



Invention Project

PowerPoint Lesson Slides
Created by Michael Bryson

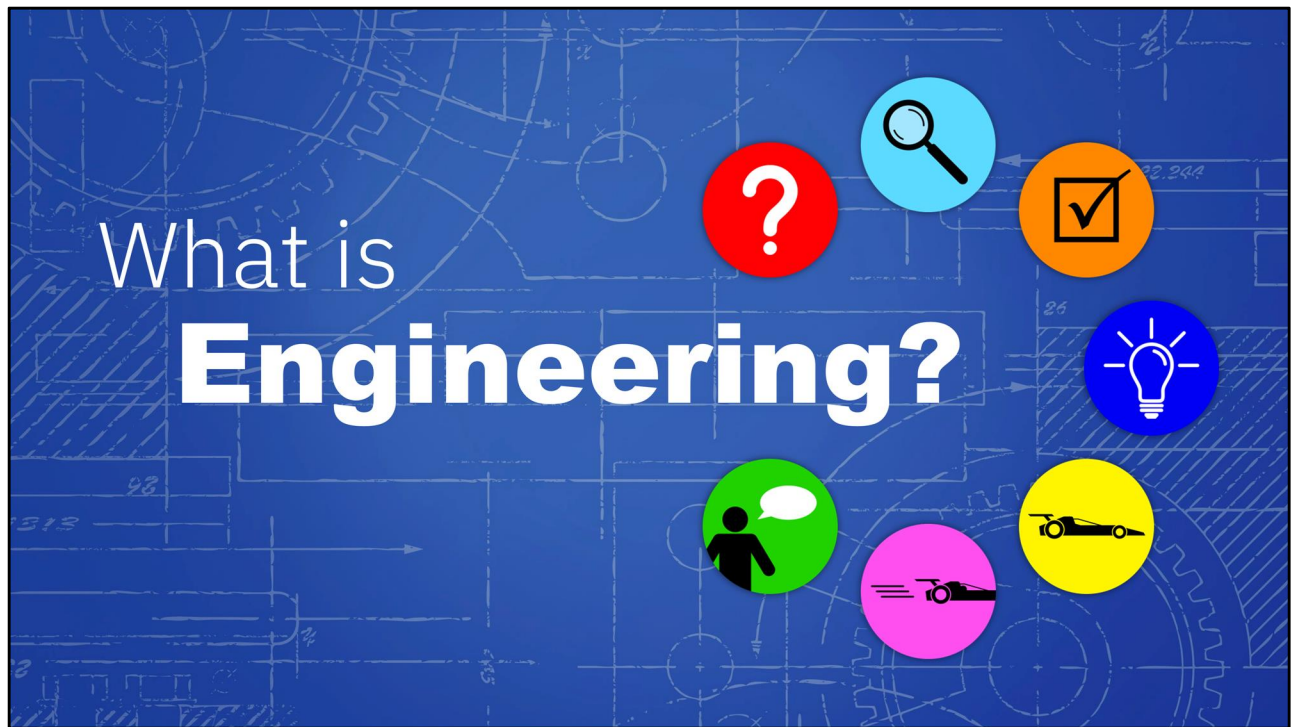
www.andrews.edu/go/invent

Andrews University STEM Division
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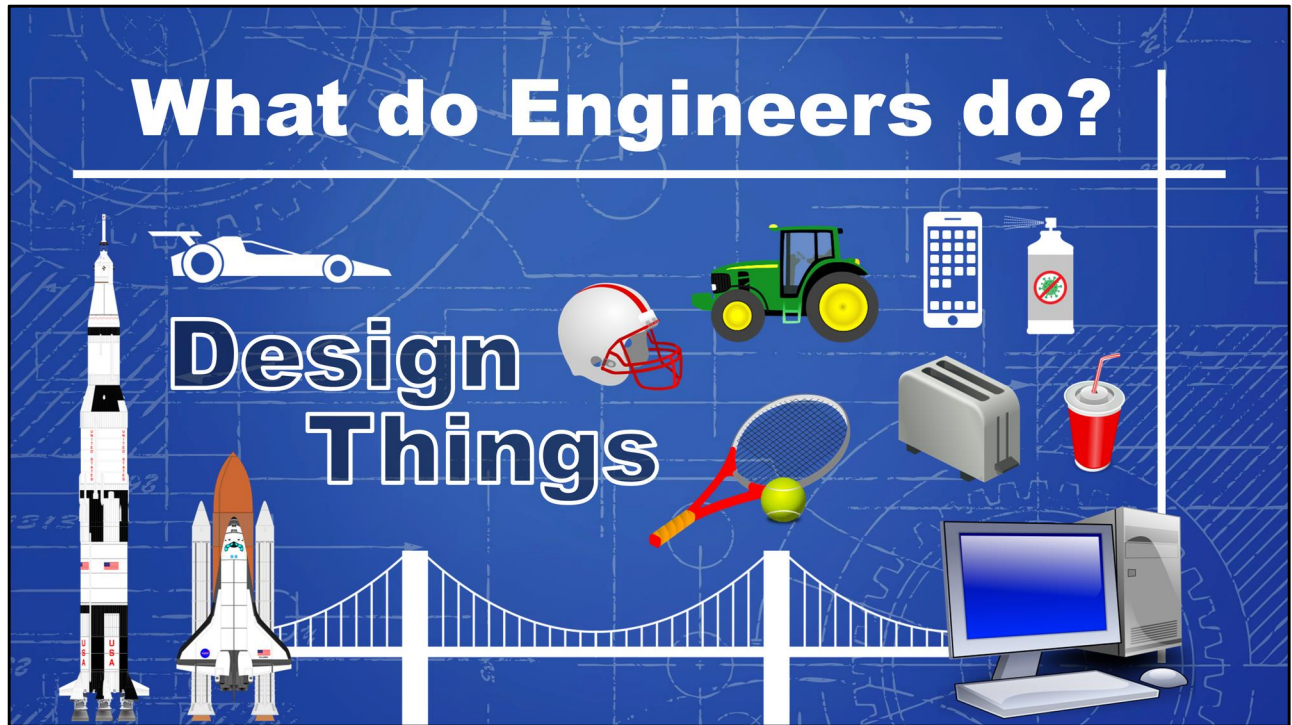
Note:

Some slides in the PowerPoint have text or images that appear out of place until full-screen playback. This is because some elements are animated and will not appear in the right place until the slide is played. There are also some animated transitions that require an extra slide to animate properly. These slides were simplified for the notes version to improve readability.

Page numbers in this document do not correspond to slide numbers in the PowerPoint.

