



## SOLUTION SEEKER ACTIVITY

### OBJECTIVES

Students will:

- Explore concepts related to the engineering design process
- Create a physical model that contributes to solving a real-world problem
- Evaluate the role prototyping can play in innovation and invention

## Prototyping Solutions

### OVERARCHING QUESTION

How can prototyping help us solve problems?

### MATERIALS

- View & Reflect handout, one per student
- Challenge handout, one per student
- A selection of different materials for prototyping\*

Ideas include:

- Cardboard
- Foam board
- Reusable/recyclable containers of different sizes
- Fabric
- String
- Rulers
- Duct tape
- Hot glue gun and hot glue
- Scissors

*\*Materials Note:* In advance of this class session, it may be helpful to ask students to bring in scrap materials and recyclable items from home such as cereal boxes, paper towel rolls, food storage containers, yogurt containers, etc.

### STANDARDS

#### Next Generation Science Standards

##### Engineering Design

- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

## ACTIVITY OVERVIEW

### Introduce

1. Begin by challenging student pairs to brainstorm problems that they, their community, and the world face. The problems may be big or small as long as they need a solution. Create a header on the board titled “Problems to Solve” and keep a list as students share.
2. Then present the class with two definitions:
  - Invention: the creation of a product or process for the first time
  - Innovation: an improvement or contribution to an existing product or process
3. Ask: Why are both invention and innovation important when it comes to solving problems?
4. Explain that students are about to watch a short video that highlights how one company—Boeing—used the power of invention to solve an important problem.

### View & Reflect

1. Before showing the Boeing Career Profile video, distribute one copy of the View & Reflect handout to each student.
2. On the handout, review the guiding question and the three categories of the chart. While watching the video, students should jot notes on the chart that are related to the guided question.
3. Then share the Boeing Career Profile video. Students may find it helpful to view the video more than once!
4. When the video is complete, encourage student pairs to use their notes to discuss an answer to the handout guiding question.

## CHALLENGE

1. Explain that the class will now be challenged to follow Boeing's lead as they use prototyping to develop their own solutions.
2. Distribute a *Challenge* handout to each student. Review the instructions and show students where they can find the prototyping materials. Then help the class divide into groups of four before encouraging them to begin.

## CONCLUDE

3. Once the Challenge activity is complete, invite groups to share the problem they selected and the design prototype that they deemed most effective.
4. Then wrap up by facilitating a discussion around the following questions:
  - What did you learn from creating physical prototypes of your solution?
  - Why is prototyping an important part of the innovation and invention process?

**Step 2—Brainstorm Solutions**

What inventions or innovations could contribute to solving this problem? Record your ideas below. The sky's the limit!

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**Step 3—Select Solutions**

Review the solutions you brainstormed, as well as the criteria and constraints. Then work as a group to select two innovations or inventions that you think would most effectively solve your problem and circle them.

**Step 4—Build**

Divide your group into pairs. Each pair will now focus on one of the solutions and use the materials available to construct a physical model of the invention or innovation.

**Step 5—Evaluate**

When both models are complete, share them with your group members. Review them, test them if possible, and discuss how they would work in a real-life situation. Then collaborate to consider:

1. What are the positive and negative aspects of both designs? Record them below.

| Design #1: _____ |      | Design #2: _____ |      |
|------------------|------|------------------|------|
| Pros             | Cons | Pros             | Cons |
|                  |      |                  |      |