

An Examination of Science Students' Drawings and Opinions on Global Warming

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Abstract: This research aims to investigate the attitudes and knowledge levels of students studying in the Science Education Department of the Faculty of Education at Trakya University regarding the effects of global warming today and especially in the coming years, using drawing techniques. The research was conducted with 22 students who were in their fourth year of study during the fall semester of the 2025-2026 academic year. The research was conducted using qualitative research techniques, utilizing drawings and semi-structured questions. Participants were first asked to draw a picture illustrating their thoughts on global warming, and then to explain their drawing in writing. They were also questioned about what they were doing to prevent global warming. The study found that all participants, regardless of their demographic characteristics, were concerned about the future and were taking various measures to prevent global warming.

Key Words: Science Students, Global Warming and Measures to Prevent, Drawing

Fen Bilgisi Öğrencilerinin Küresel Isınma Konusunda Çizim ve Görüşlerinin İncelenmesi

Özet: Bu araştırmada günümüzde ve özellikle gelecek yıllarda küresel ısınmanın etkisinden dolayı Trakya Üniversitesi, Eğitim Fakültesi, Fen Bilgisi Öğretmenliği Anabilim Dalında okuyan öğrencilerin bu konu hakkında tutum ve bilgi düzeyleri çizim tekniği kullanılarak araştırılması hedeflenmektedir. Araştırma 2025-2026 eğitim-öğretim yılı güz döneminde 4. sınıfta öğrenim görmekte olan 22 öğrenci ile yapılmıştır. Araştırma nitel araştırma tekniği ile yapılmış olup çizim ve yarı yapılandırılmış sorulardan yararlanılmıştır. Katılımcılardan önce küresel ısınma konusunda düşüncelerini ortaya koyan bir resim çizmeleri ve daha sonra da çizimlerini yazı ile açıklamaları istenmiştir. Ayrıca küresel ısınmayı önleme bakımından neler yapıyor oldukları sorgulanmıştır. Demografik özellikleri fark göstermeksizin bütün katılımcıların gelecek açısından endişeli oldukları ve küresel ısınmayı önlemek için kendilerine göre birtakım önlemler almakta oldukları saptanmıştır.

Anahtar Kelimeler: Fen Bilgisi Öğrencileri, Küresel Isınma ve Önlemler, Resim Çizme

1. INTRODUCTION

Our planet is approximately 4.5 billion years old, and due to various reasons disrupting its natural balance over time, significant changes have been observed in its climate. The geography of the world has changed many times. These changes, resulting from the disruption of natural systems, have created new interactions between the sun, atmosphere, and earth, causing changes on Earth. In other words, these changes are natural changes that occur without any human intervention (Bilgi, 2021).

Generally, the environment has been considered an endless gift bestowed upon humanity. However, the environment has been affected by human actions over the years. As the world's population increased, so did its needs. Meeting these needs required industrial production. This need for industrial production has positively contributed to the acceleration of industrialization. Increased industrialization has led to a greater need for energy. The occurrence of world wars, followed by the Cold War period and increased industrialization, led to the indiscriminate consumption of resources on Earth and rapid environmental damage (Bilgi, 2021; Yapıcı, 2003). Fossil fuels have now come into play. While the use of these fuels meets energy needs, it has also caused serious damage to the environment. Another drawback of these fuels is that they are non-renewable, meaning they cannot be reproduced. The indiscriminate consumption of fossil fuels, a non-renewable energy source, causes environmental problems (Yapıcı, 2003). Although industrialization causes many harms to nature and the environment, its importance to humans is significant. As the whole world believes, "Global Warming" is the leading environmental problem (Akin, 2006; Çepel, 2008; Eroğlu & Aydoğdu, 2016; Ersoy, 2006; McKinney & Schoch, 2003). The phenomenon of our planet's temperature rising over long-term averages compared to past average temperatures is explained as global warming. This event affects rainfall patterns on Earth, causes sea levels to rise, alters vegetation, and has a serious impact on the lives of living organisms (Bilgi, 2021).

In particular, human activities such as the overuse of fossil fuels, rapid population growth, and rising living standards are events that increase the effects of global warming. Natural disasters observed as a result of global warming are making life difficult for humans, plants, and animals alike. It is estimated that these sudden, extreme, and drastic changes in the world's climate system will leave no arable land or habitable surface in 30-

40 years. It is possible to say that humankind has a significant share in this environmental destruction (Yeşiltaş, 2009). Therefore, we bear the most important responsibility in the destruction we have caused (Alım, 2006; Ersoy & Türkkan, 2010).

This study analyzes and discusses student drawings and semi-structured questions that predict the effects of global warming, one of the major problems of the world we live in.

