

**Grade Level:** 3<sup>rd</sup> grade

**Title of Lesson:** Solar Oven Smores

**Unit Title:** Heat Energy

**Performance Standard(s) Covered:**

- S3P1. Students will investigate how heat is produced and the effects of heating and cooling and will understand a change in temperature indicates a change in heat.
  - Investigate the transfer of heat energy from the sun to various materials.

**Essential Questions:**

- How can we gather evidence that the Sun is providing energy to the Earth?

**Objectives:**

- Students will their increase their understanding of heat and how it is transferred from the sun.

**Key Words and Terms:**

- Heat
- Insulator
- Solar Energy

**Learning Activity:**

Abstract (limit 100 characters): Teacher will prepare a Solar Oven for Smores and assist students to gather necessary food materials. Students will work as a large group and will observe as solar energy is harnessed and use to melt the chocolate and marshmallows for their smores. Afterwards, each student will select one smore and enjoy it while the teacher discusses what occurred.

**Materials:**

|                          |                          |
|--------------------------|--------------------------|
| Pizza Box                | 2 Clear Sheet Protectors |
| Black construction paper | Duct tape                |
| Clear masking tape       | Scissors                 |
| Thermometer              | 1 Straw                  |
| Glue stick               | Tin foil                 |
| Ruler                    | Pen                      |
| Graham Crackers          | Marshmallows             |
| Plain chocolate bar      |                          |

### Safety Concerns:

- Ensure that students are on task and listening as they eat smores.

### Procedures:

***Before beginning the experiment, ask students what they know about solar energy and heat. Have students write down predictions of if and how the solar oven will melt the chocolate and marshmallows.***

1. On the lid of a pizza box, use a ruler and pen to measure and draw a square that is 1-2" from the sides of the box.
2. Cut along three sides of the square you just made by using box cutters or a pair of scissors.
3. Measure and cut a large piece of foil to line the bottom of the pizza box.
4. Apply glue to the bottom of the pizza box and glue the large piece of foil into place, smoothing in down.
5. Measure and cut another large piece of foil to cover the bottom of the flap you cut on the pizza box lid.
6. Apply glue to the bottom of the pizza box lid and glue the tin foil piece into place.
7. Use scissors to cut a piece of black construction paper that is 1-2" smaller at each edge than the bottom of the pizza box.
8. Use clear masking tape to tape the black construction paper to the bottom of the pizza box. Try to center the black construction paper.
9. Find a sheet protector and pull the two pieces apart. Tape these pieces together at one of their long edges. Tape the new, large piece of plastic on the inside of the box lid, NOT the flap. The plastic should span the flap opening. If it doesn't, make a larger plastic sheet!
10. Poke two small holes on the lid between the flap and the side of the lid. Poke the holes about 2" apart.
11. Wrap a thin piece of tape around the straw, near the flat end, so that one end of the tape is above the other end.
12. Tape the straw to the flap so that the flat end of the straw is near the end of the flap. Use the straw and the holes you poked in the lid as a kickstand for the flap.

***All steps above should be prepared prior to arrival in the classroom. In the classroom, have students grab 2 Graham crackers, 1 marshmallow, and one piece of Hershey's chocolate. Each student should form a sandwich with the materials and place it in the solar oven.***

13. Set up your oven with the flap up and place it in the sun.
14. As students eat, ask the following questions:
  - Why was black cardboard paper used instead of white paper?
  - Is tin foil an insulator or conductor? How do you know? What makes it a good insulator or conductor?

**Notes and Tips:**

- Be sure to dispel myth that the pizza box is what gives the smores heat.
- Ensure that students don't have allergies prior to experiment.
- Best to perform this experiment when the sun is shining.

**Modifications:**

- To modify this experiment, I would allow the students to see me prepare the solar oven. I would allow the students to play a more active role in the preparation of the solar oven.

**References:**

1. Idea from [http://www.youtube.com/watch?v=xZJmz\\_tF4NU](http://www.youtube.com/watch?v=xZJmz_tF4NU)
2. Modifications from myself