



Sample GEMS Club Activity

Topic -- Build Me a Boat!

Goal-- Over one long or two sessions, build 2 small boats that will hold at least 25 pennies for at least 10 seconds without sinking. Compare materials used and make a judgment about the better material for the job.

Supplies needed:

- Duct tape
- 20 straws
- 1 10-Square of plastic wrap
- 1 12 inch square of aluminum foil
- 8 8 oz. paper cups
- 25 pennies/washers
- Lots of towels/paper towels
- Tub of water

Vocabulary:

- Buoyancy
- Disperse

Preparation:

Collect all the supplies and lay them out so the girls can see them. Challenge them with the idea that they are going to build two different boats and determine which material will make the better boat—the boat that will hold more weight and float longer—the boat that is more buoyant.





GEMS Club Meeting:

Introduction—the challenge:

Use this little story, or something similar that has meaning in your local area:

Your friend’s family has a house near the river. One weekend it rained and rained, and they went to the house to discover that the river had risen so high that it flooded their house. They looked in the windows to find that some of their furniture and food were floating on the water from the river. Some of the things in their house did not float, however and were covered with water. How can you help your friend figure out why some things floated and some didn’t?

Ask the girls what they know about floating. See what preconceptions they have, and how they determine if an object floats or not. See if they can name/describe things which surprised them—objects or substances that floated or sank when they thought they would do the opposite.

Making Predictions:

Scientists make predictions/hypotheses about what will work in order to design experiments. The girls will predict what kinds of material will hold weight and be more buoyant before they begin experimenting.

After presenting and discussing the challenge, each girl will design a proposed solution to the challenge on the data sheet. She will predict which will work better to hold a defined amount of weight—plastic wrap or aluminum foil.





Boat Building

Plastic wrap boat

1. Pass out the following supplies:
 - a. 1 sheet of plastic wrap-10 inches long
 - b. 10 straws
 - c. 4 plastic cups
 - d. 1 yard duct tape
 - e. Scissors
 - f. 25 pennies/washers
2. Build the boat.
3. Test each boat by placing it into the tub of water and observing using the data sheet:
 - a. Does it float without any weight in it?
 - b. Put in 2-3 pennies/washers at a time, waiting 10 seconds between additions. Note on the data sheet what happens with each addition
 - c. Does the boat stay afloat each time? When is the tipping point?

Discussion/Analysis:

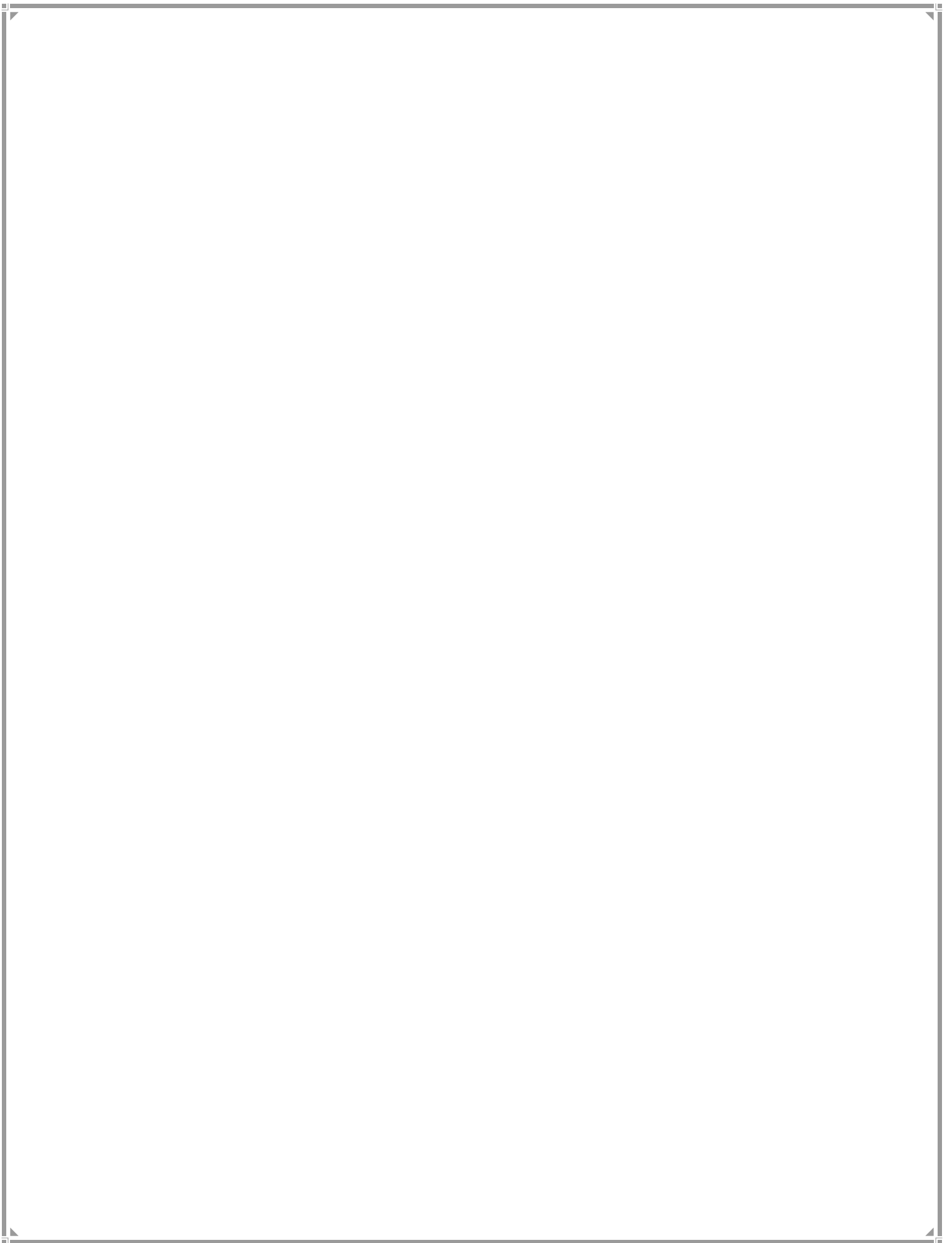
What happened? Whose boat was able to hold 25 weights without sinking?