2. MATERIAL AND METHODS

The research was conducted phenomenologically (Yıldırım & Şimşek, 2006). In the study, students were asked to create drawings expressing their thoughts on global warming, which were used as a data collection tool. The data were collected from 22 students in their final year of the Science Education Department at Trakya University during the fall semester of the 2025-2026 academic year in an environmental education course. Each student has been assigned a code from 1 to 22. Among these codes, the students with codes 12 and 18 are boys, while the others are girls. Future teachers were asked to freely draw on A4-sized paper with a pencil in order to express themselves about global warming in the coming years. Later, they were asked to explain two open-ended questions based on the drawings they made: "(1) Explain what you want to convey in the picture you drew?", "(2) Do you do anything to prevent global warming? Please write." The explanations given for the first question help make the researcher's drawings easier to interpret. The answers to the second question aim to identify what individuals have done for the world they live in to prevent global warming and to reveal their sense of responsibility. The data were later analyzed using the content analysis technique (Cohen & Manion, 1994).

3. RESULTS AND DISCUSSION

This section presents students' thoughts and explanations regarding the potential future impacts of global warming. Following this, students' views on behaviors they prioritize in their daily lives to help prevent global warming are discussed.

3.1. Student Drawings and Comment

This section includes drawings and explanations of drawings on global warming created by 22 students.

SS1 (Science Student) drew an individual weakened by atmospheric pollution. This individual is wearing a gas mask and breathing through a glass container with a tree inside on their back (Figure 1). They described their drawing as follows: *"The overall dark, polluted, and smoky atmosphere of the painting represents the hazy and unhealthy air created by greenhouse gases. The dirty clouds and gray tones symbolize a barren world, where life is becoming increasingly difficult, due to global warming. The soil is barren and lifeless; this shows the effects of climate change on drought and ecological destruction. There are no trees left due to drought and air pollution. That's why the man gets his oxygen from the small tree in the glass dome. One of the reasons for this is human deforestation. As forests decrease, greenhouse gases accumulate more, leading to global warming. All the events are interconnected. Oxygen from the tree reaches the man through the hose, and that's how he breathes. The gas mask on the man's face shows how much the quality of the air we breathe has deteriorated and how the pollution levels have reached dangerous levels. Factory fumes, vehicle exhaust, and other pollutants have increased the levels of toxic gases in the atmosphere. This has made it impossible for people to breathe clean air. The man's exhausted and helpless appearance represents humanity struggling under the adverse conditions caused by global warming, environmental pollution, and insufficient oxygen."*

Figure 1: Living in Harsh Conditions without Water and in Polluted Air



SS2 addresses several issues related to global warming as follows (Figure 2): “In this image, I have tried to illustrate some of the future effects of global warming. Global warming is the effect that occurs as a result of the Earth overheating. I also drew a symbolic thermometer inside the Earth. This represents the Earth overheating. I have indicated the causes of this warming, such as smoke and gases from factories and the use of fossil fuels, in the arid region on the left side of the image. As their use increases, global warming increases, and arid areas like the region where the factory drawing is located multiply. As arid areas form and increase, agricultural activities decrease. Trees and plants dry up. I also mentioned this in the same region. Water resources will decrease in such areas. I also mentioned the trees that were cut down in the same drought-stricken region. Cutting down trees disrupts the natural balance. Forest fires also increase as a result of global warming. I also stated this in the same arid region. Glaciers (below) also melt due to global warming. As glaciers melt, sea levels rise in that region. This threatens coastal habitats. Homes are flooded. I've also shown these things on the right side of the picture. The sea level and the houses are submerged. With the melting of the glaciers, the polar bear has become homeless and is standing on a block of ice. I mentioned it in the bottom right corner. Some fish also died due to changes in their habitat and environment. These represent the negative impacts of global warming on the ecosystem. In the green area in the upper right, I tried to illustrate the increase and change in weather patterns. Strong winds have blown off and scattered leaves from the trees. This causes trees to be uprooted and blown away. It triggers effects such as hurricanes, tornadoes, lightning, storms, and floods. I tried to express these things in my drawing with the green area as well. It harms both nature and humanity, that is, homes. The real cause of these problems is factory smoke and the use of fossil fuels. Factories are built by humans. In short, although not depicted in the image, humans are the biggest influence. If this increase is not prevented, animal species may become extinct, the region between the thermometer and arid zones will expand, and green areas will also become dry. I tried to express these things with this image.”

