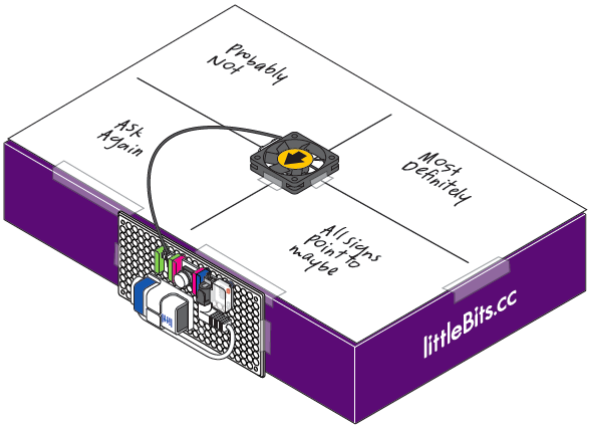
littleBits education

LESSON

Fortune Teller



Overview

In this lesson, students will:

- Observe and describe some basic forms of energy, including sound, motion, and electrical energy.
- Investigate and describe how their toy uses energy to cause motion or create a change in energy.

THE CHALLENGE

Design a moving toy that uses at least three different forms of energy.

Lesson Tags

GRADE LEVEL:

Elementary (grade 4)

SUBJECTS:

Science, technology, engineering

DIFFICULTY:

Beginner

DURATION:

45 minutes

PREREQUISITE KNOWLEDGE:

- littleBits basics
- Basic understanding of energy and motion

Supplies

Bits:

- STEAM Student Set (power, button, fan, battery and cable, battery clip, and mounting board)

Other Materials:

- 2 sheets paper
- littleBits Kit box

Tools Used:

- Pen/pencil
- Marker
- Scissors
- Tape

Description

LESSON OUTLINE:

INTRO: Introduce the lesson prompt and assess students' current knowledge.

CREATE: Groups of 2-3 students start to build their inventions.

PLAY: Students test their prototypes to make sure that it works and record their data.

REMIX: (If needed: Make changes to their inventions based on how testing went.)

SHARE: Students compile their findings and prepare to share.

ASSESSMENT STRATEGIES:

FORMATIVE ASSESSMENT: Circulate the classroom as students work, assessing their use of the Bits, teamwork, and any other relevant skills you wish to focus on. Depending on students' level of experience, you might look for students putting Bits together backwards (e.g. trying to force them together and not aligning the right sides and getting a magnetic snap), students not adding a power source etc.

SUMMATIVE ASSESSMENT Students should complete the student handout. You may choose whether this is an individual or group submission.

Standards

NGSS

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Vocabulary

Motion
Energy
Kinetic energy
Potential energy
Convert
Mechanical

Resources

ATTACHMENTS

Fortune Teller: Student Handout

SUPPORTING LINKS

US Energy Information Administration: Energy Kids

TIPS & TRICKS

#1: Keep an eye on the clock, and where students are at. Some students will want to spend too much time in the Create stage, and some students will try to speed through it.

#2: We occasionally update our Bits and accessories, so some of the names and images included in the student handout may look different from those in your STEAM Student Set. Use your Invention Guide from within your Kit to support students with the parts that they have accessible to them. Use a rubber band or glue dots if you don't have a battery clip in your Kit. The invention will function the same!

PACING (45 mins)

Prep + Setup

Intro (10 mins)

Create (15 mins)
Play (5 mins)
Remix (optional)
Share (10 mins)
Close (5 mins)

Instructional Steps

Step 1: SETUP

DURATION: 10 minutes (prior to class)

This lesson can be done individually or in small groups (2-3 students). Each group will need one STEAM Student Set and a lesson handout. Set up a central location in the classroom for assorted materials and tools.

Each group will need a power Bit, button, battery and cable, battery clip and mounting board. If you don't have a battery clip in your kit, use tape, glue dots or elastic bands to secure the battery to the board. Younger students can start out with just these materials, so they aren't overwhelmed and don't try to add unnecessary Bits. Older/more confident students can have access to any Bits in their Kits.

NOTES

- You should use a classroom timer or digital timer to help keep students on track.

Step 2: INTRODUCE

DURATION: 10 minutes

Discussion

Elicit student responses to gauge understanding and warm-up for the activity.

