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Knowledge Sources and Opinions of Prospective Social Studies Teachers about Possible Risk and Benefit Analysis: Nuclear Energy and Power Stations*

Hakkı YAZICI[1]
Afyon Kocatepe University, Afyonkarahisar, TURKEY

Ramazan BULUT[2]
Afyon Kocatepe University, Afyonkarahisar, TURKEY

Sibel YAZICI[3]
Afyon Kocatepe University, Afyonkarahisar, TURKEY

Abstract

In this study, it was aimed to determine the trust status of prospective social studies teachers regarding various knowledge sources related to nuclear energy and power stations regarded as a controversial socio-scientific issue and their perceptions on the possible risks and benefits of nuclear energy and power stations. Target population of the study consisted of prospective teachers studying in the Social studies Teaching Department of Faculty of Education at Afyon Kocatepe University during the fall term of 2015-2016 academic year. Volunteer teacher candidates from each grade participated in the study. The data required for the study were collected by using "Risks and Benefits about Nuclear Energy" questionnaire developed by İşleri (2012) and a measurement tool which determines the reliability of the knowledge

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[1]Corresponding author: Prof. Dr., Afyon Kocatepe University, Faculty of Education, Primary Education, Ahmer Necdet Sezer Campus, 03200, Afyonkarahisar, Turkey, hyazıcı[at]aku.edu.tr
[2]Research Assistant, Afyon Kocatepe University, Faculty of Education, Primary Education, Ahmer Necdet Sezer Campus, 03200, Afyonkarahisar, Turkey, bulut0476[at[gmail.com
[3]Lecturer, Afyon Kocatepe University, Faculty of Education, Primary Education, Ahmer Necdet Sezer Campus, 03200, Afyonkarahisar, Turkey,syazici[at]aku.edu.tr

sources related to nuclear energy and establishment of power stations. Descriptive statistics were conducted on the data obtained after the application of the measurement tools to 270 prospective teachers. According to the results obtained from the study, it was found out that the prospective teachers agreed that the nuclear energy and power stations were both risky and beneficial. According to another result obtained, scientists working on the issue received the highest confidence whereas members of parliament, companies and news on televisions received the lowest confidence.

Keywords

Nuclear Energy and Power Stations, Knowledge Sources, Benefits and Risks, Prospective Social Studies Teachers

Energy is an inevitable requirement to use both in daily life and in all areas of the industry sector. Developments in science and technology, increase in the world population and high-standard life expectations have enhanced the need for energy further. This need of energy has necessitated the use of energy resources in different branches.

Energy resources are broadly classified as primary-secondary energy sources and renewable and non-renewable energy sources (Durğun, 2013). Resources such as petroleum, natural gas, coal, uranium and thorium can be given as examples for primary energy sources (Demirbaş, 2002). Secondary energy sources consist of resources such as electricity and petroleum products obtained after conversion of primary energy sources (International Energy Agency, 2004; Korkmaz and Develi, 2012). Another commonly used classification is renewable and non-renewable energy sources. Renewable energy sources, which can be called as alternative energy source, is "an energy form provided by existing energy cycle in natural periods with continuity" (Urgun, 2015:3). Solar energy, wind energy, biomass energy and geothermal energy can be given as examples for this kind of energy sources (Çukurçayır and Sağır, 2007; Özcan, 2013: Tekeşin, 2011). Energy sources which has a certain amount of reserve underground and which cannot be replaced by new sources when consumed are called non-renewable energy sources (Bhattacharyya, 2011:10; as cited in Durğun, 2013:4). Coal, petroleum, natural gas and nuclear energy can be given as examples for this kind of energy sources (Uslusoy, 2012; Yavuzaslan, 2009). Nuclear energy, which falls into this kind of energy sources, has a particular importance since it has a socio-scientific feature and causes discussions in our country recently.

