From the Mountains to the Estuary: From the Schoolyard to the Bay

Meaningful Watershed Experiences for Grade 6 Students

Created by:

Prince William County Public Schools
Providing A World-Class Education

Potomac Environmental Research and Education Center
George Mason University
perec.gmu.edu

With grant support from
The NOAA Bay Watershed Education Training (B-WET) Program

National Oceanic and Atmospheric Administration
NOAA
U.S. Department of Commerce

In partnership with:

National Wildlife Refuge System

Occoquan Bay National Wildlife Refuge
Manassas Battlefield National Park

National Park Service

Guided Inquiry

Vernier Probeware Activities

"Who Contaminated the Water?"

Overview

Using Vernier LabQuest hand held technology; students will analyze water samples to determine the pH, turbidity, and conductivity. Students will analyze their data to determine which location the water sample probably came from on a watershed map.

Materials

- Distilled water
- Lab wipes, tissues, lint-free cloth
- Three large containers for water samples
- Four cups or beakers for each group of students
- Lemon juice
- Soil
- Salt
- Spoon
- pH Probe
- Turbidity Probe
- Conductivity Probe
- LabQuest

Teacher Note

Before the class, prepare three water samples for the students to use.

Sample A: 1000 mL distilled water with one teaspoon of soil
Sample B: 1000 mL distilled water, four teaspoons spoonful of soil, a pinch of salt, and two drops of lemon juice
Sample C: 1000 mL distilled water, two teaspoons of soil, a few pinches of salt, and eight drops of lemon juice

Test water samples with probes to make sure that:

1. conductivity readings increase from A to B to C
2. turbidity readings increase from A to C to B
3. pH readings decrease from A to B to C

Setting the Stage

Show your students the nitrogen cycle watershed map (figure 2.1). Explain that scientists visited this location and collected water samples. The problem is, instead of labeling the samples with a 1, 2, and 3 like on the map. The mistakenly labeled the samples A, B, and C. The students will need to be detectives to see if they can determine where the water quality samples came from.

Acquisition of Learning

1. Hand out data collection sheet to each group of students.
2. Explain that using water quality testing probes, your group needs to gather data about the water samples A, B, and C and see if you can figure out where the water samples came from on the map.
3. Hand out four beakers to each of the groups. Have the students label three of the beakers A, B, and C. Have them label the fourth beaker distilled water.
4. Pour the correct sample of water into the beakers with that label.
5. Explain that the first quantity that they are going to measure is pH. What is pH? *How acidic or basic a solution is, if less then 7 acidic, more then 7 is basic, 7 is neutral*

6. Show the students how to use the pH probeware (see *Using the Vernier LabQuest with the pH Sensor*). Plug probe into LabQuest, rinse the pH probe in distilled water beaker, then dip pH probe into sample A. Record the number on the data sheet.
7. Rinse the probe in distilled water beaker and repeat process for B and C.
8. Replace pH probe and bring out conductivity probe. What does conductivity mean? *measures ability to conduct heat or electricity* Explain that this probe measures presence of ions, including salt Na+, Cl-
9. Insert probe into LabQuest. (see *Using the Vernier LabQuest with the Conductivity Sensor*). Rinse probe in distilled water beaker. Place probe into Sample A, swirl probe and record data.
10. Rinse probe in distilled water and repeat for Sample B and C.
11. Rinse probe in distilled water and replace in box.
12. Remove Turbidity probe. What does turbidity measure? *How clear the water is*
13. Carefully take out clear vial. Stir sample A and fill vial with water (the meniscus should be at the top of the line).
14. Holding the vial by the lid, wipe sides of vial with lint-free cloth. Make sure the vial is dry before putting into sensor!!
15. Holding the vial by the lid, line up arrows and place vial into sensor. Record reading after 3 seconds. (this reading will change as materials settle)
16. Rinse vial with distilled water and repeat procedure for Samples B and C.
17. Rinse vial with distilled water and replace sensor in box.

Data Analysis

1. Have student groups record their data on the board at the front of the class. Look for any possible outliers. If you find outliers discuss the importance of taking three trials.
2. These represent multiple trials. Have students take the median of the class data and record this number on their data sheet.

Closure

1. Once the medians are found have students conclude where they think each water sample came from. *(A from location # 1; B from location #2; C from location #3)*
2. Explain how they came to this conclusion. *(Discuss point and nonpoint pollution, importance of keeping accurate records during data collection)*

Name:_____

	Sample A Group	Sample A Class Median	Sample B Group	Sample B Class Median	Sample C Group	Sample C Class Median
pH						
Conductivity						
Turbidity						

Based on the data your class collected from the water samples. From where on the watershed map do you think each sample was collected? Write the correct number for each sample.

Sample A= Number___

Sample B = Number ___

Sample C = Number ____

Explain how your team came to these conclusions: _____

_____

_____

_____

_____

_____

	pH			Conductivity			Turbidity		
Sample	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Group 1									
Group 2									
Group 3									
Group 4									
Group 5									
Group 6									

Figure 2.1 Overview of the aquatic nitrogen cycle and sources of pollution with nitrogen