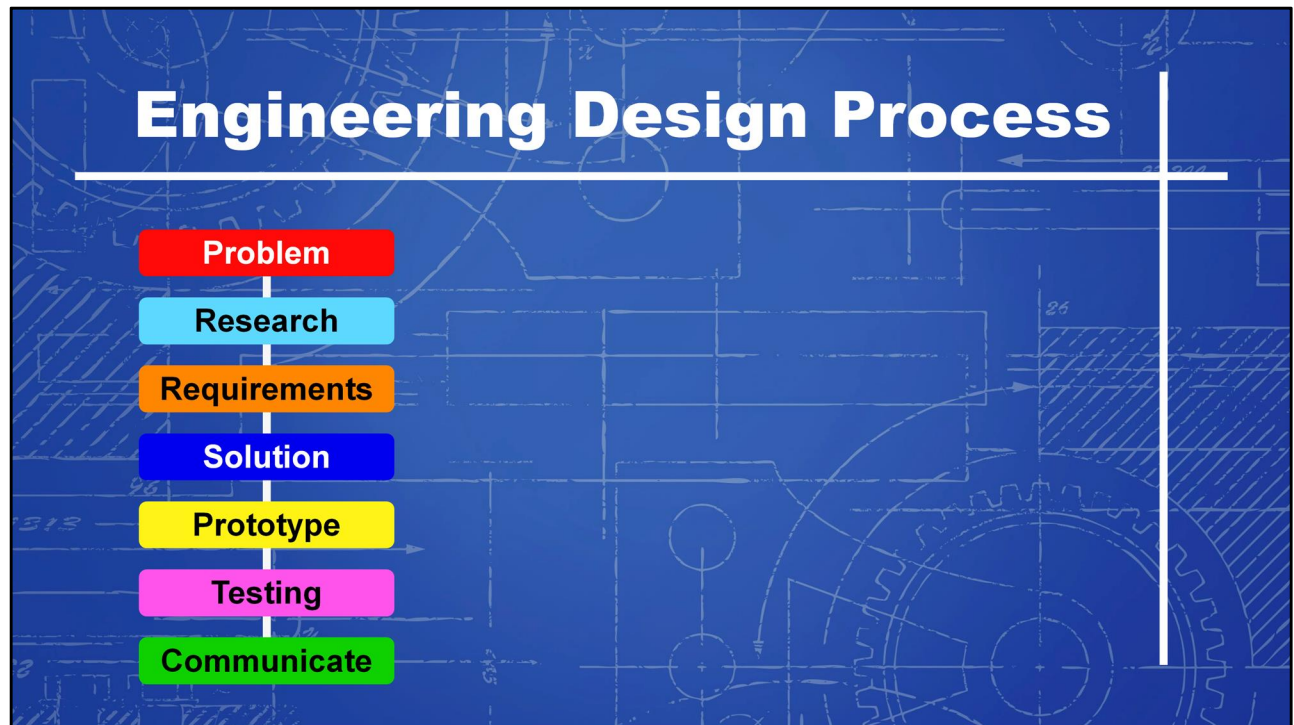


Lesson 3: What Is Engineering?



What do Engineers do?

Engineers design things to solve problems – computers, bridges, rockets, toasters, drink cups, and more.

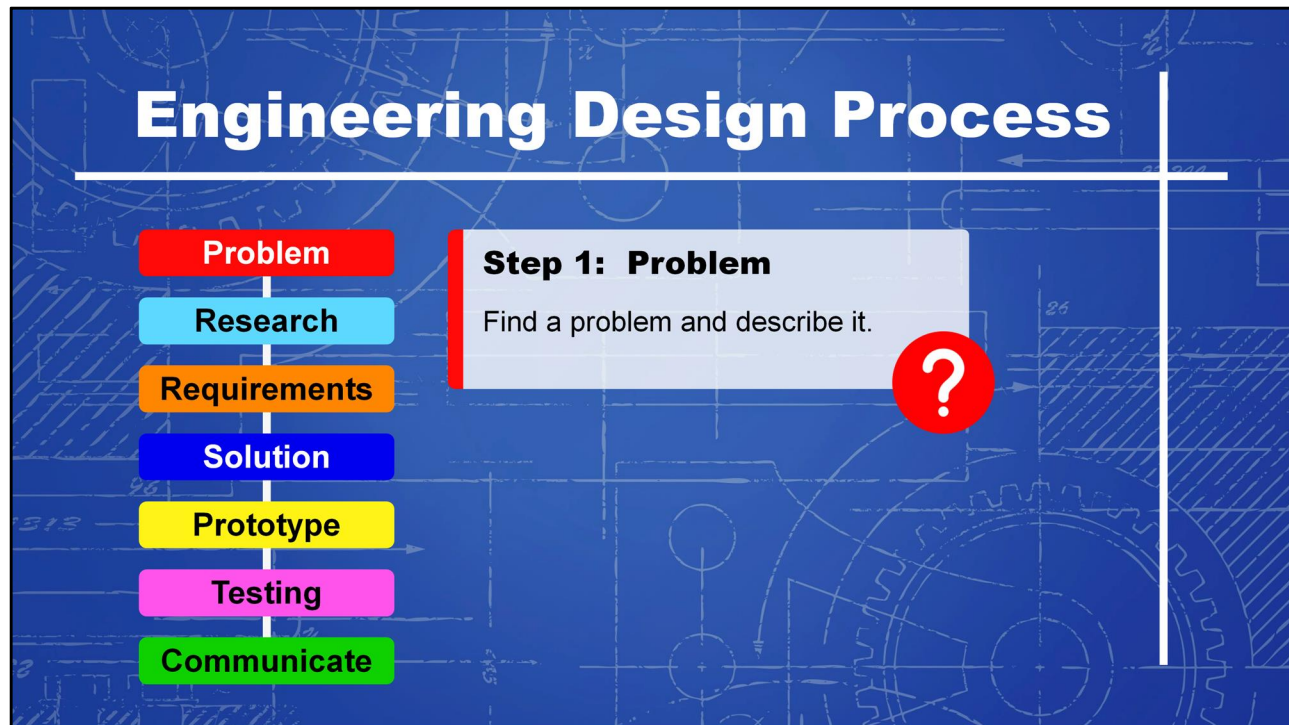


How do engineers solve problems?

They follow the engineering design process. These steps help them make things to solve real-world problems.

This process will help students create an invention to solve the class problem.

