People Changing the Atmosphere Lab
Lesson Plan

Objective: To increase understanding of ways to reduce the greenhouse effect.

Warm Up: What do you think the greenhouse effect is?

Materials:

* Carbon Dioxide Journal (1 copy per student)

Background Information:

Although students may understand the cause and effects of global warming due to the greenhouse effect, many may not establish the connection between their own behavior and its impact. By keeping a "CO2 Journal," each student establishes this connection, while simultaneously discovering what he or she can do to reduce global warming.

Procedure:

1. Determine a period of time (about one week) over which the students will measure their CO2 production. During the sample time, students should record their daily transportation, home energy, and waste behaviors. Totals for the week are entered on the worksheet “Carbon Dioxide Journal”. Some of this information can be obtained from home utility bills, car and school bus odometers, and maps.

2. Students should calculate an estimate of their direct carbon dioxide emissions. It is important to recognize this as only an estimate. The arithmetic assumes many things: that all members of the household are using energy equally, that production of the electricity uses an average ratio of fossil fuels to nuclear and renewable sources.

3. Total the emissions from different sources to get a weekly estimate. Multiply the weekly estimate by 52 to find the amount of CO2 produced in a year. Multiply the annual total by two to reflect indirect production of carbon dioxide. These indirect emissions include everything from the energy needed to make their pencils to the fuel
used to bring groceries to the supermarket. Typically, ones indirect production of CO2 is roughly equal to ones direct production.

4. Student totals will be above the global average of 9000lbs of CO2 per person per year. But even if they are less than average, this might not be good enough to stop global warming. Many experts think that stabilizing the climate may require a 50% reduction in global emissions of CO2. By examining the worksheet, students should be able to find ways to cut down: finding more efficient ways to get around; using less electricity, gas, and oil; and recycling more.

5. Ask the students to aim for a 20% reduction in their emissions, and have them figure out what steps they could take to meet that goal.

Evaluation: Observation of data collection every night and review of calculation worksheet.

Homework: Record data for each day on “Carbon Dioxide Journal”

Write one paragraph on “Carbon Dioxide Reduction” Worksheet.
**Now fill in the “**Carbon Dioxide Calculations**” worksheet with the information above to calculate how much your average CO2 emissions are per year.**
carbon dioxide calculations

Name ____________________   Date __________

Transportation

By Car:
  a) Miles traveled during the week: ________
  b) Miles per gallon of that car: ________
  c) Gallons of gasoline used (a/b): ________x 22 lbs/gal = ______ lbs CO2

By Bus:
  a) Miles traveled during the week: ________x 0.7 lbs/mile = ______ lbs CO2

Train or Subway:
  a) Miles traveled during the week: ________x 0.6 lbs/mile = ______ lbs CO2

Home Energy—check your family’s utility bills

Electricity:
  a) Kilowatt-hours of electricity used in a month: ________
  b) Kilowatt-hours used in a week (a/4): ________
  c) Kilowatt-hours used per person (b/# of people in household):
     ________x 1.5 lbs/kWh = ______ lbs CO2

Natural Gas
  a) Hundreds of cubic feet of gas (ccf or therms) used in a month: ________
  b) Therms used in a week (a/4): ________
  c) Therms used per person
     (b/# of people in household): ________x 11 lbs/therm = ______ lbs CO2

Heating Oil
  a) Gallons of heating oil used in a month: ________
  b) Gallons used in a week (a/4): ________
  c) Gallons used per person (b/# of people in household): ________x 22 lbs/gal
     = ______ lbs CO2

Waste
  a) Pounds of trash thrown away: ________x 3 lbs/lb = ______ lbs CO2
  b) Pounds of trash recycled: ________x 2 lbs/lb = ______ lbs CO2

Total
  a) Total of daily direct CO2 emissions: ________ lbs
  b) a x 365 = Total annual direct CO2 emissions: ________ lbs
  c) b x 2 = Total annual CO2 emissions: ________ lbs

Global average: 9,000
You are to aim for a 20% reduction in your emissions. Figure out what steps you can take to meet that goal. Try and find ways to cut down. What would be a more efficient way to get around? How could you use less electricity? Less gas? Less oil? And what about recycling more? Write at least one paragraph explaining how you can reduce your emissions. Ask your parents, read the newspaper or look on the Internet if you need to.