



Examination of Ninth Grade Students' Opinions on Global Warming and Climate Change by Photo Interview Technique


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Abstract

The main problem underlying environmental problems is that people do not have sufficient environmental awareness and do not attach importance to such problems. In this context, the aim of this research is to determine the readiness of the 9th grade students towards global warming and climate change. In this research, 2020-2021 academic year, there are 9 students studying in the 9th grade of a public high school in one of the districts of Aydın in Türkiye. The study is a descriptive study and data diversity was made. The interviews with the students were made with the photo interview technique using a semi-structured interview form, and the findings were analyzed using descriptive analysis. The students stated that the reason for global climate change is mostly the use of fossil fuels and the unconscious behaviors of people, they stated that there will be drought in the future and the world is in great danger. The students stated that the use of the photo interview technique in the study made it easier for them to express themselves, they were better adapted to the subject, and they conveyed their ideas about the subject more accurately and better. It has been observed that 9th grade students have limited ideas about global warming and climate change, some students confuse these concepts and most of the students have misconceptions that global warming is caused by the depletion of the ozone layer. It was concluded that the students had an idea about the precautions to be taken on the subject, and interviewing with the photo interview technique made it easier for the students to express their views on the subject.

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INTRODUCTION

Like all living things, human beings are also affected by environmental problems that are increasing day by day. The main problem underlying environmental problems is that people do not have sufficient environmental awareness and do not attach importance to such problems. Since the existence of the universe, people have always benefited from nature and engaged in activities that disrupt its balance. These activities have also caused environmental pollution and environmental pollution has increased day by day and has become a threat to human health (Demirbaş & Pektaş, 2009). Today, rapid development in technology and rapid population growth have consumed natural resources and increased pollution in nature. Factors such as the rapid increase in the world population, the destruction of fertile agricultural lands and the construction of large buildings in their place, and unplanned urbanization have adversely affected nature and increased environmental problems (Akgün, Duruk & Tokur, 2017). In our age, it is seen that the increase in consumption due to population growth has adversely affected nature and accelerated climate change on a global scale (Swim, Clayton & Howard, 2011). As a result of many human-induced activities such as global warming, the use of fossil fuels in our homes, industry, energy production, transportation, destruction of forests and the environment, the increase in methane (CH₄) and carbon dioxide (CO₂) gases and synthetic chemicals (chlorofluorocarbon-CFC) in the atmosphere The greenhouse effect can be defined as the increase in the average temperature of the world (Aydın, 2014). Global climate change is one of the most important environmental problems in our world, which is caused by people's intervention in nature and affects our world badly with its consequences and is talked about a lot (Demircan et al., 2016). Negative and unusual weather activities observed in many different parts of our world today, the change of seasons and their characteristics, the increase in the melting rate of glaciers, are clearly felt as the effects of climate change. Although the world states take many decisions to reduce the emission of greenhouse gases and cooperate against global climate change, they still cannot prevent this trend. In order to prevent this problem, it is necessary to raise a conscious and sensitive society against environmental problems. In order to reach this awareness, it is necessary to give an effective environmental education to the society (Akgün et al., 2017; Ergin, Akbay, Özdemir & Uzun, 2017). Issues that deal with environmental problems such as global warming, climate change and environmental pollution are included in socio-scientific issues (Topçu, 2015). The importance of socio-scientific issues in science education is increasing day by day and students' thoughts and attitudes on these issues are gaining importance (Sadler, 2004). One of the important goals in science education is to teach students about socio-scientific issues, including situations that everyone may encounter in daily life (Albe, 2008). For this reason, it is aimed to include socio-scientific issues in the science curriculum of the world's countries and thus to raise awareness and awareness about these issues in future generations (Oulton, Dillon & Grace, 2004). It is very important for individuals to have a good understanding of these issues as students in the decisions they will take and the attitudes they will show in the events related to socio-scientific issues that they may encounter throughout their lives (Albe, 2008; Kolsto, 2006). In Türkiye, it is seen that socio-scientific issues are included in the secondary school science curriculum published by the Ministry of National Education (MONE, 2018). While expressing their opinions on socio-scientific issues, students should act with the environmental awareness they gained in the science lesson and should show an attitude according to their own personal analysis by comparing their newly learned information with what they have learned before (Wu & Tsai, 2011). Global warming and climate change are one of the socio-scientific issues that students learn in science class and can discuss and express their opinions by using their scientific thinking skills (Topçu, 2015). It is thought that the study will contribute to the field by revealing the impact of the environmental education that high school students have received to date, and accordingly, studies on the importance given to environmental issues at the high school level and to what extent environmental issues should be included in the curriculum.

