

WATER ON THE MOVE

Background Information for Activity Leaders

Overview

Children will explore physical properties of water. Children will investigate how water moves around various shapes, adding to their understanding that water is made of flowing molecules that are impacted by their surroundings.

Key Concepts

- Water, like everything else that is classified as matter, is made up of molecules that are too small to see, even with a microscope. In **liquids**, like water, molecules move around a lot. They bounce off each other and spin around, and slide around from one side of the container to the other.
- The molecules in liquids are able to move around and spread out. That's why they are able to take the shape of the container they are in, and why they can be poured.
- As water moves around, the molecules that make up water also move around.
- Moving water forms different patterns.



Laminar flow is slow and smooth.



Turbulent flow has swirly patterns.

What to Expect

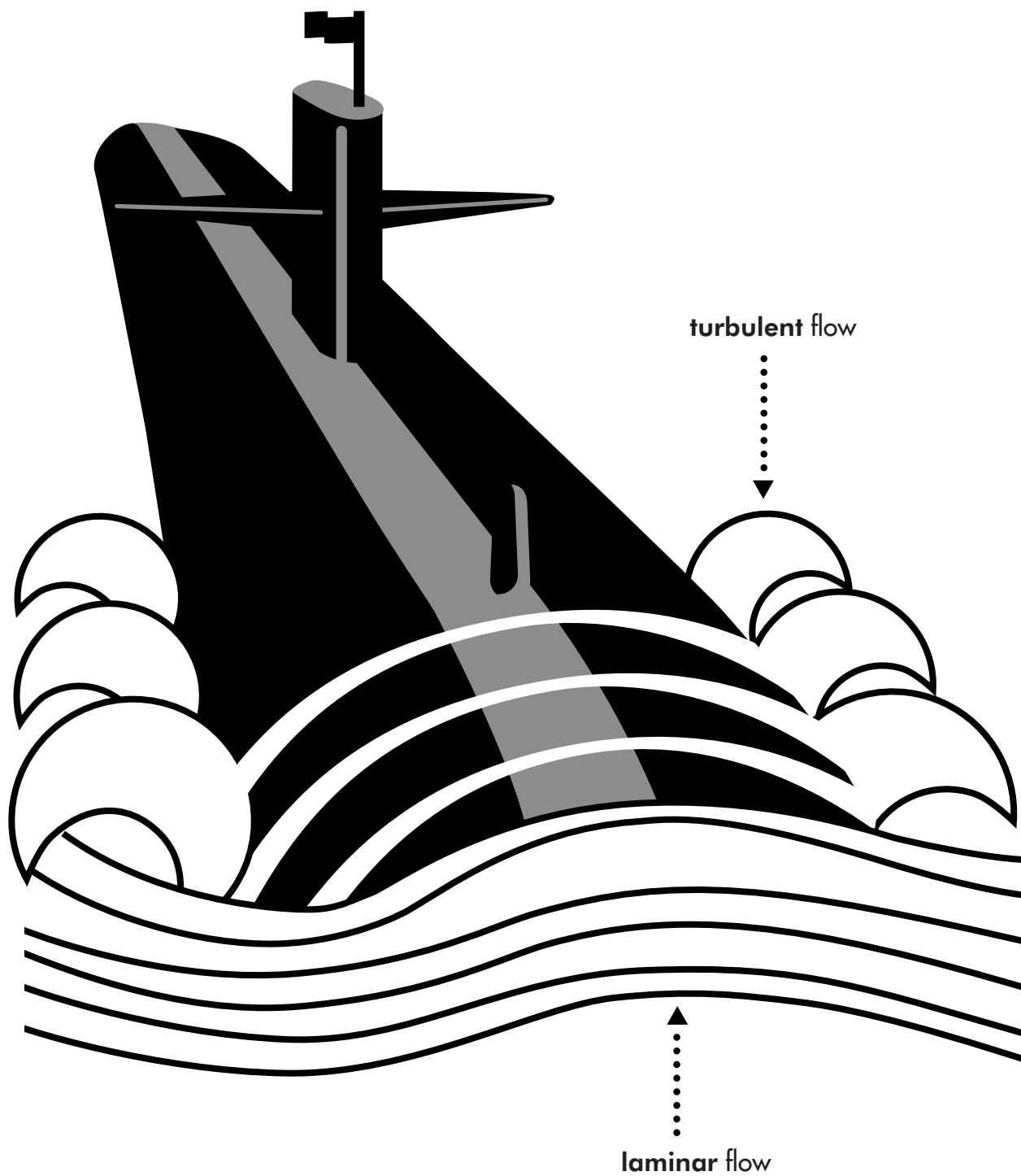
- Children will increase their understanding of the characteristics of water by observing and recording what they notice.
- Children will gain experience to begin to understand the way in which water molecules react to external forces.

