

LESSONS



LITTLEBITS ENGINEERING DESIGN

OVERALL TIME 60- to 90-minute lesson

GROUPS Three kids per kit

Next Generation Science Standards

4PS3 Energy

4PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. An example of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound.

OBJECTIVE

Kids will apply the Engineering Design Process to build a moving object.

OVERVIEW

Kids should have had prior opportunities to explore with circuits using the introductory lessons included in the littleBits Educator's Guide. The group will engage in the engineering process to guide them as they brainstorm ideas, plan, test, modify, and retest their design to meet the challenge.

MATERIALS

- littleBits kit
- Timer
- Paper
- Markers
- Tape

PREPARATION

Each group will need an Engineering Design Process Sheet. Set up an area where kids can test and demonstrate their design. Provide each team with a piece of tape labeled with

the group name or number. Post the different job roles, located in the launch on chart paper, or have it printed on index cards so each person in the group can take one.

*Kids will only be able to use the materials from the littleBits kit for the challenge.



LAUNCH 10 to 15 minutes

Have kids form groups of three. Give each group a different colored marker and a sheet of paper. Tell the groups that they will be given five minutes to come up with a list of different types of items they use or have seen that include a switch, buzzer, or button circuit. Time the kids for five minutes. Set the timer and once the time is completed, have teams share their responses. Ask kids the following question:

How many of these items do you use or see daily? Have kids raise hands and share answers with the group.

Some possible answers:

Switch - lights, power windows, door locks on a car, radio, computer

Button - emergency stop buttons, phones, doorbells

Buzzer - horn, intercom, emergency doors

Tell kids that they will be creating electrical circuits. Review the Engineering Design Process with the group and answer questions as needed. Each kid will have a job in the challenge. Share the list of job roles and tasks assigned to each one. Provide teams with two minutes to decide on the different job roles.

Organizer - holds all kids accountable while supporting the work of the Programmer and Reporter, and keeps track of time.

Programmer - completes the working demonstration and is in charge of making modifications.

Reporter - sketches design, takes notes on experiments, and reports conclusions.

Share the challenge with mentees. The **challenge** is to create a design that moves and includes one of the following: switch, button, or buzzer.

EXPLORATION 50 to 60 minutes

Teams will be given 25 minutes to design and build. Walk around to each group.

Possible questions to ask the **Organizer**:

- *What are your ideas for the design?*
- *What bits are you going to include?*
- *How did you decide?*
- *Did everyone contribute?*

After 25 minutes have gone by, give teams a 5-minute warning, marking 30 minutes. Check in with teams to see how much more time they will need. Feel free to allow more time if it is possible.

MODIFY 10 to 15 minutes

Teams can take this opportunity to make modifications to their design, and then test again.

CLOSING: FINAL DEMONSTRATION

10 to 15 minutes

Choose a team to go first. Have the **Programmer** from the team come up and share their design and the different Bits used.

Next, call on the **Reporter** from each team to answer the following questions. If they need help, they can call on someone from their team to respond. *A variation could be to have each kid answer the following questions on an exit slip.*

Did your team have difficulty including any of the Bits?

What modifications did your team make along the way?

What could your design be used to do?

If you could go back, what would you do differently now?

Continue until all teams have had the opportunity to share.

* Encourage groups to cheer for each other, and take time for teams to thank each other for being a part of their learning community.

CLEAN-UP 5 minutes

Have kids break apart the structures and use the littleBits Educator's Guide to put all the materials back in the box.