CONCEPTUAL FRAMEWORK

Looking at the literature, it has been seen that quantitative and qualitative studies have been conducted to investigate the attitudes, opinions and knowledge of students in different age groups towards global warming and climate change. In addition, there are studies showing that students at different grade levels do not have sufficient knowledge about environmental problems, are not sensitive to environmental problems and have little interest (Aksu, Temeloğlu, Özkaya & Gündeğer, 2012; Özdemir, 2010; Akgün & Atmaca, 2015; Bozdoğan, 2011; Bozkurt & Kaya, 2008; Ayvaci & Çoruhlu, 2009). In order to eliminate all environmental problems, it is necessary to give a good environmental education to the society. Environmental education to be given in order to create environmental awareness, the person to gain attitudes and behaviors to live in harmony with nature, conscious consumption of water, reduction of waste production that pollutes the nature, correct energy use, conscious consumption of natural resources is conscious and responsible, willing and active in solving problems. It can be explained as raising individuals who exhibit an attitude (Aydın, 2014). The main purpose of environmental education; to instill environmental awareness to all segments of the society and to bring a permanent positive behavior change to all individuals (Demirkaya, 2008). For example, in Bozdoğan (2011)'s research; analyzed 62 scientific studies on global warming conducted with students, teachers and teacher candidates studying at different levels in the world and in Türkiye between 1992 and 2009. As a result of this research, it has been revealed that most of the participants have insufficient knowledge about the causes and consequences of global warming and have many misconceptions. In the study conducted by Kılınc, Stanisstreet and Boyes (2008), a questionnaire was applied to students aged 15-16 who are studying in secondary education in our country to determine their views on global warming. As a result of this research, most of the participants have misconceptions about global warming, they think that one of the reasons that increase global warming is radioactive leaks from nuclear power plants, and they think that the use of nuclear weapons is related to global warming. It turned out that they had wrong information about the results. Atik and Doğan (2019) examined the views of high school students participating in their study on global climate change and it was observed that about half of the students could not define global climate change, while the other participants made unscientific and superficial definitions, had too many misconceptions and inaccurate information. When the studies on global warming and climate change in the field of education were examined, few studies were found that examined the opinions of high school students (Atik & Doğan, 2019; Aydın, 2014). Within the Special Purposes of the Science Curriculum; The objectives of "raising interest and curiosity about events occurring in nature and its immediate surroundings, developing attitudes" and "Developing reasoning ability, scientific thinking habits and decision-making skills by using socio-scientific issues" were also included (MoNE, 2018). When the secondary school curricula related to climate change and global warming, which are socio-scientific issues and increasing in importance, are examined; It is seen that the subject of "Global Warming and Climate Change" is included in the Science course in the 7th grade and in the "Matter Cycles and Environmental Problems" Unit (MONE, 2018) in the 8th grade science curriculum. In this context, a research was conducted with students in 9th grade in order to determine the readiness about climate change and global warming of students who had studied these subjects last year and started their high school education. This study is also important in terms of making interviews with students about the subject using photographs and making it easier for students to express their thoughts and opinions about the subject verbally. The study is important in that it is an original study, since there is no study on global climate change in which interviews were conducted using the photo interview technique. In this context, the aim of this research is to determine the readiness of the 9th grade students towards global warming and climate change. In accordance with this purpose, an attempt was made to seek an answer to the following question; "What are the opinions of 9th grade students about global warming and climate change?"

