

When Will It Sink?

Context: The study of buoyancy, sinking and floating

Grade level(s): 3 - 5

Science Concept: When an object is placed in water, two forces act on it - gravity pulling it down and the force of the displaced water forcing it upward. The mass of the object determines the amount of downward force acting on it - the greater the mass, the greater the pull of gravity. The size of the object determines the amount of upward force of the displaced water - the larger the object, the more water it can displace. An object will float as long as the amount of water that is displaced is less than or equal to the mass of the object. This is often reflected in the design of a floating object. An object whose mass is spread out over a large area will displace a large amount of water and a large upward force will act on the object. In addition, if the weight is not evenly distributed, but instead is concentrated in a small area, the object will be unbalanced and will tip over.

Materials: per group of two

Pans deep enough to allow the "boat" to float - 2 lb. aluminum loaf pans work well
 10 cm squares of aluminum foil (students may cut this out themselves)
 paperclips
 scissors
 metric ruler
 water

Procedures:

Focus:

1. Read Who Sank the Boat
2. Divide students into groups of two.

Explore:

1. Fill the pan $\frac{3}{4}$ full of water.
2. Cut the aluminum foil to a 10 cm square.
3. Decide which design of a boat will float and hold the maximum amount of paperclips.
4. Draw your boat design on the worksheet.
5. Following your design, make your boat from the aluminum foil.
6. Estimate and record the number of paperclips your boat will hold before it sinks.
7. Place the paperclips, one at a time in the boat until it sinks.
8. Count the number of paperclips in your boat and subtract one. This is the number that the boat held without sinking.

Reflect:

1. How did your estimate compare to the actual number?
2. How did the design of your boat determine the number of paper clips it held?

Apply:

1. You may rebuild your boat in a different design and do the experiment again.
2. How many paperclips did you use this time?
3. Why did the change in design affect the number of paperclips your boat held?
4. The book says that Mr. Pepper lived by the sea. Try this same experiment with water into which you have dissolved several spoons of salt.