Nuclear energy can be obtained by two different ways as nuclear fission occurring in nuclear reactors and as nuclear fusion (Zabunoğlu, 2012). More than 430 active nuclear power stations in the world works based on fission technique (Altın, 2004). The use of fusion technique has not reached an important point despite the efforts lasting a long time (Zabunoğlu, 2012).

Today we encounter a wide range of energy usage. Energy usage is increasing gradually in the world and in Turkey. According to 2015 BP Statistical Review of World Energy, energy consumption increased 2 % in 2013 and 0,9 % in 2014. The average rate of increase in world's energy consumption in the last decade was 2,1 % (Dudley, 2015). Population growth in developing countries and proliferation of industry has led to a rapid increase in energy demand (Koç and Şenel, 2013). It seems really

difficult to meet this increasing energy need by known energy resources. For this reason, in order to meet the increasing energy gap in parallel with energy need, it has been tended towards different energy types that can be an alternative. One of these energy types is nuclear energy which has been planned to be used in Turkey, as well.

Turkey is foreign-dependent on energy issue. This dependency is almost at the rate of 74 % and nearly all of the petroleum and natural gas and one fifth of coal are imported (Güneş, 2012). Depending on the economic development and high welfare level, Turkey has become a country in which there is the most rapid increase in energy demand among the countries of Organization for Economic Cooperation and Development (OECD) in the last decade and it is estimated that energy demand will be double in the next ten years (TC. Enerji ve Tabii Kaynaklar Bakanlığı, 2013). The rate of imported energy resources should be reduced, a variety of countries should be benefited about power supply and domestic and renewable energy sources should be made use of so as to provide security of supply and reduce foreign-dependency (Özcan, 2013). Turkey's dependence on foreign energy weakens the country in terms of economy and policy because of increasing current account deficit and being a very strategic production factor. Although the country has made a new investment in existing fossil energy sources and renewable energy sources, it does not seem possible to reduce this energy dependency without using nuclear energy (Köksal and Civan, 2010). In some research conducted, it is stated that Turkey's making use of nuclear energy will have important contributions to the country (Kızıltan; 2010; Mercan, 2011; Turgut, 2011; Zabunoğlu, 2012). According to the prepared strategic document regarding Turkey's electrical safety, it was stated that continuing the works on founding nuclear power stations, obtaining at least 5 % of energy need of the country from nuclear power stations by 2020 and increasing this rate in the upcoming years were intended (TC. Başbakanlık Devlet Planlama Teşkilatı, 2009).

Accelerating the works regarding the meet of a portion of electricity need by nuclear power stations compared to before has led to the revival of the discussions on the possible risks and benefits of nuclear power stations. In the studies conducted, different results have been obtained regarding the production of energy through the establishment of nuclear power stations in Turkey. According to the study of "Energy Preferences of the Turkish People" by Ediger and Kentmen (2010), it is found out that since Turks were clean and identified with nature, their first preference was solar energy when compared to nuclar energy. In the same study, it was stated that the ratio of the people saying yes to the solar energy for the future energy was 27,4 % higher than that of saying yes to the nuclear energy and public opinion was always up for the solar energy when those two were compared. In the study carried out by Şenyuva and Bodur (2016) with the participation of university students, it was revealed that along with the students were anxious and had a negative attitude towards the establishment of nuclear power stations, they were also indecisive about these negative attitudes due to country politics and increase in the demand of energy. According to the results obtained from another study where the participants were again university students, it was revealed that renewable energy sources were not made use of sufficiently in Turkey and that necessary investments should be made in order to benefit from these energy sources. A

large number of the same university students gave green light to the use of nuclear energy so as to meet the energy deficit of the country (Koca and Bulut, 2015). It is admitted that nuclear power stations have risks in addition to their benefits (Kızıltan, 2010; Köksal and Civan, 2010; Zabunoğlu, 2012). While carrying out debates on the benefits and risks analysis of nuclear power stations, it should be paid attention to make use of scientific knowledge. Because of information pollution on this issue, some discussions on social media may lead to misunderstandings by overestimating the benefits or risks. As cited in İşler (2012; Slovic, Finucane, Peters & MacGregor, 2004), according to "Feeling Heuristic" Theory, if individuals have a general judgement on a controversial issue, this judgement effects the individual's perception about risks and benefits related to the issue in different ways. If the general judgement is adverse, the individual perceives the risks high and the benefits low. However, if the general judgement is positive, the individual perceives the risks low and benefits high. Additionally, in this theory, it is stated that various "knowledge sources" are quite important in the formation of general judgement.

