

The Strongest Boat

Objective

The student knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results.

Materials

2 sheets of typing paper (1 for practice, 1 for the final design)
1 roll of scotch tape
pennies
container of water (put some blue food coloring in the water to make it look like "the ocean")
balance scale

EL additional materials⁶: Bilingual dictionaries, visual dictionaries, metric converter, written directions in simplified form with pictures, lab report form

EL Preparation

For beginning and intermediate students, ask aide or ESOL specialist to provide content/linguistic support and review ELL Background Knowledge, EL Language Development, and EL Vocabulary.⁷

What to do

Before the activity, group students into cooperative learning teams of 3-5 students⁵. Then model these directions for the students, speaking clearly and pointing/demonstrating/gesturing while they follow the directions on the handout³:

1. Using one sheet of typing paper and the tape, design a boat with your group. You may try different designs using one sheet of paper, but your final design must be made from only one sheet of paper.
2. Your boat must be able to fit inside the testing container, hold as many pennies as possible, and still float.
3. We will test each boat and determine how many pennies each will hold.
4. You may not test any part of your boat in the water until the actual testing begins.
5. Each group will display their boat before the testing begins, give the name of their boat, explain their design to the group, and estimate the number of pennies it will hold.
6. The winning boat will be the one that holds the most

pennies and still floats. 7. Have each group weigh the number of pennies their boat held. 8. Make a class data table that includes: group name, boat name, estimate of pennies held, actual number of pennies held, weight of pennies held. Create a class graph of the information. 9. Have students analyze their designs and discuss: strengths and weakness of the design, changes that should be made, how they would make better use of the materials, etc. 10. All of the information should be put in **lab report form** or recorded in science journals.

For all ESOL students

Write the directions in simplified language with pictures.

Label the "Testing Container."⁴

Have students add highlighted vocabulary to their word banks⁴.

Vocabulary: Pennies, estimate, float, weigh, ounces, boat, tape, design, strengths, weaknesses⁶

The hands-on nature of this lesson makes it appropriate for all levels of ESOL students, although students at different levels can perform different tasks.

Beginning (Edith)²

Model the directions using paper, tape, and pennies.

Make sure Edith is paired with a buddy in her cooperative group. She can copy lab report from buddy.⁵

Vocabulary: Pennies, float, weigh, ounces, boat, tape (provide native language support for other vocabulary)⁶

Questions⁴—Which boat will hold the most pennies? How many ounces of pennies are there in this boat?

Students fill out lab report with help from group members.⁵

Intermediate (Edgar)²

Vocabulary: Estimate, design, strengths, weaknesses⁶

Questions⁴—How much weight did you think your boat would hold?

How would you make your boat different now that you tested it?

Students fill out lab report.

Advanced (Tasir)²

Vocabulary & Language Focus: Comparatives and superlatives—more than, less than, heavier, heaviest, lighter, lightest.⁶

Questions⁴—What are the strengths of this design and why? What are the weaknesses of this design and why? Students record information in their science journals—allow them to use bulleted lists and expect syntactic errors.

Additional Information

EXTENSIONS: 1. Scale diagrams and dimensions - determine surface areas of each boat. 2. Observe effects of different variables: saltwater vs. freshwater, warm water vs. cold water, etc. 3. Discussion or Field trip to port or boatyard to observe how designs of boat is based on use/function of boat

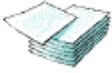
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Design a Boat Directions⁴

1. Use 1 sheet of paper and the tape to make your boat.



2. Your boat must:

- a) be made only from 1 sheet of paper;
- b) fit inside the testing container;
- c) hold as many pennies as possible;



d) float

3. Show your boat to the class and tell the class:

- a) the name of your boat;
- b) how you designed it;
- c) how many pennies you think it will hold

- You may not test any part of your boat in the water.
- The teacher will see which boat floats and holds the most pennies. The winning boat will hold the most pennies and still float.

Lab Report Form⁴

Group Name	Boat Name 	Estimate of Pennies (guess how many) 	Actual Number of Pennies 	Weight of Pennies 	Strengths + & Weaknesses -
					+ -

Changes our group should make to our boat:

How we could make better use of the materials:

