

STEM Outreach Presents:

STEM Every Day Keeps the Boredom Away

Fun in the Sun Edition

Sun Catchers

**DIFFICULTY
LEVEL: NOVICE**

PURPOSE

To explore the effects of mixing colors.

MATERIALS

Paintbrush
Tissue paper (many colors)
Liquid starch
Wax paper
Scissors

INSTRUCTIONS

1. Tear off a piece of wax paper big enough for your sun catcher.
2. Cut off the rough edges.
3. Tear/cut up small pieces of colored tissue paper in the size/shape you want.
4. Paint a layer of liquid starch on the wax paper.
5. Add pieces of tissue paper, smooth them out, and paint another layer of liquid starch on top. Experiment with layering the tissue paper and layering different colors.
6. Set aside and allow your art to dry.
7. Hang your sun catcher in a window to display!

VOCABULARY

Primary colors: Sets of colors that can be combined to make a useful range of colors

Subtractive color mixing: Color mixing with material colors, like inks, paints, or tissue paper

CONCEPT #1

Newton's Rainbow

Isaac Newton was an English physicist and mathematician. In the 1660s, he performed experiments with sunlight and prisms. He discovered that white light (normal light) was composed of seven visible colors: red, orange, yellow, green, blue, indigo, and violet (ROYGBIV).



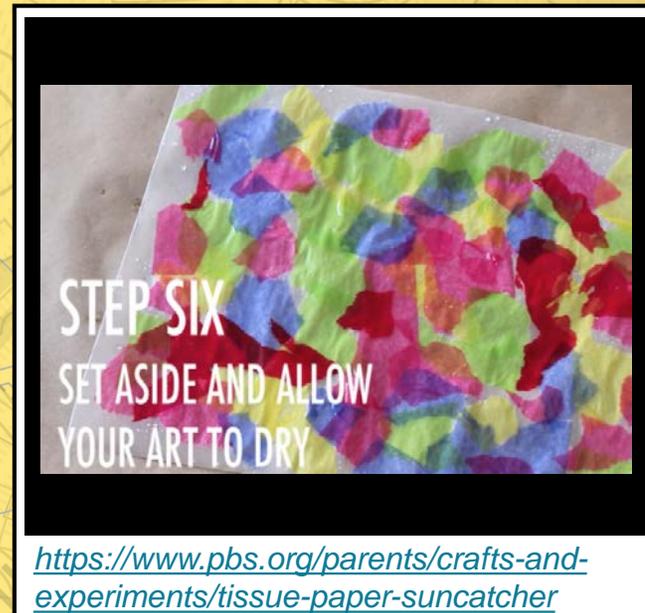
<https://www.artwithmrsnguyen.com/2014/08/radial-origami-suncatchers-5th.html>

CONCEPT #2

Color Mixing

There are two types of color mixing:

1. Color mixing with materials (ink, paint, tissue paper, etc.)
 - Primary colors: Red (magenta), Blue (cyan), and Yellow
 - Red + Yellow = Orange
 - Red + Blue = Purple
 - Blue + Yellow = Green
 - Orange, Purple, and Green are secondary colors
 - All three colors combine to make black material
 - This is called subtractive color mixing
2. Color mixing with light (TVs, Phone screens, rainbows, etc.)
 - Primary colors: Red, Blue, and Green
 - All three colors combine to make white light
 - This is called additive color mixing



EXTENSIONS

Explore more additive color mixing through a simulation at https://phet.colorado.edu/sims/html/color-vision/latest/color-vision_en.html (use the latest version of Chrome, Firefox, Safari, or Edge)

Explore color mixing with light using colored LEDs or flashlights with colored filters (https://www.sciencebuddies.org/science-fair-projects/project-ideas/HumBeh_p021/human-behavior/mixing-light-to-make-colors#summary)

