Teacher Information
Greenhouse Effect

I. Objectives

A. Forming Concepts (Introductory) Objectives

1. Identify greenhouse gases.
2. Explain why perfluorocarbons (PFCs) are a bad alternative to chlorofluorocarbons (CFCs)
3. Determine the least influential greenhouse gas.
4. Determine the most influential greenhouse gas.

B. Interpreting Data Objectives

1. Describe the trend of the concentration of carbon dioxide in the atmosphere.
2. Estimate the mean atmospheric temperature that will exist in the year 2050 if the greenhouse effect is not controlled.
3. Quantify the increase in CO_2 concentration since the Industrial Revolution.
4. Determine which country has the largest increase in its CO_2 production by measuring the percent of production.
5. Determine which country is the most responsible for CO_2 increase per capita.

C. Applying Principles Objectives

1. Hypothesize reasons that India's use of fossil fuels has increased dramatically from 1970 to 1989.
2. Explain ways to slow global warming.
3. Explain a cartoon symbolizing the way third world countries and industrialized nations use natural resources and policies that industrialized nations would like to see instigated in third world countries.

II. Interdisciplinary Uses

A. Social Studies

1. Predict the economic effects on people affected by increasing global temperatures.
2. Predict the effect on plants affected by increasing global temperatures.

B. Math

1. Interpret graphical data.
2. Calculate a percent increase in CO_2 concentration over time.
5. Calculate how many times greater one number is than another number.

C. Language Arts

1. Create written and oral communications about the greenhouse effect.
2. Develop a plan to decrease the greenhouse effect.

III. Science Standards Coordination

The Greenhouse Effect activity has been designed to incorporate science standards as specified by the National Science Education Standards (NSES) and the National Science Teachers Association (NSTA) Scope, Sequence, and Coordination (SS&C) of Secondary School Science. Only the major topics are listed. For further explanation of each standard see the complete documents:

NSES - National Academy Press, 2101 Constitution Ave, NW, Washington, DC 20481
NSTA – 1840 Wilson Blvd, Arlington, VA 22201-3000

NSES	SS&C
Properties and changes of properties of matter	Molecules
Transfer of energy	Bonds
Natural hazards	Energy transfer by heat radiation
	Energy
	Sun as an energy source
	Solar system in space

IV. Advanced Preparation

A. Materials

1. One computer per two or three students is a recommended minimum,
2. One copy of the Student Activity Book for each student or group of students.
3. You will either need to have a printer available or copy in advance a class set of materials (Interpreting Surface Observation Symbols) needed for student use in the Forecasting "Gather Data" section.

B. Time Required Completing the Activity

1. The Get Info Section takes 20 to 30 minutes
2. The Gather Data Section takes 30 to 40 minutes
3. The Application section takes about 30 minutes

C. Teacher Familiarity

Preview these materials thoroughly. As with all these activities, before using this activity in class, review the sites and work through the activity yourself to learn about forecasting so you can answer questions or direct students to the answers.

The activity is set up so students are taken to sites containing information that will be used to answer questions regarding the greenhouse effect. The sites contain either the answers or the information from which the students can infer the answers. At the end of the activity, there is a list of enrichment activities and related web sites.

D. Select Questions for Students to Answer

It would be prudent for you to read the questions students will be expected to answer. These questions are in order of ascending difficulty. Depending on grade level and ability level, you might want to assign specific questions for your students.

E. Student Grouping

These activities can be done individually or in small groups of two or three students. Students who have Internet access can also do them at home for extra credit.

F. Software Requirements and Duplication Preparation

1. Adobe Acrobat Reader is required to download the pages. Click the "Tech Info" link on the Science with NOAA Research homepage to download Acrobat Reader.
2. Download the Teacher Information, Teacher Key, and Student Activity Book PDF files from the "Teacher Info" web page.
3. Duplicate and distribute student pages. Ideally, each student should have a copy of the Student Activity Book that should be distributed and discussed the day before the exercise.