Renewable Energy 75 (2015) 649–653

Contents lists available at ScienceDirect

Renewable Energy

journal homepage: www.elsevier.com/locate/renene

The opinions of secondary school students in Turkey regarding renewable energy

Dilek Çelikler*, Zeynep Aksan

Department of Elementary Science Education, Faculty of Education, Ondokuz Mayıs University, Samsun, Turkey

ARTICLE INFO

Article history:
Received 13 March 2014
Accepted 15 October 2014
Available online

Keywords:
Renewable energy
Global warming
Secondary school students

ABSTRACT

The purpose of this study was to determine the opinions of secondary school students in Turkey regarding renewable energy resources. To this end, a 26-item questionnaire, developed by Kılınç et al. [1], was administered to a total of 445 students in seventh and eighth grades. In addition, three open-ended questions were asked of the students in order to determine their level of knowledge regarding renewable energy resources and power stations. The study data were analyzed using the SPSS statistical package program. The study results revealed that most students first heard about the concept of renewable energy when they were in secondary school (55.7%) and elementary school (24.5%). In addition, the students generally knew about renewable energy sources and their importance, although they lacked knowledge about certain aspects of renewable energy. Furthermore, the students were, in general, of the opinion that electricity from renewable energy resources is cheap, reliable, and fully replenishable; that power stations producing electricity from these energy sources are generally safe and harmless to living organisms; and that their use does not contribute to global warming.

1. Introduction

Mankind constantly endeavors to improve its own living-standards and to acquire a firmer control over the natural world. In the modern world, the increase of wealth in human societies is directly associated with the increase in energy consumption, such that energy consumption is nowadays accepted as an indicator of social and economic development. Energy represents an indispensable aspect of modern life, and is assuming an increasingly determining role in the future of both human societies and our world. The fact that the strength of countries ultimately rests on their level of economic and social development further highlights the potential importance of energy in the present-day world [2].

A large majority of the energy that is currently consumed around the world is provided by fossil fuels. The use of fossil fuels, in turn, causes the levels of CO_2 in the atmosphere to increase. As CO_2 is a greenhouse gas, the increase in its atmospheric levels inevitably contributes to the natural greenhouse effect, leading to an increase in average temperatures worldwide. Global warming represents the most significant environmental problem of our age, and the resulting climate change has the potential to trigger many political, economic, and social crises around the world and to cause irreversible harm to both nature and the world in general. According to the reports of the Intergovernmental Panel on Climate Change (IPCC), the expected consequences of global warning include the alteration of hydrological cycles, the melting of glaciers around the world, the reduction of the total area of glaciers, the rising of average sea levels, and the shifting of climatic belts [3–5]. Possible consequences of global warming also include an increase in the incidence of floods and hurricanes in certain parts of the world due to increases in precipitation, as well an increase in the incidence of droughts and wildfires in other regions, due to decreases in precipitation. The increased frequency of natural disasters such as droughts and floods is also expected to decrease agricultural productivity and freshwater sources worldwide, and to engender the extinction or significant reduction of plant and animal species that are unable to tolerate/survive these radical climatic changes. Parallel to the exceptional increases in temperatures worldwide, global warming is also expected to cause epidemics to become more widespread; to adversely affect individuals with cardiovascular, cerebrovascular, and respiratory diseases triggered by excessive temperatures; to adversely affect vulnerable individuals such as children and the elderly; and to increase the occurrence of health-related deaths [6]. This list of expected consequences indicates that global warming will have direct and severe effects on socio-economic sectors, ecological systems, and human health [4,5].

* Corresponding author. Department of Elementary Science Education, Faculty of Education, 55200 Samsun, Turkey. Tel.: +90 3623121919/5857.
E-mail addresses: dilekc@omu.edu.tr, dilekcelikler@hotmail.com (D. Çelikler).

http://dx.doi.org/10.1016/j.renene.2014.10.036
0960-1481/

The fact that the most important cause of global warning – and hence of its world-threatening consequences – is fossil fuel consumption, and the fact that fossil fuel reserves across the world are limited have led to an increasing interest in renewable energy resources [7,8]. The poorly planned utilization of non-renewable resources such as petroleum, coal, and nuclear energy, and the pollution caused by these resources in the environment and atmosphere, have led more and more people to consider the use of renewable energy resources [9]. The use of renewable energy technologies is necessary to reduce the numerous problems stemming from fossil fuel use [10].