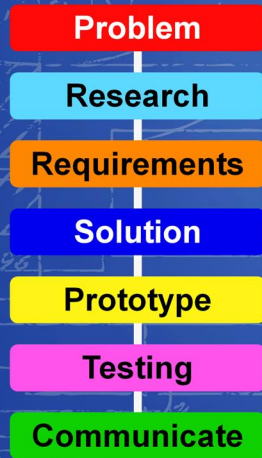
Briefly explain each step (next slide)



Step 1: Problem

Find a problem by observing the world around you.
Describe the problem in detail.

Engineering Design Process

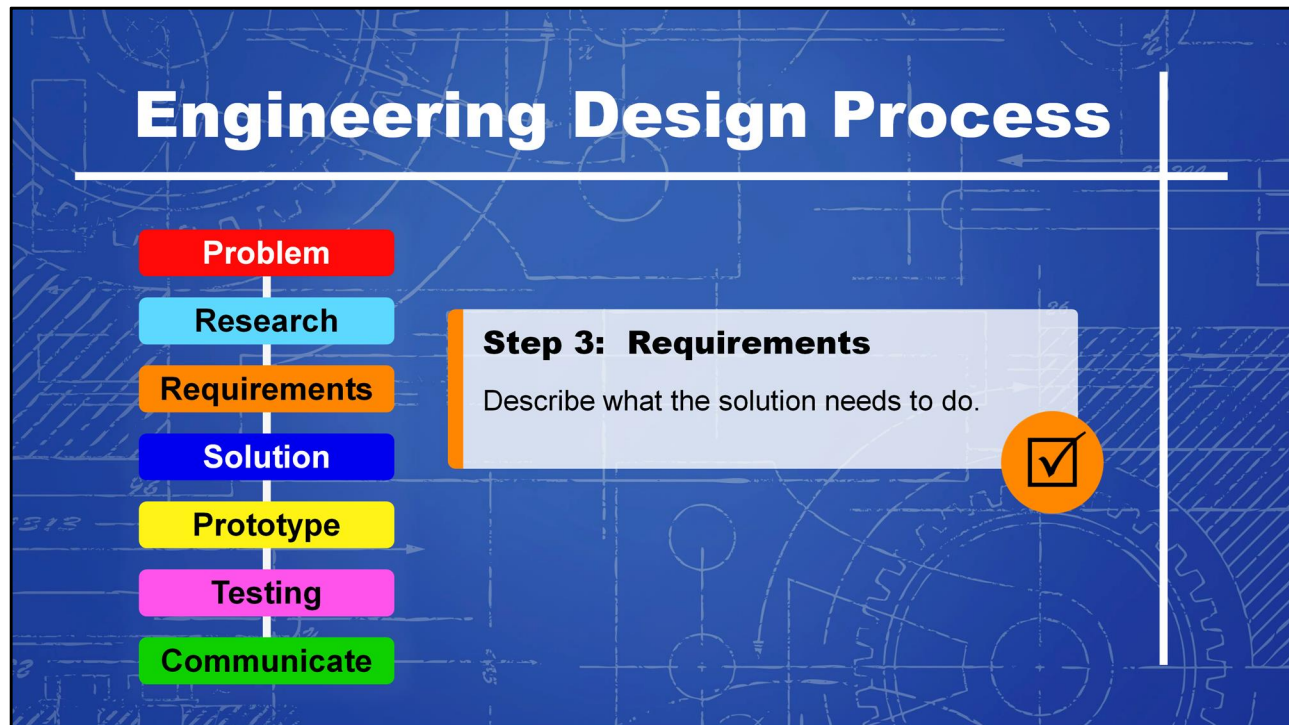


Step 2: Research

Learn about the problem.

Step 2: Research

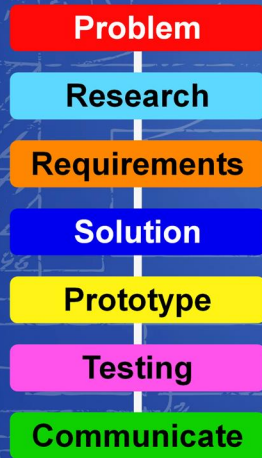
Learn more about the problem and other potential solutions.



Step 3: Requirements

List the requirements for your solution, but don't choose a solution yet. These are the things you will have to address to solve the problem.

