

# SOLAR POWER



# DESIGNER

## LESSON OVERVIEW

Grade Levels: K-5

In the book *The Toy and the Test Drive*, Argonne National Lab scientist Seth Darling suggests that, “readers like you will imagine more creative solar ideas in the future!”. After reading *The Toy and the Test Drive*, students will review the engineering design process and will discuss prototypes for solar-powered inventions. Students will then draw their own prototype for a solar-powered invention and will write a short piece of writing that explains how the prototype works.

## STANDARDS

CCSS ELA.RI.2.1	Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
CCSS ELA.RI.2.3	Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
CCSS ELA.W.2.8	Recall information from experiences or gather information from provided sources to answer a question.
CCSS ELA.RI.5.1	Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS ELA.RI.5.1	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
CCSS ELA.W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

## OBJECTIVES

- Students will discuss the engineering design process and how it is used to plan, design, and test inventions.
- Students will discuss solar-powered inventions.
- Students will design a prototype for a solar-powered invention.
- Students will write a short piece of writing that explains how their prototype works.

## MATERIALS

- Engineering Design Process handout
- Paper
- Writing/ Drawing utensils

## PROCEDURE

- STEP 1:** Read *The Toy and the Test Drive* by Gillian King-Cargile including the “Ask an Expert” section and then ask the following questions and have discussions:
- What are the part of a solar car?
  - What are other ways solar energy is currently being used?
  - What are some things that you currently use in your home or school that require a power source to work?
- STEP 2:** Review the Engineering Design Process and discuss with students each step and how it relates to inventing something new.
- STEP 3:** Have students draw (either in groups or independently) an invention that would be powered by solar energy, showing all of the details:
- How will the solar energy be collected?
  - How will the invention be used? At home? At school? For transportation?
  - What kinds of physical features will it have?
- STEP 4:** Have students discuss how their solar-powered invention would be beneficial to themselves and to society.
- STEP 5:** Have students talk about their designs and whether or not they believe the machine would work in real life. Why or why not?
- STEP 6:** Have students write a short piece of writing that explains how their prototype works, including the points discussed above.

## ENGINEERING DESIGN PROCESS



### IDENTIFY THE PROBLEM

What is the problem, and why is it important?

### RESEARCH AND BRAINSTORM

*Research:* What has been done to solve this problem? Who is affected by this problem? What current solutions are available?

*Brainstorm:* What sort of things can be used to solve this problem? How can current solutions be improved? What materials will you need? Create concept designs.

### BUILD

Decide upon your best design, gather your materials, and build your prototype.

### TEST

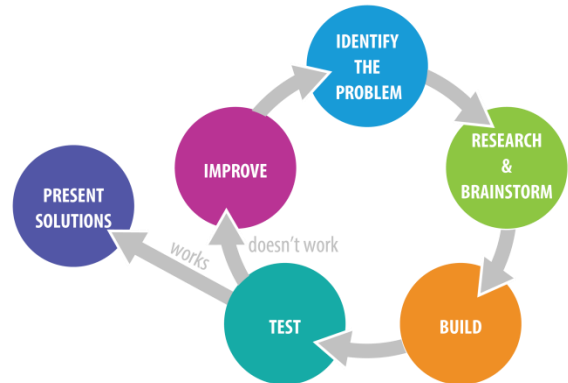
Test your prototype to determine its challenges, problems, and level of effectiveness.

### IMPROVE

If the prototype does not work, repeat the process by identifying problems with the prototype design, conducting more research and brainstorming possible improvements, modifying or rebuilding the prototype, and performing additional testing until a solid solution is found.

### PRESENT SOLUTIONS

Once an effective solution is discovered, present your work to others. Possible forms of presentation include a project board or multimedia presentation at a meeting or conference, documentation made accessible to those who can benefit from the work, and electronic communication of the solution via email, social media, blogs, websites, digital signs, videos, etc.



## RUBRIC

	Target (3)	Meets (2)	Partially Meets (1)	Does Not Meet (0)
SOLAR-POWERED INVENTION DESIGN	Does a great job showing an understanding of design for a purpose.	Does an okay job with showing an understanding of designing for a purpose.	Tries but has great difficulty showing an understanding of the design process.	Does not show an understanding of design.
WRITING ASSIGNMENT	Writing assignment is clear and uses evidence to support reasoning.	Writing assignment is clear.	Writing assignment is a little difficult to understand but includes critical components.	Writing assignment is difficult to understand and missing several components or is incomplete.
COLLABORATION	Works well with others and discusses ideas in a fair, respectful, encouraging way and is considerate of the feelings of others.	Works okay with others and discusses ideas in a fair, respectful way, but may not be encouraging. Considers the feelings of others.	Works with others, but does not contribute a fair share of work OR is discouraging and does not consider the feelings of everyone.	Does not work well with others and/or discusses ideas in an unfair, disrespectful way.
REQUIREMENTS	Meets all of the requirements for the project.	Meets most of the requirements for the project.	Meets some of the requirements for the project.	Does not meet the requirements for the project.
DEMONSTRATION OF KNOWLEDGE OF CONTENT IN DISCUSSIONS AND ACTIVITIES	Does a great job showing an understanding of the content covered in class.	Does an okay job with showing an understanding of the content covered in class.	Tries but has a difficult time showing an understanding of the content covered in class.	Does not show an understanding of the content covered in class.
Total				/15