



LESSON PLAN

Subject: Grade 6 Science

Lesson: Deeper Currents

Standards Addressed:

- Understand the structure, classification, and physical properties of matter. (6.P.2)
- Energy can be transferred from one system to another in different ways (6.P.3)

Objectives:

- Students will compare the density of mixtures to that of water.
- Students will observe how thermal energy transfer influences convection currents which then in turn create physical currents in the sea and atmosphere.
- Students will apply knowledge of these factors to analyze current routes.

Materials Needed:

- A device for watching the “Deeper Currents” video
- The “Deeper Currents” activity sheet
- (Optional) A large clear bowl or tank, food coloring, a kettle, and chilled salt water

Outline:

- Students will watch the “Deeper Currents” video. Teacher may pause video at intervals to relate the topics to things learned in class.
- Teacher will review with the class how the exchange of dense cold air and water with less dense warm air and water creates a cycle that drives currents in the atmosphere and the ocean.
- Students may complete the activity individually or in pairs.

Take It Further:

Recreate the water tank demonstration from the video by prepping salt water in advance and letting it chill in the refrigerator overnight. Color the saltwater blue. Boil some fresh water and color it red. Very slowly and gently pour the hot freshwater into one side of the bowl of cold saltwater. Let the class watch closely to see how the red slowly creeps across and the blue exchanges places with the red. Talk about how if this exchange was continuous it could create a cycle almost like a moving wheel. This is what moves currents.

Cross-Curriculum Connection:

Discuss with the class how the movement of the cold saltwater often goes a separate direction from warmer, freshwater currents on top. Relate this to the social themes of the video, how things often look different on the surface level than when you go deeper. Prompt students to write a paragraph response about something in their life that may appear different on the surface than when you take the time for a deeper look. Some students may share their paragraphs with the class and engage in teacher-guided discussion.

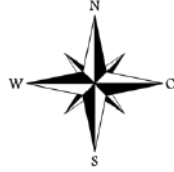




Deeper Currents

Grade 6 Science

Name: _____



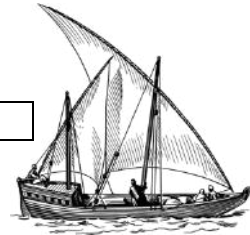
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Activity 1:

In the video, we saw a demonstration of how the water separated based on cold saltwater and warm fresh water. Which is more dense?

Circle one:

Cold Saltwater	Warm Freshwater
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Activity 2:

Did you know that a mixture like saltwater has a different density than freshwater? Think about the demonstration in the video. If freshwater has a density of 1. Which value would be more likely to represent the density of saltwater?

Circle one:

1.02 - 1.03	0.02 - 0.03
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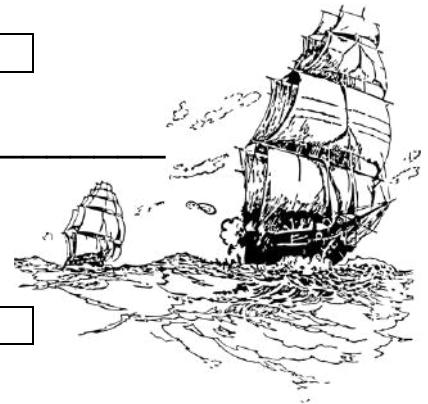
Explain how you know: _____

Activity 3:

The density of freshwater will change depending on the quantity.

Circle one:

True	False
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Explain how you know: _____

Activity 4:

Consider how energy impacts the movement of molecules in warmer water vs. colder water. If warmer water flows in a current from the Caribbean towards the cooler water off the coast of Massachusetts, what happens to the movement of the molecules over the course of that journey?

Describe below:





Deeper Currents

Activity 5:

As thermal energy is transferred from warmer currents to cooler bodies of water, the warmer water begins to cool down and sink to the bottom and the cooler water begins to warm up and rise to the top. This creates a cycle that moves the water. What type of heat transfer describes this phenomenon of cyclical movement?



Activity 6:

These types of currents can occur both in the water and in the air, pushing ships along an ocean current or filling the sails with gusts of wind. What is the name of two of these currents mentioned in the video?

