

MOTION IN THE OCEAN

Density Waves

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Motion in the Ocean

Density Waves

Skill Level

Intermediate, Grade 6

Learner Outcomes

The learner will be able to:

- Identify the properties of ocean water in a density wave experiment.
- Describe how temperature and salinity affects water movement.
- Explain real life examples of density waves in oceans.

Educational Standard(s) Supported

Science

- SPI 0607.8.3

Success Indicator

Learners will be successful if they:

- Explain the causes of resulting currents from the experiment.

Time Needed

30 Minutes

Materials List

- Clear container (one gallon-sized rectangular tote)
- Salt (three to four tablespoons)
- Warm or room temperature water (1/2 gallon)
- Cold water (one quart)
- Food coloring (two drops)
- Wooden spoon
- Density Waves PowerPoint

Introduction to Content

This lesson introduces density waves in the ocean environment and explains how the temperature and salinity affects the waves. In this lesson, students will observe and interact with a density wave construction.

Introduction to Methodology

This lesson uses modeling and hands on approaches to aid comprehension. The lesson begins with assessing students' prior knowledge of the ocean and waves, and then progressing to the underlying causes of most waves based on the temperature and salt content with the experiment.

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Terms and Concepts Introduction

Density – the degree to which something is compacted

Salinity – the amount of salt in a liquid

Setting the Stage and Opening Questions

Begin by asking the students about their experiences with the ocean and the waves they have seen in person or on television. Briefly discuss the temperature of the water they experienced on the surface versus deeper areas and the movement they observed.

Discuss how we often think of wind being the major factor of the movement of the ocean waves. However, temperature and the salinity of the water are also contributing factors to water movement and wave formation.

After sharing with the students, ask questions to assess prior knowledge.

- What is density?
- What is salinity?
- How do you think temperature affects water?

Experience

To begin the experiment, take the clear rectangle gallon container and fill with room temperature water. Explain that this represents a single current with a temperature similar to an above ground swimming pool or pond. Tell them to notice how there is no movement.

Next, mix the following in a separate container: one cup of warm or room temperature water, three to four tablespoons of salt and two drops of food coloring. Explain that this represents a second temperature ocean current.

Insert the wooden spoon (handle side down) into the warm water container. Slowly pour the second current mixture down the handle. The current will hit the side of the container, but it will stay separated and continue to move after you stop pouring.

Tips for Engagement

Involve the students in the experiment. Have them gather, mix and combine materials.

Ice water is fine but the ice must be removed first.

Make sure the cold water mixture is poured slowly down the wooden spoon handle to create a strong current.

Share

Ask the following questions:

- Why did we turn the wooden spoon upside down?
- Does the temperature order matter when combining?

Process

- What did you notice about the currents?
- What do the walls of the container represent?

Life Skill(s)

Understand the meaning of the information. (Head Thinking)

Use the senses to gain new information or find new ways to use information. (Head Thinking)

Use appropriate social skills to interact in group settings. (Heart Relating)

Use basic reading, writing, arithmetic and mathematical skills. (Hands Working)

Generalize

Present the Density Waves PowerPoint. This provides information about density, salinity, and temperature than explains how waves form and move.

- Where would you find the largest density waves, and why?

Apply

Show the following video of the Gulf of Alaska: tiny.utk.edu/densitywaves

Divide students into small groups and instruct them to explain why the waters do not mix based on what they have learned in the lesson.

Supplemental Information

Educational Standards Met

Science

SPI 0607.8.3 Describe how temperature differences in the ocean account for currents.