What does the design of the successful boat look like? How could you change your boat to make it more buoyant?

Foil boat

1. Pass out the following supplies:
 - a. 1 12-inch square of foil
 - b. 10 straws
 - c. 4 plastic cups
 - d. 1 yard duct tape
 - e. Scissors
2. Build the boat.
3. Test each boat by placing it into the tub of water and observing using the data sheet:
 - a. Does it float without any weight in it?





- a. Put in 2-3 pennies at a time, waiting 10 seconds between additions. Note on the data sheet what happens with each addition of pennies
- b. Does the boat stay afloat each time? When is the tipping point?

Discussion/Analysis

What happened this time? Whose boat was able to hold 25 pennies without sinking? What were the differences between the plastic wrap boat and the foil?

What does the design of the successful boat look like? How could you change your boat to make it more buoyant?

Which material is more successful in creating a safe boat? Why?

How did the results match your predictions?

Reflection:

What would you suggest to the friend whose family lives near the river? What about people whose houses are flooded every year? How could your discoveries help them in the future?

Flooding resources and extension activities

<http://www.pbs.org/wgbh/nova/lasalle/buoyancy.html>

<https://www.nationalgeographic.com/environment/natural-disasters/floods/>

https://www.thetech.org/sites/default/files/pdfs/Design-Challenge-Learning-Lessons/Exploring_Buoyancy.pdf

Adapted from Design

Squad: <http://pbskids.org/designsquad/parentseducators/resources/watercraft.html>

Build me a boat!

Your challenge: Your friend's family has a house near the river. One weekend it rained and rained, and they went to the house to discover that the river had risen to high that it flooded their house. They looked in the windows to find that some of their furniture and food were floating on the water from the river. Some of the things in their house did not float, however and were covered with water. Why did some things float and some things sink?

Your supplies:

- Duct tape
- 10 straws
- 1 10-Square of plastic wrap
- 4 8 oz. paper cups
- 25 pennies

Challenge one: Build a boat with these supplies and see how many pennies it can hold before it sinks.

Given these supplies, draw or describe a boat design that will hold 25 pennies before sinking.



Build and test your boat: Write or draw what happened and explain why.





Challenge Two: Change it up

- 1 12-inch square of foil
- 10 straws
- 4 plastic cups
- 1 yard duct tape
- 25 pennies/washers

Using these supplies, what do you think will happen? Draw or write this below:

Build and test your second boat. Show what happened with this challenge. What was different? What was the same?

After your discussion, what would you do differently? What would you suggest to your friend who lives by the river?





Build Me A Boat Data/Observations

Name: _____

Plastic Wrap:

Number of Pennies	Float or Sink	Comments

Total number of pennies boat will hold before sinking



Foil Boat

Number of Pennies	Float or Sink	Comments

Total number of pennies boat will hold before sinking:

