında verdikleri cevaplar incelendiğinde, katılımcıların bu konuda yeterli farkındalığa sahip olmadıkları ortaya çıkmıştır. Enerji ile ilgili konuların hem yerel hem de küresel önemi göz önüne alındığında, gelecekteki araştırmalarda farklı bölgelere özgü özelliklerin tartışılması önerilmektedir.

Atıf/Citation: Öztürk, S., Tekin, N. & Yılmaz, S. (2023). The Opinions of Eighth Grade Students on Renewable Energy Sources in their Environment: A Local Perspective. *Ahmet Keleşoğlu Eğitim Fakültesi Dergisi (AKEF) Dergisi*, 5(2), 474-487.

INTRODUCTION

Energy, which contributes to human life in every aspect of daily life and affects every field from transportation to communication to housing, has undeniable importance. With the industrial revolution, the world has entered a rapid and irreversible process of change. This situation brings the need for energy and the global and local problems to be caused by its absence directly to our agenda. Energy is a crucial factor used by the citizens of any country in their daily lives and for the industrial growth of countries (Kılıçaslan et al., 2011). According to Doğru and Demirbaş (2020), energy is a consumption commodity used as an input in many sectors, from industry to housing. The desire of human beings to lead a prosperous life, the competition among countries in order to have a say in the world economy, the rapid population growth in the world and in Türkiye and the rapidly continuing global scale industrialization cause the need for energy to increase with each day all over the world. According to Nakıpoğlu et al. (2020), this energy need doubled between 2010 and 2018. On the other hand, the rate of foreign dependency for Türkiye in energy is around 74% (Ministry of Foreign Affairs [MFA], 2020). According to Akkaya (2019), energy demand is expected to increase by 65% in developing countries and by 35% worldwide up to 2040.

Considering the increase in energy consumption, the fact that fossil fuels are still used, and the damage they cause to the environment and human health, these non-renewable resources mean that they will not be able to meet the energy needs of countries soon. The reserves of non-renewable energy sources such as oil, coal, and natural gas are decreasing with each passing day around the world (Akanlar, 2019). This means that fossil fuels will run out before the end of the 21st century.

The unconscious use of energy sources by human beings to lead a comfortable life causes many climate-related disasters. The direct correlation between global climate change, energy consumption, and development has led scientists to discover new, clean, economical, reliable, and alternative energy sources for the world. In the existing research, it is recommended to use renewable energy sources (RES) that have less negative impact on the environment instead of fossil fuels for the future of the world (Harjanne & Korhonen, 2019). In this regard, it is important for everyone in society to fulfill their responsibilities (DeWaters & Powers, 2011). RES are defined as natural and sustainable, always renewed, pure, and clean sources (Omorogiuwa & Ejiroro, 2020). According to Koç and Kaya (2015), examples of RES are solar, biomass, wind, wave, hydroelectric, and tidal energy sources.

Countries that use RES consciously and correctly, which reduces foreign dependency in terms of energy, will gain an important place in the global economy (Çelik, 2017). Use of RES will also reduce air pollution and ecological footprints and make important contributions to environmentally friendly energy production and consumption worldwide. This shows how important renewable energy is globally. According to Akkaya (2019), the most important factor showing the development of a country is its use of clean, reliable, and low-cost energy. In this regard, it is important to raise individuals who have gained a sense of responsibility towards the environment by increasing the interest and awareness of RES on a local scale as well as on a global scale.

The relevant literature is reviewed; there are studies investigating the cognitive structures of middle school students on RES (Özyurt & Ercan Yalman, 2020), perceptions of RES (Çökelez et al., 2009; Yıldırım et al., 2019), attitudes towards RES (Demirbağ, 2019; Elmas, 2018), the effect of renewable energy-oriented teaching on academic success and knowledge (Aslan, 2015; Okuyucu, 2011), and opinions on RES (Çelikler et al., 2017; Şahintürk, 2014). For example, Yıldırım et al. (2019) examined students' perceptions of RES and concluded that the examples given about renewable and non-RES are not sufficient. Demirbağ (2019) examined students' opinions on the use of RES within the scope of the theory of planned behavior and concluded that middle school students' opinions on RES use are positive. Elmas (2018) determined that the cognitive structures of students on RES are at a good level, their cognitive structures related to emphasizing the importance of RES are at a medium level, and they are at a lower level than expected in explaining the subject of energy transformations. Çökelez et al. (2009) found that middle school students are insufficient at making sense of energy sources in their minds.

