

Wind Tube

Lesson Overview: Students will build something that will hover between the top two bands for at least 3 (or 10) seconds. It can move around between those bands but can't go out the top or fall to the bottom.

Suggested Time: 40 minutes

Learning Objectives:

- To gain experience testing and iterating
- To gain an understanding of constraints and criteria
- To foster a community of collaboration
- To gain experience y dealing with frustration productively

Materials:

- Scissors

Recyclable Materials:

- Plastic grocery bags or small trash bags
- Thin cardboard (like cereal box thickness)
- Old magazines
- Weights: pennies, washers, or something small that provides weight
- Paper towel rolls
- empty yogurt containers
- empty water bottles
- wire hangers

Purchased Materials:

- balloons (although if offered balloons sometimes that's all children will use)
- Tape (masking seems to work the best)

popsicle sticks

- foil
- plastic wrap
- string
- pipe cleaners
- paper clips
- coffee filters

Directions

1. Show the students the wind tube and explain to the students that they are going to build something that will hover in the wind tube between the top two rings.
2. Show the students the materials they can choose from.
3. Tell them there is little chance the designs will work the first time and they will be able to alter the materials as needed for their designs.
4. Since the point of this activity is for students to test and iterate often, encourage them to test often and then make changes based on their tests.
5. Have students test as they build.
6. Lead a discussion of the designs to help them analyze and interpret their designs.
 - a. Did your design stay between the bands?
 - b. If not, did it sink or fly out?
 - c. Did your design stay together inside the tube?
 - d. How can you improve your design?
7. Have students keep iterating, encouraging them to analyze and interpret after testing.
8. Leave time for a final discussion with the class to talk about their design, but also the process they used and what role testing played.

Possible Discussion Topics:

- constraints/affordances of materials or inspiration provided by materials
- group dynamics
- effect of watching other groups work
- using science: thinking explicitly about drag or more like "air pushes things"
- using an "engineering design cycle" in order vs. tinkering

Wind Tube Building Directions

Materials:

- 1) Plastic sheet, about 3 feet long and at least 4 feet wide
 - a) Acetate works well, about 5 millimeters thick
- 2) Three 14" embroidery hoops
 - a) Two will work, but three makes the tube more sturdy
- 3) Clear packaging tape
- 4) A large fan that can face upwards (diameter larger than 14")

Procedure:

- 1) Roll the plastic along the long dimension into a cylinder that fits between the embroidery hoops. Secure the embroidery hoops inside and outside the plastic.
- 2) Use the tape to secure the seam along the outside of the tube.
- 3) Place the tube on top of the upwards-facing fan. Tape it if it does not stay on top of the fan.

