Lesson Plan for Oil Spills Part 1: Understanding Density and Oil Spills

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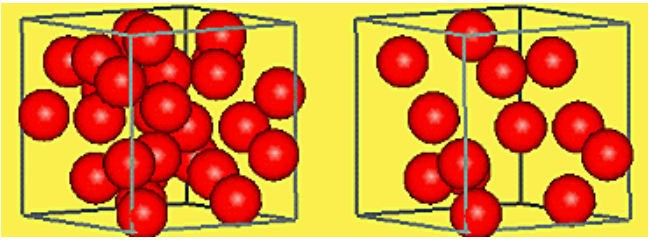
Introduction & Background Info

We can measure the density of almost anything in the universe. Density is the measure of mass divided by volume. Every day, we are able to understand density. Hot air is less dense than cold air, so hot air will rise towards the top of a room or house while cold air shifts downwards. This is also why a hot air balloon is able to stay in the air. Density is why objects will float above another. In a pool, toys float on water because the toys are less dense than the water. For instance, a beach ball is mainly filled with air; because air is less dense than water, the beach ball floats on water.

We can also consider density on an atomic level. When molecules are closer together, an object is considered denser. There is more "stuff" (mass) in the same volume of material.



The box on the left is denser (has more "stuff") than the box on the right

In this experiment, we will consider density with regards to oil and water to understand the properties and effects of oil spills. During an oil spill, oil and water separate and oil floats above water. Oil spills have drastic effects on the environment and many habitats. Those who live close by a body of water with an oil spill are most prone to inhaling dangerous chemicals when oil becomes vapor. Furthermore, any physical contact with oil is deleterious to the skin. This particularly affects those who are responsible for the cleaning the spill. Oil also impairs the sensory abilities of many aquatic animals and animals that live near the sea.

Student Objectives

- Observe the different densities of various objects.
- Understand that oil floats above water due to a lower density
- Understand the danger of oil spills in the natural environment: how oil spills in natural water systems such as oceans, lakes, and rivers are dangerous for plants and animals and damage the habitats of animals living in those areas.

Overview of Lesson Process

- If students have recently completed the lava lamp experiment, ask students to recall what happened when they tried to mix oil and water. If the lava lamp experiment has not been completed, use examples like salad dressing and do a short demo to show that oil and water do not mix well (5 min).
- Explain the concept of density and invite them to brainstorm objects they think will float or sink in water in relation to the concept of density (5-10 min).

- In groups, set up the tubs of water and have students test what objects float or sink (15 min).
- With the same tub of water, model the oil spill. Explain how this model has similar properties to an actual oil spill in the natural environment (20-30 min).
- Clean up and wrap up, recapping the lesson. Explain how oil spills come about through accidents from human intervention, and the very difficult process in cleaning after an oil spill (10 min).

Materials

Water			
Dishpans or large tubs	1 per group	S&S (FN264), 1 tub	$30
Vegetable oil	¼ - ½ cup per group	Smart & Final	$12
Marbles	a few per group	S&S (SL2146), 12 bags of 25 marbles	$10
Fake feathers	several per group	S&S (EC5710), 14g	$4
Cardboard		Supplied by mentors	
		Total:	**$60**

Additional Ideas for materials to demonstrate concept of density, supplied by mentors and students:
Corks, paperclips, cloth, candy and candy wrappers, water bottle caps, plastic bags and Ziploc bags, plastic forks, spoons, and knives, chopsticks, coins

Procedure

Part 1: Exploring Density

1. Fill the tub with water. Put various objects in the water to see how density works. Try using materials such as rubber balls, corks, pencils, leaves, or anything else that students would like to test . *Do these objects float? Sink? How does floating and sinking relate to how big (volume) or heavy (mass) the objects are? Can a large object float? Can a small object sink? Why or why not?*

Part 2: Modeling an Oil Spill

2. Put materials such as leaves, dry kelp, and pebbles in the water. These are a few of the many objects usually already present in marine environments prior to an oil spill.
3. Add vegetable oil carefully to the top of the water to create your oil spill.
4. Observe that the oil floats on the water: connect this back to the concept of density. If applicable, remind the students of the lava lamp experiment and why oil and water do not mix.
5. Construct a "model bird" by using a piece of cardboard and attaching feathers to it with either tape or glue. The purpose of the cardboard is to have a steady way to plunge feathers in the oil.
6. Put the model bird in the oil spill along with anything else the students think would be in the natural environment naturally or from human littering (cardboard, trash, cloth, etc.). *What happens to the "bird" and the other materials? Think about the animals that live in this environment and how their daily lives are affected due to the spill. Even the smallest drop of oil can kill a bird over time!*
7. Try to clean the oil off the feathers with water. *Imagine if migrating birds land in their natural habitats only to have their feathers covered in oil, making them immobile.*
8. Show before-and-after photos of marine environments affected by oil spills. Show before-and-after photos of animals affected by the oil spills.

References

Mixing oil and water: http://www.sciencekids.co.nz/experiments/oilandwater.html

Birds and oil spills: http://bird-rescue.org/our-work/research-and-education/how-oil-affects-birds.aspx

"Save the Bay" Oil Spill Activity: http://octopus.gma.org/surfing/human/savethebay.html