

# UNDERWATER VEHICLE DESIGNER



## LESSON OVERVIEW

Grade Levels: K-5

In the book *Papa's Mechanical Fish*, Papa is on a mission to create a machine that can take him underwater. In this activity students will research and develop their own plan for an underwater vehicle. After researching aquatic life and the biology that helps creatures live underwater, students will draw their own prototype and write a short story about an adventure that they will have using their machine.

## 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 how Papa used the engineering design process to plan, design, and test his inventions.
- Students will research through multimedia aquatic life and beneficial features for creating a submarine.
- Students will design a prototype using the engineering design process.
- Students will discuss their prototypes and techniques that will be used.
- Students will write a short story featuring their machine on an adventure it will take.

## MATERIALS

- Engineering Design Process handout
- Computers/mobile devices for research
- Paper
- Writing/ Drawing utensils

## PROCEDURE

- STEP 1:** Read *Papa's Mechanical Fish* by Candace Fleming and Boris Kulikov and then ask the following questions and have discussions:
- What kind of things did Papa use on his submarine that mirrored aquatic life?
  - How come his inventions didn't work the first few times?
  - What kinds of things may help people move around in water?
  - What will you do to make your submarine work?
- STEP 2:** Review the Engineering Design Process and discuss with students each step and how it relates to the story.
- STEP 3:** Have students conduct research (either in groups or individually) on aquatic life. Discuss the following topics:
- How did the animals move through water?
  - How did they change direction?
  - What kinds of physical features did they have?
- STEP 4:** Have students discuss what features of aquatic life would be beneficial to a submarine.
- STEP 5:** Have students draw (either in groups or independently) their underwater machines, showing all of the details.
- STEP 6:** Have students talk about their designs and whether or not they believe the machine would work in real life.
- STEP 7:** Have students write a short story about an adventure that they take using their machine.

## 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

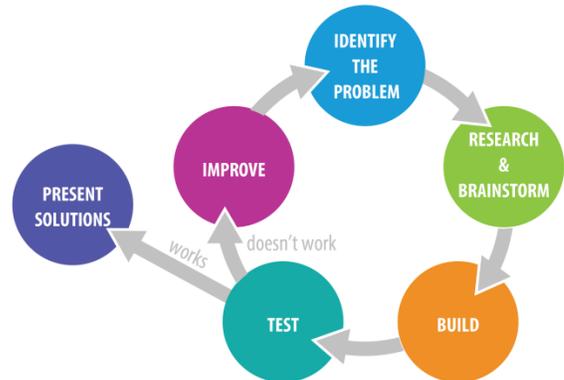
Test your prototype to determine its challenges, problems, and level of effectiveness.

### 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)
UNDERWATER MACHINE 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.
SHORT STORY	Short story is clear and uses evidence to support reasoning.	Short story is clear.	Short story is a little difficult to understand but include critical components.	Short story 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