

Design a Shoebox Solar Home

Explore solar energy and insulation with a hands-on experiment!

The Sun gives off energy in the form of light and heat, which can be collected and used to heat buildings.



Materials Needed:

Two small cardboard boxes, thermometer, markers, plastic wrap, black construction paper, scissors, tape, sunny day. *Optional:* Aluminum foil, fabric, paper in various colors.

Instructions

Step 1: Gather two cardboard boxes about the same size. Cut two holes in the side of one box. These will be your windows.

Step 2: Use markers to decorate both boxes. Make them look like houses, or be creative!

Step 3: Place both boxes in the sun for thirty minutes to one hour. Use a thermometer to measure the temperature inside both boxes. Which box is warmer?

Step 4: Tape plastic wrap over the windows on one box. Repeat Step 3. Did the plastic wrap keep the box warmer than before?

Step 5: Cover the inside of the box with black construction paper. Repeat Step 3. Did the box get warmer or cooler?



Extension: Cover the inside of the boxes with different materials, such as aluminum foil, fabric, or paper in different colors. Which materials keep the box warmest?

What is Solar Energy?



Image: NASA/SDO.

Solar energy is the energy given off by the Sun. At the center of the Sun, hydrogen atoms are under intense pressure from gravity. They undergo a process called *nuclear fusion* and get converted into helium atoms. This process generates a tremendous amount of energy, which is emitted in the form of light, heat, and charged particles.

Learn more about the Sun's energy: spaceplace.nasa.gov/sun-heat/en

On Earth, people have used solar energy for thousands of years to keep warm, cook food, and for other daily activities. People harness the Sun's energy in different ways.

Passive solar heating is the design of buildings to take advantage of the Sun's heat. It helps to have large windows that face south and are not shaded by other buildings or trees. You can also include special walls made of absorptive materials that store heat during the day and slowly release it at night, or even overhangs that block sunlight to keep a building cool.

Photovoltaic cells absorb sunlight and convert it into electricity. A group of photovoltaic cells is called a solar panel. The photovoltaic cell was invented in 1954, and they have been used in many kinds of technology, from calculators and road signs to houses and even the International Space Station! You might see solar panels in your own neighborhood.



Solar panels in Kanuti National Wildlife Refuge. Image: Steve Hillebrand, USFWS.

Solar thermal technology uses the Sun's heat to make steam, which can be used to make electricity. Sunlight reflects off the surface of large, curved mirrors, and is reflected toward a single focus at their center. The beam created by the mirrors is used to make steam, which spins a turbine to generate electricity.

Discover more about solar energy (from PBS NOVA):

www.youtube.com/watch?v=m74bMrxBkw