The Sun: Part of a Balanced Breakfast

«««« By Blake Bowley
Blake Bowley was a pre-service teacher at Trent University when he wrote this article. Blake was a recipient of the 2011 Don Galbraith Pre-service Teacher Award of Excellence with this submission.

This information is recommended for use with the Ontario Curriculum, Grade 5: Understanding Earth and Space Systems

Purpose

This activity can be used to demonstrate how to use renewable energy from the sun as an alternative to non-renewable energy sources. It also provides an opportunity to reuse materials originally created for another purpose.

Background Information

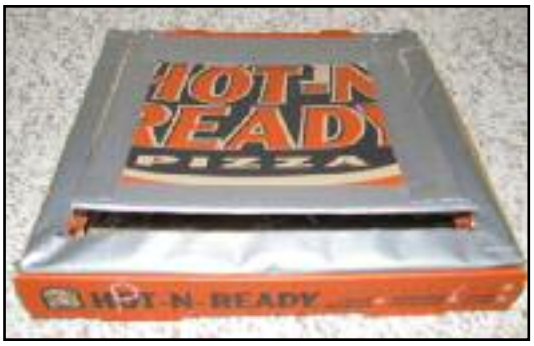
- Basic knowledge of the greenhouse effect
- Understanding the difference between renewable and non-renewable energy resources
- Knowledge of the negative impacts of energy consumption on society and the environment.

Materials

- Food to be cooked or warmed
- Pizza Boxes or any previously used cardboard
- Duct Tape
- 2 Empty Potato Chip Bags Per Oven
- Clear Plastic Wrap
- Round-tipped scissors
- Food to cook: cookies, brownies, mini pizzas are some of the easiest options

Methodology

1. Try to use previously used materials from school (leftover pizza boxes from pizza day), or have the students bring used cardboard and chip bags from home.
2. Create an example or show pictures of solar ovens for students to model.
3. Students should work in groups to create their own solar ovens.
4. One pizza box can be left as is for a small oven or use several boxes to create a larger box with a lid similar to the size of a file box, making sure it is big enough for your cooking container (cookie sheet, pan, etc.) to go into.
5. Measure 3 cm in from each edge of the lid and cut along three sides only, leaving one long side as a hinge for the flap that will become the reflector.



Steps 5 and 6

Step 8

Step 9, and with a cookie sheet inside the oven

6. Lift up the reflector and cover the hole you just cut in the lid with the plastic wrap. Tape the edges of the wrap to the box.
7. Cut the chip bags open, exposing their reflective interior.
8. Attach the chip bags to the underside of the reflector with tape or staples.
9. Prop the reflector open with a stick or tape open at an angle that will reflect the sunlight into the oven.
10. Allow the oven to preheat in the sun for 30 minutes before putting the food in.
11. Check food at 30 mininute to 1 hour intervals.
12. The students could write a science report on this experiment including points such a prediction for how long it will take the food to cook.

Tips for Use

- Start your cooking as early in the day as possible to account for any weather changes
- Plan this activity when the temperature can be expected to be at least 15° C for best results.
- Although solar ovens can be used to cook almost anything, choose an easy reliable recipe that everyone can enjoy (cookies and brownies are the easiest, although not the healthiest).
- Mini-pizzas are an excellent option because they are easy for the students to make, and if you use premade buns etc. for the crust, nothing really has to be cooked. It just has to be heated up.
- If you can, use dark coloured cooking containers or pans that will better absorb the heat.

Safety Notes

NO FOOD TO BE EATEN IN THE LAB. This activity should be run outside and in the cafeteria, and not the lab.

These ovens can reach 150° C! Use extreme caution when removing items from the oven. Ensure that foods are adequately cooked and that it has not had the opportunity to cool and re-heat. Also, be aware of any food allergies among participants when making your food selection.

Extensions/Discussion

- When choosing materials for this project, discuss with your class the importance of using reused or recycled materials and where these materials would have ended up if they were not used for this project.

- This resource can be used to explain the greenhouse effect. The clear cover allows the sun's light to enter the container and create heat while at the same time preventing the hot air that has been created from escaping. Although it is not exactly the same phenomenon, it can be compared to how the earth's atmosphere helps to warm the planet. This can be demonstrated by placing one thermometer inside the oven while keeping a second thermometer outside. The temperature will rise significantly higher inside the oven on a sunny day.

- After the experiment is completed, the students can work on their problem solving skills to try and make their ovens more efficient. This can be achieved by adding insulation to the walls of the oven or creating a lid that sits on an angle to trap more sunlight. A discussion of home construction and energy conservation could follow.

- The ovens can also serve as food dehydrators if you poke a few small holes in the sides of the box for ventilation. When dehydrating food, discussion can involve different aboriginal groups and food dehydration as a traditional method of food storage.

- The oven is an example of an alternative, appropriate technology that is being used by people in parts of the world where access to electricity or cooking fuel is limited. Discussion could include the social impacts solar ovens have on those who use them.