# Whatever Floats Your Boat

Exploration

**Challenge:** How can you use salt, water, and ice to learn about ocean currents?

**Materials:** tray that can be put in the freezer
cold saltwater and warm saltwater
ice cubes
food coloring

## Let's Dig In:

In this activity your challenge will be to discover some of the principles of ocean currents. Pay close attention to temperature and density differences as you go through this lab. Begin by filling one of your trays with cold saltwater. Let it sit until there is little motion of the water. Gently place an ice cube into the water. Add a couple drops of food coloring directly on top of the ice cube and observe it for a few minutes. Next take some of the warm salt water and pour it into a second tray. Let the warm water sit until there is little motion. Once again place an ice cube in the warm saltwater and add a couple drops of food coloring directly on the ice cube. Again, record your observations.

## Go Figure:

1. What happened to the food coloring when it was placed in the cold salt water?
2. What changes, if any, were there in the behavior of the food coloring when the salt water was warmed?
3. Write an inference based on your observations that provides an explanation about what happened to the food coloring.
4. How do your observations compare to the way some ocean currents might be affected by temperature variations, especially in polar regions?

Teacher Notes

# Whatever Floats Your Boat

Exploration

***GEOMES Topic:*** Earth's Air and Water - Ocean Currents

| | | | | |
|---|---|---|---|---|
| **Lab setup:** | none | **easy** | moderate | difficult |
| **Reasoning level:** | easy | **moderate** | difficult | |
| **Time required:** | **20-40 minutes** | 40-60 minutes | 60-90 minutes | |
| **Process skills:** | **inferring** | **interpreting data** | **questioning** | |

**Objectives:** Students will gain insight into how ocean currents form and factors that may cause them to change.

## National Science Education Standards:

Content Standards: Earth Science – Structure of the earth system
Unifying Concepts – Evidence, models, and explanation
Science as Inquiry – Abilities necessary to do scientific inquiry.

**Materials:** 2 trays of clear plastic or possible glass specimen dishes (2 per group)
prepared saltwater – add about 3.0 grams of salt to every 100 mL of water.
ice cubes (make them in regular ice cube trays to get the best results)
food coloring

## Teaching Strategies:

The colder the saltwater is the better, without the water being frozen. You might want to mix it up the night before and leave it in a refrigerator, or make it in the morning and put in a freezer until class time begins. You could also prepare an ice water combination and simply use the water from this solution. You will want students to be sure that they let the water stop most of its movement before they add the food coloring.

Rather than having each student group heat their own water, it is more efficient to prepare a large amount of warm saltwater. It is easiest to simply set up several hot plates and place beakers filled with salt water on each plate. Figure out how much you will need to warm up based on how many student groups you have.

## Sample Data and Observations:

| Cold salt water | Warm salt water |
|---|---|
| When the food coloring was put in, it spread around on top of the water. It stayed near the top of the water. | When the food coloring was put in, it began to flow down to the bottom of the pan right below the ice cube. |

**Sample Responses to Go Figure:**

1. In the cold salt water the food coloring stays near the surface of the water even after several minutes.
2. In the warmer salt water, the food coloring started to flow to the bottom of the tray.
3. Students will have varying answers. They should mention that when the food coloring is added to the colder water, the saltwater density is greater, so the food coloring will stay at the top with the freshwater from the melting ice cube. When the saltwater is warmed, cold fresh water has a greater density, so it will begin to drop down below the saltwater and some of the food coloring is taken with it.
4. Circulation in the ocean is driven by density differences in the water columns. These differences are primarily a function of the water's temperature and its salt content. In polar regions, ice formation squeezes the salt out of the ice producing fresh water. As the seasons change, the warming and cooling of the saltwater and the formation and melting of ice will have a big impact on the formation of ocean currents.

**Internet Connection:** Suggested keywords to find sites with related information: ocean currents and ocean salinity.