

# Bay Area Scientists in Schools Presentation Plan

Lesson Name Buoyancy: Who Sank the Boat?

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Grade Level K

Standards Connection(s) An object's ability to sink or float is related to its size, shape and weight.

**Abstract:** What makes an object sink or float? In this presentation, we use the very funny children's story Who Sank the Boat? by Pamela Allen to explore some basic concepts about buoyancy. Children will use their powers of observation to draw some conclusions about why some things float while others don't. We will perform some easy experiments using miniature "boats" in a tiny bay to try and get to the bottom of this question and find out who really sank the boat.

## Vocabulary/Definitions:

3 – 6 important (new) words

Buoyancy – An object's ability to sink or float

Din – Many loud sounds

Bay – A part of the sea that is mostly surrounded by land.

## Materials:

Clay – for molding into boats

Small Paper Cups – Uniform size, for simulating boats

Groups of and coins – For loading into small "boats"

Large Plastic Bins – To simulate a body of water

**Classroom Set-up:** *Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed*

Before starting with the presentation, the plastic bins will be filled with water to an appropriate depth. Each station will be supplied with several balls of clay, small plastic containers, and many pennies.

## Classroom Visit

1. **Personal Introduction:** 5 Minutes

*Who are you? What do you want to share with students and why? How will you connect this with students' interests?*

We study bioengineering at UC Berkeley. Bioengineering is where biology (the study of life) meets engineering (using math and science to solve problems).

**Topic Introduction:** 5 Minutes

*Big Idea(s), vocabulary, assessing prior knowledge. What questions will you ask to learn from students?*

Introduce the term buoyancy: who knows what it means? Write it on the board.



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Next, read the book Who Sank the Boat? by Pamela Allen.

Introduce the terms: bay, din, buoyancy. Show a picture of the San Francisco bay.

Afterwards, ask: Who really sank the boat? Why did the boat sink? Why do some object sink and others float? What are some examples of things that sink and things that float?

**2. Learning Experience(s):** \_\_\_\_\_ **35** **Minutes**

*Demonstrations, hands-on activities, images, games, discussion, writing, measuring... What will you do, what will kids do? Describe in order, including instructions to kids.*

Part 1:

Bring in some objects and have the children make predictions if they will sink or float. Put them in the water and see if their predictions are correct.

Part 2:

Next, take several equal sized balls of clay and drop one of them into the large plastic bin. It should sink to the bottom. Take another ball of clay and have the children mash it into a flat panel. Place this flat piece of clay onto the surface of the water. Does it sink or float? Take another ball of clay, mash it flat, and bend the edges up to form walls. This clay “boat” should now be floating. Does the shape make a difference? Have the kids make their own boats.

Ask: How many coins do you think this boat can hold? Listen to predictions.

Experiment: Load the clay boat with coins until it sinks.

Record: How many coins did each hold? Compare results among groups and against predictions.

Part 3:

Float the small plastic containers inside the bins. These are the boats on Mr. Pepper’s place.

Several groups of coins, labeled: cow, donkey, pig, sheep and mouse will be prepared at each station. Read the story again while loading the “animals” into the boat. Try it again, this time switching up the order of the animals (i.e. mouse, pig, sheep, cow, donkey). What happens if the boats are not properly balanced? Does the order of loading matter?

**3. Wrap-up: Sharing Experiences and Building Connections** \_\_\_\_\_ **5** **Minutes**

Review vocabulary words, and go over the important questions. Does the shape and size of the object matter? What about the order that the animals get into the boat? What about balancing it? Who is really responsible for sinking the boat, and why do we blame the mouse?

**4. Close:** \_\_\_\_\_ **5** **Minutes**

What are the factors that determines if something sinks or floats? Well today we saw that, in general, the ability of an object to float or sink has to do with how big it is, how much it weighs and its shape. Finally, make sure that all of the bins, full of water and objects, get cleaned and dried out without making a big wet mess.

**TOTAL** 55 **Minutes**



## Follow-up – After Presentation

Suggest students write a letter explaining “How we learned about \_\_\_\_\_?”

List or attach examples of activities, websites, connections for additional learning.

Attach worksheets, hand-outs, visuals used in classroom presentation.

**Condiment Diver:** [http://www.exploratorium.edu/snacks/condiment\\_diver/index.html](http://www.exploratorium.edu/snacks/condiment_diver/index.html)

**Condiment Diver - *The world's simplest Cartesian diver***

**Materials:** Squeeze condiment packet (soy sauce, ketchup, etc.), Clear plastic bottle with tight fitting lid, glass or cup of water

First, you have to figure out if your condiment packet is a good Cartesian diver candidate. Fill a glass with water and drop in your packet. The best packets are ones that just barely float.

After you have found the proper packet, fill an empty, clear plastic bottle to the top with water. Shove your unopened condiment packet into the bottle. Replace the cap... and you're done! Squeeze the bottle to make the diver sink, and release to make it rise. Amazing!

Many sauces are denser than water, but it is the air bubble at the top of the sauce that determines whether the packet will sink or swim. Squeezing the bottle causes the bubble to shrink. This smaller bubble is less buoyant and the packet sinks.

*By Eric Muller Originally published in The Physics Teacher, May 1996*

**The Shape of Flotation:**

[http://pbskids.org/dragonflytv/web\\_assets/pdf/dftv\\_gpsedguide\\_sailboatdesign.pdf](http://pbskids.org/dragonflytv/web_assets/pdf/dftv_gpsedguide_sailboatdesign.pdf)

**Above Water: Buoyancy & Displacement:**

<http://www.state.nj.us/education/21cclc/casp/lsc/unit1/Lesson11.pdf>



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# Sink or Float? Experiments in Buoyancy

--Collect 6 fruits and veggies from your grocery bag—will they sink or float in water? Does measuring the mass of the fruit or veggie help you figure out if it will sink or float?

--Before you fill in your predictions for each fruit or vegetable consider what factors or properties would cause a fruit or vegetable to sink or float...Measure the mass of the fruits and veggies on the scale and record them on the chart

--Now make a hypothesis: If I place a(n) \_\_\_\_\_ in water, it will \_\_\_\_\_

--Fill out the chart below with what happens to each fruit or veggie when you put it in the water:

What type of fruit/veggie?	Mass (grams)	Hypothesis (S or F)	Outcome (S or F)
1.			
2.			
3.			
4.			
5.			
6.			



## More to do!

Measure the estimated density of each fruit and vegetable.

**Density = Mass/Volume** : You already know the mass (above).

Measure the volume with water displacement in a large bowl or beaker.

The density of water is 1g/mL. Do you see a pattern in why something sinks or floats in water based on its density?

Use an orange or banana as your fruit. What happens when you peel the orange or banana? What do you think that means about the fruit?



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