Şahintürk (2014) examined the effect of science applications with socio-scientific content on the opinions of middle school students about RES. As a result of their study, the constructivist approach method, including the teaching of lessons through science applications with socio-scientific content, improved the mental processes of the students. Çelikler et al. (2017) examined eighth grade students' views on RES. They determined that middle school students are aware of RES and most of the environmental problems caused by energy sources, but that they have incomplete knowledge.

The literature review shows that middle school students' perceptions, cognitive structures, and attitudes related to RES have frequently been addressed in studies. When studies have been examined locally, in Atasoy et al.'s (2018) study carried out with 23 seventh grade students studying in the Black Sea region, the students' judgement about the hydroelectric power plants in the region was examined and found to be high. On the other hand, Alam et al. (2016) concluded in their study carried out with 200 participants in the Klang Valley of Malaysia that local awareness of renewable energy is lacking; in the study conducted with 617 students studying in private and public schools in Al-Karak, a religious city in Jordan, it was determined that female students had a high awareness of RES. Students generally had confusion about bioenergy, geothermal energy, fossil fuels, and nuclear energy. Although they completed the nature of renewable energy correctly, this situation varies according to the gender and school types of the students. In addition, according to Zyadin's (2015) study, two-thirds of the installation of solar energy and wind energy turbines in their regions is in relation to their knowledge of RES. Topçu and Atabey (2017) concluded in the study carried out with 31 seventh grade students in the city center of Muğla that the students developed their argumentation skills during the field trip they organized to thermal, wind, and hydroelectric power plants in their region. In this respect, it is very important for individuals to be conscious about RES and the environment (Halder et al., 2011). Therefore, it is vital for the future of the region and the country that local energy can be used or discussed by the people of the region. The Gaziantep province is rich in RES. As in the whole Türkiye, Gaziantep is a very important city in terms of renewable energy potential (Kum et al., 2019). Gaziantep is one of the cities in the South-Eastern Anatolia Region, which has a high energy need for its industry (Kum et al., 2019). Currently, 12 natural gas, 18 solar energy, six cogeneration, one biomass, one biogas, two hydroelectric, and two wind power plants serve as electricity generation power plants in Gaziantep (Energy Atlas, 2023). With this study, students will have the opportunity to think about why and how societies should use renewable energy, what effects this may have on natural systems, and what alternative options are available for energy use in their environment. In this sense, it can be localized to Gaziantep in order to make them think about the future of these energy sources in the world beyond Gaziantep.

The reduction of foreign dependency in terms of energy as well as employment and economic development is an important issue that is frequently included in the science curriculum. Expanding the use of RES in the environment of individuals is possible with the development of the opinions of students, who will be the decision-makers about these sources in the future. It is thought that this study will contribute to the literature in terms of creating a perspective that brings locality to the fore. Therefore, the study aims to determine the opinions of eighth grade students about RES in their regions. In line with this purpose, there are the following research questions:

1. What are the eighth-grade students' opinions of the energy sources they encounter in their environment?

2. What are the eighth-grade students' opinions on renewable energy sources?

3. What are the eighth-grade students' opinions on the effects of renewable energy sources on the environment?

METHOD

Research Design

In the current study, which aims to determine the opinions of the students about RES in their region, the phenomenology model, one of the qualitative research designs, was used. Phenomenological design is the process of interpretation by the researcher for the meaning of individuals' experiences (Creswell, 2012). In phenomenological studies, it is aimed at revealing and interpreting individual perceptions of a phenomenon (Büyüköztürk et al., 2019).

Participants

The study was designed with 31 (18 girls, 13 boys) eighth grade students using the purposive sampling method from among the students attending a middle school located in the Nizip district of the city of Gaziantep. The study was carried out within the scope of the eighth-grade science course in the spring term of the 2021–2022 school year. The information that is expected to be gained about RES among the participating students in the previous levels of education according to the 2018 science curriculum (Ministry of National Education [MNE], 2018) is given in Table 1. Accordingly, the students are expected to have prior knowledge about energy sources.

Table 1. *Learning Outcomes Related to Renewable Energy in The Science Curriculum (MNE, 2018)*

Learning Outcomes
F.6.4.4.1. Classifies fuels as solid, liquid, and gaseous fuels and gives examples of commonly used fuels.
F.7.5.1.4. Gives examples of innovative applications of solar energy in daily life and technology.
F.7.5.1.5. Discusses his/her ideas on how to utilize solar energy in the future.