METHOD

RESEARCH DESIGN

This research is a descriptive research. In the study, students' views on "Global Warming and Climate Change" were examined in depth. Students learn about global warming in 8th grade science class. In this study, an interview was conducted with the 9th grade students in order to learn the knowledge (readiness) they had from the 8th grade on the subject. Triangulation was performed in the study and photo interview technique, which is one of the techniques that assists the interview, was also used (Arthur, Waring, Coe & Hedges, 2012/2017). It is used for purposes such as the use of photographs in the interview process, the application of the photo interview method, understanding the behavior of people, helping young children remember events. Researchers can direct participants to discuss social issues by asking questions about photographs (Smith & Barker, 2000; Ascherman, Dannenburg, & Schultz, 1998; Entin, 1979). Photo interview is used by the researcher as an "ice breaker" activity to create a comfortable environment for discussion and to enable children to participate in the interview easily (Hazel, 1995). Recently, photo interview method has been used in various fields such as nursing, psychology, education and geography (Rasmussen, 2004; Riley and Manias, 2003; Smith and Barker, 2000; Salmon, 2001). Photographs make it easier to express an opinion on the subject and provide focus on the interview process. It has been seen that interviews with photographs can be used both for instructional and evaluation, thanks to the visuals (Ziller, 1990). In addition, photographs can create a comfortable environment for both the researcher and the interviewees, relieves pressure, improves communication positively, and creates an atmosphere of harmony and trust (Thinkler, 2014).

STUDY GROUP

The study group of the research consists of 9 students studying in the fall semester of the 9th grade of a public high school in Nazilli District of Aydın province of Türkiye in the 2020-2021 academic year. While determining these students, criterion sampling method, one of the purposeful sampling methods, was used. The criterion in the research is the students' science net in the 2020 High School Entrance Examination (LGS exam). High School Entrance Examination; The Central Examination, which is implemented within the scope of the Transition System to High Schools in Türkiye, is applied to select students for Science High Schools, Social Sciences High Schools, Anatolian Imam Hatip High Schools and Secondary Education Institutions Implementing Special Programs and Projects. In the 2020-2021 academic year, 35 of the 112 9th grade students had a science net of 20, a science net of 19 in 40 students, and a science net of 17 in 37 students and 9 students were determined. Maximum variation sampling was used to identify these students. The maximum variation was made by determining three students from among the students with the highest net worth in the 2020 LGS exam, three students from the students with 19 intermediate level science nets, and three students from the students with low net worth 17. In line with the permissions obtained from the parents of the students, the names of the students were determined with student volunteerism, by obtaining permission from the school administration in order to learn the science nets in the 2020 LGS exam.

DATA COLLECTION

In the research, semi-structured face-to-face photo interview technique was used. Four photographs were used in this research. First photo; A photo of Lake Powell in the USA taken from above in 1999 and the second photo is a photo of Lake Powell taken in 2014. While the study was being carried out, the first two photographs were shown to the students in turn and the differences between the two photographs were commented on by the students. The third photo is a satellite photo of the Aral Sea taken from space in 1988, and the fourth photo is a satellite photo of the Aral Sea taken from space in 2008. The third and fourth photographs were shown to the students in turn, and the differences between the two photographs were commented on by the students. Research data were

collected with a structured interview form on global warming and climate change prepared by the researchers. Oral interviews were conducted with the students. One-to-one verbal interviews of 15-20 minutes were held with the participating students who participated in the research voluntarily, and the interviews were audio-recorded with the consent of the participants. The students who were interviewed were coded as S1, S2, S3, S4, S5, S6, S7, S8, S9. Interview questions are given below.

INTERVIEW FORM

- 1- What do these photos tell you? (will be asked separately for each photo)
 - A) What happened in this photo?
 - B) Can you tell me the reason for the change in the photo?
 - C) Do you think there is anything in the photos that has remained unchanged as before?
- 2- What comes to mind when you think of global warming, can you define it?
- 3- What comes to mind when you think of global climate change, can you define it?
- 4- When you consider the effects of global warming and climate change, can you explain what kind of a world we will face in the future?
- 5- What are the first three concepts that come to your mind when you think of global warming and climate change?
- 6- Can you tell me what causes global climate change?
- 7- What can people do to prevent global warming and climate change?
- 8- What would you say about this interview we had with the photos?
- 9- Did your views on global warming and climate change change at the end of this meeting? It is in the form.

