

HOW CAN WE HARNESS THE POWER OF THE SUN TO SAVE LIVES? - OVERVIEW

A 4TH GRADE ISSS UNIT ON TRANSFER OF ENERGY AND ENERGY SOURCES



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Overview

This is a 5 week unit, planned using the Understanding by Design (UbD) framework, that builds on students' understanding of energy and allows them to explore energy transfer, as well as sources of energy and their applications. Students work through a series of teacher-guided, student-created investigations to understand principles of heat and light energy and then to apply those principles to a solar oven engineering project. After that, students will design and build a prototype of an invention that uses solar energy to help solve a problem. This culminating project has endless options for exploring renewable and non-renewable energy sources, as well as integrating social studies content on communities, societies or geography.

ISSS PERFORMANCE STANDARDS

- **4-PS3-2.** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- **4-PS3-4.** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- **4-ESS3-1.** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

ISSS SCIENTIFIC PRACTICES

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Constructing Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information

ISSS CROSSCUTTING CONCEPTS

- Energy and Matter
- Cause and Effect

Culminating outcome:

- Design and build a prototype of a solar powered machine that solves a specific problem of a society/community/region (social studies connection choices). Demonstrate a researched knowledge of the problem and utilize the transfer of energy to harness solar power to attempt a solution. 4-PS3-4, 4-ESS3-1

Essential question:

- How can we harness the power of the sun to save lives?

Guiding questions:

- How do we know that energy can move from place to place? How does it move?
- How can we use the idea of _____ [reflection, insulation, or other principles] to manipulate or control energy?
- Does the design of your oven result in higher temperatures inside the oven than outside? Why?
- If properly harnessed, why would energy from the sun be a good energy source to power things on Earth?
- What form of energy will be needed to solve [this specific problem]? How can you transfer energy from the sun into that form of energy?
- How could solar energy be used to enhance/benefit/save the lives of _____ [the researched community/society/region]

Progression of learning: Pair any of the following weekly activities with textbooks, videos, articles, or other texts to supplement the activity.

Frontloading: Creating a Super-Human – Get students excited about the idea of using sources of energy to save lives with this activity. Task: Create a super-human that draws power from something in nature.

WEEK ONE: Learn (or review) the forms of energy and the law of conservation of energy

WEEK TWO: Explore principles connected to light, heat, and other forms of energy (including reflection, insulation, and absorption).

WEEK THREE: Plan, create and test solar ovens to demonstrate how solar energy can be utilized by people.*

WEEK FOUR: Research a need within a specific community or society that could be solved using a solar powered machine.

WEEK FIVE: Design and build a prototype of an invention that would run off solar energy with a goal of solving the researched problem. Students should create a presentation for their design that describes their research of the problem, their machine and the transfer of energy throughout it, and conclude with an analysis of the benefits of solar energy.

Ongoing formative assessment: STEM Notebook entries; Exit Tickets for specific knowledge or skills; Teacher Check-ins throughout the culminating project; Improvements Journal – students document improvements made to engineering designs and WHY the change needed to be made