SS3 represents negativity on the left side of the image and a positive future on the right. The hand at the bottom symbolizes that the outcome the world will face is in human hands (Figure 3). “In the drawing I made, the left side shows the negative effects of climate change and global warming caused by industrial activities. Factories emitting smoke from their chimneys (a source of pollution); reddened and dried-up lands (drought, desertification); sad, tearful facial expressions (the seriousness of the situation, the dire state of the world). The right side represents a healthy ecosystem, the balance of nature, and a clean future. Green spaces, trees, plants (Healthy environment); glaciers, snow-covered mountains (Natural balance); happy, smiling faces (A healthy world). The lower part (the hands) emphasizes that the preservation of the world is in the hands of humans. Negative human activities are driving our world towards destruction, but it's not too late to improve our planet. If we focus on conservation and sustainability efforts, we have the power to make the world habitable again...”

Figure 2: The Earth's Temperature is Constantly Rising, the Soil is Cracking, and the Air is Becoming Polluted



Figure 3: The Future We Want is in Our Hands (SS3)



SS4 illustrates the importance of nature conservation for living beings in its image (Figure 4): "This image illustrates the effects of environmental pollution and climate change on nature in a simple yet powerful way. In the background, factories emitting smoke pollute the air, while in the foreground, a polar bear standing helplessly on a small piece of ice represents melting glaciers and disappearing habitats. On one hand, there is polluted air and dead trees; on the other, green nature and a clean environment. This contrast shows how human choices, or preferences, are shaping the future of the world. The image reminds us how important it is to protect nature, that even the life of a tiny creature is our responsibility. If we don't protect nature, one day we too may find ourselves in the middle of a disappearing world, just like this polar bear."

Figure 4: If We don't Protect Nature, We may be Living in a World that is Disappearing (Student with Code SS4)



SS5 focused on how humans are trying to destroy ecosystems, stating (Figure 5): "In my painting, I wanted to show how global warming threatens our world and how it might affect people, animals, and nature in the future. The parched earth and empty water bottle represent the thirst that will result from people's indiscriminate consumption of water resources. The wildfires and smoke in the background illustrate ecosystems being destroyed by rising temperatures and environmental pollution. The melting glaciers on the right, and the polar bear remaining on them, symbolize the endangered life in the polar regions and the desperation they face. The orange color in the sky emphasizes that the world has now become a "burning planet." With this image, I wanted to convey that if people do not protect nature, they will endanger both their own future and the lives of all living beings."

Figure 5: The Consequences the World may Face due to Global Warming (Student with Code SS5)



The student coded SS6 reflects very negative thoughts about the future (Figure 6): "The bear skeleton in the foreground symbolizes the collapse of biodiversity. Why a bear? The bear represents the power and resilience of nature, and one of the top predators in the ecosystem. The fact that even it couldn't survive under these

conditions underscores that no living thing is safe. If a powerful creature like a bear has perished, what chance would more delicate species or humans have?

Cracked earth and dead trees: Symbolizing desertification and the death of the ecosystem. The arid, cracked soil dominating the entire landscape indicates that the planet's water cycle has been completely disrupted. This is not just drought; it is the permanent death of the land, making agriculture impossible, and water ceasing to be a life-giving force and becoming a memory. The dead, leafless trees symbolize the disappearance of forests, the lungs of the planet. The absence of trees is evidence that the amount of carbon dioxide in the atmosphere has spiraled out of control and the life cycle has been broken.

The background symbolizes the collapse of civilization. The structures scattered across the horizon are the remnants of skyscrapers, once the pride of human civilization. These ruined towers show how human arrogance, believing it could control nature, came to an end. The state of these abandoned cities is a sign that humanity has either disappeared or was forced to leave these regions long ago. The sky in the image is not the blue sky we know. A suffocating sunlight barely shines through the dense, swirling clouds. This represents a suffocating and toxic atmosphere trapped by greenhouse gases. The sky is no longer a protective shield, but a trap that heats the planet like an oven."

Figure 6: The Possible Future State of Our World due to Warming (Student with Code SS6)



In the drawing by student SS7, the intention was to illustrate that people have two options for the future (Figure 7): "The left side of the image represents clean, vibrant, and sustainable life. It symbolizes a healthy ecosystem, human-nature harmony, and environmentally conscious living. A healthy, lush, leafy tree aims to convey living nature, abundant oxygen, biodiversity, and healthy forests. *The lush green soil and the clear blue sea represent healthy soil, clean water sources, and fertile habitats. A person watering flowers symbolizes care for nature, protecting it, and promoting sustainable living. This image emphasizes humanity's nurturing and supportive role in nature. The sun rising on the horizon and the birds flying evoke images of fresh air, peace, natural balance, and hope. A small and humble house attempts to depict a minimalist lifestyle in harmony with nature, minimizing harm to the environment.*

The right side represents a polluted, devastated, and arid world. It illustrates the devastating consequences of global climate change, industrialization, and especially deforestation. It symbolizes deforestation, the slaughter of trees, desertification, and the death of ecosystems. The thick smoke emanating from a factory indicates air pollution. These plumes of smoke, carried by the wind, illustrate deteriorating air quality and climate change. Humans cutting down trees with axes (deforestation) demonstrate the deliberate destruction of nature and the sacrifice of the future for short-term gains. The grey, cracked appearance of the soil depicts drought, water scarcity, erosion, and soil degradation. Vehicle exhaust fumes and pollution from transportation contribute to air pollution."

