

The Greenhouse Effect

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Overview:

In the early 1800's the term "greenhouse effect" was a positive term meaning the natural trace gases in our atmosphere. The term of "greenhouse effect" was not used for a negative idea until the 1950's. When the sunlight goes through our atmosphere and strikes the earth, it can either be reflected, radiate radiation or be absorbed. Everything on the earth does one of these three things. Some examples of reflection and absorbing are snow-covered landscape and sand. The snow reflects the sunlight back in to space, resulting in very low

heating of the surface. On the other hand, when the sun hits concrete or sand it is absorbed resulting in higher heating of the surface. Cloud cover also plays a part in the greenhouse effect by reducing the amount of radiation from the sun and by reducing the amount of radiation energy reflecting back into space.

Purpose:

The purpose of this lesson is to help the students understand the three different effects sunlight can have on the earth, absorption, reflection and radiate radiation. Students will learn how these three different effects relate to the heating of the earth's atmosphere. Students will also understand the relationship cloud cover has on absorption and reflection.

Standards:

Arizona Science Standards: 7th grade.

Strand 1; Concept 1; P.O.1 – Formulate questions based on observations that lead to the development of a hypothesis.

Strand 1; Concept 2; P.O. 3 – Conduct a controlled investigation, utilizing multiple trials to test a hypothesis using scientific process.

Strand 1; Concept 2; P.O. 5 – Keep record of observations, notes, sketches, questions, and ideas using tools such as written and/or computer logs.

Strand 1; Concept 3; P.O. 1 – Analyze data obtained in a scientific investigation to identify trends.

Suggested Grade Level:

3rd – 8th (mainly 7th – 8th)

Lesson Times:

1 class periods for assembly and beginning data. Recording of data once in the following 4 classes.

Materials:

4 wooden box, 4 pane of glass, sand to fill 2 boxes, 4 thermometer, 2 plastic bags, 2 mirrors to fit bottom.

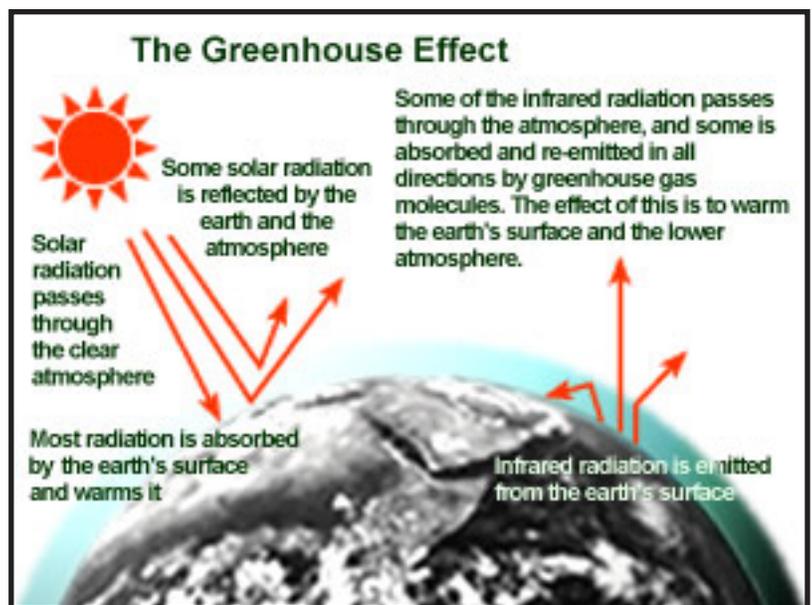
Learning Objectives:

- Students will be able to understand what the greenhouse effect is and formulate a hypothesis relevant to this experiment.
- Students will be able to assemble and execute the experiment as intended.
- Students will be able to obtain and organize data in a chart they can read and understand.
- Students will understand the difference between the three ways solar radiation is affected (absorb, radiate, and reflect).

Suggested Procedures:

Share the overview and background data on the greenhouse effect. Inform them of what it is and emphasize the three ways solar radiation impacts the earth (absorb, radiate, and reflect). Discuss in detail the importance of each affect and have the students come up with examples of each to clarify the difference.

1. Divide the students into 4 different groups.
2. Have the students create a table in their notebooks in which they will be able to record the data and inform the groups which reaction they are.
3. Distribute the 4 wooden boxes, 4 panes of glass, sand, 4 thermometers, 2 plastic bags, and 2 mirrors to the appropriate groups. Discuss with the students different ways to put together the experiment so it will be most effective. Discuss the purpose of the different parts of the experiment.



4. Allow the students time to assemble their specific box to their specification.
5. Now, have the students transport their experiments outside where they will be placed in a location that they will be hit by the sun.
6. While waiting for the sun to warm up the temperature of each box, discuss the impacts of the greenhouse effect on the human race and talk about what modern technology produces the gasses that harm the environment and create the negative greenhouse effect.
7. After about 30 minutes, have the students go out to their box and record the temperatures in their chart.
8. Proceed to share the data with the other groups by filling in a master chart on the white board. All students should record the data to complete the chart.
9. Over the course of the week the students will go out once a day to retrieve data from their box and share their findings with the class. Ask the students any trends or patterns they have observed. Does the outside weather and temperature affect the boxes? Does the sand, mirror, or plastic

bag affect the temperature as much as you thought? What would happen if the glass lid was removed? In real life, what does the plastic bag represent?

Assessment:

1. Review data that was obtained to confirm correct use of the chart.
2. Using the data on our chart, each student must find the average temperature of the four boxes and chart them on a bar graph for easy viewing.
3. Review the effects of each box had on the temperature.
4. Review the idea of greenhouse by looking at the short video at <http://earthguide.ucsd.edu/earthguide/diagrams/greenhouse/>

Extensions:

1. Using the knowledge gained from the experiment, have the students pull out a sheet of paper and write down everything they use that will contribute to the pollution of our atmosphere and discuss their impact.
2. Have students come up with ideas and ways they can improve their contribution to pollution.
3. Have them use the carbon footprint calculator at http://www.zerofootprintkids.com/kids_home.aspx
4. Discuss the results from the carbon footprint calculator and compare the results to the U.S.A. and the rest of the world.

Sources:

Climate Change Kids Site:

<http://www.epa.gov/climatechange/kids/greenhouse.html>

Greenhouse Effect – animated diagram:

<http://earthguide.ucsd.edu/earthguide/diagrams/greenhouse/>

UCAR website on Greenhouse Effect:

http://www.ucar.edu/learn/1_3_1.htm