VALIDITY AND RELIABILITY

After the interview form was prepared in order to ensure content validity, it was first presented to the expert opinion. The experts are an academician working in the Department of Science Education, a physics teacher and a Turkish teacher to check the conformity of the interview form with Turkish grammar rules. In line with the feedback from the experts, the photographs to be used in the photo interview form were determined and corrections were made in the interview form. Afterwards, a pilot interview was conducted with a 9th grade student through the prepared interview form. The interview was conducted face-to-face in a quiet classroom environment. While collecting the data, the interviews were recorded with a voice recorder with the permission of the participants. At the end of the interviews, the interview recordings recorded on the voice recorder were played by the students and the dialogue that they wanted not to be recorded were removed from the interview recording. This study was based on volunteerism. In addition, a parent permission form was requested from the students to participate in the study and the study was conducted with students who brought a signed permission form from their parents. It was stated that the data will be used only in this study and will not be published anywhere else. Within the scope of validity and reliability studies; in order to determine the consistency in the coding, the students who participated in the study were re-coded within a month and the consistency between the two codings was examined. It was observed that the codings overlapped with each other. To ensure the validity and reliability of the research; It was reported from the students that they should answer the questions in the interview form sincerely and that their names and surnames would not be written on the interview form, and instead they would be coded as student 1 (S1), student 2 (S2).

DATA ANALYSIS

Data analysis was carried out using descriptive analysis in the research. Descriptive analysis is to directly reveal the information in the materials obtained as a result of the interview, such as interview forms and observation records, without changing them. In this way, without changing the participant expressions in the observation records, by associating them with the themes, a description is made by making one-to-one quotations, and when necessary, some themes and relations between the themes can be revealed (Yıldırım & Şimşek, 2016). In the study, the answers given by the students to the questions in the interview form were coded and tables were created. In addition, the validity and reliability of the study, in other words, the credibility and consistency of the study were tried to be increased by giving sample quotations from the opinions of the students who participated in the interview. The qualitative data obtained from the one-to-one oral interviews with the students participating in the study were transcribed, the data were defined, analyzed according to the themes, and then the findings were defined and interpreted.

FINDINGS/RESULTS

In the research, the findings obtained as a result of examining the views of 9 students in the 9th grade of a public school in the Nazilli district of Aydın province, Türkiye, in 2020-2021 about global warming and climate change are as follows.

FINDINGS RELATED TO THE STUDENTS' OPINIONS ON THE PHOTOS RELATED TO THE SUBJECT

All of the students participating in the research mentioned global warming as the reason for the change in the photographs. For example, S2; "The first photo was taken in 1999 and the other in 2014. It is seen that the effects of global warming are less in 1999 and more in 2014". The opinions of the students about the photographs of the places that have been changed due to global warming and climate change are given in Table 1.

Table 1. *The students' Thoughts About the Environmental Changes Seen in the Photographs*

<i>Answers</i>	<i>Students</i>
Earphones	S1, S3, S6, S9
Increase in temperature	S1, S2, S7, S8
Evaporation of water	S1, S2, S3, S5, S7, S9
Decrease in water	S1, S2, S4, S8
The color of the water has changed	S1, S3, S4, S6, S9
The color of the black has changed	S2, S5
The trees have changed color	S2, S5, S6, S9
Global warming has an effect	S1, S2, S3, S4, S5, S6, S7, S8

When asked about the differences in the photographs, the students said the differences they saw and all of the students stated that the reason for this change was global warming. For example, when asked why the change in photographs occurred, S3; "Nature, the lake, probably due to global warming, the water evaporated too much and there was a drought." In the study with photographs, the students expressed the changes they saw and said that there is no photograph that has not undergone any change. For example, S2; "There is no place in the photograph that does not change, even the color of the air has changed, only the bridge has not changed. It has changed for the worse." replied as. S5 to the same question; "The colors of the mountains and the air have changed, the water has evaporated." replied as.