With the signing of the Kyoto Protocol in 1997 by developed and developing countries worldwide, the use of renewable energy sources has become an important part of the efforts to reduce CO_2 and greenhouse gas emissions [11]. Renewable energy sources refer to sources of energy that are naturally renewed, and can hence be reused without the risk of depletion. Sources of renewable energy include solar energy, wind energy, hydraulic energy, biomass energy, geothermal energy, and wave energy [12,13]. Since they do not release harmful gases into the atmosphere and the environment in the same manner fossil fuels do, renewable energy sources also represent a healthier and more reliable alternative for energy [13,14]. The most effective approach for ensuring sustainable development and solving the environmental problems that threaten our world is the use of renewable energy sources. Renewable energy sources represent unlimited, clean, practical, economical [15] and environmentally friendly [13,15] energy sources. In this respect, renewable energy sources will assume an important role in meeting the increasing energy demands of countries worldwide.

To reduce and the halt the deterioration of the environment around the globe, it is necessary for students to change their social and technology-related behaviors [16]. According to Açıkgöz [17], education on renewable energy should be provided in public schools, private schools, universities, and academic institutions. Certain studies predict that energy education will soon appear as a new field and discipline in both developed and developing countries [18,19]. The International Union for the Conservation of Nature (IUCN) has previously emphasized the need to change individuals' attitudes towards sustainability through educational programs [20]. As part of their formal education, all students and teachers should learn about the concepts and methods of ecologically sustainable development [21,22]. According to Agenda 21, the environmental and ethical awareness, values, attitudes, skills and behaviors needed for sustainable development are all acquired through education [22].

To promote environmental sustainability, it is important to instill environmental awareness to students at a young age; and to also inform students about environment-friendly renewable energy sources, the importance of the sources in meeting the world's energy demands, and the respective areas of use for these energy sources. Furthermore, teachers – who assume important roles in raising awareness among students on various subjects – should themselves possess sufficient and adequate knowledge regarding renewable energy sources. In this context, various studies to date have investigated the knowledge and attitudes of secondary school teachers [23], and the level of awareness of teacher candidates [24,25] regarding renewable energy sources. The aim of the current study was to determine the level of awareness and concerns of seventh and eighth grade secondary school students in Turkey regarding renewable energy sources, and to identify their opinions on the advantages and disadvantages of energy obtained by using renewable energy sources.

2. Methodology

The study was conducted with a total of 445 secondary school students from seventh ($n = 225$) and eighth ($n = 220$) grades. Of these students, 191 were male and 254 were female. The collection of study data was performed in two different stages by using a screening model. In the first stage, or part, of the study, three open-ended questions were asked of the students to determine: (1) where they first learned about the concept of renewable energy, and (2) their current knowledge regarding renewable energy sources and (3) the power stations that use them to produce electricity. In the second stage, a 26-item questionnaire developed by Kılınç et al. [1] was administered to the students. The study data were analyzed as percentages by using the SPSS statistical package program.

3. Results

The percentage distributions of the student answers to the question, “Where have you heard about Renewable Energy for the first time?” are provided in Graph 1.

According to the students' answers, 55.7% described secondary school as their first source regarding the concept of renewable energy, while 24.5% described elementary school, 7.9% described the Internet, 4.0% described the media, and 6.7% described their family as their initial source.

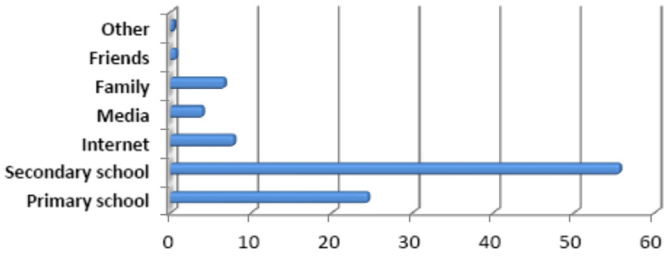
The percentage distributions of the student answers to the question, “What are the sources of renewable energy?” are provided in Graph 2.

According to the students' answers, 80.4% described the sun as a renewable energy source, while 63.4% described rivers, 62.5% described underground water, 59.8% described the oceans and seas, 41.1% described hydrogen, and 37.3% described biological waste as renewable energy sources. In addition, 22.7% described natural gas, 12.6% described radioactive elements, 12.1% described petroleum, 11.9% described fuel, and 11.5% described coal as sources of renewable energy.

The percentage distributions of the student answers to the question, “What are the types of power stations that use renewable energy sources to produce electricity?” are provided in Graph 3.

According to the students' answers, 88.8% mentioned solar power plants as a type of power station that uses renewable energy sources to produce electricity, while 85.6% described wind power plants, 58.7% described hydroelectric power plants, 55.5% described wave power plants, 53.0% described geothermal power plants, 42.9% described biomass power plants, 38.7% described hydrogen power plants, 23.4% described thermal power plants, and 20.7% described nuclear power plants as the other types of power stations that produce electricity from renewable energy sources.

The questionnaire items regarding renewable energy sources are provided in Table 1, while the percentage distributions of the student answers to these questionnaire items are provided in Graph 4.



Graph 1. Sources from which the students first heard the concept of renewable energy.