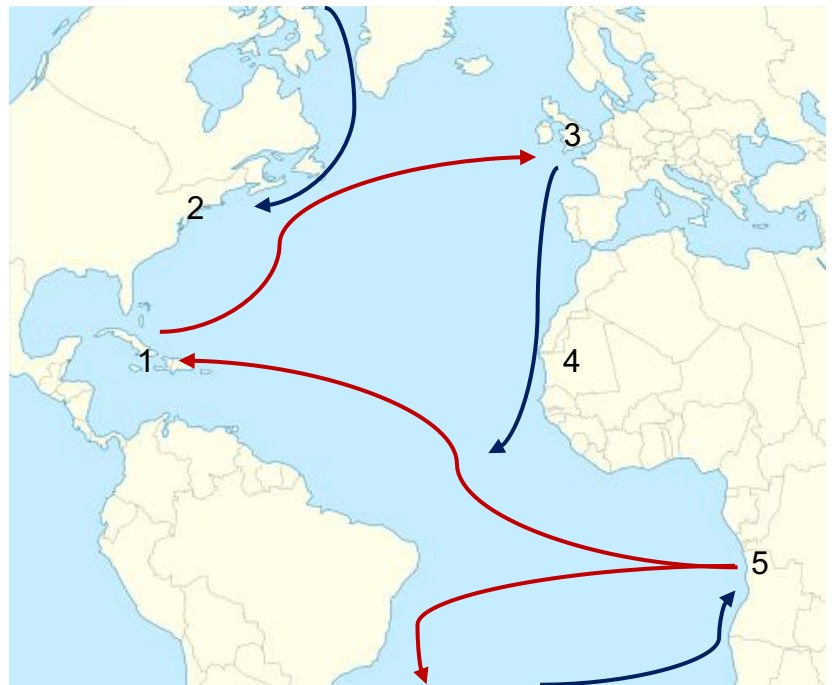
Activity 7:

Below is a map displaying streams of warm currents (red) and cold ocean currents (blue). Describe the energy transfer along the currents of triangular trade.

1. Would thermal energy increase or decrease as water from point 1 meets point 3?

2. Would thermal energy increase or decrease as water from point 4 flows towards point 1?

3. Would thermal energy increase or decrease as water flows from the north pole towards point 2.





Deeper Currents

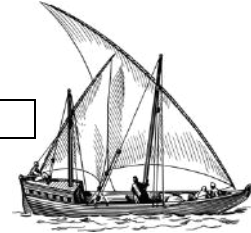
ANSWER KEY

Activity 1:

In the video, we saw a demonstration of how the water separated based on cold saltwater and warm fresh water. Which is more dense?

Circle one:

Cold Saltwater	Warm Freshwater
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Activity 2:

Did you know that a mixture like saltwater has a different density than freshwater? Think about the demonstration in the video. If freshwater has a density of 1. Which value would be more likely to represent the density of saltwater?

Circle one:

1.02 - 1.03	0.02 - 0.03
-------------	-------------

Explain how you know: *Salt water has a higher density than freshwater because it sinks to the bottom*

Activity 3:

The density of freshwater will change depending on the quantity.

Circle one:

True	False
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Explain how you know: *Density is a physical property of matter and does not change by quantity.*

Activity 4:

Consider how energy impacts the movement of molecules in warmer water vs. colder water. If warmer water flows in a current from the Caribbean towards the cooler water off the coast of Massachusetts, what happens to the movement of the molecules over the course of that journey?

Describe below:

 In warm water, the molecules move around and spread out, making the water less dense.

As the water cools down and loses thermal energy, the movement of the molecules slows down and the molecules move closer together, making the water more dense. _____





Deeper Currents

Activity 5:

As thermal energy is transferred from warmer currents to cooler bodies of water, the warmer water begins to cool down and sink to the bottom and the cooler water begins to warm up and rise to the top. This creates a cycle that moves the water. What type of heat transfer describes this phenomenon of cyclical movement?

___ **Convection** ___



Activity 6:

These types of currents can occur both in the water and in the air, pushing ships along an ocean current or filling the sails with gusts of wind. What is the name of two of these currents mentioned in the video?

___ **Jet Stream, Gulf Stream, Trade Winds** ___

Activity 7:

Below is a map displaying streams of warm currents (red) and cold ocean currents (blue). Describe the energy transfer along the currents of triangular trade.

1. Would thermal energy increase or decrease as water from point 1 meets point 3?
 ___ **Decrease** ___

2. Would thermal energy increase or decrease as water from point 4 flows towards point 1?
 ___ **Increase** ___

3. Would thermal energy increase or decrease as water flows from the north pole towards point 2.
 ___ **Increase** ___

