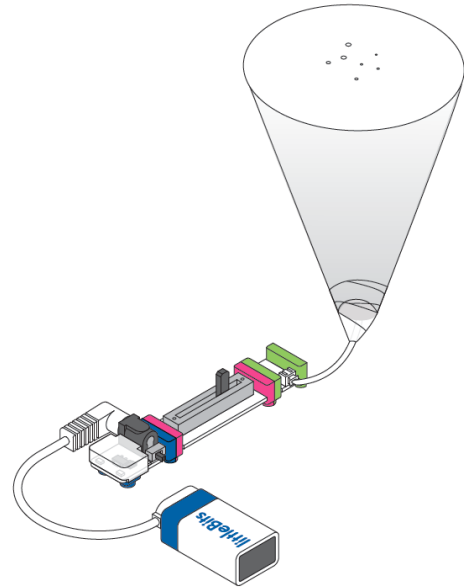


LESSON

Constellation Viewer



Overview

In this lesson, students will:

- Engineer a constellation viewer out of littleBits and invention materials in order to explore stars in relation to Earth.
- Explain their constellation and indicate the brightest stars, identifying these stars as closer to Earth.
- Explain that we see stars because of their energy as light.

THE CHALLENGE

Design a constellation viewer that allows us to see stars up close.



Lesson Tags

GRADE LEVEL:

Elementary (grade 3-5)

SUBJECTS:

Science, technology, engineering

DIFFICULTY:

Beginner

DURATION:

60 minutes

PREREQUISITE KNOWLEDGE:

- [littleBits basics](#)
- Basic understanding of constellation



Supplies

Bits:

- STEAM Student Set (power, slide dimmer, long LED, 2 shoes, and battery and cable)

Other Materials:

- Constellation viewer template (ideally printed on cardstock paper)
- Constellation stencil (printed on printer paper)
- Corrugated cardboard (5" squares or larger)

Tools Used:

- Pen/pencil
- Tape
- Glue stick or glue dots
- Sharp objects in various sizes: thumbtacks, pencils, pens



Description

LESSON OUTLINE:

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

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

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

REMIX: Consider how the invention could be improved.

SHARE: Share out ideas.

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

5-ESS11 Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.

CPALMS

SC.3.E.5.1 Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.

SC.3.E.5.2 Identify the Sun as a star that emits energy; some of it in the form of light.

SC.3.E.5.5 Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye.

SC.3.E.3.2 Recognize that scientists use models to help understand and explain how things work.

SC.3.N.3.3 Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.



Vocabulary

Source
Potential Energy

Kinetic Energy
Electrical Energy



Resources

ATTACHMENTS

[Constellation Viewer: Student Handout](#)

[Constellation Viewer: Stencil and Template](#)

SUPPORTING LINKS

[Constellations Where I Live](#)

[Extension Lesson: What is a Constellation](#)

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.

CONSTELLATION VIEWER

#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.

#3: The constellation template will work best if printed on cardstock paper.

PACING (60 mins)

Prep + Setup

Intro (5 mins)

Create (25 mins)

Play (10 mins)

Remix (10 mins)

Share (5 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. The cardboard pieces will provide support for the poke holes that you'll make in the stencil; size 5" squares will do. Save time during the lesson by cutting up corrugated cardboard into smaller pieces ahead of time.

Each group will need a power, slide dimmer, long LED, 2 shoes, and battery and cable. 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 to write down and then share why some stars are brighter than others. What star is closest to us? Why can we see some stars with our eyes and we need telescopes for others?
2. Call on a few students to share responses.

Introduce the Challenge

Explain that they'll use littleBits and the littleBits Invention Cycle to make a constellation viewer that illustrates the different sizes of stars and demonstrates how stars appear to our eyes.. The activity will be broken up into the following steps:

CREATE: Build your invention following the directions given.

PLAY: Test your circuit to make sure it works.

REMIX: Consider how the invention could be improved.

SHARE: Share out your ideas.

Divide the class into groups of 2-3 and have them set up their workstations. Pass out the constellation stencil and template printouts. Assign a constellation to each group. Clearly denoted constellations work best, such as Ursa Major, Leo, Ursa Minor, Orion, and Canis Major. If you have extra time now or at the end of the lesson, allow students to familiarize themselves with the legend of their constellation.



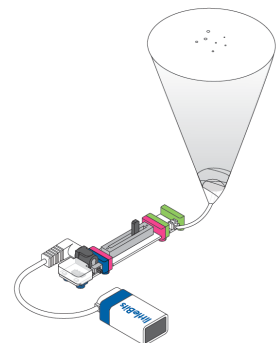
Step 3: CREATE

DURATION: 25 minutes

Students will follow the instructions and diagrams in the [student handout](#) to build their constellation viewers.

NOTES

- If students need a little extra help getting started, 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 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), so they can self-pace.



Step 4: PLAY



DURATION: 10 minutes

Test your invention!

Power on your circuit. Turn off the lights and curtain the windows. Point the wide end of your viewer towards a wall or flat surface to admire the night sky view.

Discussion

Check for student understanding by asking, “How can we see our stars brighter? Why can we see stars at night and not during the day?”

Students may suggest to have a brighter light, journey to a darker location; they may answer that our closest neighboring star (the sun!) is so bright that it prevents us from seeing other stars during the day.

Writing Box #2: Ask students to look through their viewer and draw their group’s constellation. What do they think our ancestors thought this outline was? An animal? An object? Draw your guesses! You may wish to remind students how one of the most visible constellations is the “Big Dipper” because of its shape.



Step 5: REMIX

DURATION: 10 mins

Writing Box #3: Ask students to sketch how their constellation viewer might be improved.

Answers include: having a brighter light; going into an even darker room; having more holes for more stars; making the star chart bigger.



Step 6: SHARE

DURATION: 5 mins

Call on groups to share out ideas from Writing Box #3.

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.



Step 8: EXTENSIONS

Consider the following invention or discussion prompts:

- Rather than using the slide dimmer to trigger the long LED, ask students how we could engineer a solution where the light turned on only when it was dark (Answer: the light sensor Bit; set to dark mode).
- Trade constellation viewers with another group, and draw their constellation. What do you think our ancestors thought this constellation represented? Draw your guesses!