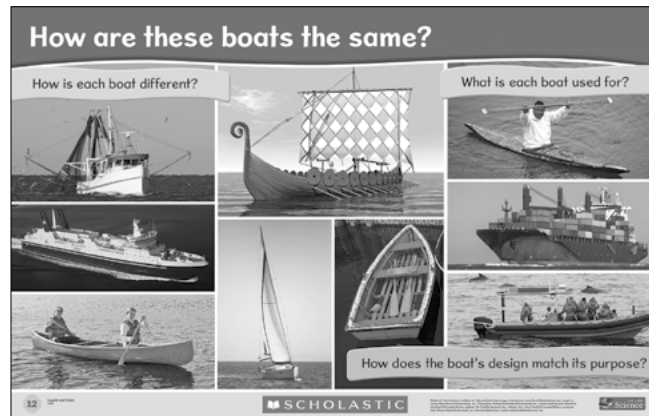


Design Challenge: Build a Boat



Focus: Students use the design process to build a boat capable of supporting a specific number of coins.

Specific Curriculum Outcomes

Students will be expected to:

- 29.0 demonstrate an understanding of sinking and floating objects by solving a related practical problem [GCO 1/3]
- 30.0 identify and use a variety of sources of science information and ideas [GCO 2]
- 31.0 respond to the ideas and actions of others and acknowledge their ideas and contributions [GCO 2]
- 32.0 compare and evaluate personally constructed objects [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- use the design process to build a boat that will carry a specific number of coins
- offer feedback on designs during a gallery walk
- acknowledge and respond to other people's ideas

NOTES:

Attitude Outcome Statements

Encourage students to:

- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- interpret, select, and combine information using a variety of strategies, resources, and technologies [GCO 5]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 12 • IWB Activity 9 • <i>What Is the Design Process?</i> poster • BLM TAG Feedback (one per group)	• tin foil • several coins of the same size (10 per group) • students' Science Journals • digital camera or tablets (optional) • large tub of water • various buoyant materials and adhesives (e.g., craft sticks, stiff cardboard, straws, Styrofoam, tape, glue)	• You might arrange for a boat builder familiar with building NL skiffs or Indigenous kayaks or canoes to visit the class. • Prepare large, uniformly sized sheets of tin foil (one per group). • Ensure that the Curiosity Centre or Reading Centre is stocked with several books about boats and boat building. You may wish to cue tablets to approved Websites showing various boat designs.	• design process

Science Background

- The ability of an object to carry extra weight and still maintain buoyancy depends on its design, its materials, and the distribution of the extra weight.

ACTIVATE

How Is It Made?

Ask students to recall previous investigations they have done and what items they have found that float. Record their answers on chart paper under the heading Things that Float.

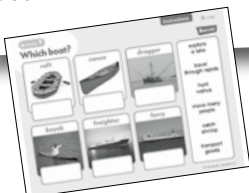
Display Science Card 12 and ask students to discuss the boats on the card. Ask:

- How are these boats the same?
- How are they different?



IWB Activity:

- Challenge students to use IWB Activity 9: *Which boat?* (see the Teacher's Website) to identify how each boat is used and which features of each boat make it work for that use.



Talk about what the boats are used for and what materials they might be made of. Then ask how much weight each boat is meant to carry (a little or a lot). Finally, discuss how each boat's design might affect how much weight they can carry. Tell students that they are going to be using the design process to create their own boat for a specific purpose.

Special Boats

Invite a boat builder familiar with NL skiffs or Indigenous kayaks or canoes to visit the class and discuss the uses of these boats and the features of the boats that make them suitable for their purpose.

CONNECT

Design Process



Review the steps on the *What Is the Design Process?* poster. Ask students to imagine that they have the following problem: they are stuck on a desert island. The only material they have is tin foil. Ask students for ideas about how to escape from the island (they will probably suggest making a boat with the foil).

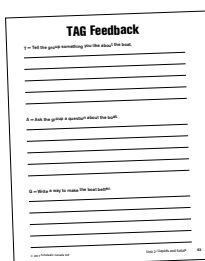
Divide students into small groups and give each group a large sheet of foil and 10 same-size coins. Explain that the coins represent the weight of the people in the group, and that the boat they build must be able to carry that weight without sinking. Inform students that they will only be given one sheet of foil for their first attempt. Prompt their thinking with questions such as:

- What shape will you make your boat?
- Where will you place the coins? Why?
- How much tin foil will you use?

Give groups time to discuss their boat design and to gather various sources of information and ideas. Sources could include books from the Curiosity Centre or Reading Centre and approved Websites. Have each group decide on a design, draw their model boat in their Science Journals, and then build it. Encourage students to record their process, either with drawings or digital photos or videos.



CONSOLIDATE



Gallery Walk

Have groups do a Gallery Walk to examine other students' first attempts. Each group should travel together, moving clockwise around the room. At its first stop, have each group fill out a copy of BLM *TAG Feedback* and leave the completed sheet for the designers. Students should be encouraged to take notes on any ideas they want to incorporate into their own design.

Groups can then return to their boat, finalize their design, and test their boat in a large tub of water. Groups should record their observations and thoughts during the test. After each test, ask the group:

- **What did you learn from testing?**
- **How can you improve your design?**

Students can redesign and retest as necessary.

EXPLORE MORE

More Boats

Provide students with tin foil and additional materials (e.g., craft sticks, stiff cardboard, straws, Styrofoam, tape, glue) and have them work in partners to design another boat, using foil plus at least one other material. Students should follow the design process when constructing this boat, as well.

WRAPPING UP THE UNIT



Revisit any remaining questions posted on the I Wonder Wall and have students discuss answers in small groups or with a partner. If there are questions that cannot be answered at the time, these can remain on the I Wonder Wall for students to research independently. Discuss what students have learned about liquids and solids; how they can be described; what happens when they are combined; and how we can use them to make useful things and to keep our world clean.

TAG Feedback

T = Tell the group something you like about the boat.

A = Ask the group a question about the boat.

G = Write a way to make the boat better.
