

Think Like an Engineer Journey: Mobility Device Design Challenge

Purpose: Find out how engineers solve problems with the Design Thinking Process. Then, take on a design challenge to engineer a new piece of mobility equipment that helps other people!

Set-Up: Mobility equipment is technology that's designed to help people with mobility impairments move from place to place. It gives users greater independence and control over their day-to-day lives by providing them with freedom of movement. Mobility equipment includes mobility aids like crutches and wheelchairs as well as artificial limbs and prosthetics.

For this design challenge, follow the steps of the Design Thinking Process to engineer a prototype of a new piece of mobility equipment for an amputee. Your equipment will need to help them to move from place to place. A prototype is a quick way to show an idea to others or to try it out. The Design Thinking Process is the steps engineers go through to solve problems. They: identify the problem, brainstorm and plan, build, test, and improve.

Activity: To get started, gather 1 large piece of cardboard (2 x 3 ft. or more), 1 roll of string, 2 sheets of felt or another medium-thick fabric, 5 rubber bands, 4 brass fasteners, 1 sheet of poster board, 5 cardboard tubes, duct or packing tape, scissors, paper, and a pencil.

NOTE: If you're missing a material or have another idea for something that might be useful, free feel to test them! For example, if you don't have cardboard tubes, you could roll poster boards or stack sturdy cups. Trying out different ideas to see what works is something engineers do!

Then, identify the problem you're trying to solve: engineer a prototype of a new piece of mobility equipment for an amputee.

After, spend a few minutes brainstorming the design of your device. Sketch your ideas on sheets of scratch paper to create a plan that keeps in mind the criteria and constraints.

- Criteria are things the design needs to accomplish. They're the goals for a prototype. The criteria for the challenge is that your prototype must: 1) help the user to move from one side of the room to the other, 2) be comfortable for the user, and 3) be easy and convenient for people to use.
- Constraints are ways the design is limited. For example, there might only be a certain amount of time to build the prototype or a limited amount of materials to make it. The constraint for this challenge is that you can only use your challenge materials, including the cardboard, string, sheets of felt, rubber bands, brass fasteners, poster board, and cardboard tubes.

It might help to ask yourself questions like:

- What sort of equipment do people use to move from place to place?
- What features of this equipment work for your user (amputee)? What special equipment already exists? How can you improve them?
- What features might your user want or need?
- What materials could you use? What parts does your prototype need?
- What mechanism (if any) will your prototype have?

Once you have some ideas, choose one to turn into a prototype.

Then, use your plan and materials to build your mobility device. As you build, feel free to try lots of different ideas to see what works and doesn't work. Remember, the goal is to practice thinking like an engineer, NOT to make a perfect prototype!

When you think you have a finished prototype, test it and see how well it works!

Before you start testing, what do you think will happen? Will your prototype be able to meet the criteria? Take a guess!

Then, find out if you were right! Test your prototype by trying it out and walking around the room.

During the test, you may find things that work and others that don't. So, after testing, make sure to ask yourself: How could you improve the prototype?

Then, improve it using what you've learned. Once you have a new version, test the new prototype again to see if your changes worked!

Want More Challenge? Try This! Redesign or add features to your equipment that help the user travel on different surface terrains. For example, what could you add to help with sidewalk ice in the winter? What could you add to help someone living on a farm with lots of soft dirt and grass? What additional features or mechanisms will you need to add for each condition?

Once you've created any type of prototype, you can share it with others. They can help you to think of new ideas and look for ways to make your prototype even better.

And that's it! You've completed a design challenge from the Ambassador Think Like an Engineer Journey! You've learned about the Design Thinking Process and used the steps to engineer a prototype of a new mobility device.

If you had fun with this design challenge, check out the other activities in the Think Like an Engineer Journey. Or, explore more about engineering and computer science with the Robotics badges.