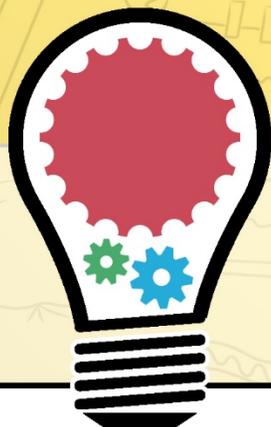
REFERENCES

Adapted from: <https://www.pbs.org/parents/crafts-and-experiments/tissue-paper-suncatcher>

<https://library.si.edu/exhibition/color-in-a-new-light/science>



<https://sensationallearningwithpenguin.com/2019/03/25/magic-rainbow-suncatcher-craft/>



Solar S'mores

**DIFFICULTY
LEVEL:
INTERMEDIATE**

PURPOSE

To explore how solar energy can be harnessed to cook food.

MATERIALS

S'mores ingredients (chocolate, marshmallows, and graham crackers)
Cardboard pizza box
Black construction paper
Aluminum foil
Plastic wrap
Wooden skewer
Hot glue/hot glue gun
Trusted adult to help with hot glue
Scissors
Ruler
Permanent Marker

INSTRUCTIONS

1. Draw a large square on the top of the box. Use scissors to remove the square.
2. Wrap the cardboard square in foil and glue the edges to secure.
3. Open the box and glue the black construction paper to the bottom of the box.
4. On the inside of the lid, carefully glue a piece of plastic wrap over the opening.

CONCEPT #1

Solar Cookers

A solar cooker uses sunlight for energy. There are many types of solar ovens, but they all work by focusing the sun's energy onto the food.

Solar cookers can save energy and can be safer alternative to fire for outdoor cooking in areas where wildfires are common.



<https://littlebinsforlittlehands.com/diy-solar-oven/>

Solar S'mores

INSTRUCTIONS

5. Time to make your s'mores! Place four graham crackers down on the black paper, 3 chocolate squares and a marshmallow on top of each one.
6. Carefully close the plastic lid of the box and glue one side of the foil-wrapped cardboard on the top back of the box.
7. Glue a skewer on the top left corner of the foil-wrapped cardboard and place the other end through the plastic wrap to hold the foil-wrapped cardboard in place.
8. Place your DIY solar oven in the sun and wait 60 minutes to watch your marshmallows and chocolate melt.

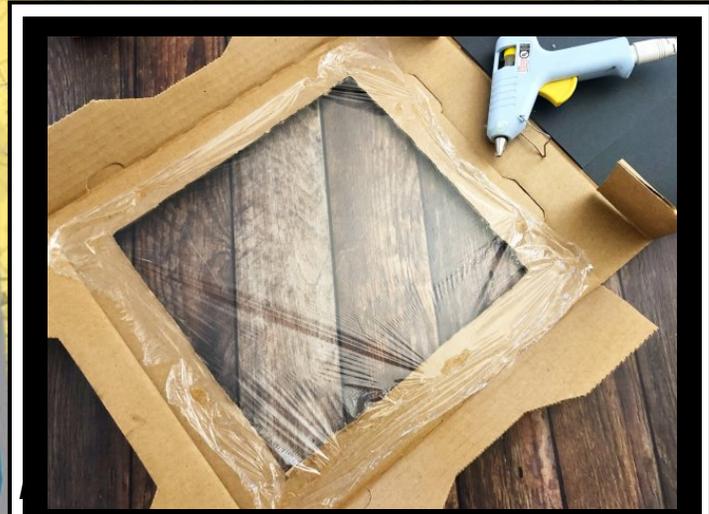
VOCABULARY

Solar cookers: uses sunlight for energy to heat food
Solar energy: energy that is present in sunlight

