BOBSLEDS

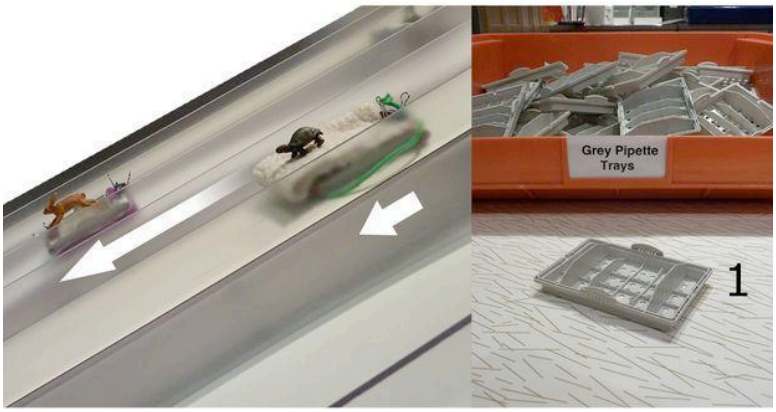
Duration: 20 minutes
Institution: Music of Science, Boston
Skill level/Age Level: 2nd – 12th Grade
Group size: 5-30 participants

INTRODUCTION

Bobsled racing is a very technical sport; it combines science and engineering to design the most efficient sled. Through this activity, participants explore concepts such as friction, gravity, and air resistance and their impact on acceleration.

Working individually or in small groups, visitors use recycled materials to design, build, and test their bobsled on our 8-foot long bobsled track. Get a first-hand experience of the design process that scientists and engineers undergo by conceptualizing the problem, designing and testing a prototype, and making modifications as necessary to optimize the solution.

The goal of this challenge is to create a miniature bobsled that is either as fast or as slow as possible. Start with one bobsled base—ours are the trays used to package pipette tips; if you're going to try this at home, you could use soap dishes.



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KEY CONCEPTS AND/OR SUBJECT AREA

- Mechanical engineering
- Forces in motion

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- Friction
- Experiment design

MATERIALS AND TOOLS

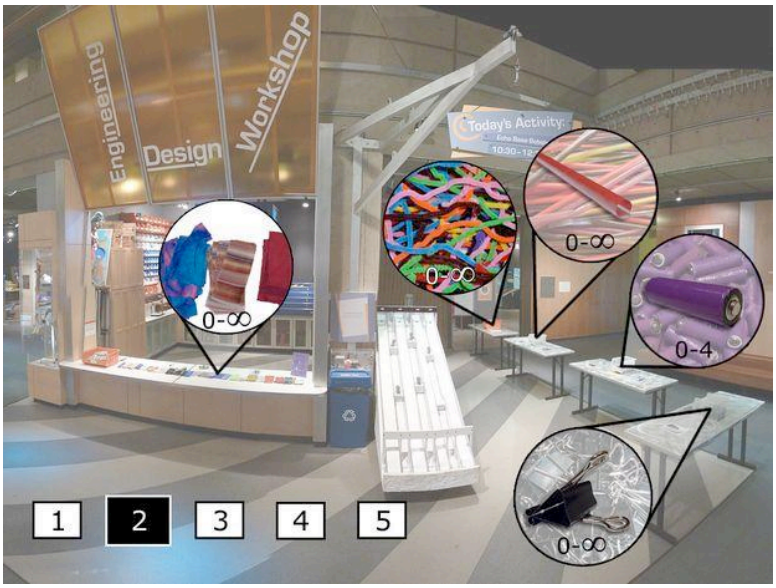
Essential Materials:

- Bobsled track (Length of rain gutter, about 2 yards long, more than one length helpful for having multiple tracks)
- Stopwatch
- Plastic pipette trays (often disposed of by bio labs, plastic soap dish trays will also work)
- Strips of fabric
- Duct-tape covered, dead AA batteries
- Pipe cleaners (can reuse, but will wear out over time)
- Plastic straws (can reuse, but will wear out over time)
- Binder clips

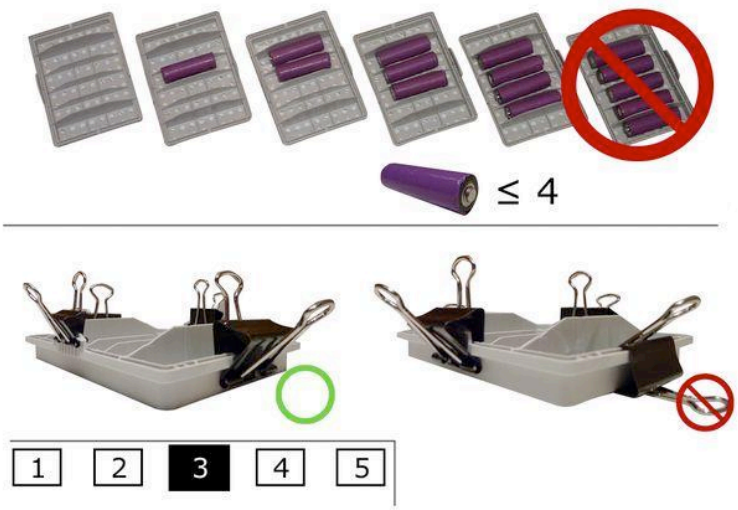
Optional Materials:

- Photos of bobsleds

HOW TO OR STEP-BY-STEP



1. You may use 0, 1, 2, 3, or 4 dead batteries in your design. No more than 4.
2. No part of the metal binder clips may touch the track because they will scratch the track.



3. Ask/Imagine/Plan
    a. Explore the materials available.
    b. Which materials are the heaviest of lightest? Which materials slide well? Test some of the sample materials. How do they perform?
    c. Brainstorm different combinations of materials you could use to design your bobsled. Decide whether you will build a fast bobsled or a slow bobsled.
    d. Think of many different possible solutions and discuss them with your team. Pick and idea you would like to design and test
4. Create
    a. Determine which materials you will use. Will you change the surface material or the weight? How will you attach all of your components to the bobsled chassis?
    b. Construct your designs with the materials you have selected
5. Test
    a. Ask facilitators to help you test your designs!
    b. Be sure to test multiple designs and keep track of the results. Try changing just one thing on your design and testing again.
6. Improve
    a. Which design worked best? What did you learn from your tests? How could you make an even faster or slower bobsled?
    b. Plan your new design like before and then ask facilitators to help you test it. Is your new design faster? Slower? Why?

FACILITATION PROMPTS AND QUESTIONS

- What is a bobsled?
- What factors influence how fast your bobsled travels down the track?
- Would your bobsled go faster if a lot of a little of the bobsled touched the track?

- Would more weight increase or decrease the speed of your bobsled?
- Would the position of the weight affect the speed of your bobsled?
- What is the friction and what influence does it have on your bobsled?
- What is the Engineering Design process?
- Why is it important to make one modification to your bobsled at a time?
- What type of energy does the bobsled have when it is all the top of the track, half way down the track and at the bottom of the track?
- Do you think that your bobsled would travel more quickly or slowly on a straight or hilly track?

KEYWORDS

- Outdoor
- Indoor
- Olympics
- Mechanical engineering
- Design Challenge
- Friction
- Physics