Engineering Design Process

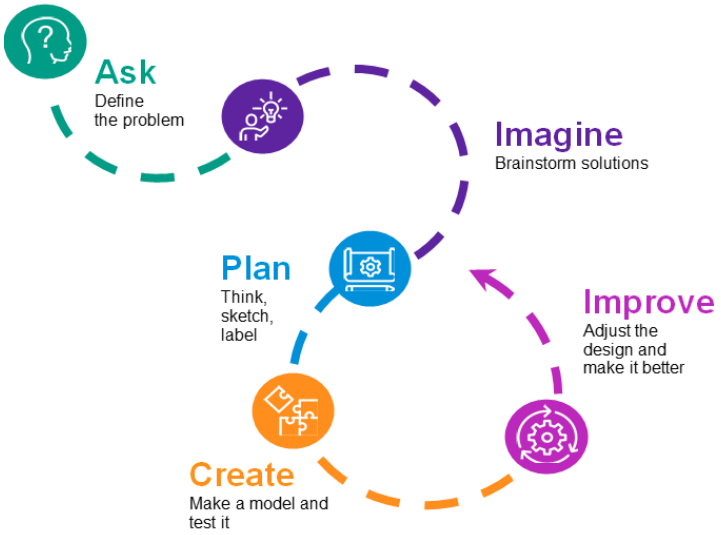
Build a WiggleBot

Materials:

- 1 Motor with leads
- Single AA Battery holder
- 1 AA Battery
- 1 cork
- 1 Cardboard Tube
- Tape
- 2 Googly Eyes
- 2-3 Pipe Cleaners (colorful)
- 2-3 Wooden Sticks (colorful)
- Aluminum foil (small piece)

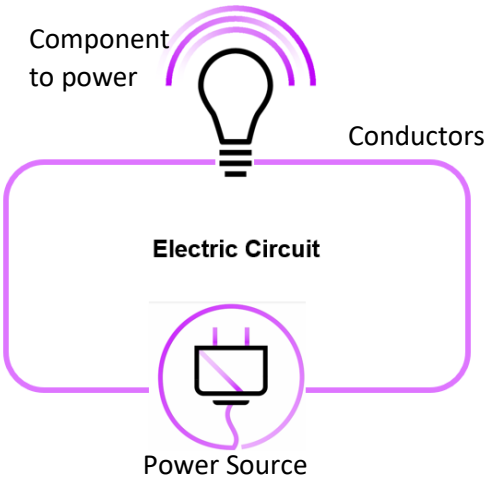
In addition:

- *Scissors*
- *Open workspace*



This guide should be used along with the 'Engr Design Build WiggleBot Slide Deck'. The steps and tips on the next page help to build the WiggleBot. Use this with students **after** completing the 'Engr Design Overview Slide Deck' and walking through the full Engineering Design Process.

Background information: What is a circuit?



CIRCUIT for WiggleBot:

- Power Source = AA battery
- Component to Power = motor
- Conductors = wires (& foil)

Students create a circuit with the mini motor in place of the light bulb. The mini motor will spin an item attached to it.
Challenge: create a wiggling motion.
Think about: what makes a cell phone vibrate.

STEP ONE – install the battery

- If the battery is not installed properly the circuit will not work & causes major frustration.
- Instruct students to look at the 'raised image' in the battery holder, note which side shows the '+'/positive side of the battery. Point out the '+' on the battery.
- If students cannot see the image, then instruct: 'flat' side of the battery on the spring.

STEP TWO – create simple circuit with motor

- Ask students about the leads that are attached to the motor and to the battery holder.
  - Point out the small part at the end that is not covered by plastic.
  - Ask students what is special about the ends? Metal is the conductor.
- Instruct students to connect the metal end of the red lead from the battery to the metal end of black lead on the motor & the black lead from the battery to the read lead on the motor.
- Students may be challenged to keep the metal wires touching.
  - Suggest they use tape or tinfoil to keep one pair of wires connected, while they connect the other pair of wires manually.
- The pin at the end of the motor will spin and the vibration will be felt and possibly heard.

STEP THREE – create the vibrating (wiggling) motion

- Ask the students about the spinning motion of the pin at the end of the motor and what could be added to make a vibration (or 'wiggle' motion).
- Add the cork to the circuit.
  - Discuss different options to attach the cork.
  - The cork will spin rather quickly, so be ready.

It requires a bit of effort to get the cork onto the pin of the motor.

Cork centered will not create wiggling motion

Off-centered creates wiggling motion

STEP FOUR – Design & Build

The rest of the lesson is designing and building the robot with the remaining materials.

- Brainstorming – encourage many ideas, don't 'throw out' any ideas. One person's crazy idea can spark another person's breakthrough solution
- Pick one design – team needs to settle on one design. A collection of various design ideas.
  - If in person, then all students on the team should build to that design.
  - If online, then students often stray from the design & that is fine.
- Build/Create – allow at least 20 minutes for students to build their Wiggle-Bot.
  - Support students with suggestions for their robot but let them be creative.
  - Be sure motor and battery are securely attached to the body of the Wiggle-Bot.
  - Consider how the wiggling can be turned on and off.
- Celebrate – ask each student to show off their creation.
  - Students share their favorite part of the activity.