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The Views of Primary School Students about Radiation

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Abstract

Radiation is a matter in which we come across a lot in our lives and something that students find difficult to understand. The study is intended to investigate opinions and thoughts of secondary school students about radiation issue. In this study, a total of 222 students from 3 different primary schools in Province of Erzurum, Turkey were given a test consisting of 7 open ended questions which was prepared by the researcher. The age range of students participated in the study were 12-15 and 108 of them were female, 114 were male. Data were presented in tables with percentages and frequencies. The findings obtained in this study which was applied by qualitative research methods were analyzed using descriptive analysis method. After the evaluation of the answers given by the students, results of the study led to the following conclusions: that students lack an adequate knowledge of radiation, and because of this, 88% of them are frightened of radiation and they have negative views about radiation since they think it's dangerous and harmful. Students were found to have lack of information on the issues; the effects of radiation, radiation sources and methods of radiation protection. Sources of great trust and accuracy should be used while studying radiation. Radiation is useful but can cause great damage if precautions are not taken. School is the most important institution of obtaining accurate information. Only a small minority of students (17%) said that they obtained the information about radiation from textbooks and teachers. This study suggests that important topics, an example of one such topic is radiation, should be inserted into the educational program and introduced to the students at an early age. We recommend the construction of educational activities that introduce and familiarize students with radiation at specific time periods and suggest methods/techniques that will enable teachers to support these ideas.

Keywords: radiation, primary school students, views

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Ortaokul Öğrencilerinin Radyasyon Konusundaki Görüşleri

Öz

Radyasyon, günlük yaşantıda sıklıkla karşılaşılan ve öğrencilerin anlamada zorluk çektiği bir konudur. Çalışmada ortaokul öğrencilerinin radyasyon konusuyla ilgili görüş ve düşünceleri araştırılması amaçlanmıştır. Araştırma kapsamında Erzurum ili merkezinde üç farklı ortaokulda öğrenim gören toplam 222 ortaokul öğrencisine, araştırmacı tarafından oluşturulan 7 açık uçlu sorudan oluşan bir test uygulanmıştır. Çalışmaya katılan öğrencilerin yaş aralığı 12-15 ve 108'i kız, 114'ü erkektir. Veriler yüzde ve freakanslar içeren tablolar şeklinde sunulmuştur. Nitel araştırma yönteminin uygulandığı çalışmada elde edilen bulgular betimsel analiz yöntemi kullanılarak analiz edilmiştir. Öğrencilerin verdikleri cevapların değerlendirilmesi sonucunda öğrencilerin radyasyon ile ilgi bilgi eksiklikleri olduğu, öğrencilerin büyük çoğunluğunun (%88) radyasyondan korktuğu ve radyasyon hakkında zararlı ve tehlikeli olduğuna yönelik olumsuz görüşlerin ön plana çıktığı gözlenmiştir. Öğrencilerin radyasyonun etkileri, radyasyon kaynakları ve radyasyondan korunma yöntemleri konularında bilgi eksiklikleri olduğu saptanmıştır. Radyasyon konusunda güvenilir bilgi kaynaklarından faydalanılmalıdır. Zira radyasyon faydalı olduğu kadar dikkat edilmediğinde büyük zararlar oluşturabilir. Okul en önemli doğru bilgi elde etme kurumudur. Öğrencilerin sadece küçük bir azınlığı (%17) radyasyon konusunda elde ettikleri bilgileri okul kitaplarından ve öğretmenlerden elde ettiklerini söylemişlerdir. Araştırma sonucunda okullardaki öğretim programına radyasyon konusu ile ilgili üniteler eklenmesi, radyasyon eğitimine erken yaşlarda başlanması, okullarda belli zaman dilimlerinde radyasyonla ilgili eğitim faaliyetleri düzenlemesi ve öğretmenlerin bu konuda desteklemeleri gerektiğine yönelik öneriler getirilmiştir.