When asked about the definition of global warming, it was seen that all of the students mentioned that the temperature of our world is increasing. It was seen that two students stated that global warming is caused by the increase in methane and carbon dioxide gases and the greenhouse effect, but these students also mentioned that warming increases with the thinning or perforation of

the ozone layer as a misconception. It was observed that they could not express the definition of global warming fully and accurately. The students' views on this subject are as follows;

- S1: *As a result of the increase in some greenhouse gases (gases such as carbon monoxide, carbon dioxide, nitrogen dioxide, methane), the increases in temperatures with the depletion of the ozone layer.*

- S2: *The situation in which greenhouse gases and methane gases, heavy metals affect the air to the world. The ozone layer prevents the sun's rays from heating the earth too much. As the ozone layer got thinner, the rays of the sun affected us and the temperature of the world increased.*

-S3: *Warming of the globe, warming of the world comes to mind. Melting of the poles, decrease in biodiversity, drought.*

-S6: *Global warming means warming the world. Drought in the world, lack of water necessary for life.*

Considering the students' views on global climate change; one student expressed global climate change as a result of global warming. A student has defined global warming as climate change. In short, the students participating in the study could not make a full and correct definition of global climate change. Students' opinions on this subject;

-S1: *I think it is something caused by global warming, we are experiencing it even now. It's almost January and it still hasn't rained and it's not cold enough. Climate change seems to be the cause of global warming.*

-S2: *Each region has its own unique climates. These climates are the same weather types that do not change for a century or two. The change of this climate due to global climate change is called. The products that will be grown due to global climate change cannot be grown due to climate change. For example, if there is no climate necessary for cocoa cultivation, it will not be produced.*

-S3: *Overheating of the world as a result of the increase in greenhouse gases.*

-S8: *As a result of greenhouse effect gases, it is called the change of the climate that causes the temperature in the world to increase and affect living things badly.*

-S9: *The sudden differentiation of the same continuous climate is called climate change.*

FINDINGS RELATED TO ON STUDENTS' OPINIONS ON THE POSSIBLE EFFECTS OF GLOBAL WARMING AND CLIMATE CHANGE ON THE WORLD

The opinions of the students participating in the research about the possible effects of global warming and climate change on the world are given in Table 2.

Table 2. *Students' Views on the Possible Effects of Global Warming and Climate Change on the World.*

<i>Answers</i>	<i>Students</i>
Drought is on the rise.	S1, S3, S7, S8, S9
Water resources are running out.	S1, S2, S4, S5, S8
Global diseases will increase.	S1, S6
Food will be harder to find.	S1, S5, S6, S9
Agriculture will be badly affected.	S1, S2, S7
Glaciers are melting very fast.	S2, S3, S5, S6, S9
Population density will increase and habitat will decrease.	S2, S4, S7, S8
Temperature rise, heavy rains, floods, etc. natural disasters will increase.	S2, S3, S7
Animals will be affected.	S3, S7, S8, S9

In the interviews with the students, about what will happen in the world in the future depending on global warming and climate change; It was observed that they used expressions such as drought, decrease in water, difficulty in finding food, natural disasters will increase, agriculture will be badly

affected, glaciers will melt, sea waters will rise, coasts will be flooded and global diseases will increase. The opinions of the students participating in the research on the subject;

-S1: Dry. First of all, the need for water will increase because water resources are running out. Since it is used commercially, trees are also cut down, so I think global diseases will increase as well. Water is everything, Food will be hard to find. Agriculture will be affected. A nightmare in itself. These diseases are lung diseases.

-S7: We will not find food because farmland will be destroyed. There will be no water needed for plants. It will be difficult to find food, there will be hunger, natural disasters, animals will perish.

