

Overview

SPRK STEM challenges are fun, interactive activities that challenge students to use creativity and teamwork to move through simple steps of the design process in order to build Sphero-based creations. The Hydro-hypothesis challenge leverages Sphero's ability to swim to test whether or not students can build a contraption to transport a load (pennies) across a small body of water. This activity would provide an excellent opportunity to discuss the concepts of buoyancy, density, surface area, and what types of materials float in water.

Getting started

Spheros are controlled via Bluetooth on either Apple (iPod, iPhone, or iPad) or Android devices. Ideally, you would do this lesson in groups of 3 or 4 students, each with their own Sphero and device. This lesson is designed for iPads, but other devices could be used. Here is what each group would need:

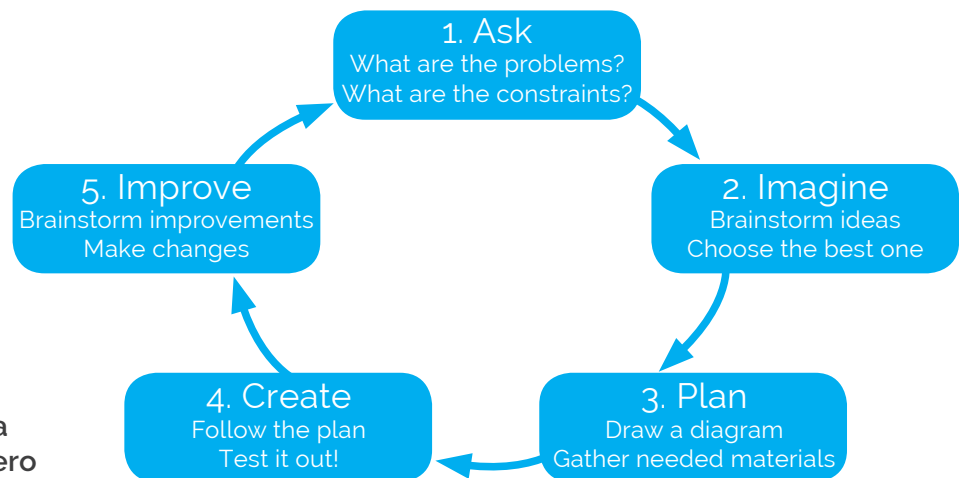
- iPad or tablet with Sphero Macrolab loaded. You can get Sphero Macrolab for free from the iTunes app store or Google Play
- Sphero that has been fully charged

Materials

- Small swim pool or large cooler to fill with water
- Pennies to test how much the rafts can hold
- Materials to build Sphero watercrafts (foam, cardboard, rubber bands, string, Duct tape, any other materials that float)
- Scissors

PART 1: Introduction – 15 minutes

- Break students into groups and briefly introduce Sphero
- Explain that for this challenge they will use the engineering design process.
- Show them Sphero swimming in water; have them take note of how much of Sphero is under water – this will help later when completing the hydro-hypothesis challenge!
- Pose the challenge: **Can you build a watercraft that is powered by Sphero using the materials we have here? It must be able to reach the other side of the pool while holding a load of 10-20 pennies.**



PART 1: Introduction (continued)

- Show the students what materials are available
- As a class, build a list of some specifications that are required for a watercraft to be successful in the challenge

PART 2: Individual brainstorming – 10 minutes

This section gives students time to generate concepts on their own, it may be challenging to think of 8 unique ideas but challenge them to think of crazy and weird designs..

- Each student has a blank piece of paper and folds it into 4 quadrants. Using both sides of the page have them draw 8 different potential designs
- Each student should then pick their favorite design to bring to the team

PART 3: Group brainstorm and selection of top design – 20 minutes

- Teams review each member's ideas and see if they can generate any new ideas
- Once they have their ideas generated, each team determines as a group which design and materials they would like to use

PART 4: Present – 20 minutes

Each team presents a picture of their selected idea and a quick description of why they believe it will be successful. You can also have them explain what they believe will be the most challenging part of construction.

PART 5: Build – 60 minutes

Students have time to build their watercrafts; it is recommended that they test frequently in the water to make rapid changes. It can be tricky to build a Sphero-powered watercraft because Sphero is partially underwater when it swims.

PART 6: Final test – 30 minutes

Time to find out which creations will sink and which will swim!

PART 7: Reflection and discussion – 45 minutes

Each individual should write up their reflections on the activity. After the individual reflection, have some time for open discussion. Some potential prompts and questions that you may want to ask are:

- What worked and what didn't?
- How would each student do things differently in the future?
- What happened the first time they tested their watercraft?
- How did their 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?

PART 8: Share your experience on @SpheroEdu

We love seeing SPRK in action! Tweet us a few photos and we'll share them with the world!

Example of a Sphero Hydro-hypothesis contraption:

