

HELPING HAND



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Global



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YOUR CHALLENGE

Design and build a device with a long handle that can grab an object that's hard to reach. This is an "assistive device"—it will help you do something you couldn't otherwise do easily.

DEFINE THE NEED

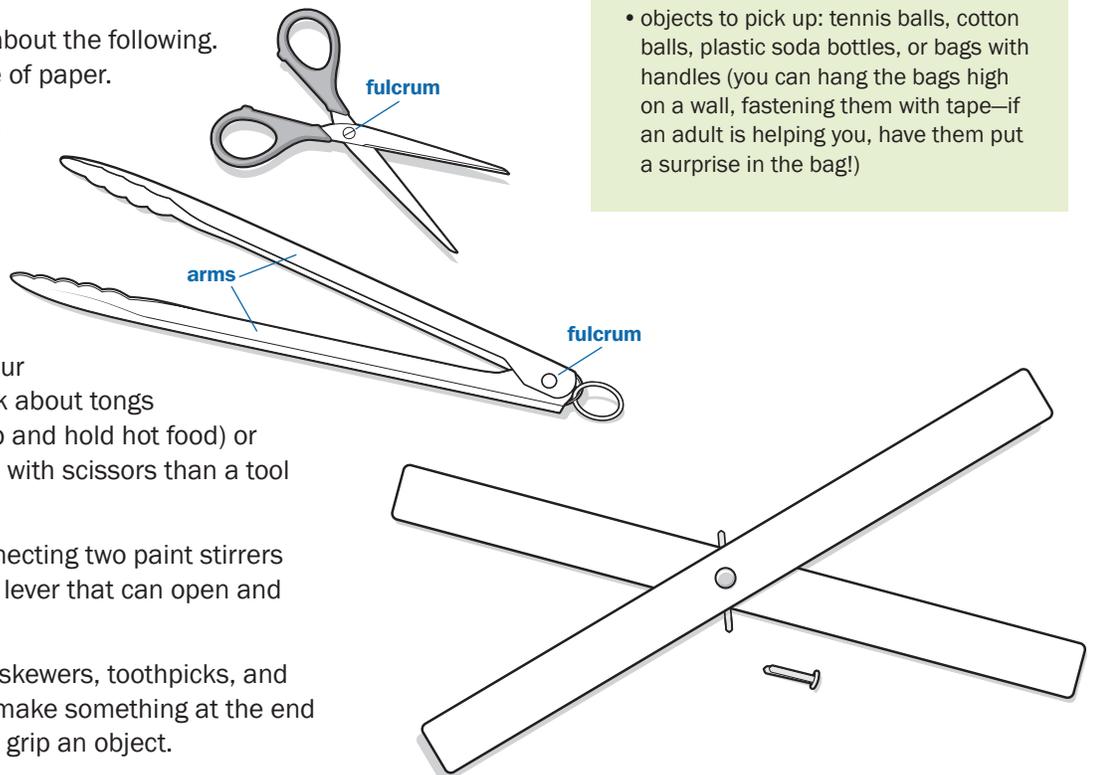
Engineers and inventors have created some amazing assistive devices for people who are sick, injured, disabled, or elderly. Wheelchairs, walkers, prosthetic arms and legs, computer programs that make speech possible—these are just some of the ways technology can make life better for people facing challenges.

Can you think of situations where having a Helping Hand would be helpful? Who could a Helping Hand help? Why would they need it?

BRAINSTORM & DESIGN

Look at your materials and think about the following. Then sketch your ideas on a piece of paper.

- Salad tongs, pliers, binder clips, scissors, and tweezers are devices that can grab things. Each of these devices has a **lever** with two arms that open and close and a **fulcrum** (the point where the arms are connected). Levers help make our lives easier in lots of ways. Think about tongs (they make it possible to pick up and hold hot food) or scissors (it's easier to cut paper with scissors than a tool like a knife).
- One good way to start is by connecting two paint stirrers with a brass fastener to make a lever that can open and close.
- The cups, rubber bands, string, skewers, toothpicks, and other materials can be used to make something at the end of the grabber that can pinch or grip an object.



