OCEAN NETWORKS CANADA

Ocean Sense
Program

Lesson 3

Module:

Science and Fishing

Time:

30 minutes

Learning pillars:

- Indigenous knowledge
- Ocean science
- Data exploration

Grade & curriculum connection:

- **BC Science 9**
  "The biosphere, geosphere, hydrosphere, & atmosphere are interconnected, as matter cycles and energy flows through them."

Created in partnership with:

Wap Sigatgyet
House of Building Strength

Aboriginal Education School District 52
Prince Rupert, Wap Sigatgyet

A UNIVERSITY OF VICTORIA INITIATIVE

Buoyancy and Density

Collectively develop a definition of buoyancy through a controlled experiment and observations.

The **density** of water is a variable that can be influenced by water, temperature, and **salinity**. In this demonstration, observe how adding salt to a solution will increase the **density**, thus allowing an egg to float and be **positively buoyant**.

Learning objectives

- Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (i.e. water density is a variable of salinity and temperature)

Materials

- Activity 3: *Floating Egg* and all materials listed therein

Teacher preparation

- Prepare the materials in groups for the students to do as a lab

Classroom instructions

Hook

1. Discuss students' personal experiences with buoyancy and density. Reference the activity *Boat Captain* and display the situations pictured on slide 20 in which they would likely experience this effect:
   a. Swimming in a pool (particularly salt water)
   b. Making salad dressing with oil and water
   c. Putting ice in a drink
2. Ask what they think is going on in each of the photos.

Step-by-step process

3. In a manner that works best for the students, discuss what factors they think contribute to buoyancy and density. This can be done as a group or individually.
4. Complete the activity *Floating Egg*.
5. Revisit factors that students talked about in their initial brainstorm. Have their ideas changed based on their experiments and observations?
6. Talking about what they learned, how would they create a definition of buoyancy and density in their own words? How would they share this information to someone who was not in the class?
    a. Expanding on the definitions of negatively and positively buoyant learned in the activity, collaboratively create a definition of neutrally buoyant.
7. Share slide 24 and discuss how Ocean Networks Canada uses floats and weights to adjust the buoyancy and density of our equipment so that it can function in the water.

Modifications and adaptations

- The individual experiments can be done as class demonstrations rather than as individual groups.

Final remarks to the educator

In this lesson, students explored how buoyancy and density can be factors of the water, or factors of the objects in the water. In nature, salinity levels can change due to evaporation or rain and are often tied to seasonal changes as well. Together, they contribute to how much an object will float, which is described scientifically as buoyancy.

Assessment

- Review the students definitions of buoyancy and density. What examples do they use? Do they have a clear understanding of the concepts?

Extensions

- Students may benefit from the challenge of trying to create either a solution or an object that is neutrally buoyant. For example, can the students make a solution that allows the egg in the activity *Floating Egg* to remain suspended midway between the top and bottom of the water in a container (neutrally buoyant in the solution).

Glossary

Buoyancy: The observation of an object 'floating' or "sinking" when placed in a liquid.

Density: How closely packed molecules are in a given subject. This can be given a numeric value by dividing the mass of the object by the volume of the object.

Negatively buoyant: The technical description of an object that sinks in a liquid.

Neutrally buoyant: When an object neither floats or sinks in a liquid.

Positively buoyant: The technical description of an object that floats in a liquid.

Salinity: The measure of the concentration of dissolved salts in a body of water.

References

Alby. (2023). *Pound-coin-floating-in-mercury* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/w/index.php?title=File:Pound-coin-floating-in-mercury.jpg&oldid=749229549.

Blacus, V. (2021). *Water and Oil* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/w/index.php?title=File:Water_and_oil.jpg&oldid=592626863

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Gonzalez, B. N. (2017). *A guy in the Dead Sea, Israel* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:A_guy_in_the_Dead_Sea,_Israel,_2017.gif.

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Floating Egg

The density of water is a variable that can be influenced by temperature and salinity. In this demonstration, students will observe how adding salt to a solution will increase the density, thus allowing an egg to float and be positively buoyant.

Materials

The following items are required for each group:

- Tall glass or graduated cylinder
- Water
- Salt
- Tablespoon
- Spoon/stick
- Fresh, raw, in the shell Eggs *(Note: You must use a fresh egg. As eggs age, they will absorb oxygen and develop an air bubble in the shell. This can make it float rather than sink in the freshwater, rendering the demonstration useless!)*
- Towels

Teacher preparation

- Decide on group size and gather materials accordingly
- Have towels ready for mopping up

Procedure

1. Introduce the activity by sharing the instructions on slide 22.
2. Fill the glass or graduated cylinder with water.
3. Place the egg (in the shell) in the glass or graduated cylinder. The egg should sink in which case it is considered negatively buoyant.
4. Add several tablespoons of salt to the vessel and stir gently to dissolve. The egg will begin to float.
5. Continue to add salt until the egg floats on the surface of the water. Once floating, the egg is considered positively buoyant.
6. Discuss with students why they think this happened and if this applies to other materials.

Conclusion

7. Display and read through slide 23.