



Science Learning Packet

Grade 6:

Ocean, Atmosphere, and Climate,

Lesson 6

science learning activities for SPS students during the COVID-19 school closure.

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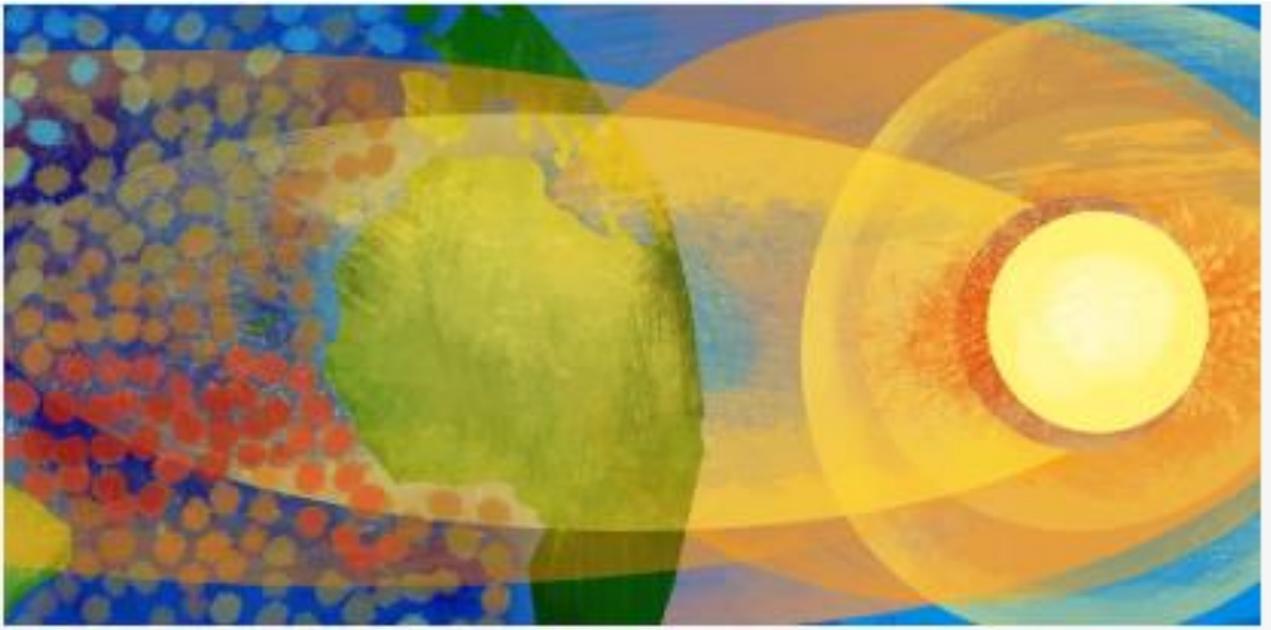
Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District's swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student's teacher.



Grade 6 Science Learning Activity
Ocean, Atmosphere, & Climate Unit
Lesson 6 Instructional Materials

AmplifyScience



Ocean, Atmosphere, and Climate

Lesson 6: Currents and Air Temperature

Hello Families,

We hope you and your family are well and safe during this time. During this unprecedented out-of-school time, the SPS middle school science team will be offering instructional opportunities for students that align with the district's adopted middle school science instructional materials.

This investigation packet is part of a series of district-aligned lessons for middle school **science developed by AmplifyScience** and adopted by SPS in 2019. While Amplify Science lessons are designed to be done in the classroom with peers, there are some activities that students can complete at home.

In this packet you will find activities to accompany the **lesson videos being aired this week through Seattle's Public television programming on [SPS TV](#) (local channel 26). The videos and packets are also posted to the, [SPS Science webpage](#) under their corresponding grade level.** These lesson videos, developed in collaboration between SPS teachers, Denver Public Schools teachers, and Amplify Science, feature teachers going through the information in the lessons. **The work in this packet is intended to be completed alongside the viewing of the video of the corresponding videos.**

Closed captioning for the videos is available many home languages if this helpful to your family.

- Click CC (bottom right of video)
- Click Setting (the gear next to CC)
- Click Subtitles/CC
- Click Auto-translate
- Choose your language

For students who have access to the internet and the following devices and browsers **may wish to log-in to their AmplifyScience account from home are welcome to do so.** Chrome and Safari are the recommended browsers to use for full functionality of the Amplify digital tools and features.



Sincerely,

Seattle Public Schools Science Department

Lesson 6: Currents and Air Temperature

So far you have learned about two things that affect Christchurch, New Zealand's air temperature: its **latitude** and the **ocean current that passes its shore**. You also know that this ocean current comes from the equator, the location that receives the most energy from the sun. But what determines how ocean currents move? You will begin to investigate this question today. Kiri Parata, the director of the New Zealand Farm Council, has sent an article to help you learn more.

Vocabulary Review from Previous Lessons:

CLIMATE: General weather patterns over a long period of time

ENERGY: the ability to make things move or change

TEMPERATURE: a measure of how hot or cold something is; a measure of the average kinetic energy of the molecules of a thing

TRANSFER: to move from one object to another or one place to another

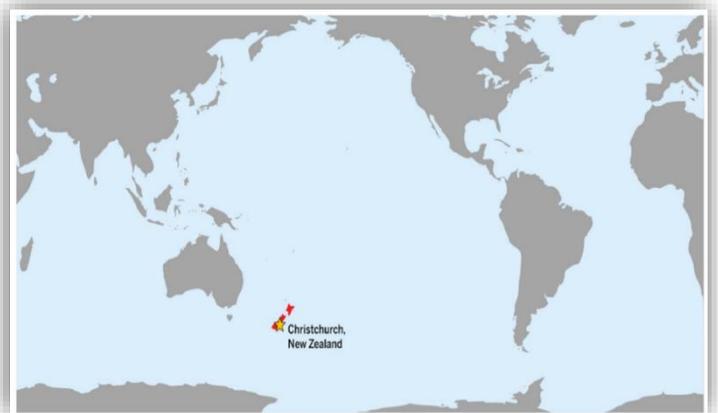
LATITUDE: the distance of a place north or south of Earth's equator

EQUATOR: the imaginary line that divides Earth into northern and southern hemispheres

OCEAN CURRENT: ocean water flowing in a continuous path

GYRE: a giant pattern of moving water that spans whole oceans and moves water from place to place in a circle

Unit Question: During El Nino years, why is Christchurch, New Zealand's temperature cooler than usual?



Location of Christchurch, New Zealand in the southern Pacific Ocean

Lesson 6 – Part 1: Finding Patterns in Global Ocean Currents



KEY
warm current: —→
cool current: —→

The map shows the movement pattern for major ocean currents. What ideas do you have about what might make ocean currents move?

Lesson 6 – Part 2: Reading “The Gulf Stream: A Current That Helped Win a War”

We started this unit by making initial claims about why Christchurch’s air temperature is cooler than usual during El Niño years. So far, we know that both the air temperature and the ocean surface temperature are cooler during El Niño years, even though the amount of incoming energy from the sun stays the same. We also know that currents affect ocean surface temperature, so something about the ocean current that passes Christchurch must change. But what? ***What would cause an ocean current to change?***

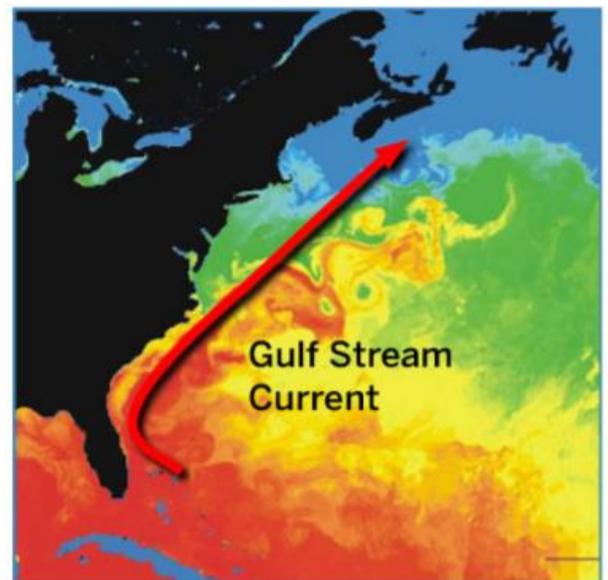
In order to figure out what determines how the ocean currents near Christchurch move, we must first understand what causes ocean currents to move. Kiri Parata, the director of the New Zealand Farm Council, has sent an article to help you learn more.