-S2: The average temperature of the world is increasing every year. This is a very dangerous situation for us. This will affect us negatively in the coming years. The glaciers in Antarctica are melting and the sea level is rising every year. Coastal countries will suffer from this. Since the sea shores will be under water, the people living here will live together above sea level and the population density will increase. Our life will be restricted as living space is reduced. The water will decrease. Water and certain weather conditions are necessary for the cultivation of agricultural products. These products do not grow.

-S3: I read a news recently. The glacier has broken, because there is a lot of biodiversity in the Horde (animals like penguins) in South Corcia, it will affect those animals, I expect very difficult days. Due to global warming, there will be heavy rains, floods, extreme droughts. Already the Middle East and Western Europe are dry.

-S9: Drought occurs, glaciers melt, animals are affected, beginning with polar bears, and living things cannot find food.

FINDINGS RELATED TO THE THREE CONCEPTS THAT COME TO STUDENTS' REMEMBER OF GLOBAL WARMING AND CLIMATE CHANGE

Opinions about the first three concepts that come to mind when it comes to global warming and climate change are given in Table 3.

Table 3. *The students' Thoughts About the Environmental Changes Seen in the Photographs*

<i>Answers</i>	<i>Students</i>
Earphones	S1, S4, S6, S8, S9
Greenhouse gases	S1, S2, S5, S7
Increase in temperature	S1, S4, S6, S9
Glaciers	S2, S3, S7, S8
Ozon layer	S2, S5, S7
Polar bear	S3, S4, S6, S8
Death	S3, S5, S9

When the students were asked about the first three concepts that come to mind when talking about global warming and climate change, some of them gave the following answers;

-S1: Drought, bad gases (greenhouse gases), increase in temperature.

-S3: Polar bear, glacier, death.

-S5: Greenhouse gas, ozone layer, death of living things.

FINDINGS RELATED TO STUDENTS' ANSWERS ABOUT GLOBAL WARMING AND CAUSES OF CLIMATE CHANGE

The opinions of the students participating in the research about the causes of global climate change are given in Table 4.

Table 4. Students' Views on the Causes of Global Climate Change.

Answers	Students
Unconscious use of nature by humans.	S2, S3, S5
Fossil fuel use.	S1, S2, S3, S4, S5, S6, S7, S8, S9
Increasing industrialization.	S1, S2, S7, S8
Factories polluting the environment.	S1, S4, S5, S7
Increase of bad gases as a result of heavy traffic.	S1, S6, S8, S9

When the students participating in the research listed the causes of global climate change, they used expressions such as the increase in human-induced traffic density, the lack of attention to the greenhouse effect gas emission to the environment in industries and factories, and the climate changed with the decrease of greenery in nature. His views on this subject;

-S1: With the increase in industrialization, the fact that no filters are installed in the factory chimneys increases a lot, the density of traffic in transportation is the use of fossil fuels; The gases formed as a result of the burning of solid fuels such as coal, the use of fossil fuels for the operation of machines in factories.

-S3: I guess the consequences of global warming. As a result of people unconsciously using nature, greenery is decreasing. The climate is changing in direct proportion to the vegetation. Greenhouse gas and heavy metals increase by using fossil fuels.

-S8: Since there is traffic density and a large number of cars, and fossil fuels are used as a result of industrialization, a lot of bad gas is released and climate change is observed.

FINDINGS RELATED TO STUDENTS' OPINIONS ON WHAT TO DO TO PREVENT GLOBAL WARMING

The opinions of the students participating in the research about what should be done to prevent global warming are given in Table 5.

Table 5. Students' Opinions About What Should be Done to Prevent Global Warming.

Answers	Students
Renewable energy should be used.	S1, S3, S5, S8
Forests should be increased, trees should be planted.	S2, S3, S9
Nuclear power plants should be abolished.	S3, S7, S8
Factories should be filtered and controlled.	S1, S3, S6
Use of public transport should be encouraged.	S1, S4, S5, S6
Cars must be electric, not diesel or petrol.	S2, S4, S7, S9

The students participating in the research gave the following answers about the subject;

-S1: Factories should be controlled. Filters can be installed on chimneys in factories. The density of traffic can be reduced, public transport should be free, some countries are working in this direction. Renewable energy should be used. They can also be encouraged. I think that Turkish society is conscious.

