

Solar Oven

3rd Grade

Unit 1 – Stories Worth Telling Again and Again

Text Connection: *Through Grandpa's Eyes* by Patricia MacLachlan

Design Challenge Summary

Challenge: What will the students be required to do?

While you were at Grandpa's house, the oven broke, and you have planned to make a snack for Grandpa! You need to work collaboratively with your group, to create a solar oven that will cook grandpa's snack efficiently.

Students will work collaboratively to create a solar oven that will cook grandpa's breakfast (perhaps eggs & buttered toast or s'mores etc.)

Standards: What standards are addressed?

Science:

NS.1.3.1 Communicate observations orally, in writing, and in graphic organizers

NS.1.3.2 *Develop questions that guide scientific inquiry*

NS.1.3.3 Conduct scientific investigations individually and in teams

NS.1.3.4 Communicate the results of scientific investigations

NS.1.3.5 Estimate and measure length, mass, temperature, and elapsed time

NS.1.3.6 Collect and analyze measurable empirical evidence as a team and/or as individuals

NS.1.3.7 Make and explain predictions based on prior knowledge

NS.1.3.8 Use simple equipment, age appropriate tools, technology, and mathematics in scientific investigations

NS.1.3.9 Apply lab safety rules as they relate to specific science lab activities

PS.7.3.3 Identify methods of producing electricity relative to Arkansas: hydroelectric, coal, oil, natural gas, nuclear, solar, wind.

Math:

3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes.

3.MD.3 Draw scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.

ELA:

W.3.10 Write routinely over extended time frames and short time frames for a range of discipline-specific tasks, purposes, and audiences.

SL.3.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Result: What will students know, value, and be able to do as a result of the lesson? What's the big idea?

Know and apply the engineering design loop.

Students will know how the thermal energy from the sun can be utilized to cook their food.

Reason about insulation, heat and light absorption.

The big idea is that the students can develop a way to harness energy from the sun to cook food without using modern technology.

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Assessment: What evidence will be used to determine student learning?

Did their food cook?
 Did their oven's temperature increase?
 Did they modify their design to cook their food efficiently.
 Did they follow the design loop process?
 Did they work collaboratively?

Prior Knowledge/Experiences: What prior content knowledge and skills will the students need?

Experience with the Engineering Design Loop process (Introduction lesson to STEM & working as a team)
 Connections to the Mathematical Practices
 Investigations/inquiry in Science
 Research Solar Oven Images to give students background on what some designs may look like. *(Vary images used so they see a variety of images and designs.)*
 How to read a thermometer.
 How to create a bar graph and collect data.
 Tell time and calculate elapsed time.
 Vocabulary: Thermal Energy (connecting to *Through Grandpa's Eyes* scene when he wakes up from the warmth of the sun). Video.

Summary/Connections: How will this design challenge connect with new/future learning, other content areas, real world experiences, etc.?

This lesson will help students develop problem solving skills and collaboration skills that are essential in succeeding in the 21st century. It will allow students the opportunity to transfer and apply skills from various content areas within one task. Students will also develop understanding of energy sources within their state, and how a specific source can be used to complete a task.

As summary activities, you can:

Create a bar graph about temperatures measured over a time period. **3.MD.3**

Calculate elapsed time for cooking food. **3.MD.1**

Write an informational essay about constructing a solar oven. **W.3.10**

Materials/Equipment/Preparation: What materials and equipment will students need to successfully complete this design challenge?

Thermometers (1 per group)
 Cardboard pizza box
 Aluminum foil
 Plastic wrap
 Black construction paper (other colors as well if you want students to reason about light absorption)
 Newspaper
 Scissors
 Tape
 Ruler or Stick
 Plate
 Food to be cooked (s'mores, eggs, toast etc.)

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Additional Information

Suggested Sequence to facilitate the task:

Day 1: Present Challenge and allow students time to collaborate and build their Solar Oven
Research Ovens with students and look at pictures for ideas.

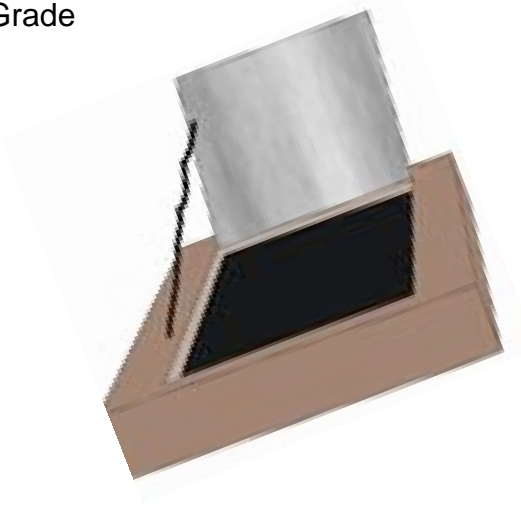
Day 2: (11:00-3:00 best time for ovens to cook) Place Ovens outside (they should not have any food in them, this is simply for students to monitor and track the oven's temperatures) periodically take students outside to measure temperature and record their data to create a bar graph of the oven's temperatures over the course of the day. This is simply for the students to test their ovens before they are to cook their snacks. (If no students chose black construction paper, the teacher should make an oven with black paper.) The students will need to compare and contrast the temperatures of other colors so that they can reason about light absorption and heat.

Day 3: Using data from previous day's experiments students will modify and adjust their ovens, they may change paper colors materials, add insulation etc. (This is the design loop happening!!!)

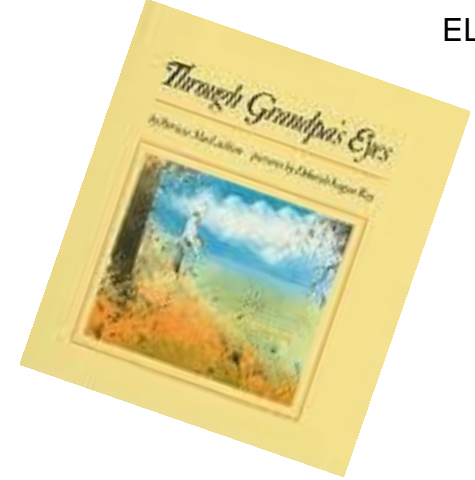
Day 4: (11:00-3:00 best time for ovens to cook) Place Ovens outside and students may place the food they are "cooking" into the oven. They will monitor their ovens and calculate the elapsed time required to cook their food.

Original Idea came from this link:

file:///H:/My%20Pictures/STEM/OSC_STEMFamilyTakeHomeActivity.pdf



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Group Supplies:

Cardboard pizza box, Aluminum foil, Plastic wrap, Construction paper, Newspaper, Scissors, Tape, Ruler or Stick, Plate, Food to be cooked