The opinions of prospective social studies teachers, who will raise the future generations and, in an a way, be one of the knowledge sources of students, regarding nuclear energy and knowledge sources will have an impact on secondary school students. The opinions of the prospective social studies teachers about nuclear energy and power stations are needed to be examined in order to estimate whether this impact will be healthy or not and to arrange the necessary intervention studies and education programs. In this study, it was aimed to determine the trust status of prospective social studies teachers regarding various knowledge sources related to nuclear energy and power stations regarded as a controversial issue and their perceptions on the possible risks and benefits of nuclear energy and power stations.

Methods

Research Design

In this study, which was carried out so as to determine the opinions of prospective social studies teachers related to nuclear energy and power stations and their trust levels regarding knowledge sources single survey method design was used. In this model, variables belonging to units and situations such as "interested event, item, individual, group, institution, subject and etc." were tried to be described (introduced) separately" (Karasar, 2013:79).

Population and Sample

Target population of the study consisted of prospective teachers studying in the Social Studies Teaching Department of Faculty of Education at Afyon Kocatepe University during the fall term of 2015-2016 academic year. Sampling of the study was selected through using maximum variation sampling technique. The reason for using this technique is to reflect different opinions in the study as far as possible (Yıldırım and Şimşek, 2013). Results of descriptive statistics related to the sampling group were given in Table 1.

Table 1
Descriptive Statistics Regarding the Sampling Group

GRADE LEVEL	%	GENDER		TOTAL
		Female	Male	
Freshman	30 %	42	28	70
Sophomore	24,1 %	37	28	65
Junior	26,3 %	37	34	71
Senior	17,3 %	42	22	64
General Total	100 %	158	112	270
	%	58,5	41,5	100

As seen in Table 1, of the prospective teachers, 70 was freshman, 65 was sophomore, 71 was junior and 64 was senior students. Sample of the study consisted of 270 students in total including 158 females and 112 males.

Data Collection and Procedure

The data required for the study were collected by using "Risks and Benefits about Nuclear Energy" questionnaire developed by İşleri (2012) and a measurement tool which determines the reliability of the knowledge sources related to nuclear energy and establishment of power stations. Data collection tool consists of three parts. In the first part, there are questions to obtain the personal information of the prospective teachers. In the second part, there is a questionnaire which reveals how reliable the statements are which are made by institutions, organisations and people that are considered as knowledge sources for the nuclear energy and establishment of power stations. This questionnaire includes 17 items. Responses given to the items in the questionnaire consist of five-point-scale ranging from "Never Trust" to "Extremely Trust". In the third part, there is "Risks and Benefits about Nuclear Energy" questionnaire which aims to reveal the opinions of the participants about the risks and benefits of nuclear energy.

During the development process of this questionnaire, six different knowledge sources about nuclear energy and nuclear power stations were interviewed. These knowledge sources participated in the study voluntarily. 115 people were contacted; 29 of them work at government organisations, 19 of them work at NGOs and 67 of them are academicians. Knowledge sources were interviewed face to face or on the phone. Interviews lasted 45 minutes on average. After receiving the permission from the participants, interviews were recorded and then they were transferred to computer environment. Voice recordings were analysed by a group of four people; the researcher, a faculty member in the field of Science Education, a faculty member in the field of Biology (genetic applications) and a faculty member in the field of Turkish Education.