Anahtar Sözcükler: radyasyon, ortaokul öğrencileri, görüş

Introduction

Radiation, which can be defined as the release of energy from atoms, is hard to understand. So, it is a term which should be understood accurately and clearly. In Hafele (2011) study concluded that the study of radiation should be initiated by learning the structure and features of it. The fact that atoms are small and have a complex structure makes radiation difficult to understand. In a study published in 2008 by Mork, it says that radiation is seen to be very complex in students mind and expresses that they pass on and develop their ideas about radiation through the media. Pratner (2005) states that the understanding of students about radiation and radioactivity is limited.

Millar and Gill (1996) asked 144 sixteen year old English students questions about radioactivity and ionized radiations which measure their knowledge about this issue. The study shows that students are unable to differentiate between the terms "radiation beam" and "radiation contamination." This study also finds that students have difficulty understanding types of radiation and the radioactive materials.

Henriksen and Jorde (2001) examined the views of students at the age of 16 in Norway and concluded that students of different educational systems had similar views and levels of understanding with respect to radiation and radioactivity. Boyes and Stanisstreet's study of 11-16 year old students led to the conclusion that students have an inadequate knowledge of radiation. The majority of these students expressed the opinion that radiation is deadly and harms to organs. This same study emphasized the importance of teachers conveying accurate information about radiation to students.

In a study carried out by Nishina (1999), students from different schools were asked questions about radiation. The authors concluded that students should be educated at young age and there is a need to support the teachers in primary and secondary schools on this topic.

In a study published in 2006 by Rego and Peralta, involving 1246 students in Portugal, students were asked several questions regarding radiation. The majority of students stated that they had heard about radiation so much, but it also turned out that the majority of them did not know what the natural radiation is and radiation types and difference between ionized and nonionizing radiation. So, they suggested that an importance should be given to radiation education.

In a study carried out by Itaki, Tomisawa, Ohgino and Aizu (2010), 161 students of health education were asked survey questions about radiation. Their responses to the questions showed that 50% of the students did not know what natural radiation is.

A study carried by Millar and Gill (1996) also states that students have a lack of knowledge about radiation and that these topics should be taught in more open education programs. Millar, Klaassen and Eijkelhof (1990) tried to find out the general idea of radiation in kids' minds and what the most common

misunderstandings are in a study. This study shows that students think that radiation and radioactivity are the same things.

The authors aimed to develop training programs for secondary school students about radiation and radioactivity issues. They expressed that this would allow children to understand this issue easier. In the study on various age groups of students carried out by Neumann and Hopf (2012), it is emphasized that teachers should not only talk about the harms of radiation, but also benefits of radiation (health, industry and related fields). In their study, Colclough, Locke, and Soares (2010) stated that students receive information about radiation formally from the schools and informally from the media (tv, newspaper, internet, etc.).

Formal education on children is more effective than informal education. It was stated that teachers play an important role in formal education. It was found that primary school teachers have a lack of information on radiation and radioactivity. According to Pilakouta (2011) it is important for humans to know sufficient information about radiation and that it is important that they start learning from school. In many countries radiation is not taught until high school (Neumann and Hopf, 2012). This results in a lack of knowledge about radiation. Clearly, many studies have been conducted aiming to reveal students' thoughts and ideas about radiation. This study aims to determine the thoughts and ideas students have about radiation which have become such an essential part of their intellectual and philosophical framework.

Method

In the study, qualitative research method used. Qualitative researches study how people understand these topics and how these effect actions (Bickman and Rog, 1998). Yıldırım and Şimşek (1999) have demonstrated that qualitative research helps to clarify the points of view of individuals regarding particular facts and also the researchers to determine the social structure and period of time when form points of views are established. How, why, which questions are the most relevant questions in the method used in (Yin, 1984).

In the current study, 222 students from 3 different primary schools in Erzurum were asked questions about radiation. The students were aged between 12-15, with 108 of them being girls and 114 being boys. To evaluate the answers of the students 7 open ended questions were brought together to form a test. Open questions help to discover the thought process and how they understand terms (Glazar and Vrtacnik, 1992). The answers to the questions were then studied by researchers, forming into numerical percentages in a systematic way. Qualitative values were expressed in percentages since it's the most common value analysis method in qualitative researches (Bolt and Lightning, 2000).

