Distribute additional materials and ask students to discuss their observations with their partner or group.

- How do the liquids look when dropped onto each material?
- How does each liquid react when you move it around with a toothpick on the material?
- What happens to each liquid when you tilt the material to one side?

Have students use rulers to measure how far each liquid spreads out on the coffee filter.

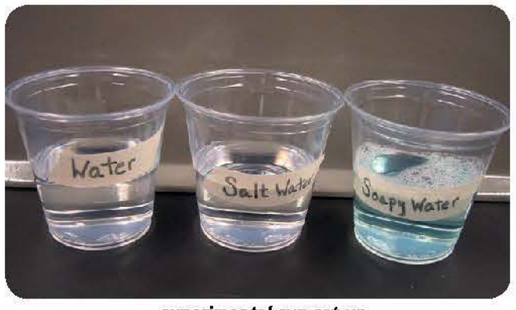
- If you quickly wave the coffee filter back and forth, do any of the liquids begin to disappear?
- Why do you think this is occurring?
- If the liquids do disappear, try adding additional drops and time how long they take to disappear completely.

Part 4
Drop, Plop

Distribute additional materials and ask students to select three objects for this experiment. Use additional cups and liquid, if necessary.

Have students drop their three selected objects into each of the liquids, making observations as they go. Students can discuss their results with their partner or group.

- What happens when each material is dropped into the various liquids?
- Which material floated? Which sank?
- Which disappeared?
- Which caused a reaction?



experimental cup set-up

References
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WRAP-UP

To wrap-up the investigation, bring your students together for a group discussion to help them understand why and how they achieved their results. It is important to share results so that everyone has a clear picture of what happened. To help you facilitate the discussion, review the explanation in "The Why and The How" using the Group Discussion questions as a guide.

Group Discussion
Explain to students that scientists learn from each other through discussion, and they build upon the work of others to make new discoveries. Just as scientists come to conclusions based on the findings of their experiments, they will now come together as a group to share their results and make conclusions about the investigations they've conducted. Have students record their final results and the explanation in their journals.

- What did you learn about water in comparison to other liquids?
- Which liquids behaved similarly/differently?
- What surprised you?
- What other liquids would you like to test?
- What new questions do you have?

The "Why" and The "How"
At first glance, the various liquids tested in this lesson look quite similar, but each has different characteristics, or properties, that make them unique. Each liquid reacts differently during a particular test. Just as each liquid has different properties, so do the other materials used in each part of the investigation. This is why the same liquid may have reacted differently on waxed paper as opposed to on a coffee filter. For example, some liquids are thin and flow or pour easily. Other liquids are thick and gooey. Honey, shampoo or corn syrup flow or move more slowly than water because of a unique property called **viscosity.** Viscosity is a liquid's resistance to flowing.

Curriculum Match-Up

- Create charts showing properties of each liquid.
- Create charts or graphs comparing how the different liquids behaved during each test.
- Create a graph for the distance each liquid spread out on the coffee filter.
- Create a graph or chart of the evaporation time for each liquid.
- Make a chart or graph of the group's findings for a particular liquid.
- Investigate other liquids and objects.
- Identify and list five ways that you use water in your daily life.

This lesson was funded in (whole or part) with federal funds from Title IV, Part B, 21st Century Community Learning Centers program of the No Child Left Behind Act of 2001 awarded to the New Jersey Department of Education.

Let's Look at Water & the Scientific Method

Learning Objectives

Students will:

1. Identify the physical and chemical properties of water.
2. Compare and contrast water to other liquids.
3. Use and demonstrate the scientific method.

Vocabulary Ventures

chemical property
field journal
hydrogen
hypothesis
liquid
observations
oxygen
physical properties
predictions
properties
scientific method
scientist
water

Water is all around us. It is the most common substance on the Earth's surface, covering nearly three-quarters of the planet. Water comes in many different forms such as rain, snow, and water vapor. It can be found in many different places such as the air, glaciers, and the human body.

All living things need water to survive. Humans need 2.5 quarts of water every day, which we get from drinking water, eating food, and breathing and absorbing moisture in the air. Did you know that up to 75% of the human body is water? Every day, the average American uses 100 gallons of water for cooking, drinking, bathing, and washing clothes, dishes and cars.

But what is water? Water is a colorless, odorless, tasteless **liquid** made of two elements called **hydrogen** and **oxygen.**

What is a liquid? A liquid is one of the three states or forms of **matter.** Any object that takes up space and has mass is called matter. Everything around you is made of matter, including the air you breathe, the water you drink and the chair you are sitting in. Liquids are fluids that typically take the shape of the container they fill. Water is different from other liquids. It is unlike any other substance on Earth, and we know this because of its unique properties or characteristics.

All matter has **properties.** Water has two basic types of properties: **physical properties** and **chemical properties.** A physical property is a characteristic that can be identified through one of our five senses (sight, touch, taste, smell, and hearing). A chemical property describes the way a substance will change or react to form another substance.