As a result of the analysis, frequently used benefits and risks expressions were determined. These expressions were turned into questionnaire items in order to collect

data. Consequently, a questionnaire consisting of two sub-dimensions as "risk" and "benefit" was developed by the study group. There are 40 items in total in the questionnaire and the both sub-dimensions include 20 items. The responses that can be given to the items are “Extremely trust", "Trust much", "Trust less", "Rarely trust" and "Never trust" (İşleri, 2012).

In order to obtain the required data for the study, permission of the instructors, whose classes the application would be performed in, was received first. Once the required permission was obtained, the researchers carried out the application process themselves. During the application, behaviours that may affect the perceptions of the prospective teachers about knowledge sources, nuclear energy and power stations were avoided. Before starting the application, the prospective teachers were informed about the aim of the study and how to fill in the questionnaire. After indicating to the prospective teachers that participation in the study was based on voluntariness, questionnaires were handed out. The application lasted approximately 25-30 minutes.

Analysis of Data

So as to analyze the data obtained from the questionnaire, SPSS 18.0 program was used. On the data, obtained by applying the data collection tools to 270 prospective teachers, descriptive statistics (percentage, frequency and arithmetic mean) were performed. Arithmetic means were calculated for each item of the questionnaires and for the benefit and risk sub-dimensions. In order to analyze and interpret the arithmetic means of the items and sub-dimensions, breakpoints created by using the formula in the brackets {(5-1)/5=0.80] were used. Point averages of responses given to the items and sub-dimensions were interpreted based on the following intervals;

5.00 - 4,20 = Extremely trust / Strongly agree

4.19 - 3.40 = Trust much / Agree

3.39 - 2.60 = Trust less/ Neutral

2.59 - 1.80 = Rarely trust / Disagree

1.79 - 1.00 = Never trust / Strongly disagree

Findings

How was the distribution of trust status of the prospective social studies teachers regarding the knowledge sources about nuclear energy and power stations?

Table 2
Frequency, Percentage and Means of the Items in the Knowledge Sources Scale

Items		f/ %	1	2	3	4	5	$\bar{x}$	Result
1	Ministry of Energy and Natural Resources	f	43	30	111	71	15	2,94	LT
		%	15,9	11,1	41	26,2	5,5		
2	Doctors	f	18	25	106	107	13	3,27	LT
		%	6,6	9,2	39,1	39,5	4,8		
3	Minister of Energy and Natural Resources	f	50	41	105	58	12	2,78	LT
		%	18,5	15,1	38,7	21,4	4,4		
4	Members of Parliament	f	113	73	58	20	4	1,99	RT
		%	41,7	26,9	21,4	7,4	1,5		
5	An environmental organization opposed to the establishment of nuclear power stations	f	43	36	83	78	26	3,03	LT
		%	15,9	13,3	30,6	28,8	9,6		
6	The newspaper reports regarding the establishment of nuclear power stations	f	45	61	116	38	6	2,62	LT
		%	16,6	22,5	42,8	14	2,2		
7	Turkish Atomic Energy Authority	f	25	48	104	76	11	3,00	LT
		%	9,2	17,7	38,4	28	4,1		
8	Government	f	58	47	71	62	31	2,86	LT
		%	21,4	17,3	26,2	22,9	11,4		
9	International Atomic Energy Agency	f	63	62	81	52	11	2,58	RT
		%	23,2	22,9	29,9	19,2	4,1		
10	Ministry of Health	f	33	31	86	97	22	3,16	LT
		%	12,2	11,4	31,7	35,8	8,1		
11	Scientists working on nuclear energy in Turkish Atomic Energy Authority	f	14	29	80	106	37	3,46	MT
		%	5,2	10,7	29,5	39,1	13,7		
12	News on television	f	52	89	104	17	8	2,41	RT
		%	19,2	32,8	38,4	6,3	3		
13	Scientists conducting studies on nuclear energy and power stations at universities	f	15	23	69	123	39	3,55	MT
		%	5,5	8,5	25,5	45,4	14,4		
14	Scientists working on nuclear energy in Ministry	f	19	25	101	91	32	3,34	LT
		%	7	9,2	37,3	33,6	11,9		

	of Health								
15	Electricity Generation Corporation which is state-sanctioned company	f	48	54	109	43	12	2,69	LT
		%	17,7	19,9	40,2	15,9	4,4		
16	Companies which are the operators of the nuclear power stations that are planned to be established	f	114	58	69	18	10	2,08	RT
		%	42,1	21,4	25,5	6,6	3,7		
17	Course books studied at university	f	14	49	95	99	13	3,18	LT
		%	5,2	18,1	35,1	36,5	4,8		

How was the distribution of the views of the prospective social studies teachers regarding the possible risks and benefits of nuclear energy and power stations?