As you read the article:

- Think carefully about what you read. Pay attention to your own understanding.
- As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
- Examine all visual representations carefully. Consider how they go together with the text.
- After you read, discuss what you have read with others to help you better understand the text.

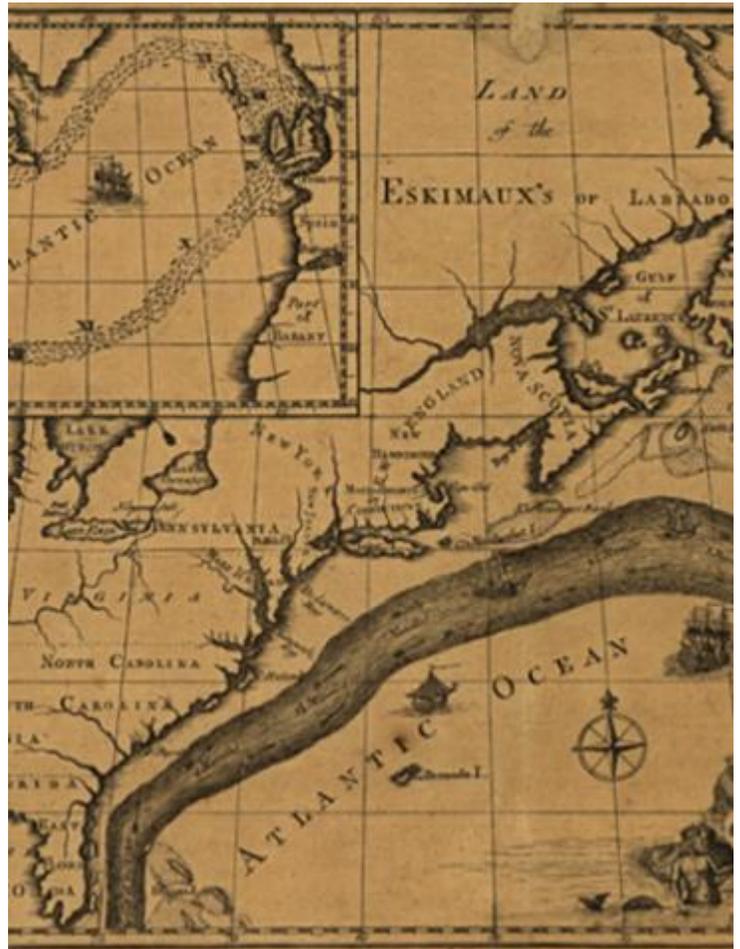
The Gulf Stream: A Current That Helped Win a War

Can you believe that an ocean current may have helped the United States become the United States? Before the Revolutionary War, Benjamin Franklin—you may know him as one of the founders of our country—and his cousin mapped a strong current called the Gulf Stream, which flows north along the East Coast of the United States. Understanding where the Gulf Stream flows was helpful for sailors coming and going from East Coast ports because ships that sailed in the same direction as the Gulf Stream, or cut straight across it, could go faster than ships that tried to sail against it. Some people have even claimed that this knowledge of the Gulf Stream might have helped America win the Revolutionary War, because American ships were able to travel around the area more quickly than British ships.



This image of the Atlantic Ocean uses color to show water temperature: the warmest water looks red and the coolest water looks blue. You can see the warmer water of the Gulf Stream traveling north along the coast of North America.