A **scientist** is a person who explores the natural world in order to better understand it. Scientists investigate different areas of science such as biology, physics or the environment. There are many different types of scientists who study the different properties of water. Some examples of scientists who study water include chemists who examine how water interacts with other elements; meteorologists who study how water interacts with the atmosphere to create weather conditions; and ecologists who study how water is connected to the environment.

The **scientific method** is a set of techniques that scientists use to investigate something interesting or puzzling. You can follow these steps to research almost anything:

1. Develop a question about something interesting, puzzling or problematic.
2. Gather information about your questions.
3. Form a **hypothesis** (a proposed explanation or an educated guess) and make **predictions** based on the information gathered.
4. Perform experiments and make observations to test the hypothesis and predictions.
5. Analyze your findings or results of the experiments.
6. Make conclusions based on the findings.
7. Share the results of your investigation.

The human body is made up of 75% water.

Good scientists use their senses to investigate the topics they are studying; however, because some substances are harmful, we will not be using our sense of taste during these experiments. Scientists also record their **observations,** questions, predictions, results and diagrams in a **field journal** so they may refer back to them at a later time.

Time Needed to Conduct Investigation
This investigation has four parts.
Organize and set up materials: 10 minutes
Introduce the lesson: 10 minutes
Conduct the investigation: 30 – 40 minutes
Student journaling/group reflection: 10 minutes
Total estimated time: 60 – 70 minutes

Investigation: Getting Our Feet Wet

Materials

For groups of four
Student journals and writing tools

Part 1
- Ten 9 oz clear plastic tumblers
- 200 mL measuring cup or beaker
- Masking tape
- Pen
- ½ liter bottle with tap water
- Paper towels
- Sponges for cleanup

Choose two of the following liquids:
- ½ liter white vinegar
- ½ liter baby oil
- ½ liter seltzer
- ½ liter salt water (¾ cup of salt mixed with ½ liter of water)
- ½ liter soapy water (½ liter of water mixed with liquid soap)
- Karo syrup

Part 2
- All materials from Part 1
- Popsicle sticks
- Plastic spoons

Part 3
- All materials from Parts 1 and 2
- Straws or eyedroppers
- Waxed paper
- Aluminum foil
- Brown coffee filters
- Dry sponges (no scrubber side)
- Toothpicks
- Rulers

Part 4
- All materials from Parts 1, 2, and 3
- Additional 9 oz cups

Students will choose three of the following objects:
- Raisins
- Biodegradable starch packing peanuts
- Styrofoam packing peanuts
- Beads
- Corks
- Sugar
- Salt
- Baking soda

TIP
Familiarize yourself with the lessons before you do them with your students. This way, you will know what outcomes to expect.

TIP
This lesson can be done over two days.
Gather all materials before you begin.

Part 1
Making Sense of Water

GET READY!

Brainstorm
Ask students what they think of when they hear the word "water". Record your students' answers on a flipchart or blackboard. Your students will record ideas in their student journals.

Ask students to share what they know about water:
1. What is water?
2. Where does water come from?
3. Why is it important?
4. What makes water different from other types of liquids?
5. Who studies water, and how?

PROCEDURE

Inform your students that they will be conducting several experiments using parts of the scientific method to learn about some of water's unique physical properties. Ask students to identify the steps to the scientific method as they conduct the investigation.

After your students complete this investigation, bring them together for a group discussion to reflect upon their results before moving on to the next part. Remind students that, as a good scientist would do, they should share their findings for each activity, and record the results in their student journals.

1. Before you begin the investigation, ask students to choose two liquids from the materials list to compare with water.
2. Fill each of the cups with 100 mL of the three liquids (two choices plus plain water).
3. Label each cup of liquid with masking tape.

SAFETY TIP
Instruct students NOT to stick their noses directly into the cups because some materials are hazardous to inhale directly. Use the wafting technique by holding the cup with one hand and waving the other hand over the opening of the cup to draw the odors towards the nose.

the wafting technique

PREDICT

Much in the same way that scientists use the scientific method to investigate something interesting, students will make predictions in this experiment based on what they already know about water.

Have your students predict what differences and similarities they expect to find between water and the other liquids in this experiment.

OBSERVE

Ask students to make some simple observations and record them in their student journals in the chart format provided:

- How does each liquid look?
- What is the color?
- Is it runny or thick?
- Do any of the liquids have an odor?
- What is the texture? How does each liquid feel when you rub the liquid between your fingers?

SAFETY TIP
Explain to students that they should never touch any substance in these experiments unless the facilitator informs them that it is safe to do so.

Part 2
This Way and That Way

Distribute additional materials and ask students to use the popsicle sticks and plastic spoons to make various observations.

- How does each liquid look when you stir it with a popsicle stick?
- What does each liquid do when you swirl it around in the cup using a circular motion?
- How does each liquid behave when you scoop it up with a spoon?
- What happens when you drop each liquid back into the cup from the spoon?
- Do the liquids make a sound?

Part 3
A Little at a Time

Have students use eyedroppers or straws to pick up the liquids and drop, a little at a time, onto the various materials provided.

TIP
To pick up liquid using the straw, have students dip one end of the straw into the liquid and place a fingertip over the other open end of the straw, then lift the straw out of the cup.

straw dropper technique