The convenience sampling method, one of the purposive sampling methods, was used to determine the participants. This method facilitates the research process by allowing the researcher to choose cases that are easy to reach in terms of time and location (Büyüköztürk et al., 2019; Özmen & Karamustafaoğlu, 2019). The main reason for choosing the convenience sampling method is that the students at the school where the first author of the study works can be reached more easily. Moreover, in order to focus on the issue of the locality of energy, the city of Gaziantep is thought to be a good choice as an important industrial city. Information about the students is given in Table 2.

Table 2. *Information About the Students*

Variable	**Group**	**n**	**%**
Gender	Female	18	58,06
	Male	13	41,94
Grade	Grade 8	31	100
Total		31	100

Research Instruments and Processes

A semi-structured interview form was used as a data collection tool developed by the first researcher. There are four questions in the interview form. These questions were prepared to elicit information about (1) the energy sources that the participants encountered in their region; (2) the characteristics, examples, and ways of producing renewable energy; (3) the positive effects of RES on the environment; and (4) the negative effects of RES on the environment. In order to ensure credibility, confirmability, and transferability in the study, the data collection tool was prepared by considering the objectives set in the science curriculum (MNE, 2018) and submitted to the review of four different field experts, two physics educators and two science educators, in terms of its compatibility with the curriculum. These experts reviewed the scientific suitability of the semi-structured interview form, the scope of the data collection tool, language, and expression. Which interview question covers which objectives is given in Table 3.

Table 3. *Question Distribution According to the Science Curriculum (MNE, 2018)*

Learning Outcomes	Question Distribution
F.8.7.3.3. Explains how electrical energy is produced in power plants. Hydroelectric, thermal, wind, geothermal and nuclear power plants are mentioned.	1, 2
F.8.7.3.4. Generates ideas about the advantages and disadvantages of power plants. Students are asked to generate and defend their ideas about the evaluation of power plants in terms of benefits, disadvantages and risks.	3, 4

During the data collection process, four semi-structured interview questions were asked of the students. During the interview, data was collected from volunteer participants by taking voice recordings in environments where they could express themselves. The participants were asked for their permission to tape-record the interview, and while 18 of them allowed their interviews to be tape-recorded, 13 did not. The answers of the participants who did not allow voice recording were noted by the first researcher. The interviews were completed in 15-20 minutes with each participant.

Data Analysis

In this study, the content analysis method was used to evaluate the obtained data. Content analysis involves the interpretation of the data obtained considering themes and categories by creating codes and organizing them (Özmen & Karamustafaoğlu, 2019). Data analysis was obtained from the interviews, and the audio recordings taken during the interviews were transcribed and analyzed. Afterwards, the data was categorized into meaningful codes. Based on these codes, themes were created that express the data more generally and collect the codes under certain categories. Since some participants reported more than one opinion for the same category, the opinions of the participants were placed in all the appropriate codes. The data was coded separately by researchers, and the codes were compared with each other. The researchers made the final decision by checking the points they could not decide on in the first round of coding. During the analysis of the qualitative data, the coding of the researchers was compared, and the percentage of agreement was calculated according to Miles and Huberman's (1994) formula ([Agreement / (Agreement + Disagreement) x 100]), and the percentage of agreement was calculated to be 80% in the first round. The statements on which the researchers could not agree in the first round were found to consist of definitions or examples that the students could not decide on. The sections where there were disagreements were re-evaluated, and the content analysis was finalized by reaching a consensus, and the final percentage of agreement on coding was calculated to be 90%. This shows that the results obtained are reliable. The data are given together with their frequencies in tables containing themes, categories, and codes. In the presentation of the findings, codes such as S1, S2... are used instead of the real names of the participants to keep their identities confidential. In addition, the findings are supported with direct quotations from the statements of the students, and the results are interpreted.

Ethic

Aksaray University Human Research Ethics Committee approved this study to comply with ethical principles (25.10.22, 2022/07-26).

FINDINGS

In this part of the study, which examines the opinions of the students on RES, the findings obtained from the interviews with the participants are presented.

The Opinions of the Students on the Energy Sources in their Environment

The findings obtained from the statements of the students about the energy sources used in their environment are given in Table 4.