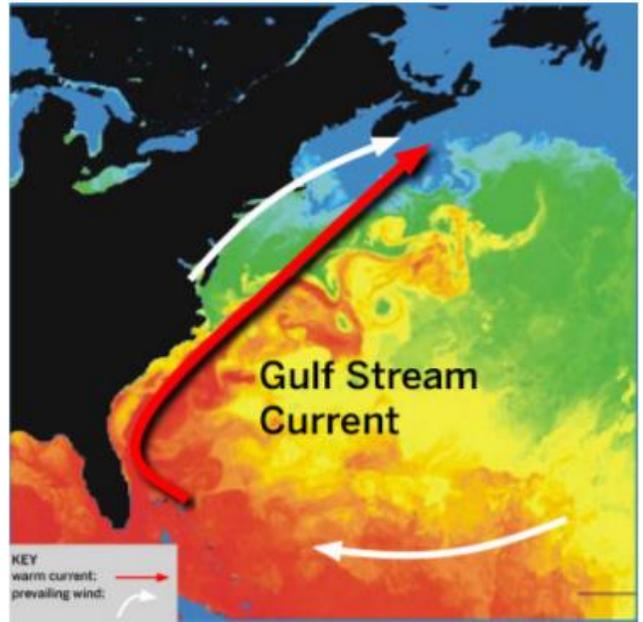
The Gulf Stream still flows today, and it still affects how goods are shipped around the world. The Gulf Stream forms near the tip of Florida and flows north, carrying warm water from the Caribbean up the east coast of North America and across the North Atlantic. This large, strong current carries more than 100 million cubic meters of water per second, more than all the world's rivers combined.



Benjamin Franklin and his cousin made the first maps of the Gulf Stream.

What causes the Gulf Stream current to flow, and what determines its route? The strength and direction of the Gulf Stream are driven partly by prevailing winds—winds that always blow in the same direction and are strong enough to push ocean water around. Prevailing winds near the equator blow from east to west across the ocean. Prevailing winds farther north and south blow in the opposite direction: they go from west to east. Another factor that affects the direction of the Gulf Stream and other ocean currents is the location of the continents. When a current hit a continent, it is redirected to follow the coastline.