Engineering Design Process



Step 4: Solution

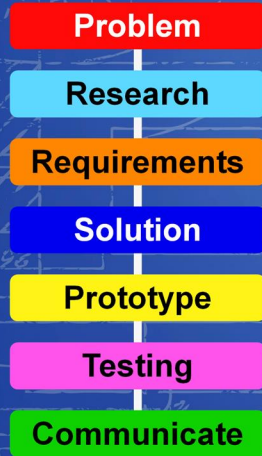
Think of the best way to solve the problem.



Step 4: Solution

Consider any and all possible solutions. Compare these solutions to the requirements and pick the one with the best chance of success.

Engineering Design Process



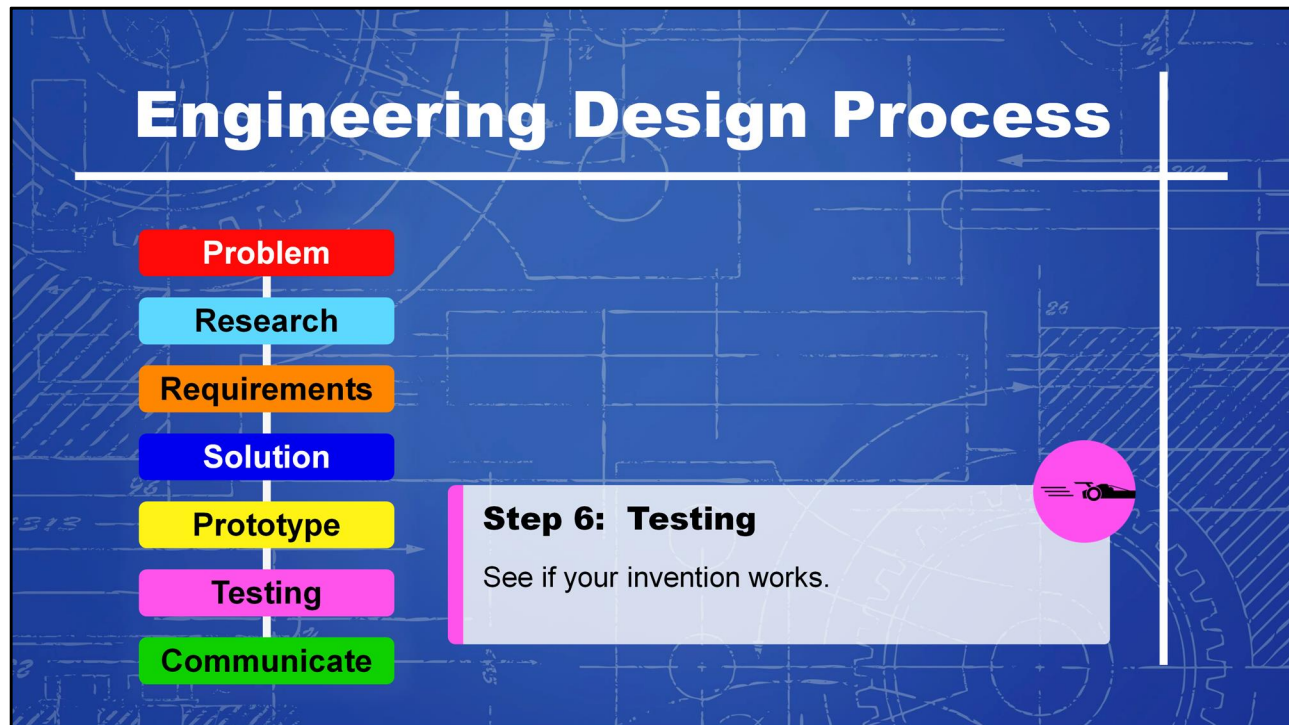
Step 5: Prototype

Draw your invention and build it.