Figure 7: People have Two Options for the Future (Student with Code SS7)



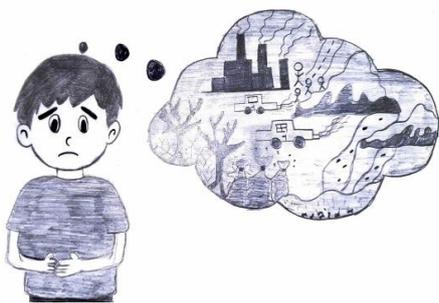
SS8 expresses the fragility and anxieties of the future (Figure 8): *“What I want to convey with the image is this: Lately, whenever I hear about global warming, I feel a sense of anxiety. Because this is no longer just a distant environmental problem, but a reality that affects all our lives. For years, as humans, we have recklessly exploited nature, harming the environment in order to produce energy, consume more, and live in comfort. Now we are actually facing the consequences of these actions, and we will continue to face them even more in the future.*

I believe that global warming will drastically change the world in the future. As scientists have stated in their articles, melting glaciers will cause sea levels to rise, and some countries will be submerged. Seasons will become mixed, droughts will increase, and floods will occur in some regions. This will affect not only nature but also people. Food production will decrease, access to clean water will become difficult, and people will be forced to migrate in search of more habitable places. These migrations could bring with them wars, diseases, and economic inequalities.

I am most afraid of the shrinking habitats of living things. Because some animal and plant species will not be able to adapt to these temperature changes and will become extinct. Because I believe every living thing in the ecosystem has a role, even the extinction of one species would change the balance of the world. Exhaust fumes and non-recyclable materials worry me a lot.

In conclusion, global warming reminds me how fragile the future is. If we humans don't change, nature will establish its own balance without us.”

Figure 8: SS8's Concerns about Our World



SS9 likened global warming to a melting ice cream (Figure 9): *“The purpose of drawing this picture is to strongly convey to everyone how dangerous global warming is and the damage it is causing to our planet. I drew the world like a melting scoop of ice cream because melting ice cream is the simplest and most striking way to illustrate how glaciers and our entire planet are melting due to global warming. The cracking of the ice cap and the dripping water indicate that irreversible damage has begun and that we are depleting our resources too quickly. That sad expression on the face of the earth represents the melting glaciers, the suffering and tears of nature. I wanted to explain that excessive heat from the sun disrupts the entire system, and even the sun, the source of the heat, is bothered by it. The small umbrella on the ice cream symbolizes hope, but it also represents inadequacy. A single umbrella cannot stop such a catastrophe. While our individual efforts are valuable, they underscore the need for massive global action. Clearly, the world is suffering, and we must act.”*

Figure 9: The Suffering Our World is Experiencing and Its Future (Student with Code SS9)



SS10 presents us with two different aspects of our world through two different images (Figure 10): "In this painting, I wanted to show the effects of global warming and a better future achieved through preventative measures, all in one frame. The painting depicts two different futures for the world. On one hand, there are the dire consequences of failing to protect nature; on the other hand, there is the beautiful future we can create by protecting nature.

The left side represents the world in danger. The sky is in shades of red and orange, representing rising temperatures and air pollution. The smoking factories indicate the burning of fossil fuels, i.e., carbon emissions. The dry, cracked earth is a sign of water scarcity and desertification. A polar bear standing on melting ice illustrates the disappearance of the polar regions due to climate change. The subtitle reads "Time is running out" → emphasizing the need to take immediate action against global warming.

The right side represents a hopeful future. The sky is blue and sunny, meaning clean air and a balanced climate. Wind turbines and solar panels represent renewable energy sources. Green trees and happy children represent a world where nature can thrive. Animals like rabbits symbolize the continuation of healthy ecosystems. The subtitle reads "Act now" → reminding us that we need to take immediate action to stop global warming.

In conclusion, this image tells us that if we don't protect nature, the world will burn and living beings will suffer. But if we live with clean energy, reforestation, and environmental awareness, a greener, happier world is in our hands."

Figure 10: Which Side should We Choose? (SS10)

The future is in our hands, which will we choose?