Table 4. *The Opinions On Energy Resources Encountered in the Environment*

Theme	Category	Code (f)
Energy sources	Renewable	Solar (18)
		Wind (10)
		Water (9)
	Non-renewable	Natural Gas (15)
		Coal (12)
		Wood (2)
	Inappropriate answers	Gasoline (1)
		Soil (1)
		Electric transformer (1)

According to Table 4, the participants gave only solar (f=18), wind (f=10) and water (f=9) as examples of RES used in their environment. Natural gas (f=15) and coal (f=12) were the most given examples of non-RES. Below are sample statements of the participants:

"We use natural gas and some energy is obtained from the energy of the water from the dam in Karkamış." (S7, Non-renewable)

"I read about it in a news article. Some regions in Gaziantep get a lot of wind and they produce energy by putting wind turbines in those regions…" (S13, Renewable)

"Since Antep is a very hot place, we take advantage of the sun. And there are windmills in the mountains on the way to Adana." (S14, Renewable)

"I don't think wind energy is used, but we definitely benefit from the sun." (S20, Renewable)

"We have solar energy in our garden; we get electricity because our village is in a distant place." (S27, Renewable)

Participants explained which of the energy sources they mentioned are renewable/which are non-renewable and the reasons for their being renewable or non-renewable as follows:

"Solar, wind and natural gas are renewable because these resources are always in our lives, we can use them all the time and they never run out." (S13, Renewable)

"The sun, wind are renewable energy because they are endless, they never run out. Wood and coal cannot be reused and will one day run out underground." (S8, Renewable)

"The wind, the sun are renewable because we can get the energy and use it again and again." (S12, Renewable)

"…Water power is renewable because every time it rains, dams refill, hatches open, and electricity is stored." (S24, Renewable)

The Opinions of the Students on RES

The findings regarding the students' opinions on RES are given in Table 5.

Table 5. *The Opinions on RES*

Category	Code (f)
Characteristics of renewable energy	Constantly renewed (16)
	Endless (7)
	Not harming the nature (5)
	Long life (2)
Example of RES	Solar energy (25)
	Wind energy (22)
	Hydroelectric energy (13)
	Geothermal energy (2)
	Hydrogen energy (2)
	Thermal power plant (4)
	Underground resources (2)

		Naturel Gas (2)
Ways to produce RES		Sun (18) Wind (17) Water (6)

In Table 5, the students expressed renewable energy as being constantly renewed (f=16), endless (f=7) and not harming the nature (f=5). It is seen that more than half of the students who gave examples to RES mentioned solar energy (f=25) in their explanations and then wind energy (f=22) and hydroelectric energy (f=13) were given as examples to RES. Most of the students stated that renewable energy is obtained from the sun (f=18) and wind (f=17). Below are sample statements of the participants:

"Since South-eastern Anatolia is very hot we benefit from solar energy thanks to solar panels, so renewable energy can be energy that is not harmful to nature. Examples include solar panels and wind turbines… from dams… Because the water flows so fast, the water spins the instrument and electricity is stored."(S1, Not harming the nature).

"Renewable energy is reusable. Less harmful than coal. I think it could be solar, hydroelectric, thermal power plants… Energy is obtained from the rays of the sun… Energy is produced as the wind blows."(S4, Endless).

"Renewable energy is not finite, it comes from nature and does not harm the environment. Geothermal, solar, wind and hydraulic energy can be given as examples of renewable energy sources… Solar energy is obtained from the heat and light of the sun… Hydraulic energy comes from water… Wind energy comes from wind."(S10, Not harming the nature).

"It is the energy that we can't finish. Since it is nature itself, we can continuously reuse it. I have heard of solar energy, wind energy and hydrogen energy." (S31, Constantly renewed).

"Solar, wind and natural gas are renewable…" (S13, Renewable).

"Hydroelectric, that is, the energy of water, is an example of renewable sources…" (S29, Renewable).

The Opinions of the Students about the Effects of RES on the Environment

The findings obtained from the opinions of the students about the effects of RES on the environment are presented in Table 6.

Table 6. *The Opinions on the Effect of RES on the Environment*

Theme	**Category**	**Code (f)**
Impact on the environment	Positive	Prevention of global warming (11) Not causing environmental pollution (10) Electricity generation (8) Living things (6)
	Negative	Environmental pollution (6) Harming living things (4) Costly (2)
	Ineffective	No effect (15)

According to Table 6, the most frequently mentioned positive effect of RES by the participants is the prevention of global warming (f=11), followed by their not causing environmental pollution (f=10), their contributing to electricity generation (f=8) and their positively affecting the life of all living things (f=6). Some of the participants on the other hand stated that RES have some negative effects in terms of environmental pollution (f=6) and harming living things (f=4). Below are sample statements of the participants:

"Renewable energy does not harm the environment, it is said so in the books..." (S5, Not causing environmental pollution)

"Renewable energy can prevent global warming that harms nature. Does not cause air pollution." (S14, Prevention of global warming)