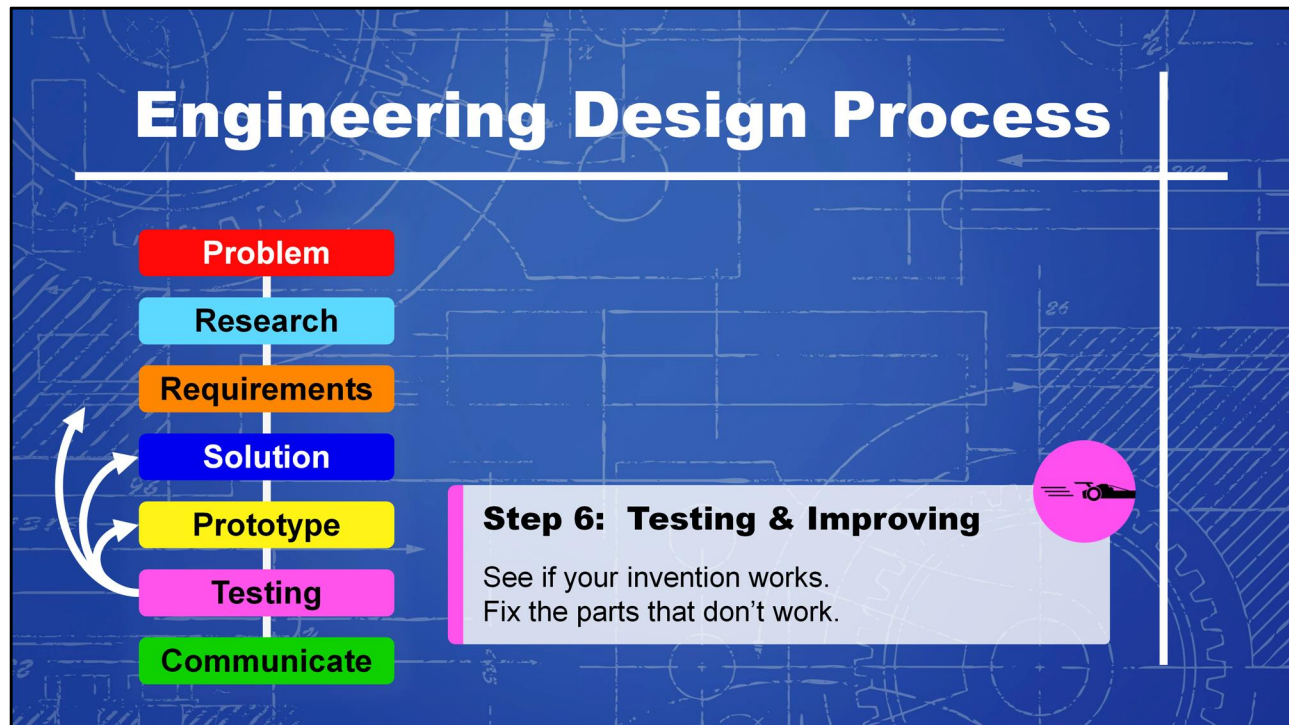
Step 5: Prototype

Design and build a prototype (model) of the solution you chose.