-S2: Forests should be increased, renewable energy should be used, fossil fuels should not be used. Cars will not be used with diesel and gasoline in Europe, All vehicles will be electric. It also emits less harmful gas.

-S3: Clean energy is used green energy. Renewable energy should be used. Factories can install filters to prevent water pollution. Nuclear power plants can be removed because they are built near the water to cool, creating massive water pollution. Forests may increase, trees should be planted.

-S5: Public transportation should be used, public transportation fees should be reduced, people should get on public transportation vehicles, renewable energy sources should be used, thus global warming can be prevented.

FINDINGS RELATED TO THE OPINIONS OF STUDENTS ON THE USE OF PHOTO INTERVIEW TECHNIQUE

When the students participating in the research were asked about their thoughts on the photo interview technique, all of the students stated that the visuals were a reminder and helpful for what they were going to tell about the subject. The students participating in the research gave the following answers about the subject;

-S1: This raised my awareness of the situation. It would remain abstract without photography.

-S2: The images helped me with what I was going to tell. It reminded me of the effects of global warming.

-S3: The effect of doing it with photos was good because when you see the photos, the effects of global warming come to mind without asking any questions.

-S4: I remembered what I was going to say about the subject with the photographs.

-S5: The photographs made me think well, I remembered the subject.

-S9: The photo was good, I understood better what to say.

FINDINGS ON STUDENT OPINIONS ON THE EFFECT OF THE RESEARCH ON GLOBAL WARMING AWARENESS

Eight of the students who participated in the research stated that their awareness of global warming and climate change increased, and that they remembered things about global warming. One student stated that there was no change in his views on the subject. Student answers on the subject;

-S1: Changed. I was aware of it, but I was forgetting in daily life. It increased my awareness.

-S2: I remembered the things that affect global warming and became more conscious.

-S9: I had awareness, but I realized once again that more importance should be given to this issue.

-S3: It didn't...

DISCUSSION, CONCLUSION AND IMPLICATIONS

In the research, according to the data obtained from the face-to-face interviews made orally using the photo interview technique; It has been observed that 9th grade students have limited ideas about global warming and climate change, some students confuse these concepts and most of the students have the misconception that global warming is caused by the depletion of the ozone layer due to the greenhouse effect. Teachers' misconceptions and their handling of Global Warming and Climate Change may have caused misconceptions in students. Eroğlu and Aydoğdu (2016) reached results that support this view in their study with pre-service science teachers. Arsal (2010), in his study with prospective teachers, determined that the participants had misconceptions about greenhouse gases. In addition, Atik and Doğan (2019) investigated the opinions of high school students on climate change in their study, that nearly half of the participants could not define global climate change, and the remaining students made superficial and unscientific definitions. they state that very few students mention greenhouse gases while describing global climate change. These results support findings of this study. Ayvacı and Çoruhlu (2009), in their study with students, revealed that the participants had misconceptions about the greenhouse effect and global warming, which supports the findings of this study. Kılınç et al. (2008), the conclusion that the participants confuse the causes and consequences of global warming with the depletion of the ozone layer, supports the results of the research. In the study, students stated that global warming is increased by gases that cause greenhouse effect. In the study of Aydın (2014) with secondary school students, the fact that more than half of the students reported that the greenhouse effect and global warming are directly proportional supports this result.

In the study, it is seen that the students have knowledge about the effects of global warming and climate change. All of the students said that there will be a drought in our world in the future, that the world is in great danger, that the need for water will increase with the decrease and disappearance of water resources, global diseases will increase, agriculture will be badly affected, glaciers will melt, sudden floods, abnormal precipitation and climate change will occur. They stated that biodiversity would be adversely affected. News about Global Warming and Climate Change in newspapers in recent year television programs, public spots, may have increased awareness among students by including it among the priority topics in TÜBİTAK projects. Some studies in the literature support this result (Yalçın, 2010; Eroğlu & Aydoğdu, 2016). For example; Aydın (2014) stated in his study with high school students that the air temperature will increase with global warming, clean water resources will be polluted and destroyed, sea, rivers and lakes will be affected and the water level will increase, climates will change, flood disasters, drought and desertification will increase. and animal species will be affected and some species will disappear and their habitats will be affected and changed.

