

Lesson 29: Climate Change (Grade 11)

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Lesson 29.1

Duration: 45 minutes

Objective

- Students will be introduced to the phenomenon of climate change
- They will be able to define the term “global warming” accurately
- They will understand the causes of global warming and will be introduced to preventive measures

What do you need?

Reading material: “Climate Change” (see below)

What do you do?

Pose the question, “What do you think ‘climate change’ means?” All the answers are to be written on the board and grouped so the main ideas can be identified.

The teacher hands out the reading material on climate change. Each student reads the material and then the group completes the diagram on causes and effects of global warming.

The teacher leads students in understanding that each cause generates an effect which, in its turn, can lead to new effects. Students will have a firmer knowledge of the meaning of causal effect.

One of the students will act as the planet Earth, five students will act as sun rays, and four others will act as greenhouse gases (CO₂, CH₄, N₂O, water vapors). The children write their characters on a piece of paper and fasten them onto their clothes. The sun rays come to the planet Earth from space and revolve around the planet Earth. A few greenhouse gases also revolve around the planet Earth.

Only two of the sun rays stay with the planet Earth, and the rest leave. One of the sun rays that have stayed explains that he or she is necessary for ensuring the temperature needed for life on Earth, and the greenhouse gases help the Earth to keep part of the warmth, like the roof of a greenhouse.

But when the number of students acting as greenhouse gases increases, they surround the sun’s rays and do not allow them to go back to space. The sun rays are compelled to stay on the Earth, and the temperature rises so high that planet Earth becomes depressed and

turns to the other students in the classroom: “People, I cannot stand this global warming any longer: if this goes on, sudden storms, floods, and fires will threaten you at any time.”

Homework assignment

Collect information on measures to prevent global warming.

Lesson 29.2

Duration: 45 minutes

Objectives

Students will:

- Enhance their knowledge of measures to prevent global warming
- Be able to recognize the important role of forests among CO₂ emission reduction measures
- Develop a sense of responsibility for protection of the environment and saving natural resources
- Collect and analyze information independently, and take part in preventive measures against global warming

What do you do?

The teacher assigns students to write an essay in 10 minutes, “My Role in Solving the Problem of Global Warming.” Afterward, students may read their essays to the rest of the class.

The teacher runs this part with a short lecture, and then summarizes the ideas raised by students in their essays, drawing attention to the fact that the main cause of global warming is the increase in greenhouse gas emissions.

Therefore, reduction in CO₂ emissions is important for preventing global warming. The possible ways to achieve this include:

- preserving and increasing forest-covered areas
- recycling paper
- using alternative sources of energy (sun, wind, water, biomass, geothermal)

A forest is an absorber and accumulator of CO₂ from the atmosphere. Therefore, reductions in forest areas lead to an increase in CO₂ in the atmosphere.

Paper production is a major reason for deforestation, so one of the best solutions is to recycle paper. Recycling one ton of paper saves 17 trees, 30,000 liters of water, and

20,000 kW of electricity. Thus, collecting used paper for recycling will help save the forest and protect the environment.

Reading Material: Climate Change

We often hear news about natural disasters like floods and storms. Each one of us has tried to understand the reason for these events. These unusual phenomena of nature are also attracting the attention of the world community. Studies show that these are all signs of climate change or global warming. Climate change or global warming is the long term or continuous change in the weather of a certain area, region, or the entire planet. This change occurs when the balance of the solar energy absorbed and reflected by the atmosphere and the surface of the Earth changes. Let us try to find out the reason for this.

The energy of the Sun reaches the Earth mostly in the form of short wave radiation. Part of the radiation is immediately reflected from the upper layer of the atmosphere back to space, while the rest passes through the atmosphere and warms the surface of the Earth. Afterwards the Earth radiates part of this energy back to space in the form of long wave infrared or thermal radiation. It is like the warmth emitted by a stone warmed by the Sun. The other part of the energy is absorbed by the greenhouse gases in the atmosphere.

Greenhouse gases obstruct the immediate passage of thermal energy from the Earth to space and create a “natural greenhouse effect” which creates the necessary temperature for the existence of life. The issue, however, is that the amount of greenhouse gases in the atmosphere has increased too much because of human activities; where formerly the presence of greenhouse gases was a necessary condition for the existence of life, in excess it leads to global warming and is destructive for humanity.

The natural greenhouse gases include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and chlorofluorocarbons (CFCs). Carbon dioxide accounts for 60 percent of the harm caused by greenhouse gases. It is generated when producing energy and burning fossil fuels (coal, oil, natural gas). Carbon dioxide is generated, for example, when heating and lighting an apartment, cooking food, or driving a car. A large amount of carbon dioxide is also emitted during industrial and other production processes. Additionally, the carbon accumulated in the wood of decomposed trees passes into the atmosphere in the form of CO₂.

According to projections, if the concentration of greenhouse gases doubles (which may occur in the early 21st century) and no actions are taken to reduce them, the climate will respond by getting rid of the surplus energy because energy cannot accumulate unhindered. This will result in the winds changing direction, precipitation will be more frequent because of the high level of vaporization, polar glaciers will thaw, sea level will rise, and droughts will be observed in some regions.

Climate change will accelerate desertification, water resources will be reduced, the frontiers of croplands will be altered, evaporation of water from soil and dehydration will

intensify, and many species will become extinct. These changes may subject millions of people to hunger.

Global warming has already resulted in changes in nature's balance:

- The mass and area of snow cover and land ice have decreased; snow cover and land ice are the only source of drinking water for 40 percent of the population
- The size of glaciers and floating icebergs of the northern hemisphere have decreased 10–15 percent; over the past 50 years, Arctic ice has thinned 40 percent
- In some areas the permafrost has started to thaw
- In the areas where rains were rare, flooding now occurs, which can cause the economies of these countries to suffer
- Forest fires are becoming increasingly frequent and even modern technologies can be powerless to fight them, which leads to greater carbon dioxide emissions
- Sea level has risen 17 cm, and the territories of some areas are endangered including the Netherlands, Shanghai, Manhattan, and Calcutta which may be flooded by water
- As a result of climate change, 130 million residents of Bangladesh, India, and Pakistan may be displaced from the areas of their permanent residence; the main reasons will be sea level rise, droughts, and the instability of monsoons

Every person on the planet must participate in the solution of the problem of global warming. At the state level, an example of regulation on this issue is the Kyoto Protocol, the purpose of which is to stabilize the content of greenhouse gases in the air. This will be possible to achieve through the reduction in greenhouse gas emissions, as well as a lowering of carbon dioxide in the atmosphere that can be absorbed by forests and other natural sinks.

Today the problem of global warming is gaining the attention of all states. To ensure effective international cooperation aimed at the alleviation of the adverse impact of climate change, the UN Framework Convention on Climate Change was passed in Rio de Janeiro on May 9, 1992. The Convention establishes the overall responsibility of all states to fight global warming and its negative consequences.

In 1997, the Kyoto Protocol was adopted as a supplement to the UN Framework Convention, which provides quantitative restrictions for states on greenhouse gas emissions, based on the economic development level of each state.

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