

## Activity 3

# House Warming

### DESIGN A HOME FOR THE CLIMATE WHERE YOU LIVE.

Today, some house builders are using passive solar design to increase energy efficiency. The key is to use the sun's heat to warm a house in the winter, and to avoid the sun's heat in the summer to keep the house cool. In this activity, girls will test paperboard models of different building designs to discover how the design affects the amount of heat that enters the house.

**SMART START:** Set up each lamp at the testing stations (ideally one testing station per small group). The girls' houses should be approximately 8 inches from the bulb; you may need to clamp lights to tables or chairs to achieve this. Be sure to use 120 watt incandescent bulbs. Less powerful bulbs do not put out enough heat.

#### Here's how:

**1. Introduce passive solar heat.** Ask girls about their experience when the sun comes in a window. When do they want sun? When do they not want it?<sup>2</sup> Present the **SciGirls Challenge:** How does the design of a home affect the amount of solar heat that gets in?

**2. Brainstorm.** Ask girls to brainstorm all the variables that could increase or decrease the sun's effect on the internal temperature of a house<sup>6</sup>

### You'll Need:

#### For testing stations

- ♦ 1 120 watt incandescent lightbulb
- ♦ 1 work light with clamp (or desk lamp capable of holding a 120 watt bulb)
- ♦ 1 stopwatch

#### For each small group

- ♦ paperboard (e.g., cereal box, shoebox, tissue box)
- ♦ scissors
- ♦ ruler
- ♦ masking tape
- ♦ 1 thermometer
- ♦ markers
- ♦ paper and pencil
- ♦ optional: plastic wrap for windows

2 hours

(house shape, house size, window size, window placement relative to the sun).

**3. Choose your variable.** As a large group, decide which variable to test (e.g., window size).

Then, divide girls into small groups<sup>1</sup> and assign each group one version of the variable to test (e.g., small window, medium-sized window, large window).

**4. Design and build.** Have each group sketch a house design, including measurements, and then draw the pieces to be cut on a piece of paperboard. Cut out the pieces, and then tape

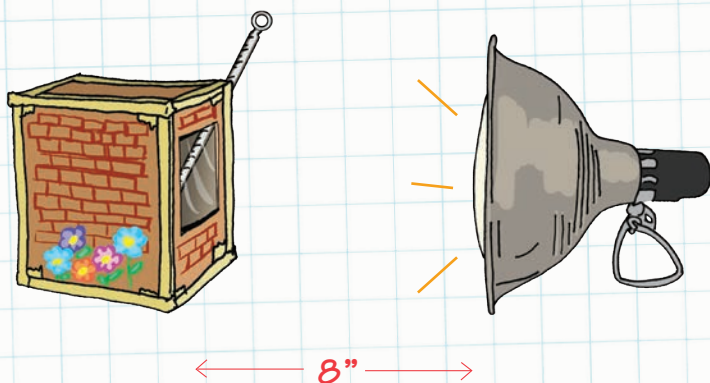
# House Warming continued

the house together, leaving a space to insert the thermometer. Allow time for groups to decorate their houses,<sup>4</sup> but make sure that decorations don't interfere with the variable being tested.



**POINTER:** If girls are struggling to build their house, start by proposing the following challenge. Give one piece of paper, tape and a pair of scissors. Ask them to design and build a self-supporting cube with these materials.

To see how the SciGirls tested their shanty prototype watch the *SciGirls Investigate* DVD. (Select *Insulation Station: Prototype testing*.)



**5. Collect data.** Have the girls secure the thermometer to their house with the end near the center, placing it so it can be read easily. The girls should record the initial temperature, then place the house about 8 inches from the bulb, as shown in the illustration. For the

experiment, the girls will turn on the lamp and record the temperature every minute for 5 minutes. Then they'll turn off the lamp and again record the temperature every minute for 5 minutes.

The lightbulbs will be hot when they have been on for a while.



**6. Analyze results.** Ask the girls, How hot did your house get? How cold? What is the difference between the hottest and coldest temperatures?

**7. Share.** Have groups come together and share their results. Which version of the variables tested was the best design for the climate where you live? What about other areas of the country? What other variables would you test?<sup>6</sup>



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<sup>1-7</sup> See **SciGirls Seven** strategies on page 3.