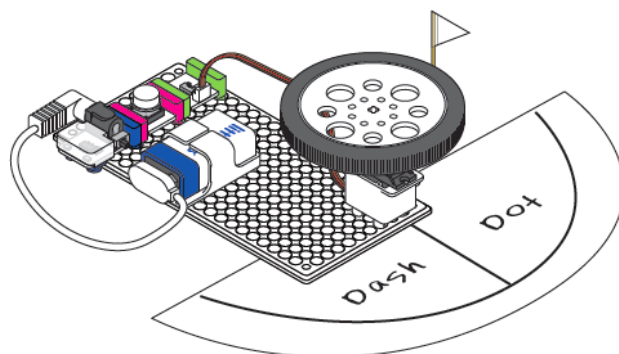


LESSON

Morse Code Device



Overview

In this lesson, students will:

- Engineer a machine to communicate a code.
- Troubleshoot and expand on original design.

THE CHALLENGE

Design a littleBits Morse Code device to communicate with other student groups.



Lesson Tags

GRADE LEVEL:

Elementary (grade 4)

SUBJECTS:

Science, technology, engineering

DIFFICULTY:

Beginner

DURATION:

45 minutes

MORSE CODE DEVICE

PREREQUISITE KNOWLEDGE:

- [littleBits basics](#)

- Basic understanding of Morse Code



Supplies

Bits:

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

Tools Used:

- Pen/pencil
- Marker
- Scissors
- Tape

Other Materials:

- Construction paper
- Toothpick or wooden skewer



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.

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

SHARE Students create and decode their secret messages.

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

3-5-ETS1.1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.



Vocabulary

Morse Code
Cipher

Communicate



Resources

ATTACHMENTS

[Morse Code Device: Student Handout](#)

SUPPORTING LINKS

[Morse Code Decoder](#)

[Admiral Denton Blinks Morse Code](#)

[TV Show: "The Office," Jim and Pam Morse Code](#)

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 (5 mins)

Create (15 mins)

Play (5 mins)

Remix (optional)

Share (15 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 (23 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, servo, battery and cable, battery clip, wheel 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: 5 minutes

Discussion

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

1. **Writing Box #1:** Ask students, "Name all of the reasons that you can think of for using a 'code' to communicate."
 - a. Some answers might include to communicate in secret; to communicate before there was technology; to talk to computers who don't understand human speech; to communicate at all since all language is a type of code!

MORSE CODE DEVICE

2. Ask students to share their responses, asking them to imagine how Morse code messages are sent. Guide students to articulate that they can use sound, light, or actions.
3. “Can you think of any way to communicate with me, using Morse code and no sound?” Recognize and praise students’ ingenuity, especially highlighting any student who figures out blinking or other gestural movements!
4. Optional discussion (use discretion for younger students): Share the story and video of Jeremiah Denton, the United States Navy admiral who blinked “TORTURE” during a video while being held as a Prisoner of War. If time permits, you may share the footage of Admiral Denton, located in the Supporting Materials. Alternatively, there are many pop culture examples of Morse code and other ciphers that students might enjoy. Consider showing them the clip from television show “The Office,” where two characters use various ways to communicate in Morse Code.

Introduce the Challenge

Explain that they’ll use littleBits and the littleBits Invention Cycle to create their Morse Code device to communicate secret messages. 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.

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

SHARE: Pair up with another group to create and decode your secret messages.

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



Step 3: CREATE

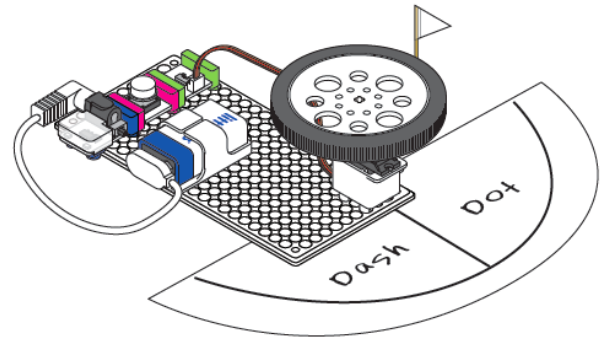
DURATION: 15 minutes

Students will follow the instructions in the [student handout](#) to build their communication devices.

NOTES

MORSE CODE DEVICE

- 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!

Power on your circuit. Test that when the button is briefly pressed, the flag only enters the “Dot” portion, and that when held longer, the flag passes into the “Dash” area. Adjust your flag’s placement if needed.



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 next section.



Step 6: SHARE

DURATION: 15 minutes

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

MORSE CODE DEVICE

1. **Writing Box #2:** As groups conclude their builds, direct them to write a short message of encouragement, both in the alphabet and in Morse code. Some examples might include, “Go For It” or “Winning.” Project on the board, or print out a copy of the [Morse Code decoder](#) for each group.
2. Pair up student groups. Have one team go first to send their code to the other team. The receiving group will record the dashes and dots received, then decode the message.
3. **Writing Box #3:** Record the message you’ve received and decoded from another group.
4. Optional: If time permits, students can play a game of “Telephone” with their machines! Have one group (A) transmit a message to another group (B), not allowing other groups to see the transmission or allowing group A to confirm the message. Then, have group B send the message to group C. Repeat until all groups have gone, and then have the final group read out the message. How well did groups receive the message?



Step 7: CLOSE

DURATION: 5 mins

Students should take apart their inventions and put away the Bits according to the diagram on the [back 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:

- Remix the device and create a different code machine, perhaps with our regular alphabet!
- Ask students to engineer a way for two littleBits machines to talk to each other rather than humans, mimicking what most technology actually does today. Students may discover they can create two circuits, one with the button attached to bright LED and one with the light sensor attached to the buzzer. By using the LED as a button-controlled flashlight, the light sensor will cause the buzzer to signal!