Time is running out, act now

In SS11, she tried to show us in her painting the negative consequences that we might face if we don't take precautions regarding the future of our World (Figure 11): *“Global warming is one of the biggest environmental problems not only today, but also in the future. With this image, I wanted to illustrate that while we have a world like the one on the left today, in the coming days it will become a world like the one on the right. As the amount of greenhouse gases in the atmosphere continues to increase, global temperatures will gradually rise. This is how I wanted to illustrate this situation in the image;*

- *It will highlight climate imbalances. So, as seen on the right side of the picture, there will be drought, glaciers will melt.*

- *Forest fires will occur more frequently and over wider areas. While there is a green (living) tree on the left, in the future this tree will be burned and dried up (as I have drawn on the right).*

- *Species will begin to disappear. In the picture, there are butterflies on one side but not on the other.*

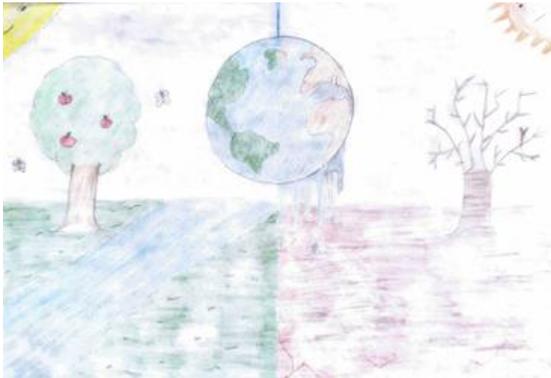
- *Agriculture and food production will also be negatively affected because the soil structure will deteriorate. As I tried to show in the picture, one side has fertile soil full of greenery, while the other side has dried-up, infertile soil.*

- *Water scarcity will occur; as I tried to show in the picture, streams and rivers will dry up.*

- *Most importantly, air pollution will occur, which will affect human health (That's why I showed one side brown and the other side blue in the picture).*

In short, I tried to illustrate in this image what our world will become as a result of global warming. While the left side represents normal conditions, I tried to show that in the future we may face negative consequences like those shown on the right.”

Figure 11: Consequences of Global Warming



SS12 predicts a global catastrophe (Figure 12): *“The drawing depicts a world divided in two, symbolizing the contrast and catastrophe created by global warming. The left side of the globe highlights melting glaciers and rising sea levels. The dried-up tree burning in the flames on the right symbolizes rising temperatures, droughts, forest fires, and the destruction of the ecosystem.”*

Figure 12: Negative Consequences that will Occur due to Rising Temperatures



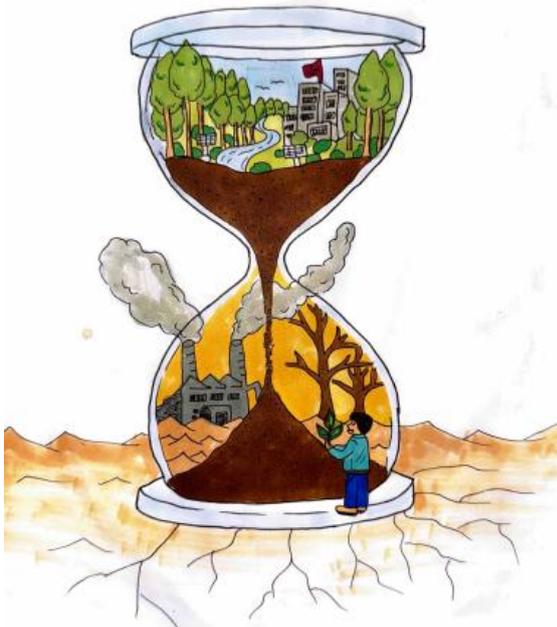
SS13 states that measures taken in the near future are now almost ineffective: (Figure 13). *“The image depicts the drought caused by the increase in greenhouse gases in the atmosphere due to global warming, which has raised the average surface temperature of the Earth, and the consequences of deforestation. Global warming is causing intense heat waves, resulting in soil cracking and desertification. I wanted to convey, through the child holding water and connecting with the earth, that global warming will reach a very advanced point in the future, and that it will not be fixed with our small solutions, but will reach an irreversible point. Also, the deodorant on the child's hand is one of the reasons for the situation.”*

Figure 13: Cracked Soils due to Water Scarcity Around the World



SS14 attempted to explain the effects of global warming by likening our world to an hourglass (Figure 14): *“In my painting, I used an hourglass to illustrate the coming days of global warming. The upper part represents the green and habitable world we haven't yet lost, while the lower part, represented by factories and drought, shows the dark future that awaits us due to global warming if we don't take precautions. The rapid flow of time (the earth above) downwards symbolizes how we are losing this beautiful world day by day. But at the very bottom, the person planting the sapling despite all the negativity represents hope and the importance of individual effort. I wanted to convey that we still have a chance to stop the effects of global warming.”*

