OAR NORTHWEST: EDUCATION

CWF Africa to the Americas Expedition 2013

Lesson 1.1: What makes a boat a boat?

http://www.jmbamboo.com/20

http://cruise840.blog.fc2.com/blog-entry-

Introduction

This lesson will explore the question: What makes a boat a boat? The CWF Africa to the Americas Expedition boat, the *James Robert Hanssen*, will serve as our model. At the end of the lesson students should be able to explain why a boat floats and list properties that help boats to carry cargo and navigate through water.

The lesson should be introduced using a variety of different images of boats and have students list if they are actually a boat why or why not. Use images from PowerPoint (www.oarnorthwest.com/education) to lead discussion based on recent Supreme Court ruling found here: http://bit.ly/115avEK
(See below for alternate plan for social science lesson*)

Enter the James Robert Hanssen! Use the 3D model from the OAR NW site (www.oarnorthwest.com/education), and images and videos from the site to introduce the boat to the students.

A few facts about the boat:

- The ocean rowboat is 8.8 meters long (29 feet)
- The aft cabin is 2.4 meters long (8 feet). This is where the rowers sleep in shifts, record scientific data, blog and upload photos and videos to OARNorthwest.com. There is no support ship following the crew, but they have deep-sea survival training, safety equipment, a satellite phone and GPS tracking capabilities.
- The rowboat is equipped with a desalination unit to convert salt water to fresh for drinking, a wind turbine and solar panels to power research and communications equipment and a broad spectrum hydrophone to record underwater sounds of marine life

Based on previous discussions, ask students to make a list of why they think the OAR NW crew is using the *James Robert Hanssen*. What about that boat is suited for an ocean voyage? Make another list of properties they think every boat needs in order to be a boat.

Discuss list of properties. Make sure to include buoyancy if kids do not. Lead discussion about mass/density/volume. Use tin can and spoon of approximately same weight and demonstrate that one sinks and one floats. Ask why one floats and other sinks if the items are the same weight? Ideally they will answer air and it has greater volume, can lead into d=m/v if they are ready or just discuss those properties. Then ask students to make a hypothesis about what will happen if tin can is filled with water? Demonstrate.

Activity

Boat making

The first few steps of this activity reiterate displacement and density. They can be skipped if the class has a good understanding of these. The activity would then be best prefaced with a discussion about boat design and having the students make predictions on which design will hold the most weight. Other materials could be introduced for boat building, Styrofoam or cardboard work well. For a longer lab more in depth version see below**

Materials:

- Aluminum foil — flat sheets of the same size
- Container for water at least as big as the sheet of foil
- Water
- Pennies
- Marker

Procedures

1. Take two pieces of aluminum foil — put a penny in the middle of one and tightly form it into a ball; lay the other piece flat and put a penny in the middle of it.

Ask students:

What do you think will happen when the flat sheet & penny is placed in the water?

What do you think will happen when the ball of foil with the penny is placed in the water?

2. Place the flat sheet with the penny on the surface of the water.

Ask students:
What do you observe?

Why do you think this happened?

3. Place the ball with the penny in the water.

Ask students:
What do you observe?

Why do you think this happened?

4. Take the flat sheet and penny out of the water and bend the edges up to form a boat. Be sure to seal the edges tightly so it does not leak. Gently place the boat in the water.

Ask students:
What happens to the foil boat?

Why do you think this happens?

5. It is now time to add cargo to your boat.

Ask students:
How many pennies do you think your boat can hold before sinking?

6. Slowly add weight (pennies) to your boat a little at a time. Keep adding additional weight until you sink your boat.

Ask students:
How does the amount of pennies your boat held before sinking compare to your prediction?

7. Use another piece of foil to build another boat.

Ask students:
Can you build a boat that will hold more weight (pennies)?

What will you do differently and why?

8. Float your second boat in the water. Add pennies slowly until your boat sinks.

Ask students:
How many pennies did your boat hold before sinking?

How does the amount of pennies compare to your first boat?

What can you determine about the size and shape of objects in water and whether they float or sink?

Lesson Wrap-up

A concluding discussion can be had with the students each reiterating what they learned about the boats they designed. They can compare their list of things they thought a boat needed to what they actually designed. They can also look back at their answer about the *James Robert Hanssen* and see if their answers would change.

*For older students a mock court maybe used to have them make a ruling about what makes a boat a boat. Go to the classroom law project website (http://bit.ly/112KDdx) for more ideas on running a mock trial.

**As an addendum to the lab you design the boats in order to withstand waves/rough seas rather than just to hold weight. The boats can be tested by being placed in a large container of water at a set measured distance from the side. A weight can then be dropped at the other side to create a wave. To increase the wave the weight can either get incrementally larger or can be dropped from a higher height.

Citations
-Lesson structure based on NOAA's POET platform (http://1.usa.gov/X8u3SL).
-Boat making activity adapted from Carolyn Currin's lesson (http://bit.ly/VL4ZBM)