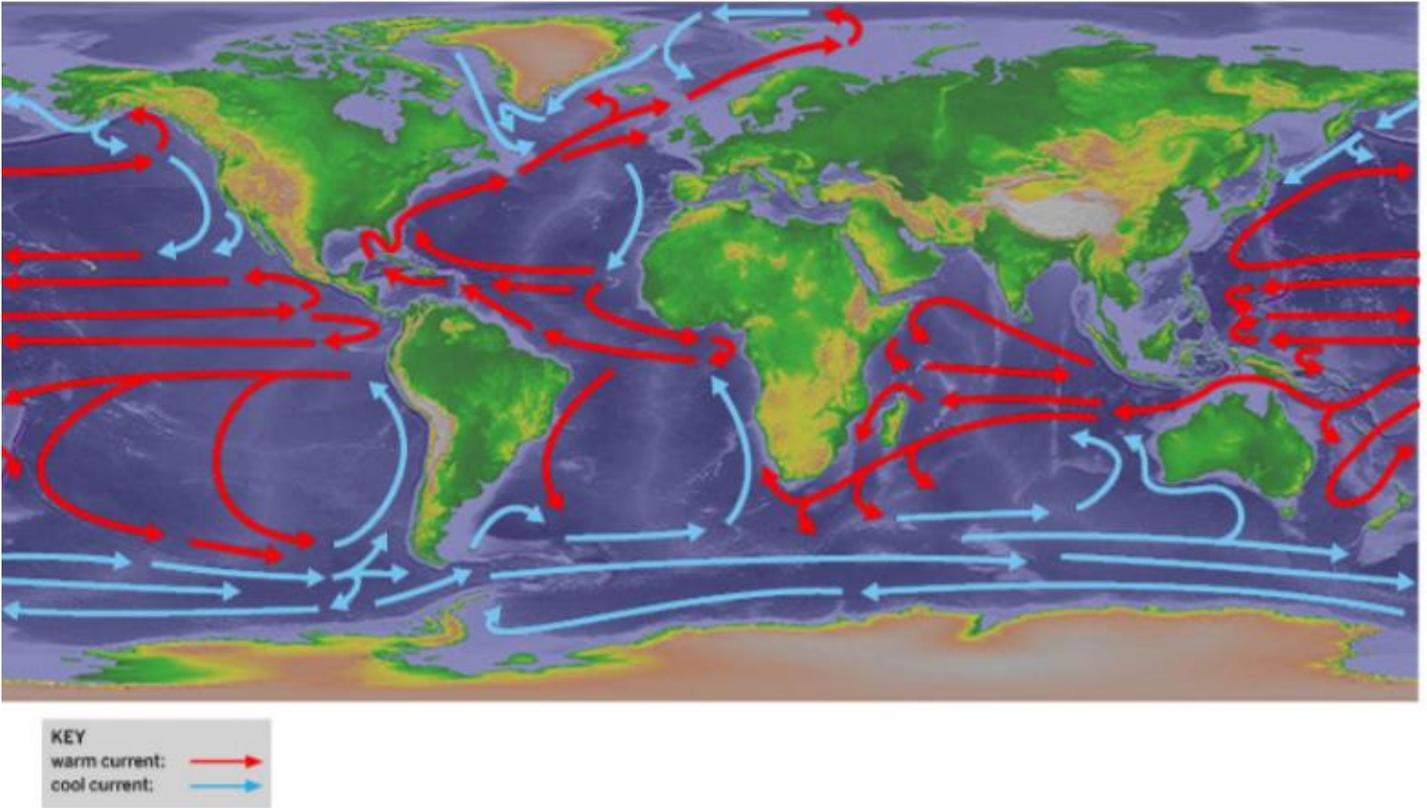
The Gulf Stream flows from south to north. How do winds blowing from the east or west make a current that flows to the north? The Gulf Stream starts off the coast of Florida, where the prevailing winds blow the water west toward Florida, in the same direction as the wind. When the water reaches Florida, it can't go any farther west, so it's forced to turn. The water flows north along the edge of North America. When the Gulf Stream reaches New England, the prevailing winds moving from west to east blow the Gulf Stream away from the coast of North America and across the northern Atlantic. The Gulf Stream warms up the air wherever it goes. The warm water carried from the equator contains a lot of energy, which transfers to the cooler air above it, bringing warm air temperatures to the East Coast of North America and making Western Europe warmer than other places at similar latitudes.



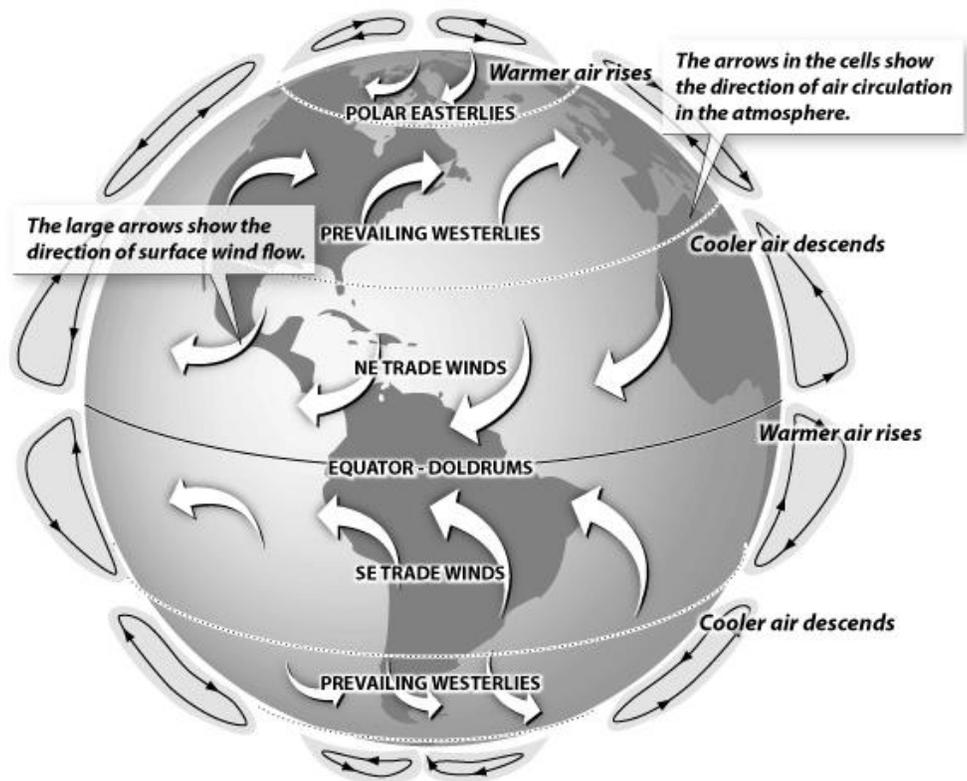
The Gulf Stream begins when warm water near the equator is pushed west across the Atlantic Ocean by the prevailing winds. When the water runs into North America, it is forced to go north along the coastline. In this map, the warmest water is represented by the color red and the coldest water is represented by the color blue. Water at a temperature between the warmest and the coldest is represented by yellow, orange, or green.

