Objectives:

* Understand the purpose behind building a robot ; what robots are good at that humans are not and the reverse
* Understand the basic components of a robot
* Get excited about using the lego robotics kits

Resources:

This lesson draws elements from the following lessons Teach Engineering STEM Curriculum for K-12, from UC Boulder:

[What is a robot?](https://www.teachengineering.org/lessons/view/umo_robotsandhumans_less1)

[Are we like robots?](https://www.teachengineering.org/lessons/view/umo_robots_less)

[Understanding communication with robots](https://www.teachengineering.org/activities/view/umo_robotsandhumans_act1)

Intro Video:

4 minutes on why we build robots

<https://www.youtube.com/watch?v=8wHJjLMnikU>

Identifying what tasks are suited for robots:

Have students fill out the *Humans vs Robots* worksheet, where they decide whether certain tasks are more suited for a robot or for a human. Discuss why humans are better at certain tasks than robots, and why robots are better at certain other tasks.

Program a human:

Students will program their **~~blindfolded~~** tutors **with eyes closed** to pick up 3 objects in the room. As an example, students will give instructions on how to pick up a ball and a piece a paper in the middle of the room, and to pick up a pencil in the corner of the room.

To save time and to keep everyone engaged, while keeping tutors safe, pair up with one other group and program one tutor, while the other supervises with their eyes open.

Program a Human Challenge:

1. Students will give the first instruction on how to start picking up objects. Instructions are valid if they just explain how the tutor should move, e.g., walk forward 3 steps, bend your elbow until the angle is 90 degrees. Instructions are invalid if programmed tutor must use their own visual processing or critical thinking skills, e.g., walk towards the pencil.
2. Instructions will be given to mentor to carry out **literally**. Often, the mentor will perform actions not intended by the student (to comical effect).
3. Students will give the next instruction. Essentially, just repeat steps 1-2 until all 3 objects are picked up. Tutors should keep in mind that different objects require different grip techniques, and special care must be taken to ensure you don’t drop one object while trying to grab another one.

Would this challenge have been easier if the tutors weren’t blindfolded?

Would it be easier if our robot tutors could make decisions based on their senses? For example, would it be easier if a robot understood the command “pick up pencil?”

Basic parts of a robot:

1. Have the students read through the description of the four basic parts of a robot.
2. Ask the students to look at the simple robots pictured on the worksheet. Have them circle and identify at least one power source, control system, input and output.

EXAMPLES:

Power source - the rack of 6 batteries at the back of the bottom robot

Control system - the printed circuit board on the bottom robot

Input - the sensors that look like a pair of eyes on the top robot

Output - the motor for the wheels on the top robot, the claw on the bottom robot

1. Ask the students to find human analogies for each component of a robot

Examples:

Power Source - food we eat!

Control System - brain, central nervous system

Input - eyes, ears, nose, nerves, tongue

Output - hands, legs, voice

1. WRAP UP QUESTION: Thinking back to the experience in Program a Human, would it have been easier to pick up the object if the humans were allowed to use their sensors and make decisions based on their programming? If there is extra time, you can repeat the challenge using phrases such as: “Walk forward until you see your foot is within 6 inches of the object,” or “reach down until you feel all 5 finger tips are in contact with the object.”

Lego WeDo robot demo:

1. Hold up a spirograph picture, produced with the [spirograph WeDo robot](https://drive.google.com/open?id=1G4_DyA1L76_v3Cz68k1WGxEMcWlVstGO).
2. Ask students how long it would take to draw something like this? How long would it take a robot?
3. Connect the WeDo spirograph robot to a laptop, place it on a piece of paper, uncap the attached marker and program it to drive for several seconds.