Figure 14: Global Models that could be Faced If Precautions are not Taken



SS15 represents the options available to humanity regarding global warming (Figure 15): *“The image I drew symbolically depicts the impact of global warming on our planet and the choices humanity faces. The image*

being split in two suggests that the same planet could have two different futures. On the left, the Earth appears bare, burned, and blackened. The sky is orange and smoky, representing air pollution and rising temperatures. There is no vegetation on the ground, the soil is cracked, and life has almost completely disappeared. I wanted to depict a future where global warming is uncontrolled, people are destroying forests, and vehicles and energy production methods are constantly releasing greenhouse gases into the atmosphere. On the right, however, the world is blue and vibrant, the sky is clean, and the air is clear. Trees, plants, and birds represent a healthy ecosystem. I wanted to depict how an environmentally conscious society, where people protect nature, recycle, and use renewable energy, will be able to live in a cleaner environment in the future. The human hand that lies between these two sides is the future of the world in our hands, in the hands of humanity. If we change our energy consumption habits, plant trees, and use natural resources consciously, we can move our world towards a healthier future."

Figure 15: Which Side of the World We Choose Depends on Our Actions



SS16 states that people need to be made aware of the negative effects of global warming (Figure 16): "I tried to express the devastating effects of global warming by likening the Earth to a melting ice cream. Due to global warming, temperatures are increasing day by day, disrupting the natural balance. The main affected areas are glaciers. The melting of glaciers endangers the lives of many creatures, especially polar animals. In the lower section, I tried to explain the rise in sea level and its impact on urban life. Climate change is destroying the habitats of many species, forcing them to migrate. Many species whose habitats have been destroyed are facing the threat of extinction.

The threat of global warming is increasing day by day, making life more difficult for living beings. Of course, global warming doesn't happen on its own. People also need to become more aware and protect our planet."

Figure 16: The Challenges Faced by many Living Things Whose Habitats have been Destroyed due to Global Warming



SS17 shows that the future of the world is in human hands (Figure 17): “This image shows a person holding a globe in their hand. This hand represents humanity and responsibility. The darkened and cracked surface of the Earth symbolizes the devastation caused by global warming and environmental pollution. The falling water droplet represents hope, nature’s desire for rebirth, and the belief that humanity can still make things right.

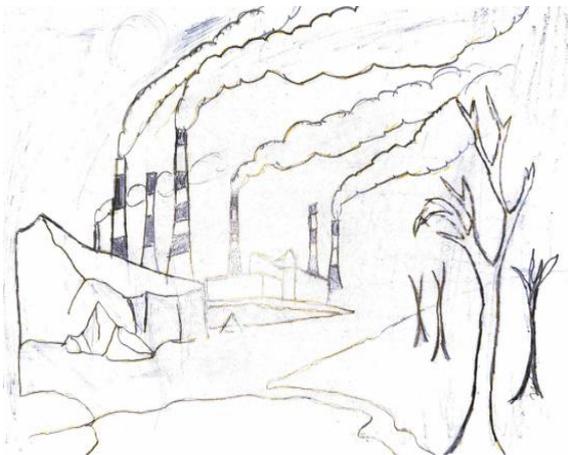
The message I want to convey with the image: “The world is in our hands, is the prevailing thought. As humanity destroys nature instead of protecting it, our planet is darkening, living things are becoming extinct, and the climate balance is being disrupted. If we don’t stop this trend, we will destroy our own living environment. However, the droplet in the picture shows that hope still exists and that we can save the world with even a small effort. What I want to convey with this image is that every person has a responsibility to protect the planet, and the future depends on our choices today. The world is in our hands; protecting it or destroying it depends on our choices.”

Student code SS18 discussed the causes of global warming (Figure 18): “This image illustrates the root causes of global warming. Factory chimneys release CO₂ into the atmosphere as a result of burning fossil fuels. The treeless landscape symbolizes the destruction of forests that bind CO₂. These human activities increase CO₂ in the atmosphere, leading to the greenhouse effect and global warming.”