The Gulf Stream is one of the most important surface ocean currents in the world—it's very strong, covers a long distance, and has significant effects on the way humans live. Without its influence on trade routes and maybe even on the Revolutionary War, the United States might never have become the United States!

Major Ocean Currents and Prevailing Winds



Near the equator, the prevailing winds blow from east to west and drive ocean currents from east to west. Closer to Earth's poles, the prevailing winds blow in the opposite direction, from west to east. On this map, you can see how the direction of the prevailing winds in different places on Earth affects the patterns of the ocean currents.



Lesson 6 – Part 2 Continued: Re-Reading and Exploring the Sim

New Vocabulary from the Reading:

PREVAILING WINDS: winds that move in one direction and are strong enough to push ocean currents

Reread paragraphs 4 and 5 on page 7 from the article (beginning with “The Gulf Stream flows from south to north”) and highlight evidence that helps you answer the Investigation Question: What determines how ocean currents move? Carefully read the following sentence and fill in the missing words.

_____ push ocean currents. When ocean currents hit a _____, they can change direction.

Sim Mission: Winds and Warm Currents

You read about a warm current called the Gulf Stream. Investigate a warm current in the Sim, and then answer the questions.

- Launch the Ocean, Atmosphere, and Climate Sim.
- Select wind map mode from the navigation menu and click play to start.
- Find a warm current (coming from the equator).
- Focus on the current you selected. Observe the direction of the wind and the direction of the warm current.

1. How do prevailing winds affect the direction of ocean currents?

2. Set the speed of the wind to HIGH, then MEDIUM, and finally LOW. Observe what happens to the current. How does the speed of prevailing winds affect ocean currents?

Lesson 6 – Part 3: Current Tank Investigation

Investigation Question: *What determines how ocean currents move?*

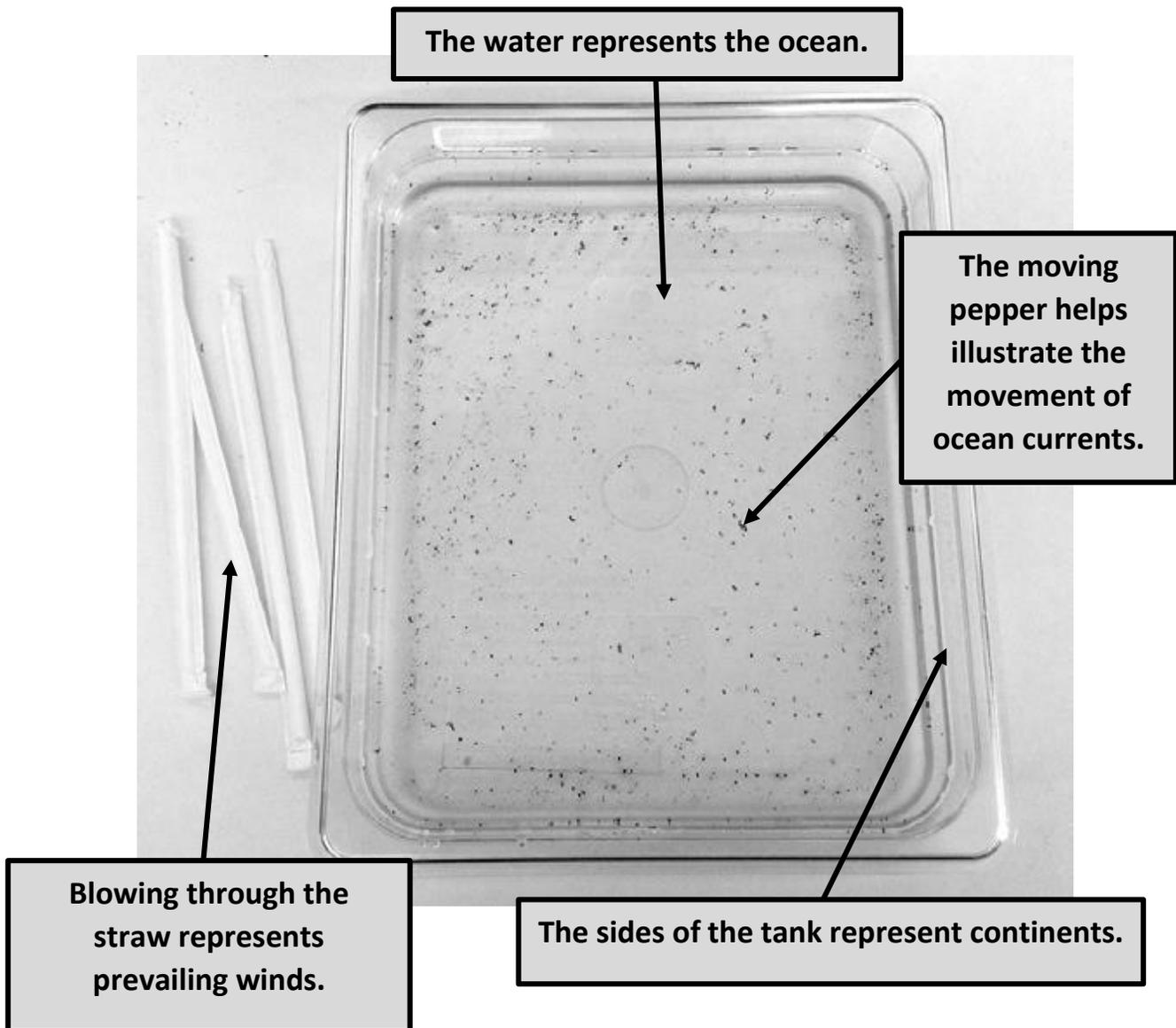
In order to gather more evidence about how currents move, we will simulate wind on a water surface to see its effects. Look for patterns in the way the water moves.

Scientists use models to learn about things they cannot observe directly. We will use this model to learn about how prevailing winds affect the movement of ocean currents.

Materials needed for this hands-on activity:

- a straw or a tightly rolled up piece of paper in the shape of a straw
- ground pepper
- a shallow, water-proof container, like a baking pan

Note: You will need a pitcher or other pouring device, a water source, and towels



Lesson 6 – Part 3 Continued: Current Tank Investigation

1. Discuss and record your predictions.
 - Read each mission description carefully.
 - Think about the direction you plan to direct the wind in order to complete the mission.
 - Make a prediction drawing for each mission: draw one arrow to show how you will direct the wind and another arrow to show how you think the current will move (see example in Mission 1).
2. Collect materials and set up your tank model. Materials needed for this hands-on activity:
 - a straw or a tightly rolled up piece of paper in the shape of a straw (if you are doing this activity with a partner, do not share the straw!)
 - ground pepper or other small particles that will float on water and not dissolve
 - a shallow, water-proof container, like a baking pan
 - fill the tank with about 1 inch of water
3. Complete the missions, one at a time.
 - Blow wind through your straw at an angle to the surface of the water.
 - Blow in only one direction. Do not blow air directly into the water.
 - Have only one person blowing at a time. Take turns, so no one becomes dizzy.
4. Record your results after each mission by describing what you observed.