"It can be reused again and again as wind, water and the sun are endless. They do not emit harmful gases to our environment and prevent global warming." (S24, Prevention of global warming)

"They do not pollute the environment, they do not create air pollution, they do not pollute the seas." (S8, Not causing environmental pollution)

Some participants stated that RES have positive effects on the environment, but they also added that they may have negative effects, too:

"The sun and its energy do not harm our environment, but wind turbines can harm birds." (S1, Harming living things)

"…There is not much harm, but solar power plants take up space on agricultural areas, I think, this can be a bad thing." (S4, Environmental pollution)

DISCUSSION, CONCLUSION, RECOMMENDATIONS

In the current study, in which the opinions of students on RES in their environment were investigated, the opinions of participants about renewable energy, the energy sources in their environment, and the effects of RES on people and the environment were elicited.

The answers given by the students about the energy sources used in their environment (Gaziantep) were examined. The students stated that the most used energy in their environment was solar energy, followed by the energy produced by natural gas, coal, wind, water, and wood. All the participants who talked about the electricity produced from hydroelectric energy, which is one of the most repetitive answers, especially emphasized the hydroelectric power plant in Karkamış, which is close to Nizip district. Therefore, the locality of the energy we emphasized in our study was supported.

The presence of participants who defined natural gas as RES when classifying RES shows that their views and knowledge on this subject are limited. Our country, which is trying to become one of the world's leading countries in renewable energy, has advantages arising from its geography and climate. For example, the annual sunshine duration in our country is quite high (MFA, 2020). Gaziantep is one of the provinces that benefits the most from solar energy, with very high temperatures in the summer months. Despite this, the limited knowledge of the students may indicate that the subject of renewable energy should be more emphasized and promoted in formal and informal learning environments, mass media, and all social media platforms. In a study conducted by Doğu and Demirbaş with 150 grade 6 students studying in Central Anatolia and the Western Black Sea, it was seen that the students participating in the study had sufficient knowledge, especially when defining wind and solar energy systems. According to Armağan Öner (2006), in the study carried out with 212 grade 7 and 8 students studying in Kırıkkale, it was found that the students participating in the study had sufficient knowledge about energy resources.

The opinions of the participants about RES are examined, and it is seen that they define these resources based on their features, such as being constantly renewed, endless, not harming nature, and being long-lasting. In this sense, it can be said that the students' awareness of RES is high. While defining RES, the participants may have responded with the idea that they exist by themselves in nature, such as the sun or wind, and that there is no risk of extinction based on the RES around them. For this reason, it seems normal that they were quite good at defining RES. This is similar to the result of the study of Kılıçaslan et al. (2011) in the literature. Kılıçaslan et al. (2011) concluded that the students who participated in their study defined renewable energy as the energy that never ends when used and that causes the least harm to nature. Similarly, in the study conducted by Başaran Uğur et al. (2020), students defined the RES as self-renewing, long-term use, and continuous energy. In the study by Çakırlar (2015), students used expressions such as energy that can be repeated, infinite, and less harmful to the environment while defining RES. These studies support the

conclusion of the current study that the features of renewable energy are used while the concept of renewable energy is defined. Since the participants included in the current study are studying in the eighth grade, they have frequently encountered the definitions of energy resources up to this grade level. The fact that the students have sufficient knowledge about the features of renewable energy can also be associated with the fact that the participants have gained knowledge of the objectives set in the science curriculum (MNE, 2018) related to renewable energy in their previous levels of schooling.

According to the results, students' views on the subject were limited to solar, wind, and hydroelectric. Given that besides the renewable energy power plants used in electricity production such as solar, wind, and hydroelectric energy, Gaziantep province actively benefits from power plants such as biomass, biogas, and cogeneration as well as renewable energy plants, this shows that the participants' views on RES are limited. Moreover, some of the answers given by the students show that some students define non-RES as RES. Some participants defined non-RES, such as thermal power plants, natural gas, and underground resources (coal, oil), as RES. This shows that some participants have difficulty distinguishing between RES and non-RES and that they have misconceptions about the subject or lack information. Studies in the literature show that the examples given by students to RES are insufficient (Benzer et al., 2014; Boz, 2020; Şahintürk, 2014; Yıldırım et al., 2019). In the study conducted by Kılıçaslan et al. (2011) on elementary school students, it was observed that the students' perceptions of RES were limited to wind and sun. In this regard, it can be said that the findings of the current study are parallel to the results reported in the literature. Similarly, in the study of Çelikler et al. (2017), most of the students' examples of RES were wind, geothermal, and solar power plants. However, they found that, although they were aware of most of these sources, they lacked information. In the other study (Elmas, 2018), in the results of the word association test applied to the sixth-grade students, the answers given by the students on the subject were limited to the sun and wind, similar to the current study. It can be said that both findings are similar to the findings of the study. In the study of Karakaya Cirit (2017), pre-service teachers made statements without scientific basis by stating that natural gas, nuclear energy, coal, oil, etc. are renewable. Kaldellis et al. (2012) concluded that, similar to the current study, the participants did not express biomass energy as an example of RES. All these results show that students' examples of RES are limited, and their existing knowledge contains misconceptions. The fact that students' knowledge about energy sources is limited to energy sources found around them is also supported in the current study. This fact can be tested in other regions of Türkiye. For example, it is being wondered whether rivers will come to the fore as an energy source in a study to be conducted in the Black Sea Region, where energy is mostly produced from rivers. For this reason, it can be suggested that studies be carried out in different regions to reveal the local characteristics of energy issues that can be discussed under the umbrella term of socio-scientific issues.

