

Biomes: Extreme Climate

Grade Level: 6-8

Subject: Ecology

Duration: Three class periods

Objectives

Students will

- discuss important terms related to global warming;
- create a web connecting global warming, the Arctic, and world climate;
- write a paragraph explaining the role of the Arctic in the world climate.

Materials

- Large index cards
- Pens
- Ball of string or yarn

Procedures

1. Before you begin this lesson, write each of these terms on a separate index card: global warming, greenhouse effect, Gulf Stream, ocean water, sea ice, glacier, permafrost, climate in western Europe, polar bear, large waves, fossil fuel, coastline erosion, SUV (sport- utility vehicle), methane, severe weather events (tornadoes, storms).
2. After watching *Biomes: Extreme Climate*, ask students to define the following terms:
 - Arctic (region around the North Pole, including the Arctic Ocean and parts of North America, Asia, and Europe)
 - global warming (gradual increase of the temperature of Earth's lower atmosphere due to an increase in carbon dioxide, methane, and other heat-trapping gases)
 - greenhouse effect (phenomenon whereby Earth's atmosphere traps solar radiation, caused by the presence of carbon dioxide, water vapor, and methane that allow incoming sunlight to pass through but absorb heat radiated from the surface)
Note: The natural greenhouse effect makes our planet livable, but human activities are creating an enhanced greenhouse effect.
 - Gulf Stream (current in the Atlantic Ocean that carries warm water from the Gulf of Mexico up the coast of North America and toward Europe; as it moves, it releases heat into the northern hemisphere)
 - sea ice (a layer of ice formed from seawater; it changes with seasons and floats on the ocean, carried by winds and currents)
 - glacier (huge mass of ice and compacted snow, most often found at high altitudes and latitudes where snow accumulation exceeds melting)
 - permafrost (soil or rock in polar regions that remains frozen year-round)
 - fossil fuel (a hydrocarbon deposit—petroleum, coal, or natural gas—derived from living matter of a previous geologic time and used for fuel; when burned, it releases carbon dioxide and other heat-trapping gases into the atmosphere)
 - climate (meteorological conditions—temperature, precipitation, wind—that characteristically prevail in a particular region)

3. Have students to sit in a large circle. Hand out an index card to every second or third student so they're evenly placed around the circle. Explain that students will create a "worldwide web" to illustrate how the terms on their cards are connected.
4. Hand the ball of string to a student holding a card. Ask her or him to think of one way the term on the card is connected to a term on another card. Have the student explain the connection and then, holding onto the string, pass the ball to that student. The next student should do the same thing. Continue this activity until all terms have been connected and the web is visible. (Several cards will be used more than once.)
5. Ask students who do not have cards to describe connections that weren't included in the web.
6. Students may make these connections:
 - SUVs and other cars burn fossil fuels, which release carbon dioxide into the atmosphere. Carbon dioxide contributes to global warming because it is a gas that traps heat in the atmosphere. Global warming is causing the Arctic sea ice to melt. The melting sea ice releases freshwater into the Gulf Stream. This would slow down the Gulf Stream, affecting the climate in Western Europe.
 - Global warming is decreasing the amount of sea ice. With less sea ice, when the wind blows, ocean waves become much larger. Larger waves contribute to coastline erosion because they travel farther ashore and have more energy.
 - Increased temperatures brought by global warming cause glaciers to melt. Water from the glaciers is added to ocean water, causing sea levels to rise. Ocean levels are also expanding because as global warming heats the water, it expands. Rising sea levels contribute to coastline erosion.
 - Global warming is causing sea ice to form later in the fall and melt earlier in the spring. This threatens the survival of polar bears that depend on the ice to hunt seals, their primary food source, because they have fewer weeks of feeding.
7. After this activity, ask students to write a paragraph explaining the following sentence: The Arctic is part of a larger climate system. They should use at least three supporting details in their paragraph.

Evaluation

Use the following three-point rubric to evaluate students' work during this lesson.

- **Three points:** Students were active in class discussions; showed strong understanding of concepts; made at least one strong, clear connection between the terms; completed a thorough, thoughtful paragraph that included at least three supporting details.
- **Two points:** Students participated in class discussions; showed satisfactory understanding of concepts; made one acceptable connection between the terms; completed an adequate paragraph that included two or three supporting details.
- **One point:** Students participated minimally in class discussions; showed minimal understanding of concepts; did not make acceptable connections between the terms; created an incomplete paragraph with one or no supporting details.

Vocabulary

Arctic

Definition: region around the North Pole, including the Arctic Ocean and parts of North America, Asia, and Europe

Context: Global warming has had a devastating impact on the Arctic's geography and wildlife.

climate

Definition: meteorological conditions—temperature, precipitation, wind—that characteristically prevail in a particular region

Context: Human activity is causing great changes in climate.

fossil fuel

Definition: a hydrocarbon deposit—petroleum, coal, or natural gas—derived from living matter of a previous geologic time and used for fuel

Context: When burned, fossil fuels release carbon dioxide and other heat-trapping gases into the atmosphere.

global warming

Definition: gradual increase of the temperature of Earth's lower atmosphere

Context: Many scientists believe that global warming is caused by an increase of heat-trapping gases like carbon dioxide in the atmosphere.

greenhouse effect

Definition: phenomenon whereby Earth's atmosphere traps solar radiation, caused by the presence of carbon dioxide, water vapor, and methane that allow incoming sunlight to pass through but absorb heat radiated from the surface

Context: The natural greenhouse effect makes our planet livable, but human activities are creating an enhanced greenhouse effect that is changing global climate.

Gulf Stream

Definition: major current in the Atlantic Ocean that carries warm water from the Gulf of Mexico up the coast of North America and toward Europe

Context: As it flows, the Gulf Stream releases heat into the northern hemisphere.

permafrost

Definition: soil or rock in polar regions that remains frozen year-round

Context: Global warming is causing some permafrost to melt and erode coastlines.

sea ice

Definition: a layer of ice formed from seawater; it changes with seasons and floats on the ocean, carried by winds and currents

Context: The thickness of sea ice varies, but on average it's about three meters thick.

Academic Standards

California Science Standards:

Grade 6: 2)a; 4)b,d,e; 5)b,d,e; 6)a,b

Grade 7: 3)a

Grade 8: 3)c,d

National Science Standards

This lesson plan addresses the following national standards:

- Science in Personal and Social Perspectives: Populations, resources and environments; Science and technology in society
- Life Science: Populations and ecosystems; Diversity and adaptations of organisms
- Physical Science: Properties and changes of properties in matter

Social Studies

From the National Council for the Social Studies (NCSS) <http://www.socialstudies.org> .

This lesson plan addresses the following thematic standards:

- People, Places, and Environments
- Science, Technology, and Society

Credit

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