

CLASSROOM ACTIVITY

Clean Water

OBJECTIVES

Students will be able to:

- **Sequence, describe, and illustrate** each step that public water systems use to treat water.

OVERVIEW

In this activity, students will be able to describe different water treatment methods used to provide safe drinking water to their community. They will discover different types of inorganic materials that could be suspended in their water before the treatment process, and view living organisms found in local water samples under a microscope. Students will be able to identify the closest water treatment plant to their school and determine if their tap water from home comes from this plant or whether their water comes from a private ground water well. After conducting research, students will create an infographic summarizing the major steps involved in the water treatment process.

NATIONAL STANDARDS

Next Generation Science Standards

1. **Interdependent Relationships in Ecosystems**

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Common Core Language Arts

2. **Integration of Knowledge and Ideas**

Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words to address a question or solve a problem.

BACKGROUND

Have you ever wondered where the water in your kitchen faucet comes from? How often do you drink water straight from your refrigerator or tap? According to the United Nations, by the year 2030, forty percent of the world's population will not have access to clean drinking water. Many people around the world are forced to drink untreated or unfiltered water directly from streams and rivers which are full of living organisms and harmful bacteria. Modern water treatment facilities are designed to remove these harmful organic and inorganic materials and ensure

the water is safe to drink. The United Nations reports that the world needs to quadruple the pace of water treatment improvements to meet the targets of sustainable development goal 6—clean water and sanitation. Did you know that 30% of treated water is lost in aging infrastructure? That is a staggering percentage and a solvable problem. The focus this year for World Water Day 2023 is “accelerating change.” The change that we need can be accelerated by working collaboratively with foreign and domestic governments, private industry, and activists like you to ensure equal access to clean drinking water as a basic human right.

KEY VOCABULARY

- Colloid
- Coagulation
- Flocculation
- Sedimentation
- Ions
- Turbidity
- Potable
- Sludge

MATERIALS

- 1 beaker filled with tap water
- 1 beaker filled with dirty river (pond) water
- Microscopes
- Microscope slides
- Cover slips
- Pond water identification guide
- Student Resource—*Cleaning Water*

TEACHER PREPARATION

- Collect a sample of dirty river or pond water
- Prepared slides of river water samples
- Set up microscopes around the room

PROCEDURE

1. Begin the activity by showing students the two beakers filled with water. Ask students which water they would rather drink. Students will obviously choose the clear water. Remind them that most people in other parts of the world have no choice at all. Ask students to predict what might be in the river water that is making it so brown and dirty. Share with students that inorganic materials like clay, silt, sand, and minerals are suspended in the water making it brown in appearance.

2. Ask students if they think living organisms are present in the water. Invite them to share what kinds of organisms they think may be present and examine the river water under a microscope. This could be set up in advance or students can prepare their own slides depending upon time. Have students work with a partner to identify organisms in the water sample using a pond water identification guide. Generate a class list of organisms that were observed by having students record them on the board.
3. Explain that all these suspended particles (organic and inorganic) floating in the water are known as colloids and these colloids together cause a state of cloudiness known as turbidity. Did you know that there is a relationship between turbidity and the risk of getting a disease? Ask students to predict what that relationship would be. Research shows that if the turbidity increases so does the risk of illness. For example, according to the CDC around 1.3 million people around the world each year get cholera and over 100,000 people die from it. Cholera is caused by a bacterium that causes symptoms like diarrhea, vomiting, and leg cramps. People with severe cases can rapidly lose body fluids leading to dehydration and shock. Without treatment, death can occur within hours.
4. Have students work with a partner to generate a list of ideas or processes that could remove the colloids suspended in the water. Invite students to share their ideas and record them on the board.
5. Discuss the difference between a water treatment plant and a wastewater treatment plant. A water treatment plant generally takes water from ground, surface, or rainwater sources, makes it drinkable and distributes it to water storage tanks or directly to people. Whereas a wastewater treatment plant generally collects sewage from your house and other wastewater (and in some cases stormwater) from various sites, cleans it, and releases it back into the environment at a safe level for humans, fish, and plants to be around.
6. Share with students the name of the closest water treatment plant to the school. Share that over 13 million people in the United States get their water from a private ground water well instead of a public water system. Ask students if they know where their tap water comes from.
7. Distribute the student resource *Cleaning Water* to each student. Students can work with a partner, in small groups, or individually to create the infographic. Review the goal and criteria for the assignment. Depending upon student familiarity with the free infographic websites, a demonstration of how to select a template to modify may be required.

EXTENSION

As an extension of this activity, have students identify how far their house is from the nearest water treatment plant and determine where monitoring sensors could be placed to track the amount and location of possible water leaks due to the aging infrastructure.

Sources

- [Organisms Found in Pond Water](#)
- [Publications, Data, & Statistics | Drinking Water | Healthy Water | CDC](#)
- [Water Treatment | Public Water Systems | Drinking Water | Healthy Water | CDC](#)
- [How Do Water Treatment Plants Work?](#)
- [World Water Day](#)
- [Beneath the Surface: A Deep Dive into the World of Water](#)
- [After the storm | Beneath the Surface | BBC StoryWorks](#)
- [The Film—Thirst for Power](#)

How do water treatment plants make water safe to drink?

Goal: Create an infographic that answers the question. When creating an infographic, you should include engaging visuals to communicate information quickly and clearly, but also help the viewer understand and remember the content.

Infographic Criteria:

1. Coagulation & Flocculation
 - Description of process
 - List reasons why this step is necessary
 - Identify common chemicals used
 - Illustration of step
2. Sedimentation
 - Description of process
 - Identify the product produced in this step and what is done with it
 - Illustration of step
3. Filtration
 - Description of process
 - Identify substances still present in the water at this point of the process
 - Identify the materials needed for this process. What materials could be used to improve smell and taste?
 - Illustration of step
4. Disinfection
 - Description of process
 - Identify substances still present in the water at this point of the process
 - Identify three treatments used in this process
 - Illustration of step
5. Leak Detection
 - Describe three methods to preserve the loss of water before it reaches the consumer
 - Include diagrams for each method

Free Infographic Sites to Use:

- [Canva](#)
- [Piktochart](#)
- [Venngage](#)

Possible Resources

- [Water Treatment | Public Water Systems | Drinking Water | Healthy Water | CDC](#)
- [WSO Water Treatment Grade 1: Coagulation & Flocculation](#)
- [How Do Water Treatment Plants Work?](#)