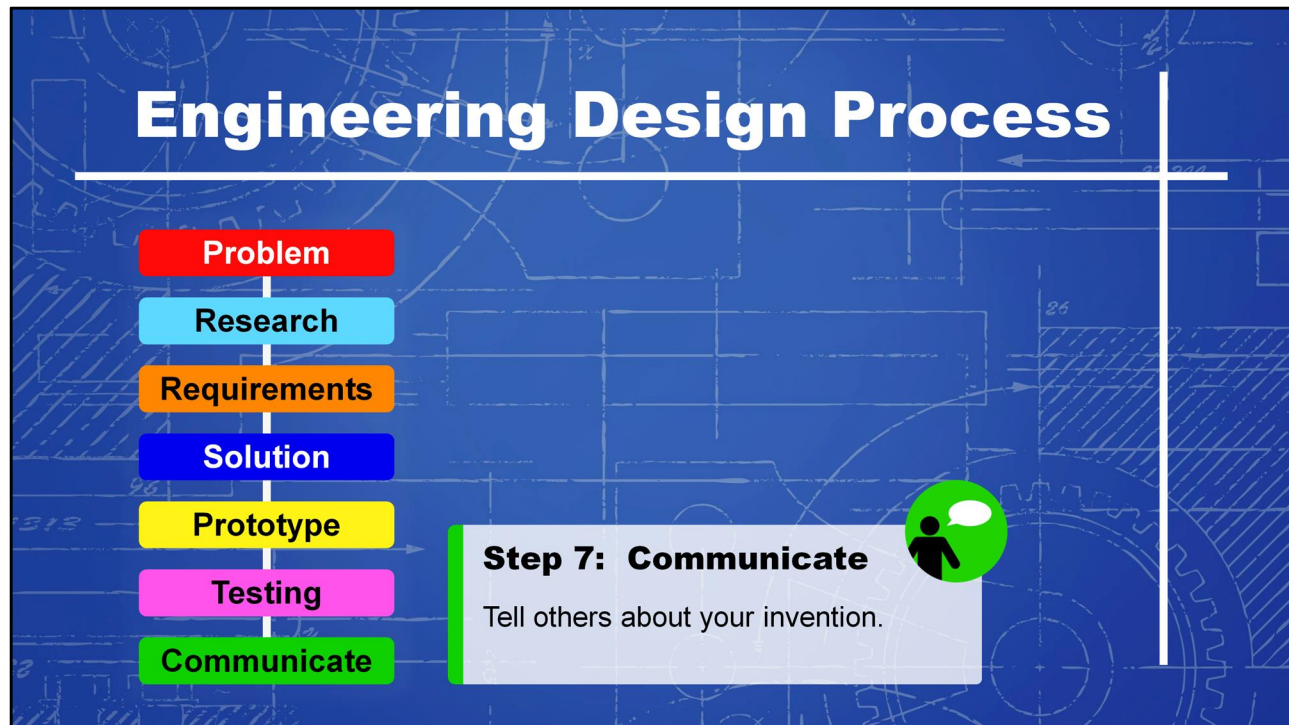
Step 6: Testing

Test the prototype to see how well it works.



Step 6: Testing (& Improving)

Test the prototype to see how well it works. Return to previous steps and make improvements as necessary.



Step 7: Communicate

Tell others what you accomplished. Show them the final result and explain the steps you took.

Example Problem

Problem

Find a Problem:

- Choose a simple problem to practice solving as a class.

Example Problem:

This activity should be completed together as a class. Guide the students through this process, letting them discuss and contribute throughout.

You will not be doing the entire design process with this example (only the first 4 steps). As you progress through the example, write and draw on the board.

Find a Problem:

- Choose a simple example to solve with the class.
- You can find Example Problems on our website (Activities section in Teacher Resources) or choose your own.
https://www.andrews.edu/cas/stem/invent/downloads/example-problems_k-2.pdf

Example Problem

Problem

Describe the Problem:

- Imagine you are describing the problem to someone who knows nothing about it.
- What do they need to know to solve it?

Describe the Problem:

- List anything that might be important to know when looking for a solution.

Example Problem

Research

Research the Problem:

- Who or what has this problem?
- What things already solve this problem?
- Can you solve it better or differently?

Research the Problem:

- Consider the questions for the chosen problem.
- To save time, this step can be simplified or skipped for the example.
- Students will go more in depth when doing it for the class problem.

Example Problem

Requirements

List Solution Requirements:

- What does it need to do?
- What should it not do?
- Safety, size, weight, strength, time, cost, etc.

List Solution Requirements:

Write the requirements on the board.

- What things must the solution meet or do?
- What must the solution not do (limitations or restrictions for the design)?
- Consider the requirements for the solution without choosing a specific solution yet.
- The requirements will be the checklist for the invention.

Example Problem

Find Solutions:

- Brainstorm as many ideas as possible.
- Write or draw every idea.
- There are no bad ideas!

Solution

Find Solutions:

Write/draw the solutions on the board.

- Let students think of and draw solutions on their own or in groups.
- Have the students share with the class.
- Think of as many ideas as possible.
- Even bad ideas may spark an idea in someone else.
- Consider solutions you can make.

Example Problem

Choose the Best Solution:

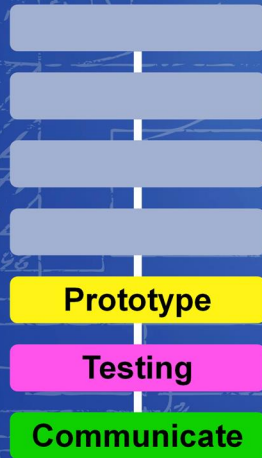
- Share, discuss, compare, and change ideas.
- Does the solution meet the requirements?

Solution

Choose the Best Solution:

- Discuss as a class or in small groups.
- Choose the solution that best meets the requirements.
- The solution should ideally be original or innovative (improve on existing inventions).

Example Problem



Remaining Steps:

- Design and build a prototype.
- Test the prototype and make it better.
- Show and tell others.

Remaining Steps:

- When students do this with the class project, they will then design, build, test, and improve their solution.
- At the end, they should prepare a presentation.

Next Class

Work with your classmates to...

- **Research the problem**

Starting next time, the students will work on their project as a class. They will follow the engineering design process and you will document their progress in the class Logbook (available on our website, Project Resources section in Teacher Resources).

If you want your students to interview people for their research (next class), you may want to assign that today.

Invention --- Project

