

BUILDING A BOAT

Performance Standard 12C/11B.B

Students will apply the processes of technological design to compare qualitative and quantitative properties of matter accordingly:

- *Knowledge:* Identifying objects and classifying objects according to mass, volume, and buoyancy.
- *Application:* Design and construct a boat that will float and hold pennies.
- *Communication:* Explain how the factors of mass, volume and buoyancy allow the boat to float.

Procedures

1. ***In order to know and apply concepts that describe the properties of matter (and energy) and the interactions between them (12C) and the concepts, principles and processes of technological design (11B),*** students should experience sufficient learning opportunities to develop the following:
 - Question and investigate ways to test some of the different properties of matter, focusing on buoyancy.
 - Propose ideas for testing buoyancy of certain materials.
 - Determine contest rules for Building and Floating a Boat.
 - Select, construct and test their design.
 - Record data that documents the testing process.
 - Communicate their results.
 - Suggest alternative design modifications for further testing.

Note to teacher: This activity relates to knowledge associated with standard 12C, while addressing the performance descriptors for stage B within standard 11B. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
2. Begin investigation by asking about what makes something float or sink. Encourage students to ask more questions about what they already know about floating and sinking. Provide examples of materials (foil, clay, foam, wood, etc.) Encourage more questions about the relationship to the masses or volumes of the materials to their buoyancy, etc. (Do the materials that weigh the most or occupy the most space always sink?) They can categorize the materials by increasing masses or area to propose relationship to buoyancy. Guide students toward answering their questions using applicable scientific vocabulary terms and resources.
3. Introduce the premise of this activity to design a floating object from something that may not float. Introduce your annual Penny Floating contest; the winner will float a boat with the most pennies. Provide students with materials needed to construct their boat. They may want to suggest additional materials within reason for testing. Students will design a boat that will hold pennies and still float. They need to draw their design plan and test their model with increasing numbers of pennies. They should report about their design and its success. They need to explain why they thought their design worked (or didn't work). Offer time to allow students the opportunity to propose how their design could be improved.
4. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
 - *Knowledge:* Materials were classified according to mass, volume and buoyancy correctly.
 - *Application:* A boat design from their assigned/chosen materials did float.
 - *Communication:* Explanation of buoyancy, design and construction were complete and correct; design modifications were possible and appropriate.

Examples of Student Work not available

Time Requirements

- 2-3 class periods (to examine materials initially and to create design; to test design.)

Resources

- Materials to build a boat for each student or pair of students (foil, clay, foam, etc.)
- Water container for testing
- Pennies
- Science Rubric