Table 3

Frequency, Percentage and Means of the Items in the Benefits of Nuclear Energy Sub-Scale

Items		**f/ %**	**1**	**2**	**3**	**4**	**5**	$\bar{x}$	**Result**
2	Nuclear power stations are more reliable than other kinds of power stations.	f	61	92	74	28	13	2,40	D
		%	22,5	33,9	27,3	10,3	4,8		
3	Nuclear raw materials can wait longer without deterioration compared to other raw materials (petroleum, coal etc.) used in other kinds of energy.	f	19	35	83	109	21	3,29	N
		%	7	12,9	30,6	40,2	7,7		
7	Nuclear power stations produce more energy than other kinds of power stations.	f	10	16	54	106	81	3,87	A
		%	3,7	5,9	19,9	39,1	29, 9		
8	Nuclear power stations can produce electricity for a long time.	f	8	13	58	118	68	3,85	A
		%	3	4,8	21,4	43,5	25, 1		
10	Price increase in nuclear raw materials is less than that of other energy raw materials (petroleum, coal etc.).	f	20	35	123	63	23	3,24	N
		%	7,4	12,9	45,4	23,2	8,5		
11	Nuclear power stations provide new field of operation and increase in employment rate in the area they are established.	f	16	29	65	110	47	3,54	A
		%	5,9	10,7	24	40,6	17, 3		

15	Nuclear power stations can produce electricity at desired rate in each season of the year while production of electricity in other kinds of power stations (such as hydrothermal) depends on nature conditions (such as annual rainfall rate).	f	11	17	79	112	50	3,64	A
		%	4,1	6,3	29,2	41,3	18,5		
16	Countries with nuclear weapons will have voice in the international arena.	f	9	19	34	99	105	4,02	A
		%	3,3	7	12,5	36,5	38,7		
19	Having nuclear power stations will decrease the foreign-dependency on meeting energy need.	f	8	17	42	111	89	3,96	A
		%	3	6,3	15,5	41	32,8		
21	Nuclear power stations provide development in technology by contributing to the improvement of industry.	f	10	18	67	118	57	3,72	A
		%	3,7	6,6	24,7	43,5	21		
22	Nuclear power stations can be operated longer than other kinds of power stations.	f	9	15	69	123	52	3,72	A
		%	3,3	5,5	25,5	45,4	19,2		
26	Electricity production is cheaper in nuclear power stations compared to the one in other kinds of power stations.	f	20	23	98	78	48	3,42	A
		%	7,4	8,5	36,2	28,8	17,7		
27	Nuclear energy provides variety in energies by creating alternatives to the ones used today.	f	17	15	62	117	55	3,67	A
		%	6,3	5,5	22,9	43,2	20,3		
29	When raw materials used in nuclear power stations are bought, they can be used longer compared to raw materials (petroleum, coal etc.) in other kinds of power stations.	f	13	16	93	87	60	3,61	A
		%	4,8	5,9	34,3	32,1	22,1		
32	Countries with nuclear technology will have voice in the international arena.	f	12	10	38	101	104	4,04	A
		%	4,4	3,7	14	37,3	38,4		

