Solar Oven Challenge

Long before we were using photovoltaic cells to generate electricity from the sun, we were using the sun to dry our crops and clothes, warm up our buildings, and heat water. Students likely know the phrase "it was so hot outside, you could fry an egg." They've also probably left candy in a hot car and experienced the melting effect from that solar collector. This challenge asks students to use solar energy and create the best solar collector to heat or cook some food.

This activity is based on *Solar Oven Challenge*, an activity found within NEED's solar curriculum guides. You can construct the ovens based on this design, using a pre-fabricated pizza box, or you can have students come up with their own design completely from scratch. Essential materials include, cardboard chip tubes or other cardboard, plastic wrap, food, and a thermometer. Additional materials can be provided based on what is available. A list on page 3 provides some inspiration for necessary and suggested materials. It is often fun to provide detractor materials, or materials that may not appear to be useful, as students can work through that challenge to refine their design.

Design Parameters

- Given a chip canister and/or additional teacher approved items, construct an oven to cook or heat food.
- Students opting to use alternative materials must standardize their oven to equal a similar volume of those using chip canisters.
- Construction design must include a flap that opens to allow sunlight to enter.
- Insulation may be used, but insulation must be kept to one single layer.
- Include space to allow for thermometers to be inserted.

Testing Parameters

1. Select the food that will be utilized and provide each team with the same amount of food items. Determine the oven temperature you wish for students to achieve. Share this information with students.
2. Place ovens into the open, sunny area of students' choosing, and on your cue, ask students to place food and thermometers inside to begin cooking.
3. Keep track of the time and students keep track of their temperature to determine which design reaches the temperature in the shortest amount of time, and has cooked the food to the desired doneness.

Teachers' Cheats

- Skewers can be used to prop open an angled awning or flap. Skewers can also be used as a rotisserie mechanism to prop up food.
- Make sure to set parameters on oven size that allows for the thermometers to fit inside.
- Digital thermometers, while helpful for quick readings, may not work well if the oven needs to be outside for extended periods of time. Often, digital thermometers have automatic shut-off to conserve battery power.
- Select food items that are student-friendly and cook easily based on your climate and the time of year. Food can also be skipped altogether and simply measure temperature.
- Sealing air leaks will be important in cooler climates. Make sure tape is available for students to use.
- Insulation can be effective for cooking in cooler climates.

Extensions and Enrichment

- Have a contest to see which design can cook a hot dog to the highest temperature. Provide digital thermometers after allowing ovens to sit for a prescribed amount of time. Spear the hot dogs to determine internal temperature.
- Limit the number of materials students may use for construction, *i.e.* only 6 inches of tape, 1 square foot of foil, etc.
- Incorporate budgeting by attributing cost to each material. Add lowest cost to the challenge parameters.
- Allow student ovens to be pulled into the shade or a cooler location to determine which design holds its temperature the longest.