Figure 17: The Kind of World We Want to Live in is up to Us

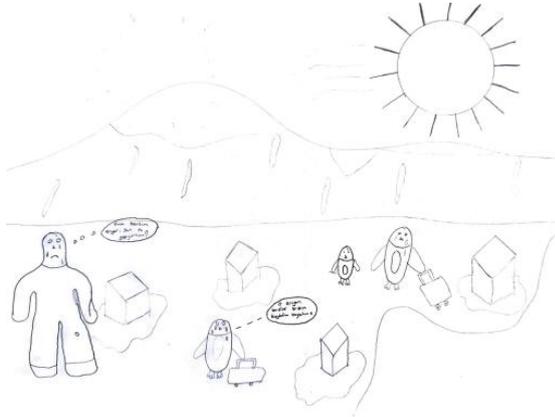


Figure 18: Causes of Global Warming



Student code SS19 reflected the issue of generational extinction caused by global warming in their drawing (Figure 19): “The image shows a polar bear and penguins. These animals' habitat is the poles. However, due to global warming, the poles are melting and their habitat is disappearing. In my drawing, penguins are trying to move from the poles. However, there is no other suitable place for them to live. This endangers their species. It signifies extinction, the disappearance of life. In the picture, the sun shining in the polar regions can be seen as a kind of increase in air temperature. As you've drawn it, this also represents the melting of glaciers, meaning the polar regions are turning into water. That's why the penguins are crying.”

Figure 19: Extinction of Living Things due to the Destruction of Ecosystems



Student code SS20 describes the effects of global warming on nature and living things (Figure 20): “In this drawing, I've depicted a lone polar bear on a block of ice, opposite two icebergs that have begun to melt. The drawing aims to highlight the negative changes that global warming is causing in the polar regions. Melting glaciers are shrinking the polar bear's habitat, leading to serious imbalances in the ecosystem. At the same time, the melting of glaciers is causing sea levels to rise and increasing environmental problems on a global scale. With this drawing, I wanted to illustrate the negative effects of rising temperatures on both nature and living beings.”

Figure 20: The Shrinking of Habitats for Living Things As a Result of Melting Glaciers



Student code SS21 puts forward two different options regarding global warming (Figure 21): “On the left side of the picture, the sky is covered in smoke; fumes from factory chimneys are polluting the air. The ground is cracked, the trees are withered, life has vanished. This side symbolizes a dark future where humanity will carelessly confront nature. On the right side of the painting, the opposite is true: a vibrant natural environment. This section represents the healthy and sustainable future we can have if we protect nature. The person in the middle is standing exactly in the middle of the two paths. This means we will decide which direction the future will take. So the image conveys the message, our future is in our hands; we can either protect or destroy nature.”

Figure 21: Humanity at a Crossroads Regarding the Future



Student code SS22 expressed the negative effects of global warming (Figure 22): “The dead tree in the picture symbolizes the damage that global warming is inflicting on nature and plants. In the future, as temperatures rise, rainfall will decrease, drought will increase, the soil will be unable to retain water, and plants will not be able to survive. This situation explains the drying up of forests and the disruption of ecosystem balance. I wanted to convey that nature, once green and vibrant, no longer shows any signs of life. The orange sky represents the warming Earth's atmosphere. I wanted to use this color to convey extreme heat, polluted air, the effects of greenhouse gases, and the scorching heat of the sun. The sight of ruined buildings and abandoned surroundings illustrates how humanity's damage to nature is ultimately leading to its own demise. Global warming will increase storms, fires, and droughts, making cities uninhabitable and forcing people to migrate. I explained that in a dehumanized environment, human life would be very difficult or would cease to exist. I talked about the melting of glaciers in the polar regions and the destruction of animal habitats. By drawing the polar bear on the ground here, I wanted to illustrate that not just one animal, but all living species are in danger.

In the image, I generally illustrated how global warming will make nature uninhabitable in the future. Drying trees, collapsing cities, extinct animals, and polluted air are all warnings. It shows that if we don't protect nature, the future will be bleak.”

Figure 22: The Challenges the World will Face due to Global Warming



3.2. What are Science Students Doing to Prevent Global Warming?

This section evaluates the responses of prospective teachers regarding their activities to prevent global warming (Table 1).

Tablo 1: Activities Students are Undertaking to Prevent Global Warming

Activities carried out	f
Using public transportation	18
Walking short distances	10
Giving importance to afforestation	9
Paying attention to electricity usage	18
Preventing unnecessary water consumption	15
Contributing to recycling	15
Trying not to produce unnecessary waste	3
Avoiding waste	4
Throwing the seeds of eaten fruit into the soil	2
Not smoking	1
Using energy-saving light bulbs at home	3
Using sustainable materials (glass, cloth bags)	2
Reducing plastic use	6
Not using deodorant	2
Reading to become aware of this issue	1
Being a conscious citizen and a conscious consumer	5
Trying not to harm nature	1
Carefuling not to pollute the environment	3
Informing people about the need to protect the environment	7

The activities undertaken by students to prevent global warming are summarized in 19 items. Among these, using public transportation and avoiding unnecessary electricity consumption stand out with 18 individuals. Following these, water conservation and recycling are seen as important priorities for students.