1. Ask students to name different forms of energy. Answers can include sound, motion, and electrical energy.

2. Then, set the stage by asking the following question, “Think of a moving toy that you have." What motion does it follow? Encourage students to think of both mechanical and non-mechanical toys.
3. **Writing Box #1:** Review what kinetic energy is with your class. Then, have students think about their toy when it is in motion. What forms of kinetic energy would they observe? Sketch and label your toy to show the different forms of energy. Answers may include electrical energy, heat, light, motion, and sound.

Introduce the Challenge

Explain that they’ll use littleBits and the littleBits Invention Cycle to create their own moving toy -- a fortune teller that predicts the future! To make our toy move, we’ll have to transfer energy from one object to another, meaning that the energy has changed from potential energy to kinetic energy. The activity will be broken up into the following steps:

CREATE: Build your invention following the directions given.

PLAY: Test your circuit and invention to see how well it works and record your data.

REMIX: (If needed: Make changes to your inventions based on how testing went.)

SHARE: Compile your results and reflections to share with the class.

Divide the class into groups of 2-3 and have them set up their workstations.

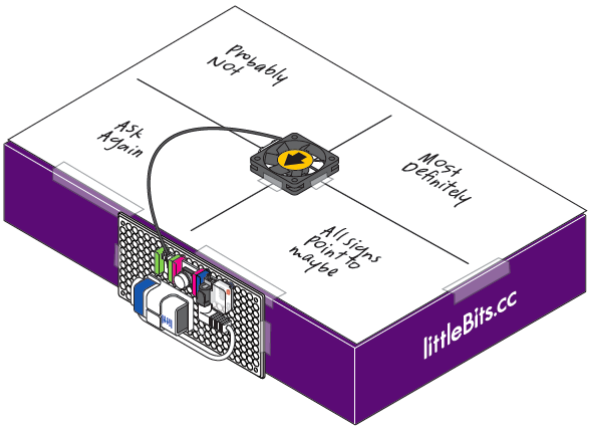
Step 3: CREATE

DURATION: 15 minutes

Students will follow the instructions in the student handout to build their fortune tellers.

NOTES

- If this is your first lesson with littleBIts or your students need a little extra help getting started, have students reference the Bit Index in their STEAM Student Set Invention Guide or the littleBits website to learn how specific Bits work.
- The Create phase may take more or less than the allotted time, depending on the group and students’ familiarity with littleBits. You may want to give students guidance on what they should do after assembling their circuit (e.g. move on to



the Play phase to test their circuit), so they can self-pace.

Step 4: PLAY

DURATION: 5 minutes

Test your invention!

What does your future hold? Will you be rich and famous? Will you get an A on your next science test? Let's find out! Turn your circuit on. Ask a yes/no question, press the button, and let the toy decide your fate! Take turns playing with the toy.

Step 5: REMIX

DURATION: Optional

If any students struggled with their invention, allow a few minutes to adjust the circuit or materials so they can move onto the reflection questions.

Step 6: SHARE

DURATION: 10 minutes

Prompt students to extend, record, and explore their creations.

1. This toy can tell us a lot about the future, but what can it tell us about energy? Examine your toy at rest. Where is there potential energy?
    a. Answer: Potential energy is stored in the battery, in the form of chemical energy.
2. Remind students that a force is required to cause change, from potential to kinetic energy. What force did we use?
    a. Answer: We pressed the button, which closed the circuit and allowed chemical energy (potential energy) to change into electrical energy (kinetic energy).
3. Now press and hold the button in your circuit again. What form of energy do you observe?
    a. Answer: We observe motion energy from the movement of the spinning fan blades. This is another form of kinetic energy.
4. **Writing Box #2:** Is all the electric energy used up by the energy of motion as the fan blades are spinning? What happens to the rest of the energy?
    a. Answers include: Some of the energy is converted into heat, and some is converted to sound energy because we can hear the fan motor.
5. **Writing Box #3:** What other forms of energy can you observe? Students sketch their circuit and

label the following types of energy: potential and kinetic, and different forms of energy: electrical, sound, heat and motion.

Step 7: CLOSE

DURATION: 5 mins

Students should take apart their inventions and put away the Bits according to the diagram on theback of the Invention Guide. Students should clean up their workspace and return any usable materials/tools.

NOTES

- Remember that Bits aren't made out of titanium, so a calm and productive clean-up closing section is important to keep Bits safe.

Step 8: EXTENSIONS

Consider the following invention or discussion prompts:

- How could we add another form of energy to our circuit?
- What changes could we make to the design that would allow us to change the speed of the fan?