CONCEPT #2

Trapping the Heat

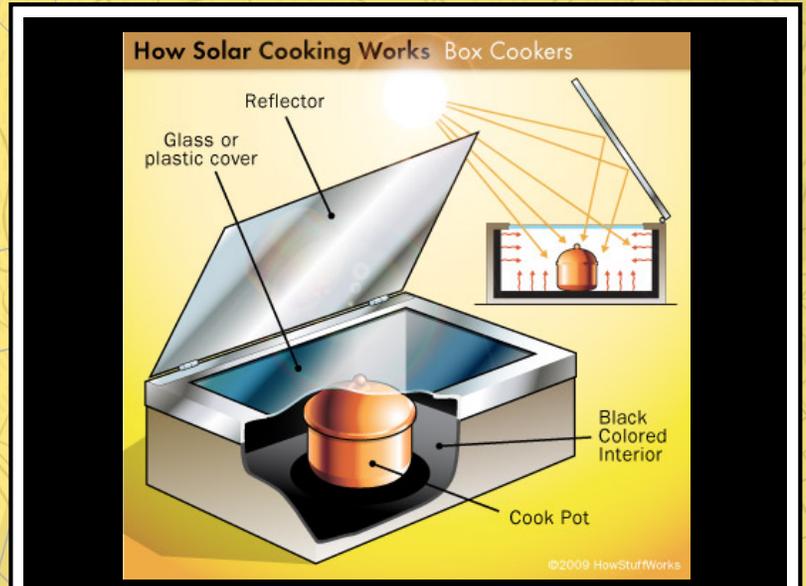
The plastic "window" of your solar cookers works like a greenhouse roof: it allows sunlight to pass into the box, while also trapping the heat. The black paper at the bottom of the box absorbs the sunlight which warms it and therefore the food.



<https://littlebinsforlittlehands.com/diy-solar-oven/>

CONCEPT #3 **Solar Energy**

Solar energy is the energy in sunlight. After traveling through the Earth's atmosphere, most of the Sun's energy is in the form of visible light and infrared light radiation. Plants use photosynthesis to convert the solar energy into chemical energy (sugars and starches) which help them grow.



<https://science.howstuffworks.com/environmental/green-science/solar-cooking1.htm>



<https://littlebinsforlittlehands.com/diy-solar-oven/>

EXTENSIONS

Explore more about the greenhouse effect through a simulation at https://phet.colorado.edu/sims/html/color-vision/latest/color-vision_en.html (use the latest version of Chrome, Firefox, Safari, or Edge)

REFERENCES

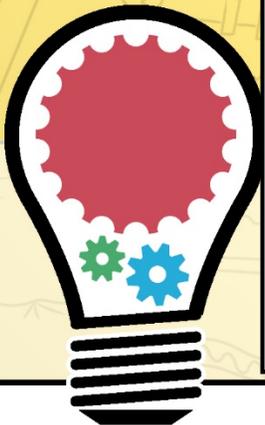
Adapted from:

<https://littlebinsforlittlehands.com/diy-solar-oven/>

<https://sciencing.com/solar-oven-5365247.html>

<https://www.scientificamerican.com/article/sunny-science-build-a-pizza-box-solar-oven/>

https://wiki.kidzsearch.com/wiki/Solar_energy



Build a Cooler

**DIFFICULTY
LEVEL:
ADVANCED**

PURPOSE

Design and build a device that can keep a frozen treat cool for 30 minutes.

MATERIALS

Container (lunchbox, cardboard box, bag, etc.)
Insulation (i.e., newspaper, cotton balls, packing peanuts, foam, bubble packaging, etc.)
Plastic bag that closes tightly
Something frozen (i.e., ice pop, ice cube, etc.)
Household materials: cardboard, paper clips, scissors, small paper cups, tape*