MATERIALS (per person)

There are lots of possibilities for designs; you'll probably only need some of these materials.

- 4–6 paint stirrers (found at paint supply or hardware stores) or thin wooden slats (see *Preparing Stirrers* on back)
- 3 or 4 brass fasteners/split pins
- tape (duct or masking)
- a few pieces of sturdy cardboard (any size)
- scissors
- rubber/elastic bands
- string
- paper or plastic cups
- toothpicks
- wooden skewers
- objects to pick up: tennis balls, cotton balls, plastic soda bottles, or bags with handles (you can hang the bags high on a wall, fastening them with tape—if an adult is helping you, have them put a surprise in the bag!)

- How will you make your grabber long enough to reach the object?
- How will you be able to control the grabbing motion when it's at the end of a long handle?

BUILD, TEST, EVALUATE, & REDESIGN

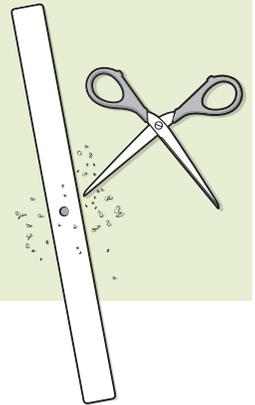
- Build the grabber.
- Test it by trying to grab and pick up different objects.
- Observe any problems, and if needed, redesign.

Problem-Solving Tips

WHAT IF . . .

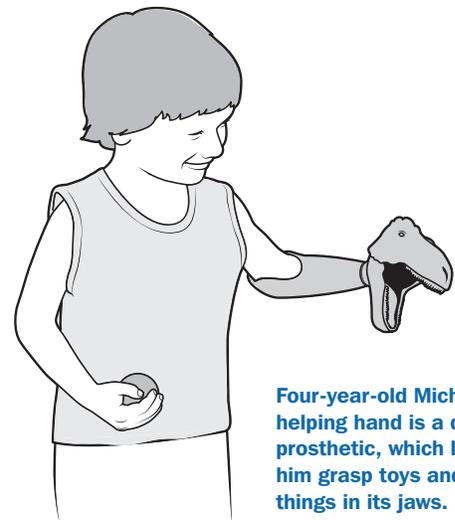
- **the arms open but don't close . . . or close but don't open?** Try rubber bands, string, or skewers to help make the device open or close.
- **it keeps dropping things?** Make sure the arms close tightly enough to actually hold something. Paper cups, skewers, or cardboard may help make "hands" at the end of the arms that can grip something.
- **the arms bend or twist?** Reinforce them with something stiff.

Preparing Stirrers (ask an adult for help). Using a scissors (or a Phillips head screwdriver), an adult should make small holes in the stirrers. Turn and twist one blade of a sharp scissors in one spot until it goes through the other side. In half the stirrers, make one hole in the middle. In the others, make two holes—each about two inches from the ends of the stirrer. This will allow you to make different types of levers.



ENGINEERING AND INVENTION IN ACTION

There's something unique about four-year-old Michael. Born with six inches of his left arm missing, Michael wears a standard prosthetic (i.e., artificial) hand. It has some limitations—Michael can pick up and hold things, but can't squeeze or press very hard. Michael's father wanted him to be able to do more with his prosthetic hand and have some fun in the process, so he contacted engineers at the Open Prosthetics Project. Together, they built Michael two extra hands unlike any you've seen! One is a dinosaur puppet Michael uses to grip things by controlling its jaws. The other is a fishing rod Michael uses to catch fish and reel in stray toys. Michael's father continues to think up and build more hands for Michael. "Once you have the training," he says, "you can conceive, design, and build whatever your imagination pictures."



Four-year-old Michael's helping hand is a dinosaur prosthetic, which lets him grasp toys and other things in its jaws.



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