

Activity

Solar Oven Challenge

Grades 6-8 and Grades 9-12

Subject areas:

- Science
- Technology
- Math

Time: 120 minutes

Overview

In this challenge, students will design, build and test a solar oven to be used by NASA in an upcoming trip to the moon. The moon does not have any wind but it does have an abundance of sunlight. Harnessing that renewable resource will be essential to establishing a colony on the moon.

What you'll need

- General building supplies (tape, scissors, glue, etc)
- Thermometer
- Timers
- Cardboard box
- Aluminum pans
- Aluminum foil
- Black construction paper
- One piece of plexiglass big enough to cover the box OR plastic wrap
- Sunshine OR gooseneck lamp with 100W bulb
- S'mores fixin's (graham crackers, marshmallows, and chocolate)
- Oven mitts

Instructions

Activity 1: design and build a solar oven

Your mission is to design and build a solar oven to cook your own S'mores simply using a cardboard box and a few extra materials. Your solar oven must meet the following specifications:

1. It must have a "footprint" of no more than 40 cm x 40 cm.
2. In 10 minutes, the temperature inside the box must increase by 15°C.
3. You may use any available materials to line the bottom and inside of box.
4. Your food may not touch the bottom of the oven directly. You must design a way to best cook 2 S'mores off of the bottom surface.
5. You must cook the two S'mores at two different heights. You will also test which height allows food to cook at a faster rate.

Activity 2: experiment and record

- Using the materials provided, build you solar oven based on your design. Remember the goal is to capture heat in your oven to cook S'mores.
- Record the starting temperature of the oven: _____ °C
- Record the heights of the food from the oven floor: _____ cm _____ cm
- Place the S'mores in the oven. Close the lid and begin cooking.
- Record the temperature change in the table below. Make sure to use oven mitts when lifting the lid or manipulating anything inside the oven

| Time Min:sec | Oven Temperature °C | Time Min:sec | Oven Temperature °C |
|-----------------|------------------------|-----------------|------------------------|
| 0:00 | | 5:30 | |
| 0:30 | | 6:00 | |
| 1:00 | | 6:30 | |
| 1:30 | | 7:00 | |
| 2:00 | | 7:30 | |
| 2:30 | | 8:00 | |
| 3:00 | | 8:30 | |
| 3:30 | | 9:00 | |
| 4:00 | | 9:30 | |
| 4:30 | | 10:00 | |
| 5:00 | | 10:30 | |

Record any observations of your food while it is cooking. These observations will help to determine which food placement height allows for quicker cooking.

| Time Min:sec | S'more 1 _____ cm | S'more 2 _____ cm | Time Min:sec | S'more 1 _____ cm | S'more 2 _____ cm |
|-----------------|----------------------|----------------------|-----------------|----------------------|----------------------|
| 0:00 | | | 5:30 | | |
| 0:30 | | | 6:00 | | |
| 1:00 | | | 6:30 | | |
| 1:30 | | | 7:00 | | |
| 2:00 | | | 7:30 | | |
| 2:30 | | | 8:00 | | |
| 3:00 | | | 8:30 | | |
| 3:30 | | | 9:00 | | |
| 4:00 | | | 9:30 | | |
| 4:30 | | | 10:00 | | |
| 5:00 | | | 10:30 | | |

Activity 3: quality assurance form

Team name: _____

Names of engineers: _____

| | Yes | No |
|---|-----|----|
| Did the solar oven increase in temperature by more than 10°C? | | |
| Did this team's design differ from your team's design? | | |
| Did both S'mores melt? | | |

Which height position worked best in this solar oven? _____

List the specific strengths of the design:

List the specific weakness of the design:

Inspected by: _____

Signatures: _____

NB Curricular Outcomes

Specific Curriculum Outcomes (SCO) are statements that identify specific concepts and related skills underpinned by the understanding and knowledge attained by students as required for a given grade.

Science 6 - 10

SCO 1.1 - Students will ask questions about relationships between and among observable variables to plan investigations (scientific inquiry and technological problem-solving) to address those questions.

SCO 1.2 – Students will collect and represent data using tools and methods appropriate for the task.

SCO 1.3 – Students will analyse and interpret qualitative and quantitative data to construct explanations.

SCO 1.4 – Students will work collaboratively on investigations to communicate conclusions supported by data.

SCO 2.1 – Students will consider factors that support responsible application of scientific and technological knowledge and demonstrate an understanding of sustainable practices.

Mathematics 6

SP1 - Create, label and interpret line graphs to draw conclusions.

SP2 - Select, justify and use appropriate methods of collecting data, including: questionnaires; experiments; databases; electronic media.

SP3 - Graph collected data and analyze the graph to solve problems

NB Global Competencies

The Global Competencies are the skills, sets of knowledges, and attitudes of a well-rounded person. They cross disciplines and contexts, and enable a person to thrive in local, virtual, and global communities.

- [Critical Thinking and Problem Solving](#)
- [Innovation, Creativity and Entrepreneurship](#)
- [Sustainability and Global Citizenship](#)

Activity downloaded from https://www.nasa.gov/pdf/435855main_BuildaSolarOven_6to8.pdf