Common Misconceptions

- *Children may think: "Since we can't see individual molecules in water, there must not be any."*
Even though water is clear, it is made up of matter. Matter is made up of tiny molecules. These particles are constantly flowing and moving around.

WATER ON THE MOVE

Turbulent and Laminar Flow Illustration



WATER ON THE MOVE

Data Collection Sheet




Name: _____

Date: _____

WONDER When water flows, it looks like this:

RECORD Draw your observations:

Data Table

shape	Water Flow Observed	
	before	after
 SQUARE		
 CIRCLE		
 TRIANGLE		

CONCLUDE What did you notice about the way water flows?

Set Up the Expedition

Materials:

For the activity leader:

- **Water On the Move** Learning Cards
- (1) one-liter water bottle filled two thirds with water
- (1) extra large container of liquid hand soap; it must contain glycol stearate
- (1) bottle of food coloring
- (1) cutting board
- (1-3) large baking potatoes
- (1) knife or cookie cutters (triangle, rectangle and circle)
- (1) turbulent and laminar flow illustration

For each group:

- (1) 9" by 9" aluminum cake pan

For each child:

- (1) **Water On the Move** Data Collection Sheet
- (1) small clear plastic water bottle with lid

Prepare the demonstration:

1. Fill a one-liter water bottle two-thirds full of water.
Prepare the following mixture during the Engage section of the lesson.
2. Add 5 drops of food coloring to the water in the bottle.
3. Pour liquid soap containing glycol stearate into the bottle until it is completely full.
4. Close the bottle tightly and mix the contents well.
5. Place the illustration where all the children can see.

Prepare the exploration:

1. Precut one potato per group into the following shapes (approximately 5 cm by 5 cm by 2.5 cm): a circle, a square and a triangle.
2. Place a tray and three shapes for each group at the science center.
3. Pour enough liquid from the demonstration mixture into each tray so that there is 1.5 cm liquid in the tray.

WATER ON THE MOVE

Activity Leader's Guide

Group Size: 4-6 children

Time: 45 minutes

Engage

- 1 Gather the children together. Swirl the water in the one-liter water bottle; make it splash and make waves.

Say:

"What does water look like when it moves from one place to another?" Children may notice that the water splashes and that it forms waves in the bottle.

Say:

"Those are ways we can describe some of the movements water makes. Let's investigate other ways in which water moves."

- 2 As you explain, prepare the mixture described in the **Prepare the demonstration section**, starting with Step 2.

Say:

"I am adding food coloring to the water to make it easier to see. I will also add liquid soap that gives water a pearly shine so that we can see the way it moves and flows."

Swirl the contents of the bottle so the children can see how water flows inside the bottle.

Rotate the bottle smoothly so that the water has a laminar flow.

Say:

"When a liquid is flowing slowly and smoothly it has a laminar flow."

WATER ON THE MOVE

Activity Leader's Guide

Agitate the bottle so that the water forms swirling patterns.

