



Engineering Design Process

Engineers solve problems by following a series of steps. These steps help them:

- Think creatively
- Test ideas
- Improve their designs





Identify the Problem

State the challenge to solve in your own words. What are the constraints that may limit your designs?

Build Understanding

What do you know about the problem? What has been done in the past? Asking questions or researching the problem may help you find a starting point.



Plan

Brainstorm possible solutions. The more ideas the better! Work in teams to choose a couple solutions you think have the best possibility of working and sketch them out.



Prototype + Test

Build working models and test them. Collect data, when possible, to compare how well different designs meet the challenge.



Adjust & Test

Make changes to your designs and test again. You may decide to try something completely new – that is fine!



Reflect + Share

At the end of the design time, think about the process you and your group followed to get to your final design. As a class, share what you learned.



The **ENGINEERING DESIGN PROCESS** in Action

Pet Feeder example



Identify the Problem

You are responsible for cleaning up after your pet who is a very messy eater. You want a feeding system that reduces the mess and the time you spend cleaning!

Build Understanding

Observe your pet eat. What might be some factors contributing to the mess? Is the container too small for the amount of food, is it too low for your pet to comfortably reach?



Plan

Decide what materials and tools are available. Sketch out a couple designs. Pick one that you have a good chance of success.



Prototype + Test

Build a working prototype using pet-safe materials. There's always an opportunity to be creative and personalize your project!



Adjust & Test

Did it work like you thought it would? What adjustments or other ideas might improve your results?



Reflect + Share

Share your successes with your family. Tell them about the process and what you learned. What other aspects of your daily life might you be able to improve with a little engineering?



The **ENGINEERING DESIGN PROCESS** in Action

Toy Car Example



Identify the Problem

Your assignment is to build a toy car from a set list of materials. The car needs to use the power of one rubber band to travel at least 2 meters across the classroom floor.

Build Understanding

Play around with the building materials to get a sense of how they best go together. What are some of the factors that affect the energy transfer from the rubber band to the car?



Plan

In small groups, come up with a couple different design ideas. Are three wheels better than four? Does the size of the wheel matter?



Prototype + Test

Build a working prototype and test it out. Measure and record your results. How consistent are your results?



Adjust & Test

If you don't achieve the goal the first time, make one change at a time and re-test.



Reflect + Share

As a class, discuss each group's approach to the challenge and what they learned. Share your final cars and how closely they achieved the goal.



STEM+M: How do we add Manufacturing?

A small change to how the Toy Car activity is presented can move it beyond a purely engineering activity into an engineering and manufacturing activity.

Engineering: Design a cart that rolls 2 meters using rubber bands.

+Manufacturing: Build 5 identical carts using the same materials and process – and check each one for quality.

Benefits of including a manufacturing focus:

- Teamwork and Collaboration
- Critical Thinking and Reasoning Skills
- Enhanced Problem-solving
- Career Readiness skills