33	In nuclear power stations, energy is produced at the rate that it can be used for a long time.	f	9	14	60	122	56	3,77	A
		%	3,3	5,2	22,1	45	20,7		
34	Nuclear power stations do not produce greenhouse gases as hydrothermal power stations do.	f	34	30	139	43	20	2,94	N
		%	12,5	11,1	51,3	15,9	7,4		
36	The investment cost in nuclear power stations is less than the one in other kinds of power stations (wind, solar etc.).	f	57	55	79	51	27	2,76	N
		%	21	20,3	29,2	18,8	10		
37	Nuclear power stations do not cause global warming.	f	80	59	85	29	13	2,38	D
		%	29,5	21,8	31,4	10,7	4,8		
38	Nuclear energy is a good alternative to close the energy gap of developing countries such as Turkey.	f	23	24	70	98	54	3,51	A
		%	8,5	8,9	25,8	36,2	19,9		
							Total	3,47	A

Strongly Disagree: SD, Disagree: D, Neutral: N, Agree: A, Strongly Agree: SA

Descriptive statistics results of the responses given by prospective social studies teachers to the items in the benefit analysis of nuclear energy and power stations sub-scale were provided in Table 3. According to the data in the table, the first three items that prospective social studies teacher perceived as the benefits most were respectively: "Countries with nuclear technology will have voice in the international arena (4,04), countries with nuclear weapons will have voice in the international arena (4,02) and Having nuclear power stations will decrease the foreign-dependency on meeting energy need (3,96)." In the same table, three items that they perceived as the benefits least were respectively: "Nuclear power stations do not cause global warming (2,38), nuclear power stations are more reliable than other kinds of power stations (2,40) and the investment cost in nuclear power stations is less than the one in other kinds of power stations (wind, solar etc.) (2,76)." Mean score of the items in benefit analysis sub-scale ranged between 2.38 and 4,04. The overall average of all the items was 3,47. When this average is taken into consideration, it can be said that prospective social studies teachers agree that using of nuclear energy and power stations is beneficial.

Table 4
Frequency, Percentage and Means of the Items in the Risks of Nuclear Energy Sub-Scale

	Items	f/ %	1	2	3	4	5	$\bar{x}$	Result
1	Nuclear power stations pollute the environment.	f	18	29	56	86	81	3,68	A
		%	6,6	10,7	20,7	31,7	29,9		
4	Nuclear power station reduce the tourism activities in the area they are established.	f	29	29	51	97	61	3,49	A
		%	10,7	10,7	18,8	35,8	22,5		
5	Nuclear power stations threaten the aquatic life with the hot water they leave in the area they are established.	f	11	17	23	120	97	4,03	A
		%	4,1	6,3	8,5	44,3	35,8		
6	Nuclear power stations cannot work when there is power cut and this case causes their cooling units to break down.	f	18	26	115	76	33	3,30	N
		%	6,6	9,6	42,4	28	12,2		
9	Investing in nuclear energy prevents investing in renewable energies such as wind and solar.	f	36	57	72	65	40	3,06	N
		%	13,3	21	26,6	24	14,8		
12	Computer models used to calculate the possibility of accidents and risks in nuclear power stations are not reliable.	f	12	50	124	51	30	3,14	N
		%	4,4	18,5	45,8	18,8	11,1		
13	Nuclear power stations may be exposed to terrorist attacks.	f	9	19	59	114	69	3,80	A
		%	3,3	7	21,8	42,1	25,5		
14	Nuclear waste dissolves in the underground water.	f	9	13	57	118	65	3,83	A
		%	3,3	4,8	21	43,5	24		
17	There are uncertainties on how to store nuclear waste.	f	9	13	70	111	65	3,78	A
		%	3,3	4,8	25,8	41	24		
18	Investment costs of nuclear power stations are high.	f	7	14	40	119	81	3,97	A
		%	2,6	5,2	14,8	43,9	29,9		
20	Companies issuing license on the establishment of nuclear power stations are under pressure of politicians.	f	10	27	109	70	54	3,49	A
		%	3,7	10	40,2	25,8	19,9		
23	That people work in certain stages of nuclear power station increases the possibility of making mistakes.	f	14	35	87	82	48	3,43	A
		%	5,2	12,9	32,1	30,3	17,7		
24	Nuclear power stations causes cancer in infants and children in the areas they are established.	f	9	22	53	92	94	3,89	A
		%	3,3	8,1	19,6	33,9	34,7		
25	Radioactive substances leak	f	7	10	32	96	124	4,19	A