According to the participants, RES have positive effects on the environment; they are necessary for electricity production; they make important contributions to life; and they do not cause air pollution or global warming. In the study conducted by Çelikler et al. (2017), the students stated that RES are inexhaustible, non-polluting, and environmentally friendly sources and that these sources are important because they prevent environmental pollution. Similarly, in the study conducted by Yıldırım et al. (2019), some of the students talked about the negative effects of RES by stating that wind energy harms migrating birds and solar energy has harmful rays. In the study of Başaran Uğur et al. (2020), it was seen that the participants emphasized that RES could decrease the yield of the land if they were installed on agricultural lands. It is evident that these studies have similar results to the current study. As a result, the opinions expressed by the students about renewable energy were found to be related to the effects of RES on the environment and their contributions to the future of countries and human life.

Since the local characteristic of energy was examined in the current study, it remained limited to the middle school eighth grade students and Gaziantep's Nizip district. Given that all individuals should recognize and make sense of the RES around them, it can be recommended to conduct similar studies in different cities and regions with larger study groups from every grade level. Moreover, in relation to local characteristics of energy, students' views on energy sources around them in different regions can be determined, and cross-

regional comparisons can be made. In the study, students have difficulty classifying energy sources and have some misconceptions. For this reason, field trips to renewable energy power plants can be organized to raise awareness among students who have difficulty classifying. Students who have difficulty distinguishing the positive and negative features of RES can be taken to visit formal-informal environments such as science centers, museums, or power generation plants as part of out-of-school learning.

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GENİŞLETİLMİŞ ÖZET

Giriş: Enerji tüketiminin artması, fosil yakıtların halen kullanılıyor oluşu, çevreye ve insan sağlığına verdiği zararlarda göz önünde bulundurulduğunda yenilenebilir olmayan bu kaynakların yakın gelecekte ülkelerin enerji ihtiyacına cevap veremeyeceği anlamına gelmektedir. Enerji bakımından dışa bağımlılığı azaltan yenilenebilir enerji kaynaklarını (YEK) bilinçli ve doğru kullanan ülkeler küresel ekonomide önemli bir yer elde edeceklerdir (Çelik, 2017). Bu durum yenilenebilir enerjinin küresel anlamda ne kadar önemli olduğunu göstermektedir. YEK'e olan ilgi ve farkındalığın küresel ölçekte olduğu kadar yerel ölçekte de arttırılmasında, çevreye karşı sorumluluk bilinci kazanmış olan bireylerin yetiştirilmesi önem kazanmaktadır. Yapılan çalışmalar, ortaokul öğrencilerinin YEK'e yönelik algıları, bilişsel yapıları ve tutumlarına alanyazında sıklıkla yer verildiğini göstermektedir (Aslan, 2015; Çelikler vd., 2017; Çökelez vd., 2009; Demirbağ, 2019; Elmas, 2018; Okuyucu, 2011; Özyurt & Ercan Yalman, 2020; Şahintürk, 2014; Yıldırım vd., 2019). Bunun yanında yerel olarak ele alındığında YEK'in ortaokul öğrencilerinin görüşleri üzerine yapılan çalışmaların ise sınırlı olduğu görülmüştür. Bireylerin YEK'e yönelik görüş ve çevre bakımından bilinçli birer vatandaş olabilmeleri oldukça önemsenmektedir (Halder vd., 2011). Bunun için yerel imkanların varlığının yanında, yerel enerjinin de bölge halkı tarafından kullanılabilir veya tartışılabilir olması bölge ve ülke geleceği için değerlidir. Gaziantep bölgesi yerel enerji kaynakları bakımından incelendiğinde, yenilenebilir enerji potansiyeli bakımından oldukça verimli bir şehirdir (Kum vd., 2019). Gaziantep'te hâlihazırda, 12 doğalgaz, 18 güneş enerjisi, altı kojenerasyon, bir biyokütle, bir biyogaz, iki hidroelektrik ve iki adet rüzgâr enerji santrali elektrik enerjisi üretimi yapan santraller olarak hizmet etmektedir (Enerji Atlası, 2023). Ülkelerin enerji bakımından dışa bağımlılığın azalması ile bununla beraber istihdam ve ekonomik kalkınmanın sağlanması fen bilimleri öğretim programında sıklıkla yer verilen önemli bir konudur. Bireylerin çevrelerindeki YEK'in kullanımını yaygınlaştırmak, gelecekte bu kaynaklar hakkında karar verici görevi üstlenecek öğrencilerin görüş geliştirmesiyle mümkündür. Bu çalışmanın alanyazına bu bağlamda yerelliği ön plana çıkaran bir perspektif oluşturması bakımından katkı sağlayacağı düşünülmektedir. Dolayısıyla bu çalışmada ortaokul sekizinci sınıf öğrencilerinin bölgelerindeki YEK'e yönelik görüşlerini belirlemek amaçlanmıştır. Belirlenen bu amaç doğrultusunda aşağıdaki araştırma soruları oluşturulmuştur:

