

## Hands-On Activity

### The Greenhouse Effect

In this activity, students will demonstrate the following Inquiry Skills:

- Design Investigations
  - Make or use models that:
    - Simulate a real thing that cannot easily be studied or manipulated.
    - Function exactly like or similarly to the real thing
- Gather Data
  - Use tools and the use of SI (metric system) to accurately measure:
    - Temperature
  - Chooses appropriate tools to conduct an investigation
    - Thermometer
  - Use senses to observe
    - Seeing (color, shape, size, texture, motion)
  - Uses the appropriate format to record data:
    - Writing (journal, worksheet, electronic text)
- Interpret Data
  - Identifies and interprets patterns
    - Based on an analysis of data collected during an investigation
- Evaluate Evidence
  - Drawing and supporting a conclusion by:
    - Using data to determine the cause effect relationship observed in the investigation
    - Reporting out trends and patterns in the data
    - Extrapolating results beyond the investigation

Materials:

- For each pair of students:
  - Large glass jar
  - Thermometer
  - Sunny day or sun lamp (or regular lamp with an incandescent bulb)

Ideally, this activity should be done outside on a sunny day. Alternatively, it can be done inside near a sunny window. If the conditions are not sunny on the day of this activity, a sun lamp or regular lamp with an incandescent bulb may be used inside instead.

Pair students together and have each pair choose one location to work in. Instruct students to record all data, make drawings, and write their analysis in their science journal or notebook. The thermometer should be placed at that location by itself so that it is in the direct sun (or in the direct light of the lamp). Students should allow the thermometer to rest undisturbed like this for several minutes so that they

obtain an accurate reading of the air temperature at this location. Students should record both their procedure and their observations.

Then they should place the jar over the thermometer in the same location. If the thermometer is long and the mouth of the jar does not cover the length of the thermometer, students should adjust the thermometer so that it is upright inside the jar leaning against the side of the jar. The jar mouth should rest flush with the surface of the experimental space so that air inside the jar cannot circulate with outside air. Students should observe the temperature readings on the thermometer over several minutes and record both their procedure and observations.

When students are finished, bring the entire class together for a discussion about what they observed. Ask: what effect did the jar have on the temperature of the air? (it raised the air temperature) Why did the air temperature increase inside the jar? (air was trapped inside and could not circulate with outside air; radiant energy coming in became converted to heat energy of air molecules moving) On Earth, what is the equivalent of the jar? (the atmosphere, which traps heat) Finally, ask: What does fossil fuel do to make this situation worse? (carbon dioxide in the air traps heat, so when fossil fuels burn and add more carbon dioxide to the air, we see an even greater greenhouse effect than we normally do).