	from nuclear power stations in case of an accident.	%	2,6	3,7	11,8	35,4	45,8		
28	Radioactive waste of nuclear power stations is dangerous for the livings.	f	7	9	34	85	131	4,22	SA
		%	2,6	3,3	12,5	31,4	48,3		
30	Nuclear power stations may collapse or explode in natural disasters such earthquake and flood.	f	5	20	50	99	95	3,96	A
		%	1,8	7,4	18,5	36,5	35,1		
31	Nuclear accidents lead to irreparable negative results.	f	4	18	22	88	136	4,25	SA
		%	1,5	6,6	8,1	32,5	50,2		
35	Raw materials required for nuclear energy production have to be imported and this case increases the foreign-dependency.	f	27	33	85	81	43	3,30	N
		%	10	12,2	31,4	29,9	15,9		
39	Handling and transportation of raw materials is costly.	f	14	20	74	104	58	3,64	A
		%	5,2	7,4	27,3	38,4	21,4		
40	Dangerous weapons which may affect many people can be produced by using nuclear energy.	f	13	11	24	93	128	4,16	A
		%	4,8	4,1	8,9	34,3	47,2		
							Total	3,58	A

Strongly Disagree: SD, Disagree: D, Neutral: N, Agree: A, Strongly Agree: SA

Descriptive statistics results of the responses given by prospective social studies teachers to the items in the risk analysis of nuclear energy and power stations sub-scale were provided in Table 4. According to the average scores provided in the table, the first three items that prospective social studies teacher perceived as the risksmost were respectively: "Nuclear accidents lead to irreparable negative results (4,25), radioactive waste of nuclear power stations is dangerous for the livings (4,22) and radioactive substances leak from nuclear power stations in case of an accident (4,19)." In the same table, three items that they perceived as the risks least were respectively: "Investing in nuclear energy prevents investing in renewable energies such as wind and solar (3.06), computer models used to calculate the possibility of accidents and risks in nuclear power stations are not reliable (3,14) and nuclear power stations cannot work when there is power cut and this case causes their cooling units to break down (3,30)." Mean score of the items in risk analysis sub-scale ranged between 3,06 and 4,25. The overall average of all the items was 3,58. When this average is taken into consideration, it can be said that prospective social studies teachers agree that using ofnuclear energy and power stations has its risks.

Conclusion and Discussion

The results obtained from this study which was conducted with the intent of determining the trust status of prospective social studies teachers regarding various knowledge sources related to nuclear energy and power stations and their perceptions on the possible risks and benefits of nuclear energy and power stations were as in the following;

According to the results related to the trust status of prospective teachers regarding knowledge sources related to nuclear energy and power stations; the knowledge sources which had the highest trust average were determined respectively as scientists conducting studies on nuclear energy and power stations at universities (3,55), scientists working on nuclear energy in Turkish Atomic Energy Authority (3,46) and scientists working on nuclear energy in Ministry of Health (3,34). The least trusted knowledge sources were determined respectively as members of parliament (1,99), companies which are the operators of the nuclear power stations that are planned to be established (2,08) and news on television (2.41). The results obtained from the study of similar nature carried out by İşleri (2012) shows great consistency with the ones obtained from this study. In his study it was determined that first three knowledge sources that were trusted most were Turkish Atomic Energy Authority, scientists working on nuclear energy in Ministry of Health and at universities while the least trusted three knowledge sources were members of parliament, the companies which were the operators of the power stations and news on televisions, as well (İşleri, 2012). According to the results obtained from conducted research, scientists working on the issue received the highest confidence whereas members of parliament, companies and news on televisions received the lowest confidence. Based on these results, it can be stated that benefiting from the opinions of scientists who are either in or out of the field and who are perceived as reliable sources will have a positive contribution to the analysis of the risks and benefits of nuclear energy and power stations which is one of the leading controversial issues and to providing its social acknowledgement by the community.