4. CONCLUSION

When students' opinions on global warming are assessed, almost all express negative views and are concerned about the future. Students believe that this situation is caused by human activities and that the future will also be shaped by humans (Figures 3, 7, 10, 14, 15, 17, 21). Most students think that humankind has two paths ahead. One option is to protect nature by using it sustainably and ensuring the continuation of life, while the other is to destroy ecosystems and living beings by continuing to consume rapidly.

Since global warming is caused by human activities, excessive and indiscriminate use of fossil fuels, which is the cause of it, must be abandoned and restricted. On the other hand, due to the rapid increase in the world's population, the efforts spent to solve the problems of food, shelter, heating, and health of these people lead to the release of more greenhouse gases into the atmosphere and an increase in air, soil, and water pollution; therefore, it is necessary to keep population growth within acceptable limits. Efforts to meet human energy needs through sources other than fossil fuels should be increased. For example, clean energy should be obtained by making greater use of solar, wind, ocean currents, ocean waves, geothermal, and river energy. In efforts to improve living standards, the encouragement of indiscriminate consumer use of goods must be prevented. Furthermore, all necessary measures must be taken as soon as possible to ensure that natural events occur within their own cycles. We can say that the issue of global warming should be addressed through the sensitivity and cooperation of all countries and individuals (Akin, 2006).

Let us not forget that since the moment humankind appeared on Earth, it has faced numerous events that have even threatened the very survival of its species. Each time, thanks to its intellect and logic, it has fought against these challenges, found solutions, and ensured the continuation of its species to this day. Therefore, instead of

waiting for nature to restore the disrupted balance of the climate system within its own ruthless rules over tens, hundreds, or even thousands of years, we must implement urgent and lasting solutions.

The students from whom the data was collected are, as individuals, involved in many activities to prevent global warming. The most frequently implemented measures were public transportation (SS1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21) and the economical use of electricity (SS2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 20, 21, 22). They also attach importance to afforestation and tree protection (SS1, 7, 10, 11, 12, 16, 17, 19, 21), but this is considered insufficient. Two students stated that they throw fruit seeds into nature, and it is expected that these behaviors will improve. Individuals should raise greater awareness about nature in their immediate surroundings. Of course, this cannot be achieved solely through individual efforts; countries and the world as a whole need to pay more attention. Because more and more damage is being done to the environment every day. Therefore, we have a responsibility to act with the future of the world in mind.

REFERENCES

- Akın, G. (2006). Küresel ısınma, nedenleri ve sonuçları. Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi, 46, 2 (2006) 29-43.
- Alım, M. (2006). Avrupa birliği üyelik sürecinde Türkiye’de çevre ve ilköğretimde çevre eğitimi. Kastamonu Eğitim Dergisi, 14(2), 599-616
- Bilgi, K. (2021). Fen bilgisi öğretmen adaylarının küresel ısınma hakkında bilgi ve tutum düzeylerinin incelenmesi. (Yüksek Lisans Tezi). Kırşehir Ahi Evran Üniversitesi Fen Bilimleri Enstitüsü Matematik Ve Fen Bilimleri Eğitimi Anabilim Dalı, Kırşehir.
- Cohen, L. & Manison, L. (1994). Research methods in education. London: Routledge.
- Çepel, N. (2008). Ekolojik sorunlar ve çözümleri. Ankara: TÜBİTAK Popüler Bilim Kitapları.
- Eroğlu, B. & Aydoğdu, M. (2016). Fen bilgisi öğretmen adaylarının küresel ısınma hakkındaki bilgi düzeylerinin belirlenmesi. Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 29(2), 2016, 345-374.
- Ersoy, F. & Türkan, B. (2010). İlköğretim öğrencilerinin çizdikleri karikatürlere yansıttıkları sosyal ve çevresel sorunların incelenmesi. Eğitim ve Bilim Dergisi, 35(156), 96-109.
- Ersoy, Ş. (2006). Küremiz ısınıyor. Bilim ve Ütopya. 139, 5-13.
- McKinney, M. L. & Schoch, R. M. (2003). Environmental Science: Systems and Solutions. Jones & Bartlett Publishers.
- Yapıcı, M. (2003). Sürdürülebilir kalkınma ve eğitim. Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi, V,(1).
- Yeşiltaş, N. K. (2009). I. ve II. Dünya Savaşları Arasında Dünya’da Bilim, Teknoloji ve Sosyal Değişme (1914-1945). Bilim Teknoloji ve Sosyal Değişme. Ata, B. (Ed.) Ankara: Pegem Akademi.
- Yıldırım, A. & Şimşek, H. (2006). Sosyal bilimlerde nitel araştırma yöntemleri. 5. Baskı, Ankara: Seçkin Yayıncılık.