1. Sekizinci sınıf öğrencilerinin bölgelerinde karşılaştıkları enerji kaynaklarına yönelik görüşleri nelerdir?
2. Sekizinci sınıf öğrencilerin yenilenebilir enerji kaynaklarına yönelik görüşleri nelerdir?
3. Sekizinci sınıf öğrencilerinin yenilenebilir enerji kaynaklarının çevreye etkilerine yönelik görüşleri nelerdir?

Yöntem: Sekizinci sınıf öğrencilerinin çevrelerindeki YEK'e yönelik görüşlerini tespit etmeyi amaçlayan bu çalışmada, nitel araştırma desenlerinden fenomenoloji kullanılmıştır. Fenemonoloji deseni, araştırmacı tarafından bireylerin deneyimlerinin anlamına yönelik yorumlama sürecidir (Creswell, 2012). Çalışma Gaziantep'in Nizip ilçesinde bulunan bir ortaokulda amaçlı örneklem yöntemine göre belirlenmiş sekizinci sınıfta öğrenim görmekte olan 31 (18 kız, 13 erkek) öğrenci ile tasarlanmıştır. Katılımcılar amaçlı örneklem yöntemlerinden uygun (kolay ulaşılabilir) örneklem yöntemine göre belirlenmiştir. Uygun örneklem yönteminin seçilmesinde temel amaç, çalışmanın birinci yazarın görev yaptığı okuldaki öğrencilere daha rahat ulaşılabilmesinden kaynaklanmaktadır. Bölgenin önemli bir sanayi şehri olarak Gaziantep'te çalışmanın gerçekleştirilmesi, enerjinin yerelliği bakımından önemsenmektedir. Dolayısıyla çalışmada hem yerel konuların ele alınması hem de araştırmacının görev yaptığı bölge hakkında görüşlerin ele alınması, amaçlı örneklemi ön plana çıkarmıştır. Araştırmada veri toplama aracı olarak birinci araştırmacı tarafından geliştirilen yarı yapılandırılmış görüşme formu kullanılmıştır. Görüşme formunda dört soru yer almaktadır. Görüşme soruları; (1) katılımcıların bölgelerinde karşılaştıkları enerji kaynakları; (2) yenilenebilir enerjinin özellikleri, örnekleri ve üretim yolları; (3) YEK'in çevreye olumlu etkileri; (4) YEK'in çevreye olumsuz etkilerini içeren sorulardan oluşmuştur. Veri toplama sürecinde katılımcılara yukarıda açıklanan sorulardan oluşan yarı yapılandırılmış görüşme formu yöneltilmiştir. Görüşme sırasında veriler gönüllü katılımcılardan, kendilerini ifade edebildikleri ortamlarda ses kayıtları alınarak toplanmıştır. Bu çalışmada, elde edilen verilerin değerlendirilmesinde içerik analizi yöntemi kullanılmıştır. Kodlayıcılar arası uyum yüzdesi %90 olarak hesaplanmıştır.