When average scores of the risk and benefit analysis dimensions regarding nuclear energy and power stations are analysed, it is seen that the mean score of the items in the risk analysis dimension was 3,58 while the mean score of the items in the benefit analysis dimension was 3,47. The mean scores of the both dimension correspond to "agree" range. Based on these results, it can be stated that the prospective teachers think that the nuclear energy and power stations are both risky and beneficial.

When opinions about possible risks and benefits of nuclear energy and power stations are examined, it is seen that the first three items which had the highest average were respectively: "Nuclear accidents lead to irreparable negative results (4,25), radioactive waste of nuclear power stations is dangerous for the livings (4,22) and radioactive substances leak from nuclear power stations in case of an accident (4,19)." According to the results obtained from a similar study, nuclear waste's being dangerous for the livings, leaking of the nuclear substance in possible accidents and leading to irreparable negative results were found out to be the most important factors for perceiving nuclear energy and power stations risky (İşleri, 2012). In the study carried

out by Ateş and Saraçoğlu (2013), it was stated that prospective teachers thought that nuclear power stations affected environment negatively, radioactive substances may leak in the environment and nuclear waste may leak in underground water if any precautions were not taken. Depending on the results of the research, it was revealed that the leading factor causing prospective teachers to perceive nuclear energy and power stations risky was the harm that may be given to the environment as a result of some incidents (leak, earthquake, accident etc.)

The first three items which prospective social studies teachers perceived as the most beneficial in the benefit analysis dimension were respectively: "Countries with nuclear technology will have voice in the international arena (4,04), countries with nuclear weapons will have voice in the international arena (4,02) and having nuclear power stations will decrease the foreign-dependency on meeting energy need (3,96)." In the study carried out by Ateş and Saraçoğlu (2013), it was found out that prospective teachers stated that countries with nuclear technology would have voice in the international arena and foreign-dependency of the countries having nuclear energy would decrease. In the study conducted by İşleri (2012), it was found out that nuclear technology and weapons were perceived useful because of their contribution to international relations. In a different study which had parallel results with this study, it was stated that most of the prospective teachers supported nuclear energy since it was seen as an alternative source to close energy gap, it decreased foreign-dependency and it effected the development in a positive way (Koca and Bulut, 2015). As a consequence, it was found out that most important factors which had an effect on prospective teachers' perceiving nuclear energy and power stations beneficial were that having nuclear energy, weapon and technology would brought respectability and prestige to the countries and using it as an alternative source decreased foreign dependency.

Suggestions

When the relevant literature is viewed, it is seen that different results were obtained from the studies related to nuclear energy and power stations. However, these studies are inadequate to reflect the general opinion about the nuclear energy and power stations throughout the country. Similar studies should be applied to different sample groups in order to clarify the general opinion. A study that reveals the knowledge level of university students and local people on the possible risks and benefits of nuclear energy and power stations should be conducted and how conscious the public is on this subject should be found out. Correspondingly, it is necessary to increase the level of consciousness by including required content in educational programs and mass communication channels.

The prospective teachers agree that nuclear energy and power stations have both positive and negative aspects. So as to guide the opinions of the prospective teachers related to these topics objectively in the right direction, unbiased information about the subject should be introduced by the scientists that they acknowledge as the reliable sources by making them participate in various discussion programs. Additionally, various conferences may be organized at universities and scientists specialized in this field may be invited in order to inform the students.

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Biographical Statements

Hakkı YAZICI is a professor in geography education at the University of Afyon Kocatepe. His research interests focus on teacher education and geographical education.

Ramazan BULUT is a research assistant in social studies at the University of Afyon Kocatepe. His research interests focus on teacher education and primary education.

Sibel YAZICI is a lecturer in social studies at the University of Afyon Kocatepe. Her research interests focus on teacher education and historical education.