

HYDRO-HYPOTHESIS

OVERALL TIME 2- to 4-hour lesson

GROUPS Three to four kids

PROGRAMMING LEVEL Intermediate
Block: Simple Controls (Loops), Sensors, and Comments

CONTENT THEME Science

OBJECTIVE

- I will identify how the Sphero BOLT can power a water-based vehicle constructed with inexpensive materials.
- I will drive the Sphero BOLT across a water course in a straight line with a payload attached.
- I will learn to improve the Sphero BOLT's performance as the power source for a water-based vehicle.
- I will analyze the effectiveness of my work with supporting facts and reflect on the learning.

OVERVIEW

Design and test a contraption for the Sphero BOLT to carry a load of pennies across a small body of water. You will need to consider buoyancy, density, surface area, and what types of materials float in water. Drive the Sphero BOLT to move the load across a designated distance and/or around floating obstacles.

MATERIALS

- Sphero BOLT
- Foam
- String

- Cardboard
- Scissors
- Rubber bands
- Tape, pennies
- Small swimming pool or large tub of water

EXPLORATION: CAN THE SPHERO BOLT MOVE THROUGH WATER?

The Sphero BOLT can move through the water, but how can the Sphero BOLT transport a load of pennies while moving through water?

Using the materials supplied in your classroom, build a watercraft powered by the Sphero BOLT to carry a load of 10-20 pennies.

If given the chance, try driving the Sphero BOLT in water.

- Does it float? How does it move across the water?
- Is it easy to control? Why or why not?
- What could you do to improve how the Sphero BOLT performs in water?

Watch the video below to see how the Sphero BOLT reacts to carrying pennies under water.

► <https://youtu.be/1IUz0cTSdR4>

EXPLORATION: DESIGN IDEAS

Take a blank piece of paper and fold it in half. Fold it in half again the other way so you have four sections. Based on what you know and have learned about how the Sphero BOLT operates in water, think of four unique ideas for a penny-carrying contraption and draw each one in a separate section.

Crazy and weird ideas are encouraged! Pick your favorite to share with your team. Take a look at the video below to give you some inspiration for your ideas!

► <https://youtu.be/EQa7YStVfWQ>

EXPLORATION: FLOATING OBSTACLES

Think of some fun and silly floating obstacles that can mark a spot in the water course that the Sphero BOLT must navigate around. The obstacles should remain in place even if impacted by the Sphero BOLT as it passes by.

SKILLS BUILDING: DESIGN ENGINEERING

Experiment with materials and designs to determine which performs best. *Which elements should you include in your design?*

With your team, review each member's ideas and see if you can come up with any new designs. Select the best design to create and determine the materials needed.

Present a picture of your team's idea to the class and describe why you think it will be successful.

- *What will be the most challenging part of the construction?*

SKILLS BUILDING: BUILD AND TEST

Below is a video and an image to help you with some ideas. Your watercraft **does not** have to look like either of those. Remember, crazy and wacky are just fine.

► <https://youtu.be/2L-i3z6dRrU>

Start building your watercraft with your team. Remember to think about buoyancy, the density of the materials you use, and their surface area. If you are unsure of why those things are important, do a quick search on each one and how they relate to floating objects.

Don't get discouraged if your design isn't working as planned. Keep at it and test your design along the way.



CHALLENGE: SINK OR SWIM

Time to find out which creations will sink and which will swim! Test your contraption with different numbers of pennies. It can be tricky to build a Sphero BOLT-powered watercraft because the Sphero BOLT is partially underwater when it swims.

Provide directions and specifics of the challenge to kids. May the best boat float!

REFLECTIONS

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

- *What worked and what didn't?*
- *How would you do things differently in the future?*
- *What happened the first time you tested your watercraft?*
- *How did your watercraft change from the initial design?*
- *What materials worked best?*
- *What happened when more weight (pennies) were added?*
- *What was the hardest or most fun part of the challenge?*