INSTRUCTIONS

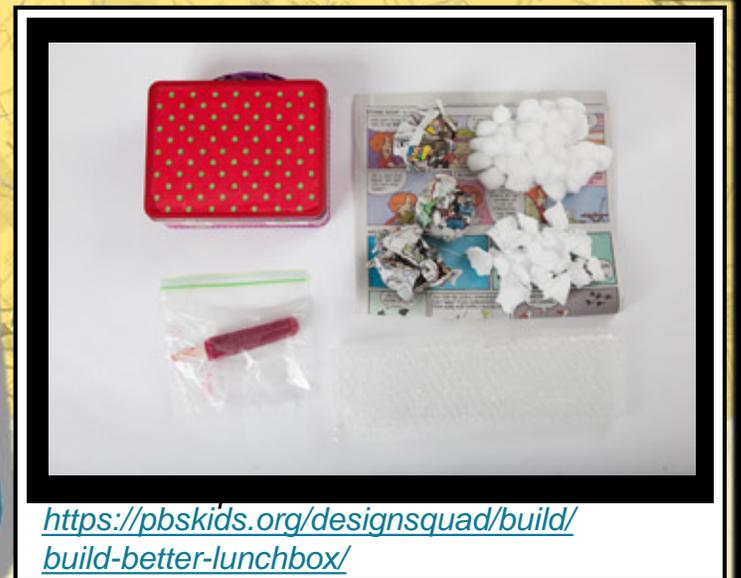
1. Choose your cooler. Use any of the suggested containers. Or try another one you think will work.
2. Insulate your cooler: Remember, materials don't insulate! It's the AIR that's trapped inside a material that insulates.
3. Put the frozen item inside. Place frozen item in sealable plastic bag to keep it from getting too messy.
4. Add more insulation
5. Close this lid
6. Wait 30 minutes
7. Evaluate: How'd your lunchbox do? Is your ice pop still frozen? Yes? Then eat your treat. If not, try again!

CONCEPT #1

Engineering

Engineering is working with others to solve problems and improve our world. An engineer imagines creative and useful solutions to problems and works with others to design, build, and improve things we use every day.

Engineers are creative, work in teams, and change the world!



<https://pbskids.org/designsquad/build/build-better-lunchbox/>

*Get permission from a trusted adult before using materials you find around the house.

Build a Cooler (cont.)

VOCABULARY

Insulator: keeps heat from moving

Engineering Design Process: the series of steps engineers use to arrive at a solution

EXPLORING FURTHER

Research the following terms to explore how to improve your design:

- Insulator
- Vacuum

Use your materials in a different way to trap more air; or use different kinds of materials. See if you can achieve less melting in 30 minutes.

Go for longer. Build a cooler that can keep something frozen for a full hour. It helps to pre-cool the insulation and to keep the lunchbox away from serious heat.



CONCEPT #2

Insulation

Insulation is about stopping heat from moving between objects.

For example, to keep something cold, an insulator stops heat from transferring to that object. To keep something hot, an insulator stops heat from leaving the object.

Air is one of the best insulators because the molecules are so far apart, the heat has a hard time moving from object to object. Think of materials that trap air like foam, cotton balls or crumpled paper.



CONCEPT #3

Engineering Design Process

Engineers use the Engineering Design Process to develop and refine their solutions:

1. Identify the need or challenge
2. Research and develop possible solutions
3. Draw a possible solution
4. Build and test the solution
5. Modify and retest the device



<https://pbskids.org/designsquad/build/build-better-lunchbox/>



<https://www.sciencebuddies.org/stem-activities/build-a-cooler>

EXTENSIONS

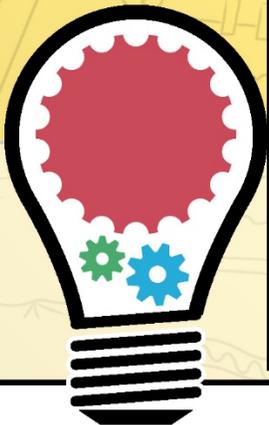
Explore more about insulators through a simulation at <https://www.sciencekids.co.nz/gamesactivities/keepingwarm.html>

(use the latest version of Chrome, Firefox, Safari, or Edge)

REFERENCES

Adapted from: <https://pbskids.org/designsquad/build/build-better-lunchbox/>

<https://www.sciencebuddies.org/stem-activities/build-a-cooler>





More Activities for Fun in the Sun

Making Sun Prints

<https://theresjustonemommy.com/how-to-make-sun-prints/>

Experimenting with UV Beads

<https://www.stevespanglerscience.com/lab/experiments/uv-reactive-beads/>

Making Garden Sundial

<https://www.kcedventures.com/blog/how-to-make-a-sundial-for-kids>

Building a Sprinkler

<https://www.sciencebuddies.org/stem-activities/water-sprinkler-toy?from=Blog>

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