

E.T. - A LOCAL WAY OF LEARNING

Title: SOLAR COOKING

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Grade Level: 4-12

Concepts:
1. The Sun
6. Natural Resources
8. Values and Attitudes

Disciplines:
1. Social Studies
2. Science
3. Language Arts
4. Math

Objective:
Students shall construct a solar oven according to the attached specifications (cardboard instead of sheet metal), and cook and eat food. Student shall make oral or written presentation of the reason for creating the oven, why it works as it does, and the possible emergency uses.

Rationale:
The earth has a finite supply of natural resources which are rapidly being depleted. -As this occurs, the cost of energy producing fuels escalates. Utilization of Solar Energy will offset the necessity of cooking with fossil fuels.

The Virgin Islands are fortunate in having mostly sunny days and being located in the sub-tropics, having hot sun for the project. Flat black paint is used on-the oven's inside surface because black absorbs all light (and heat).

Materials Needed:
At lower grades substitute packing boxes for sheet metal. Linoleum knife to cut the cardboard.
Insulating materials, i.e., Styrofoam pellets or fiberglass
One sheet of Plexiglas or glass
Flat black paint
Resin
Duct tape

Directions/Activity:
Using the attached specification sheet, students can work in groups, under supervision, to assemble the materials listed, measure and cut the cardboard to the desired sizes, assemble, and stuff with insulation. The door in the back of the oven must be insulated also and fit tightly enough to prevent escape of heat.

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Inside the oven, make temperature tests with a thermometer, setting the oven in various positions with respect to the sun. Experiment with reflectors to test for impact upon oven temperature.

Bake as you would in a conventional oven, using covered dishes, or foil wrapped food in a pan. Attention must be given to the movement of the sun to reposition the oven for maximum exposure. When the food is cooked, enjoy.

Resources:

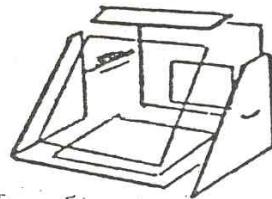
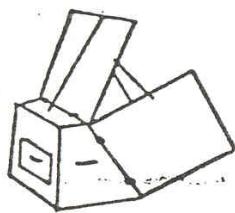
The Virgin Islands Energy Office will send a representative to the classroom to discuss alternate sources of energy. Solar oven plans may be obtained from the Energy Office.

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HOW TO BUILD A SOLAR OVEN

If you want to cook with free fuel, try a solar oven. It is simple, easily made, and inexpensive. The oven consists of a box for the food, a glass to admit and trap heat, and reflectors to direct the sunlight into the oven.

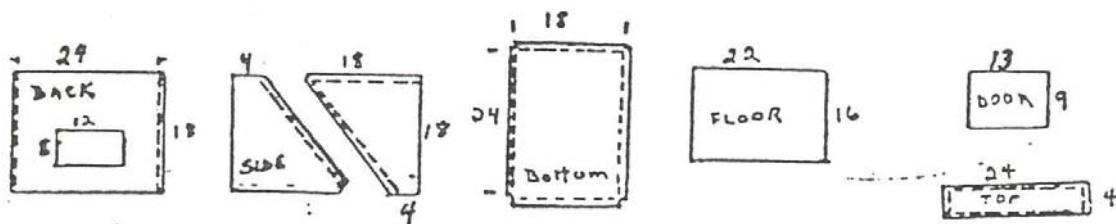


Besides the sheet metal* parts, you will need a piece of window glass, sealing strips for the glass, and three handles. You will insulate the box with fiberglass insulation two inches thick for greater heat retention.

Materials:

26 Gauge Sheet Metal*	16 sq. feet
2" Fiberglass insulation	12 sq. feet
Double strength window glass	22 x 24"
Drawer handles	3
Flat black paint	
Sealer strips	8 feet
Aluminium sheet	22 x 24" (3 pieces)
22" Metal angles	1 x 1" (2 pieces)
3" Hinges	(5 pair)

Here are the dimensions to which the sheet metal should be cut. Unless you are familiar with metal work, it is a good idea to let a sheet metal shop do the cutting and bending.



*Intermediate grades (4-6) substitute corrugated cardboard for sheet metal and make other adaptations as necessary to make a simple oven sufficient to demonstrate cooking an egg.

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Now, with the metal parts formed either in a sheet metal shop or at home, you are ready to assemble the oven. The simplest way is with 1/8 inch rivets. With the bottom of the oven on a flat surface, hold the side panel against it and in its proper place. Use a 1/8" drill bit, placing holes in the side panel and on into the flange of the bottom. It is a good idea to pop a rivet as each is drilled in insure alignment and prevent shifting of the parts. With both side panels attached to the bottom, the back of the box may now be put in place and holes drilled. Be careful to keep the parts lined up as you progress.

The spun glass insulation. is now cut to fit the bottom, sides, and top metal pieces. Glue them in place, tape the seams, and spray all the inside area with flat black paint. When the paint has dried, place the oven floor (22 x 16 inch piece) on the insulation and paint this piece.

Now it is time to fit the glass in place. First, cut strips of the foam sealing tape and attach them to the edges of the glass on both sides (8 pieces). Place the glass in position so that the bottom edge of glass is under the bend of the bottom sheet metal. Lightly press one 22 inch angle against the glass and rivet it in place. Do the same for the other side. Do not force the glass so that it flattens the sealing strip, because the strip acts as a cushion to prevent breakage of the glass, in addition to its sealing function.

With the glass installed, the top may be put on and riveted to the back and sides. Fit the door into the back opening and rivet hinges in place. The oven is now complete except for the carrying handles on each side and a similar handle on the door. These are attached with screws.

In tests, the box itself will reach an inner temperature of 250 degrees. If we could increase the amount of heat- going into the box, the oven would get hotter. For this reason we add the light aluminum reflectors. Rivet two hinges to each reflector, then the sides. Swing the top reflector up and down while watching the inside of the oven, and you will be able to tell when you have it at the proper angle by the reflection of the sun's rays on the insulation.

Bend the end of a piece of wire to act as a stop; insert the wire in a hole in the top reflector and wrap the other end around a loosened screw on the top of a box. Swing the side reflectors into position. Using two wires, attach them to the reflector.

This oven reached a temperature of 350 degrees in 15 minutes. The first time it was used it baked a loaf of bread in just over an hour, and then cooked a three pound roast in three and a half hours! A whole meal can be cooked in the solar oven. The menu is limited only by your imagination.