

Introduction to Water Quality Testing

Lesson 8

Objectives

The student will be able to do the following:

- Recall types of pollution (dirt, soaps, fertilizers, etc.)
- Be able to use scientific terms for pollution (nitrate, phosphate, turbidity, bacteria, heat)
- Understand and define other water quality parameters (pH, dissolved oxygen, biological oxygen demand)
- Become familiar with the water quality tests

Materials

- Water quality testing materials, one kit per group
- Worksheet for each group or each student
- Cups and Styrofoam plates (if desired to keep things contained) or paper towels

Background

This unit builds on the introduction to water pollution. Students will use the water quality tests to determine if there is any pollution in tap water, to become familiar with using the water quality tests.

Advance Preparation

Ensure that water quality kits have enough materials for each test. One kit per group is provided. Each group should have a copy of the directions, which is provided in the kits.

Each group should have a reporting sheet.

For the coliform test, a few cups of water should be left standing over night to allow any excess chlorine to evaporate.

Procedure

1. Start with a very short review.
 - What is pollution? Pollution can be any materials (or things – such as energy) that are added to the environment that HURT the environment.
 - Why do we care about pollution? – Living things get sick or die
 - Where can we find pollution? – Air, Water, Land, Noise
 - How does pollution get into the stream? – Directly, indirectly
 - Remember the 9 kinds of pollution from the previous lesson:
 - i. Dirt,
 - ii. Too many nutrients (fertilizer),
 - iii. Too many nutrients (soaps),
 - iv. Oil/gasoline,
 - v. Bacteria,
 - vi. Heat,

- vii. Pesticides/chemicals
 - viii. Organic matter
 - ix. Trash
2. Talk about which ones you can test. Testing for oil/gasoline and pesticides/chemicals are difficult, so we will test for the other things. Things like trash are directly observed, so we don't use water quality tests to look at these.
 3. Explain that we will test for 8 parameters:
 - Dissolved Oxygen
 - i. Animals and plants that live in water need oxygen in the water to survive. Some types of pollution – like too many bacteria – and some types of invasive species – like invasive plants and fish – can use up too much oxygen. Dissolved Oxygen is not a type of pollution, but it can tell us if there are other pollutants in the water.
 - Biological Oxygen Demand (BOD)
 - i. Although we can't test directly for organic matter, we can test indirectly to determine if there is too much demand on the oxygen in the water. Demand would come from organisms, and organisms can be stimulated to grow by the presence of organic matter.
 - Too many nutrients from fertilizer (Nitrate)
 - Too many nutrients from soap (Phosphate)
 - Dirt/Sediment (Turbidity)
 - To see if there is any acid (from trash) or soap in the water
 - i. pH is a measure of whether the water is acidic (like a lemon or vinegar) or basic (like when the water has soap in it and you can't get it off your hands). pH can be used to tell us indirectly what is in the water. For instance, acid can come from a lot of types of trash or chemical pollution. Bases can come from fertilizers.
 - Bacteria
 - i. This is called Coliform
 - Heat, by taking the temperature
 4. Explain that we will practice using these tests with tap water before we go outside to test the stream for these. Make some hypotheses – what do they think will be in the water? For tap water, there should be no nitrate, phosphate, turbidity, or bacteria. pH should be around 7 and dissolved oxygen and BOD should be good to excellent. We will simply record temperature.
 5. Break students into groups and distribute each test kit.
 6. Have each group fill up cups of water from the drinking fountain.
 7. Each member in the group should help, but as a group they are responsible for conducting each test:
 1. Dissolved Oxygen and Temperature
 2. Nitrate
 3. Phosphate
 4. pH
 5. Turbidity

6. Coliform and BOD – both of these must be set aside. This student MUST label and carefully place these tests so that they can be checked in 2 days (coliform) and 5 days (BOD).
8. Each group will be responsible for doing each test, recording the results, and reporting the results to the rest of the group.
9. After students have finished all of the tests, pull the group back together to get all results and discuss whether results matched their hypotheses. Given that there will be results from 10-11 groups, this can be a good time to discuss the importance of repetition.
10. To record results, it would be good to make a large table (11 groups x 11 parameters). For each group, record:
 - Dissolved Oxygen Result
 - DO Rank
 - pH result
 - pH rank
 - Temperature
 - Nitrate result
 - Nitrate rank
 - Phosphate result
 - Phosphate rank
 - Turbidity result
 - Turbidity rank
11. In 2 and 5 days, the additional results and ranks for coliform and BOD can be added to the tables, respectively.
12. Students should make a determination about the tap water. Is the water quality poor or good? Is it safe to drink?

Water Quality Testing

- To know if there is pollution in our water, we have to do tests of the water quality. These tests will tell us if pollution is present and about the health of the water.
- We will practice using the water quality tests using tap water.

Directions:

1. Each group will get a water quality kit. Label the kit with your names and group name. Take a look at what comes with your kit. Make sure you have all of the materials. Do not lose any materials. Be careful with glass tubes.
2. Inside the kit are tests for several water quality parameters. Your group needs to do every test:
 1. Dissolved Oxygen and Temperature
 2. Nitrate
 3. Phosphate
 4. pH
 5. Turbidity
 6. Coliform and Biological Oxygen Demand
3. There are enough tests so that each person in a group can have a chance to try a test. Just do one of each test and save the rest of the tabs for later. **WORK AS A GROUP.**
4. Record your results in the table on the back. Make sure every field is filled in. Some tests need to be checked after several days.
5. When it is time to discard the water quality tests, dump the water into the sink with lots of running water.
6. Make sure that all tubes, cards, and other materials are put back into the kits. The kits are your responsibility!

Tap Water Test Results

Water Quality Parameter (what we're testing)	Color in the tube	Number associated with each color (write down your units!)	Water Quality Rank
Dissolved Oxygen (DO)		ppm _____ % Sat. _____	
Nitrate			
Phosphate			
pH			
Temperature			
Turbidity			
Biological Oxygen Demand (BOD) Day and Time for test to be finished _____		BOD ppm _____ DO ppm _____ Difference between BOD - DO ppm _____	
Coliform Bacteria Day and Time to be checked: _____		Word that describes the color (circle one): Positive Negative	

What is the quality of the tap water at Hokulani Elementary School? _____