Say:

“When a liquid is flowing in agitated swirling patterns it has a turbulent flow.” Show the children the illustration provided.

Say:

“Look at this drawing of a submarine beginning to dive under the water. Can you see two types of water movement around the submarine? Which movement is laminar and which movement is turbulent?”

Explore/Expand

- 3** If you are working with more than 4-6 children, divide the children into groups. Distribute the Data Collection Sheets and the Learning Cards.

Say:

“Follow the directions on the Learning Card to investigate how water moves or flows around various shapes, and how it moves inside a bottle.”

- 4** Allow children enough time to complete the WONDER, EXPLORE, RECORD, EXPAND and CONCLUDE sections of their Learning Card.

Conclude

- 5** Gather the children together and ask the following questions:

“What patterns did you see in the water using each shape?” Lead the children into a discussion using the words laminar and turbulent.

“Was the direction the object was facing important? Describe how.” As the water passes the objects the flow is laminar, past the objects the flow becomes turbulent.

“What patterns do you see inside the bottle when you shake it?”

“What patterns do you see inside the bottle when you swirl it slowly?”

“Describe each pattern as laminar or turbulent”

- 6** **Say:**
“Congratulations! You have earned your ‘Ask Me About Water’ stamp. You are ready to tell people about properties of water.”

WATER ON THE MOVE

Expedition Learning Card

? How does water move when it flows?

 **flow**
laminar flow
turbulent flow

 Explore how water flows.

1 WONDER What does water look like when it flows?

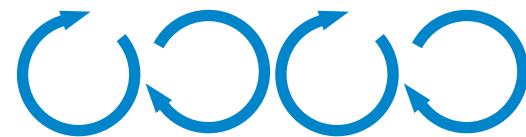
 Write or draw your ideas on your Data Collection Sheet.

2 EXPLORE Use the aluminum tray, the colored soapy mixture, and the shapes made from potatoes to learn everything you can about how water moves around various shapes. The two drawings below describe how water may move around objects.

- Begin by placing one potato shape at a time into the tray containing the soapy water mixture your activity leader prepared.
- Place a pencil under the middle of the tray so you can tip the tray back and forth to see how the water flows around each of the shapes.
- You may need to use your finger to keep the potato shape from slipping.
- Repeat with other shapes.



Laminar flow is slow and smooth.



Turbulent flow causes swirling patterns.

WATER ON THE MOVE

Expedition Learning Card

3 RECORD Notice everything you can about the patterns the water makes as you tilt the tray back and forth.

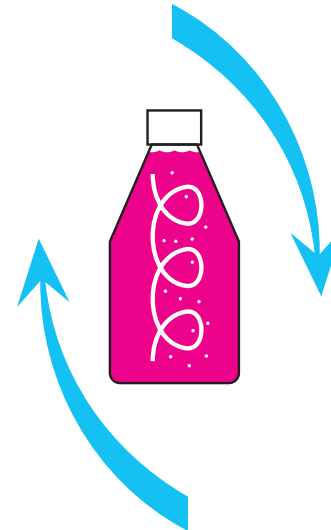
 Draw the patterns you see on your Data Table before and after the water flows around the shape.

4 EXPAND Make your own flowing water bottle. Pour the mixture from the tray into your small water bottle. Screw on the cap. Turn the bottle upside-down a few times to mix the soap and water. Observe the water flow inside the bottle.

If there's foam in your bottle, take off the cap and slowly trickle some water into the bottle. The foam will run out over the top of the bottle. When all the foam is out of the bottle, recap the bottle tightly. There should be no air space left at the top of the bottle.

5 CONCLUDE What did you notice about the way water flows?

 Record what you noticed in your Data Collection Sheet.



Discovery

Why did we do that?

- Water particles flow around objects.
- Water can form swirly patterns called turbulent flow.
- Water can also form smooth lines called laminar flow.

Congratulations!

You have earned your "Ask Me About Water" stamp! Now you are ready to tell people about water!

