



Global Warming is Hot Stuff!

Grade Level: 4,5,6

Subject: Science/Social Studies

Overview: Global warming is a hot topic. Some scientists believe the Earth is warming up. While that may be hard to believe in the middle of a Chicago winter, if it's true it could mean big changes for our planet.

Objective: To understand the concept of the greenhouse effect and the way that students' behavior affects global warming

Procedure: Take two jars and put a teaspoon of water in each jar. Put a lid on just one jar. Place both jars in a sunny spot. After a few hours, check on the jars. You'll see that the open jar hasn't changed, but the closed jar will be steamy and hot inside. What happened? The heat from the sun could not escape from the closed jar.

BACKGROUND INFORMATION

How do you keep a whole planet warm?

Light from the sun warms land, water, and air. In turn, the warmed-up land, water, and air give off heat, which rises up toward the sky. Gases in the Earth's atmosphere capture some of that heat and prevent it from escaping into space. This heat trap keeps the ground, oceans and air at fairly stable, predictable temperatures -- warm enough to allow thousands of plant and animal species (including humans, like us) to thrive.

Without heat trapping, the earth's surface would be about 60 degrees Fahrenheit colder than it is now. If you're living in a place like Chicago, which means you'd have to wear boots and a heavy coat in **July**. BRRRRR! (We won't even talk about **January**!) The earth's overall temperature has changed often across the eras -- the long periods of time we use to measure the Earth's age. We know this because paleontologists have studied the fossils of plants and animals, and because geologists can read the earth's history in rocks and soil. In hotter eras, dinosaurs clomped across warm green landscapes filled with plants. In colder eras, the woolly mammoth survived in rugged terrain of ice and snow.

For the past 10,000 years, the earth has had relatively stable temperatures. But, for the past 100 years or so, scientists have noticed the Earth seems to be warming up more than usual. This phenomenon is called global warming.

What is the greenhouse effect?

You now know the Earth's surface and atmosphere stay warm when gases in the air trap heat from the sun. Have you ever been inside a greenhouse, the all-glass buildings where plants are grown? They're very warm, because the glass walls allow the sun's rays in but prevent the heat from getting out.

Think of the earth as being inside a giant greenhouse. The gases act like a greenhouse's glass walls -- they keep heat from escaping into space, and the earth stays warm.

The greenhouse gases

The main gases that cause the greenhouse effect are:

- water vapor
- carbon dioxide, or CO₂
- methane
- nitrous oxide



Some "greenhouse gases" occur naturally in the Earth's atmosphere. But scientists measuring the gases say the amount of gases in the atmosphere has increased in the past few decades. For instance, the amount of CO₂ in the atmosphere is 30% greater than what it was 150 years ago. Scientists believe CO₂ levels will rise another 30% during the next 50 years.

The increase in greenhouse gases is expected to raise the average global temperature of the planet by 2 to 9 degrees Fahrenheit over the next 50 to 100 years.

Most of the increase is due to human activities, like:

- burning gasoline to drive cars and trucks
- burning oil, coal or wood to produce electricity
- for heating, cooling, and other purposes burning forests to clear land

All these activities, and many others, release greenhouse gases into the atmosphere. With greater amounts of greenhouse gases in the air, more heat will be trapped, and the Earth will get warmer...and warmer...and warmer.

What might happen if Earth heats up?

If Earth gets hotter, some of the following things might occur:

- New coastlines would have to be drawn on maps! Because water expands as it is heated, and because oceans absorb more heat than land, sea levels around the world would rise. Cities on coasts would flood.
- Temperate places that now receive frequent rain and snowfall (like Wisconsin) might become hotter and drier. Inland lakes and rivers would shrink. Forest fires could occur more often. Frequent periods of drought would make it hard to raise crops for food. There would be less water available for drinking, showers, irrigation, even swimming pools!
- Plants and animals unable to take the heat may go extinct, and be replaced by heat-tolerant species.
- Hurricanes, tornadoes and other storms caused by changes in heat and water evaporation might occur more frequently and be more intense.

Global warming: It is more than just a game of up-and-down on a thermometer.

There's a lot of debate going on about global warming. Some scientists say it's nature's way -- something that has happened in the past and will likely occur again. Other say global warming is occurring faster because of human beings and that human beings can stop it, or slow it, if they so choose.

One thing is certain: We do not yet know enough about how Earth works to accurately predict what the increase in greenhouse gases caused by humans will do to the planet. The relationships among land, water, air, plants and animals do not follow a simple pattern, where one action automatically leads to the same result.

For instance, an increase in carbon dioxide (the main greenhouse gas) may warm the Earth, and with the greater warmth more trees might grow. Trees absorb carbon dioxide to make wood and grow larger. With more CO₂ captured in trees and less CO₂ in the atmosphere to hold in heat, the Earth would cool down. Right? On the other hand, trees are also very good at trapping the sun's heat. So with more trees, the Earth would get warmer. Right?

We really don't know for sure. After all, the Earth is a big place -- a place that's worthy of your attention and study. Perhaps someday you'll unlock yet another of Earth's secrets.

YOU can help slow global warming!

Just because we're not absolutely certain of how more greenhouse gases will affect the Earth doesn't mean we should sit back and do nothing.



Besides increasing greenhouse gases, burning too much gasoline and other fossil fuels creates air pollution and wastes energy. Who wants to breathe bad air, or always look up at a dirty sky?

You can help slow global warming by:

- Walking, riding your bicycle, or taking the bus instead of always going by car.
- Not wasting electricity (turn off the lights, the radio, the TV and the computer when you're not using them).
- Reducing, reusing or recycling all kinds of items, from soda pop cans to clothes, to save energy and raw materials.
- Planting trees to help absorb excess CO₂, and to provide shade and windbreaks to keep buildings at more even temperatures so they will require less energy for heating or cooling.

Glossary

- **Era:** The longest division of geologic time, measured in millions of years.
- **Fossil fuels:** A fuel such as oil, which comes from decomposed living matter from another geologic era.
- **Geologist:** Someone who studies the origin and structure of the Earth.
- **Greenhouse:** A glass-enclosed building used to raise plants that need controlled temperatures and humidity.
- **Greenhouse gases:** Gases that trap heat in the atmosphere. They include water vapor, carbon dioxide (CO₂), methane and nitrous oxide.
- **Paleontologist:** Someone who studies fossils, such as skeletons or leaf imprints.

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