In the research, it was observed that 9th grade students generally have knowledge about the factors that cause global climate change. All of the students said that the use of fossil fuels, most of the students said that people's unconscious use of nature, the decrease in greenery, the cutting of trees, the increase in industrialization, the lack of filters in factory chimneys, and the traffic density cause climate change. According to the results of their study by Atik and Doğan (2019), the most important causes of global climate change are; They stated that people have unconscious behaviors towards the environment and polluting nature. Similarly, participants in Aydın's (2014) study mentioned rapid industrialization as one of the biggest factors in global warming. The results of these studies are supportive.

It has been observed that the students participating in the research generally have knowledge about the behaviors and activities that should be done to prevent global warming. All of the students stated that renewable energy should be used first and that fossil fuels should not be consumed. In addition, most students stated that forests should be increased, trees should be planted, factories should be inspected and filters should be installed in their chimneys. Students; They stated that nuclear power plants should be closed since using nuclear energy pollutes the water and a lot of water is consumed in cooling processes, public transportation vehicles should be encouraged, and electric vehicles should be used instead of diesel and gasoline vehicles. It is thought that the students have knowledge about these subjects since they have covered these subjects in the 8th grade. When the studies in the literature are examined, the results of the study and Atik and Doğan (2019), Aydın (2010), Kılınc et al. (2008), Yalçın (2010) and Khalid (2001) study results overlap. For example; Aydın (2014) stated in his research that most of the students stated that more trees should be planted to reduce the effects of global warming, the use of fossil fuels should be reduced, the use of renewable energy sources that are not harmful to the environment should be increased, and recycling such as paper collection should be given importance. In their study, Eroğlu and Aydoğdu (2016) stated that almost all of the participants stated that in order to reduce the effects of global warming, it is necessary to increase afforestation in the environment, to stop fossil fuel consumption, to use renewable energy sources for energy needs, to give importance to recycling such as paper collection, and to use public transportation vehicles in transportation. In the research conducted by Kılınc et al. (2008), the measures that most of the students think will reduce global warming; reducing the use of vehicles in traffic, using recycled paper, increasing afforestation processes. In his research, Ziller (1990) stated that photographs help participants to remember and focus on the interview process, thus providing a significant benefit in reaching the goal of the interview. The fact that Thinkler (2014) stated that a comfortable environment was created for both the researcher and the interviewees with the photographs he used in his research, it reduced the pressure, improved communication in a positive way, and created an atmosphere of harmony and trust, which supports the result.

When the students participating in the research were asked about their thoughts on the photo interview technique, all of the students stated that the visuals were a reminder and helpful for what they were going to tell about the subject. Some studies in the literature support this result. For example; Ascherman, Dannenburg and Schultz (1998) stated in their study that the photo-interview technique helped young children remember events and explain their ideas.

The recommendations developed based on the data obtained in this study are as follows:

Students' lack of knowledge about global warming and climate change should be eliminated.

It should be tried to eliminate the misconceptions of the students about global warming, greenhouse gases and the depletion of the ozone layer. In order for students to learn these subjects by doing and experiencing, activities (argumentation activities such as concept cartoons, Vee diagrams, expressions tables, evidence cards), projects and researches that they participate in one-to-one can be done.

Visual materials can be used to reveal students' misconceptions about global warming and climate change.

Photo interview technique can be used in appropriate researches so that students can express their views better.

By examining the results of the study, the importance given to environmental education in high school curricula can be rearranged by taking these results into account.

AUTHOR CONTRIBUTION

- First author have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data.
- The second author have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data.
- The third author have been involved in drafting the manuscript or revising it critically for important intellectual content.
- The fourth author have given final approval of the version to be published.

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