Open ended questions directed to the students are:

1. What do you think radiation is?
2. Where did you learn what you know about radiation from?
3. Can you name a few radiation sources that you know of?
4. How can we understand the presence of radiation?
5. Are you frightened of radiation? Why?
6. Which organ do you think will be harmed the most when we suffer from radiation overdose?
7. How can we protect ourselves from radiation?

Findings

The results of the 7 open-ended questions of the 222 primary school students are reported in Tables 1-7, one table for each question.

In response to the question, "What do you think radiation is", 25% of the students defined it as rays coming from electrical or technological tools; 23% said it was a dangerous ray or a dangerous thing; and 11% said that it was something that caused illnesses or even cancer. Some students defined it as waves, infrared rays, energy (7%, 5%, and 4%, respectively); 10% said that they didn't know what radiation was and 15% of the students gave responses other than those indicated here.

Table 1

Summary of Student Responses to Question 1

Students' Answers	**f**	**%**
Rays spreading from technological tools	56	25
Dangerous ray or dangerous thing	50	23
Bad thing causing illnesses or cancer	25	11
Wave	16	7
Infrared rays	11	5
Energy	8	4
Others	33	15
I don't know	23	10

The second question was asked to determine the students' primary source of information that regarding radiation (Table 2). A staggering 44% of the students answered that they got their knowledge from the internet. Then, in decreasing order, 25% said television, 13% said newspapers or magazines, 9% said they learned it from their teachers and a small faction (8%) said they received their information from their school book. Four percent of the students did not answer at all.

Table 2

Summary of Student Responses to Question 2

Students' Answers	**f**	**%**
Internet	98	44
Television	56	25
Newspapers or magazines	28	13
Teachers	19	9
School book	17	8
No answer	4	1

In tables similar to Tables 1-2, students' responses to the remaining five questions are given in Tables 3 – 7.

Table 3

Summary of Student Responses to Question 3

Students' Answers	**f**	**%**
Mobil Phone	51	23
Television	44	20
Computer	41	19
Atom	28	13
Nuclear plants	21	9
X ray device	16	7
Others	12	6
I don't know	7	3

In the next question students answered the question of how would they detect the presence of radiation (Table 4). Thirty percent (30%) of the students thought that aches in the body would show it. Headaches, dizziness, heart aches, leg aches were the most common answers. 16% of the students answered radiation measurement tools (survey meter), 13% said when we get cancer? and 9% said that the warning signs told us that radiation is in the area. 9% said that they couldn't understand and 23% said that they don't know.

Table 4

Summary of Student Responses to Question 4

Students' Answers	**f**	**%**
Aches in the body	67	30
Radiation measurement tools	36	16
Cancer	28	13
Warning signs	19	9
We can't understand	19	9
I don't know	53	23

In the fifth question students were asked whether they were scared of radiation and the reason why. 196 of the 222 students responded with yes. The majority of the students who said yes took into account all the negative aspects such as it causing cancer or illnesses. Even though 24% said yes they could not give a reason for it. 7 students out of 26 who gave the response 'no' said that radiation is everywhere and it's useless to be scared of it, 5 said that they could run away from it, 4 said that eating yogurt protects me and so I'm not afraid, and the final 10 said no with no reasonable reason.

Table 5

Summary of Student Responses to Question 5

Those who said yes	**f**	**%**
Because it causes cancer	62	32
It harms us	50	25
It's dangerous and bad	26	13
It prevents our growth	11	6
Doesn't know	47	24
Those who said no		
Because its everywhere	7	27
I can run	5	20

The sixth question asked which organ the students believed would be affected the most if we were to suffer from radiation overdose (Table 6). 32% of the students said the brain, 14% said the heart, 11% the whole body, 9% the ear, 19% said different parts and 15% said that they didn't know.