Bulgular: Katılımcılar bölgelerinde kullanılan enerji kaynaklarına YEK'ten güneş (f=18), rüzgâr (f=10) ve suyu (f=9) örnek olarak vermişlerdir. Yenilenemez enerji kaynaklarına ise en çok doğalgaz (f=15) ve kömürü (f=12) örnek vermişlerdir. Katılımcıların yenilenebilir enerjiyi; sürekli yenilenen (f=16) ve sonu olmayan (f=7) özellikte olduğunu ifade ettikleri görülmüştür. YEK'e örnek veren katılımcıların yarısından fazlasının güneş enerjisi (f=25) cevabını verdikleri görülmüştür. Katılımcıların büyük çoğunluğunun yenilenebilir enerjinin güneşten (f=18) ve rüzgârdan (f=17) elde edildiğini ifade ettikleri görülmektedir. YEK kullanımının çevreye yönelik olumlu etkisi olarak katılımcılar, en çok küresel ısınmaya engel olmasını ifade etmişlerdir (f=11). Katılımcılar YEK'in, çevre kirliliği (f=6) ve canlılara zararı (f=4) bakımından olumsuz olarak etkilerinin olacağını da belirtmişlerdir.

Sonuç, Tartışma ve Öneriler: Katılımcıların çevrelerinde kullanılan enerji kaynaklarına yönelik verdikleri cevaplar incelendiğinde, öğrenciler çevrelerinde en çok kullanılan enerjinin güneş enerjisi olduğunu ifade etmişlerdir. Yine en çok tekrar eden cevaplardan olan hidroelektrik enerjiden üretilen elektrikten bahseden katılımcıların tamamı özellikle Nizip yerleşkesine çok yakın olan Karkamış'taki hidroelektrik santralini vurgulamıştır. Bu durum katılımcıların çevrelerindeki enerji kaynaklarına ilgili olduklarının bir göstergesidir. Katılımcıların YEK'e yönelik görüşleri incelendiğinde, bu kaynakları sürekli yenilenen, doğaya

zarar vermeyen ve uzun ömürlü olmaları gibi özelliklerinden yola çıkarak tanımladıkları görülmektedir. Bu anlamda katılımcıların YEK'e yönelik görüş ve farkındalıklarının yüksek olduğu söylenebilir. Alanyazın çalışmaları, araştırmamızın yenilenebilir enerjiye yönelik görüşlerde, bu terimi tanımlama konusunda yenilenebilir enerjinin özelliklerinden faydalanıldığı sonucunu desteklemektedir. Katılımcıların YEK'e verdikleri örnekler incelendiğinde, konu hakkındaki görüşleri güneş, rüzgâr ve hidroelektrik ile sınırlı kalmıştır. Gaziantep ili yenilenebilir enerji santrallerinin yanında biyokütle, biyogaz ve kojenarasyon gibi santrallerden de aktif olarak faydalanmaktadır. Bu durum katılımcıların YEK'e yönelik görüşlerinin sınırlı olduğunu göstermektedir. Alanyazında yer alan çalışmalar da öğrencilerin YEK'e verdikleri örneklerin yetersiz olduğunu göstermektedir (Benzer vd., 2014; Boz, 2020; Şahintürk, 2014; Yıldırım et al., 2019). Katılımcıların YEK'in çevreye etkilerine verdikleri cevaplar incelendiğinde, çevreye olumlu katkı sağladığı, elektrik üretimi için gerekli olduğu, canlı yaşamına katkı sağladığı, hava kirliliği ve küresel ısınmaya sebep olmadığı yönünde olumlu etkilerin olduğunu ifade etmişlerdir. Alanyazın incelendiğinde benzer sonuçlara rastlamak mümkündür (Çelikler vd., 2017; Karakaya Cirit, 2017). Katılımcıların yenilenebilir enerjinin çevreye olan olumsuz etkilerine verdikleri cevaplar incelendiğinde, herhangi bir gerekçe sunmaksızın, çevreye zararı olmadığını belirten katılımcıların çok sayıda olduğu görülmektedir. Bu katılımcıların yenilenebilir enerjinin çevreye olumsuz etkisi ile ilgili derin bakış açısına sahip olmadıkları söylenebilir. Bu araştırmada enerjinin yerel özelliği ön plana alınarak bölgesel olarak gerçekleştirildiği düşünüldüğünde, farklı bölgelerde, daha geniş ölçekli olarak öğrencilerin çevrelerindeki enerji kaynaklarına yönelik görüşleri belirlenip bölgesel karşılaştırma gerçekleştirilebilir.