

BRIDGE CHALLENGE

OVERALL TIME 2- to 4-hour lesson

GROUPS Three to four kids

PROGRAMMING LEVEL Beginning Block:
Roll, Delay, Sound, Speak, and Main LED

CONTENT THEME Science

OBJECTIVE

- I will identify how the Sphero BOLT can cross a bridge constructed with inexpensive materials.
- I will illustrate the process of determining which code elements would be best suited to accomplish an objective.
- I will drive and create a program that moves the Sphero BOLT over a bridge of my own design.
- I will analyze the effectiveness of my work with supporting facts and reflect on the learning.

OVERVIEW

Build a bridge using classroom materials and then program the Sphero BOLT to drive across it. This challenge can also include researching different types of bridges and incorporating those concepts into the designs.

MATERIALS

- Sphero Bolt
- Tape
- String
- Glue

- Popsicle sticks, toothpicks, uncooked pasta, balsa wood, cardboard or other building material
- Measuring tape or rulers
- 2 tables or other objects to span the bridge across

WARNING: If the Sphero BOLT is dropped from a distance of more than 36 inches (3 feet or .9 meters) above the ground, it may crack.

EXPLORATION: BRIDGE CHALLENGE INTRODUCTION

There are a lot of different types of bridges. Which types have you seen before? Research different types of bridges and think of how you might build one for the Sphero BOLT to cross it.

As you learn about different types of bridges, think about the following:

- What kind of bridges exist and how are they designed?
- How are they built?
- How might you construct your bridge?
- How large of a bridge can you build in your classroom with the materials provided?

Watch the video of the Tacoma Narrows Bridge collapse. What are some important things you can learn from watching this video when designing your bridge?

► <https://youtu.be/j-zczJXSxw>

EXPLORATION: ENGINEERING FRAMEWORK

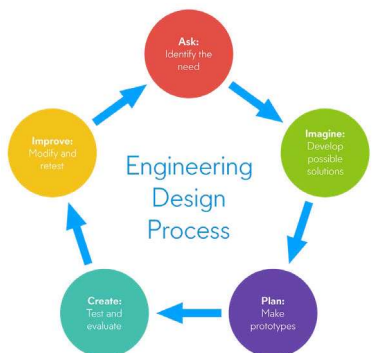
On a piece of paper, list at least five features that your bridge will need in order to support the Sphero BOLT as it crosses.

Think about the Engineering Design Process and how it can help guide your building of a bridge.

As you brainstorm ideas, constraints, and possibilities, consider the following:

- *What are the Sphero BOLT's dimensions?*
- *How wide is the gap that the bridge needs to span?*
- *What are the materials and how can they be used?*
- *What surfaces does the Sphero BOLT drive best on?*

► https://youtu.be/nesX_q-wYl8



EXPLORATION: BRIDGE DESIGNS

Take a piece of paper, fold it in half, then in half again the other way. Each one of the boxes created is a space for an idea. Come up with some ideas of your own, and then share with the rest of your team. Collaborate on a single idea.

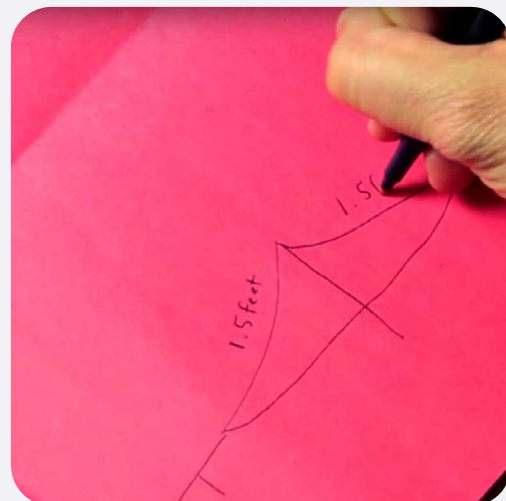
When working with your team, try to:

- Have one conversation at a time.
- Share as many ideas as possible.
- Be short and sweet.
- Build on the ideas of others.
- Be visual.
- Be encouraging; especially the “This might sound crazy...” ideas.
- Stay on topic.
- Defer judgement.

SKILLS BUILDING: THE SPHERO BOLT PROGRAM

Open a new Blocks canvas and begin to experiment with some code. *Which blocks are best suited to help the Sphero BOLT cross safely?*

While evaluating different materials, think about which will best support the Sphero BOLT's weight and which make it easier for the Sphero BOLT to cross the bridge. All of this will influence the type of program you create.



SKILLS BUILDING: BUILD A BRIDGE

Build that bridge!

Take your time and make smart material decisions during the building process. Always measure before cutting, and make sure to test for strength and rigidity. Don't hesitate to place or to roll the Sphero BOLT up onto your incomplete bridge from time to time to make sure things are going as planned.

► <https://youtu.be/-j8C3HgVTMM>

SKILLS BUILDING: CROSSING THE BRIDGE

Open back up the program you began in Step 4. Now that your bridge is done, you need to practice having the Sphero BOLT cross the bridge. This may take several tries. Experiment with speed and duration. Also, it is super important that you place the Sphero BOLT in the same starting spot each time before aiming.

► <https://youtu.be/Qj92sXEvsqo>

CHALLENGE: FINAL PRESENTATION

Come together as a class and test the bridges. Set up your bridge and run the program for the Sphero BOLT to cross it.

Each team should make a short presentation (4-5 minutes) about your bridge plan. Your presentation should include the following:

- *Why do you believe your team's bridge was successful (or not)?*
- *Which materials did you use, and why?*
- *What part of the building process was difficult?*

If there is time, try programming the Sphero BOLT to cross other bridges created by your classmates.

REFLECTION

Write your reflections on this activity and discuss with the class.

- Record whether or not your bridge was successful. If it failed, note where the failure occurred.
- *How would you do things differently in the future?*
- *What materials worked best?*
- *What bridge type worked best?*
- *What was the hardest or most fun part of the challenge?*