

WHAT'S COOKING WITH SOLAR?

Teacher-led Activity

Solar energy or energy from the sun is one source of power that we can use for heating. This 'hands-on' activity provides students with the experience of collecting solar energy to heat food.

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INTENDED LEARNING OUTCOMES

The students will develop an efficient solar energy collector and explain the key scientific design features, which are:

- the colour of its collecting surface
- its surface area
- its angle to the sun
- the heat storage medium (in this case, pizza).

WHAT YOU NEED

- The [Pizza Box Solar Oven Diagram](#).
- [Instructions for Building and Testing a Pizza Box Solar Oven](#).

Materials for the pizza box solar oven include:

- one pizza box from a pizza delivery store
- newspapers
- black paper
- clear tape
- scissors
- clear plastic wrap
- aluminium foil
- an A4 piece of paper (rectangle)
- a pencil or pen
- a ruler or a stick
- a piece of pizza (or grated cheese on bread).

FOCUS

- How can we collect solar energy to heat food?
- Brainstorm the materials required to construct a solar oven to heat food.

MANAGING THE ACTIVITY

Separate the class into four groups. Provide each group with the diagram, instructions, materials, and equipment to make a solar oven. Allow the students 10 minutes planning time before assembling them. Check the students are clear about the purpose of the activity and their roles. Allow plenty of time to build and test models.

Teacher's focused interaction

Bring the class back together. Talk about:

- how the pizza was heated
- what happened to the pizza
- the features of an efficient solar energy collector (a successful model)
- what things you could do to enhance the efficiency of your solar collector.

REFLECTION

- What did this activity tell you about what solar energy can do?
- Is there anything you might change and why?
- What other ways can solar energy be collected?

EXTENSION

Provide the students with the opportunity to redesign their solar energy collector. Does the redesigned solar energy collector work better? Why does it work better?

Take apart cheap solar garden lights, draw the components, and explain how they work. Design your own solar lights.

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SUPPORTING RESOURCES

- Ministry of Education (2003). Book 29: Solar Energy. Building Science Concepts. Wellington: Learning Media.
- Leaves: All-Natural Solar Collectors (New York State Energy Research and Development Authority).
An activity exploring leaves as solar collectors.

http://www.powernaturally.org/Programs/pdfs_docs/17_Leaves_Collectors.doc

- Building a Parabolic Solar Water Heater (Infinite Power of Texas).
An activity that shows students how to make a solar water heater and explores renewable and non-renewable concepts.

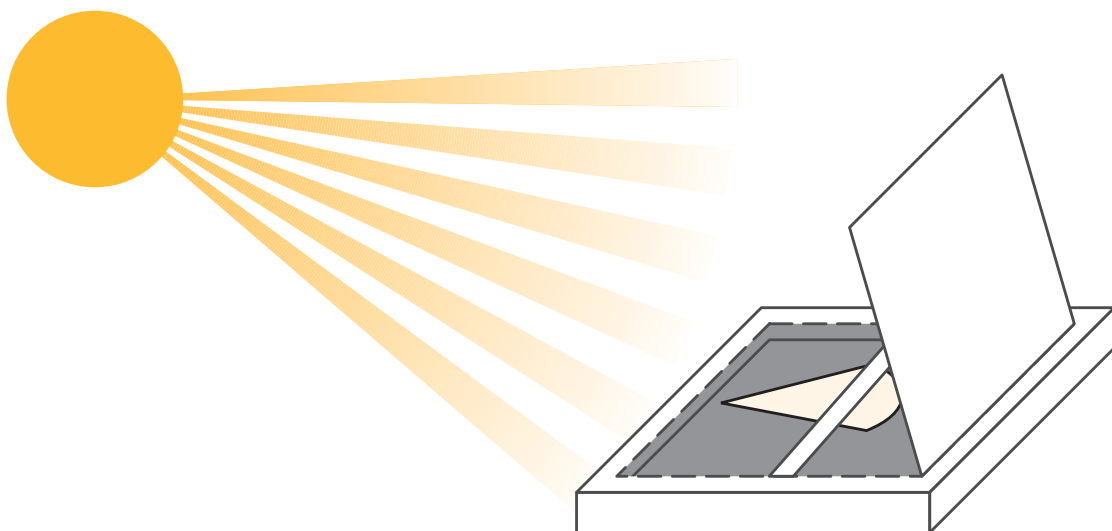
<http://www.infinitepower.org/pdf/10-Lesson-Plan.pdf>

PIZZA BOX SOLAR OVEN DIAGRAM

The key scientific design features of a pizza box solar oven are:

- the colour of its collecting surface
- its surface area
- its angle to the sun
- the heat storage medium (in this case, pizza).

Label the diagram with the design features.



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INSTRUCTIONS FOR BUILDING AND TESTING A PIZZA BOX SOLAR OVEN

Building a pizza box solar oven

1. Close the lid of the pizza box.
2. Trace the outline of the piece of paper onto the centre of the box lid.
3. To create a flap of cardboard on the box lid, carefully cut the two long edges and one of the short edges of the rectangle.
4. Gently fold the flap back along the uncut edge to form a crease.
5. Wrap the underside (inside) face of this flap with aluminium foil. On the other side of the flap, tape the edges of the aluminium foil so that the foil is held firmly. The aluminium foil will reflect the solar radiation into the box.
6. Open the box. Place the black paper on the bottom of the box. This will help to absorb the solar radiation.
7. Close the box. Roll up some newspaper (a couple of centimetres thick). Fit the newspaper around the edges of the box. Tape the newspaper to the bottom of the box, not the lid. The newspaper provides insulation, which will slow down heat loss from the box.
8. Cut two pieces of plastic wrap, which are 3 centimetres larger than the flap opening on the box top. Open the box and tape one piece of plastic wrap to the underside of the flap opening. After taping one side, make sure you pull the plastic tight and tape the other sides. The plastic should be sealed against the cardboard.

9. Close the box and tape the other piece of plastic wrap to the top of the flap opening. Make sure the plastic is tight and tape down all four edges to form a seal. This creates a layer of air as insulation.

Testing a pizza box solar oven

On a sunny day, carry a piece of pizza and the box outside. Find a sunny spot. If it's cold outside, place a towel or blanket under the box so the underneath doesn't get cold. Open the box, put the pizza in the centre, and close the box. Open the flap and turn the box so the foil is facing the sun. The shadow of the flap should go straight back from the back of the box. Move the flap up and down and note how it reflects the sunlight. Use a ruler or stick to prop up the flap so that it bounces the sunlight into the box. Expect heating time to take about twice as long as conventional methods and allow about half an hour to preheat.