Describe what each component of the Currents Tank Investigation represents. Use the Word Bank below, if needed.

In the Currents Tank Investigation, . . .

- the water represents _____
- the sides of the tank represent _____
- blowing through the straw represents _____
- the moving pepper helps illustrate the movement of _____

Word Bank

continents

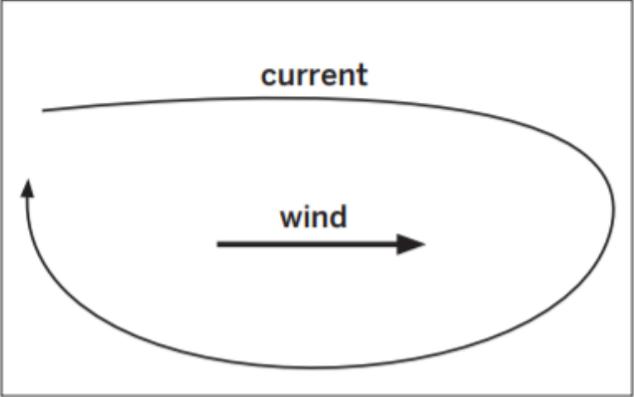
currents

prevailing winds

the ocean

Lesson 6 – Part 3 Continued: Current Tank Investigation

1. Discuss and record your predictions.
2. Use materials correctly.
3. Complete the missions, one at a time.
4. Record your results after each mission by describing what you observed.

Mission 1: Find a way to make the current move in one direction, like a gyre.	
Predictions: 	Results: Were you able to complete this mission? <input type="checkbox"/> yes <input type="checkbox"/> no If yes, describe how. If no, why not? _____ _____ _____ _____ _____

Mission 2: Find a way to make the current move in a direction that is different from Mission 1.	
Predictions: 	Results: Were you able to complete this mission? <input type="checkbox"/> yes <input type="checkbox"/> no If yes, describe how. If no, why not? _____ _____ _____ _____ _____

Mission 3: Find a way to make the current move faster than it moved in previous missions.

Predictions:

tank



Results: Were you able to complete this mission?

yes no

If yes, describe how. If no, why not?

Prevailing winds cause ocean currents to move in the same direction as the winds . . . (circle one)
in all places in the ocean in some places in the ocean nowhere in the ocean.

Describe evidence from the Gulf Stream article and the Currents Tank Investigation that supports the claim you chose.

Lesson 6 Wrap-Up

- The article shows that the Gulf Stream sometimes moves in the same direction as prevailing winds. It moves in a different direction than the prevailing winds when it hits a continent.
 - ✓ Prevailing winds are winds that move in one direction and are strong enough to push ocean currents.
 - ✓ The Gulf Stream current carries warm water from the equator northward, along the east coast of North America.
- Using the sim, focusing on what happens to a current when the speed and direction of the wind change, we discovered:
 - ✓ The currents go in the same direction as the wind. When you change the direction of the wind, the water changes direction too.
 - ✓ The currents go faster when the wind is set to high, and they go slower when the wind is set to low.
- While investigating how ocean currents form using our tank model we learned:
 - ✓ Ocean currents move in the same direction as the prevailing wind in some places in the ocean, but not all.
 - ✓ The Currents Tank Investigation shows that water moves in the same direction as the air blown through the straw, but only on one side.
 - ✓ When the water hits the edge of the container, which represents the edge of a continent, it turns.

KEY CONCEPT: Prevailing winds and the position of continents determines the direction of ocean currents.



Up Next: Lesson Seven

- How can changes to prevailing winds affect the air temperature of a location?
- Use the Sim to find evidence about how changes to the prevailing winds can affect the amount of energy in the air