Table 6

Summary of Student Responses to Question 6

Students' Answers	**f**	**%**
Brain	72	32
Heart	30	14
Our whole body	24	11
Ear	19	9
Others	43	19
I don't know	34	15

The final question asked how we could protect ourselves from radiation (Table 7). 40% answered that they would stay away from areas with radiation. 10% of the students said cactus to protect themselves. 9% said they wouldn't play with electronic devices for too long. These answers were followed by answers such as going to the hospital, having a bath, wearing a protective vest. The remaining 19% said that they do not know.

Table 7

Summary of Student Responses to Question 7

Students' Answers	**f**	**%**
We will stay away	89	40
Cactus	22	10
Spending less time with devices	21	9
We will go to the hospit	11	5
Take a bath	12	5
Protective vest	10	5
Others	15	7
I don't know	42	19

Conclusion and Discussion

Radiation coming from natural and manmade sources is all around us. Nowadays radiation can be used in a wide perspective as in technical, medical or industrial. Radiation is very complex and often not well understood. Many of the studies carried out showed that students have a lack of information about a radiation that we come across in our everyday lives (Millar and Gill (1996); Boyes and Stanisstreet (1994)). This study has also come to a similar conclusion. When the students were asked to answer the first question which is'What do you think radiation is?' 98 students (44%) did not answer it clearly. Some of them stated that radiation was a bad thing, a dangerous thing, some of them had no answer. When they were asked to write a source of radiation the majority answered with artificial radiation sources which showed that they were unaware of natural ones. In Prather's (2005) study, it was also concluded that the majority of the students were unaware of natural radiation.

The students (44%) said that they learned about radiation from the internet. In a study published in 2010 by Acar and Ince, it was expresed that most web sites had inaccurate or false information about the terms radiation and radioactivity. The information that Cactus is a protector of radiation has spread to a lot of people by means of the internet. But accuracy of this information has not been proved scientifically. In this study, the students were asked the question which is 'how can we protect ourselves from radiation'. 22 of the students answered that we can protect ourselves by the help of plant cactus. Even though this isn't scientifically proven, students take this as real information and think that it can protect them from radiation.

It is hard to predict what sort of biological affect radiation will have on our bodies (Kam, 2005). In the question that asked which organ would be harmed the most by a radiation overdose the answers clearly show that students have a lack of information about this issue. 88% of the students said that they are afraid of radiation. The result of some studies showed that the majority of students have fear of radiation (Itaki 2010, Pilakouta 2011, Boyes and Stanisstreet 1994, Tada 1999). The most popular reason as to why students are afraid of radiation is that it causes

illnesses or possibly cancer. Studies was shown to derive from the atom bombs dropped on Hiroshima and Nagasaki in 1945, the explosion that took place in the nuclear plant in Chernobyl in 1986 , the nuclear plant accident in Furushima in 2011 and the affects these nuclear accidents had on humans. Films in our day, the information in literature and the negative image imposed in the media about radiation is the reason why radiation is seen as a scary thing (Tada, 1999).

In most countries, public and private schools are the most essential and primary instruments of learning and conveying information to young, developing, and impressionable minds. As the responses in this study indicate, a small percentage of the students said that they learned the information they know about radiation from teachers or school books. In many studies, it was concluded that the radiation topic in school books isn't sufficient enough and that teachers don't know enough about radiation themselves either (Morgul, 2004). It appears that our own qualitative study reported in this paper tends to support this conclusion.

Education of radiation is important in schools (Boyers and Stanisstreet, 1994). Because radiation is the part of our lives. The education of radiation should be carried out at early ages. When all the results are taken into account a good education in schools can allow students to understand radiation better. With a good education system the point of view of students to understand radiation can change. With scientific information students can be taught the good features of radiation as well as the harmful ones. The best way of eliminating ignorance about radiation is by adding new units to the school books of primary schools, to organize educational activities about radiation in specific time periods and to promote the teachers the idea that they should support the fact that radiation is essential.

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