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Chemistry 511
Classroom Activity

Water Chemistry Lesson:

Overview

If we rely only on our eyes and nose, we sometimes miss important indicators of water quality. Chemistry provides another way to inform our perception of water quality. By testing the water of a stream we get an immediate numeric indication of the chemical composition of the stream at that point in time. Each test tells us specific information. We will perform some basic water-chemistry analysis. This lesson should provide students with an opportunity to observe the temperature, pH, and dissolved oxygen in water. Free flowing stream water should be cooler than the air. It should have a neutral pH because there is a narrow band that supports life. It should have enough oxygen for creatures to breathe. Some of the chemical solutions used in these tests are strong acids or bases, and some are toxic. Wash affected areas immediately if students spill any of the solutions on themselves. Ask students to report any spills immediately. Also ask students to report any broken glassware or problems with equipment or apparatus.

Objectives

Students will:

- * Use chemical testing as a means of assessing water quality.
- * Learn sampling techniques and "in the field" testing techniques.
- * Explore two testing techniques and compare them.
- * Learn about specific chemistry tests for water quality.

Concepts

This lesson is basic guided activities to provide a baseline understanding of water chemistry. The fifth grade students will understand the importance of "in the field" sampling techniques. Learn how our eyes and nose can fool us when beginning to think and learn about water quality. Explore two testing techniques, and their relative import to local water quality. Understand that there are specific chemistry tests that give us exact information about a single parameter of water quality. Understand how and why biological indicators denote water quality over time and chemical testing indicates water quality at the moment of the test.

PA Educational Standards

Related PA Proposed Environment and Ecology Standards

Environmental Health

- * Identify various examples of long-term pollution and explain their effects on environmental health.
- *Identify diseases that have been associated with poor environmental **quality**.

Ecosystem and their Interactions

- * Explain how human activities affect local, regional and national environments.
- * Describe what effect consumption and related generation of wastes have on the environment.

Humans and Environment

- *Explain how human activities affect local, regional and national environments.
- *Explain how a particular human activity has changed the local area over the years.

Materials

1. A sample bottle for collecting water for each station
2. Testing kits
3. Thermometer
4. pH meter
5. Recording materials
6. Clean water to rinse the equipment
7. Watch or stopwatch
8. Waste bottle or bucket with lid if many students participate
9. Surgical gloves
10. Eye protection
11. Bucket for washing hands
12. Boots to take samples
13. Antiseptic solution to wash hands after the sampling

Set Up

Scout and prepare testing stations. Look for safe access, interesting context, and a place to run the tests comfortably. Specific instruction for students to follow for each test should be located at the testing station. Review the instructions with your student before you begin the test. Instruct chaperones and students regarding issues of safety and use of the kits prior to the test. Follow the instructions carefully.

Estimated Duration

The field time: one to one and a half hours. To use the chemical testing equipment properly, students require a minimum of one class period to practice before the fieldtrip. Invite the chaperones to learn the techniques at the same time. Schedule class time after the fieldwork to analyze and discuss the data collected.

Lesson Plan

Class setting

Prepare to work in small groups in this outdoor workshop. Before the fieldtrip teachers must explain the procedure for water chemical analysis, and demonstrate how to use the equipment. Students must rehearse using the chemical testing equipment, and learn of the importance of documenting the data and of working as a team.

Discussion

Almost everything on earth is soluble in water. Imagine that all the things that could dissolve into water when it rains on our watershed, consequently becoming part of it. Discuss the parameters for which we will be testing, and discuss how we compare different streams to determine health or quality. Brainstorm the human activities further up in the watershed that might have affected our results. Discuss how humans can protect water quality.

Key Words

1. Alkalinity
2. chemical
3. chloride
4. dissolved oxygen
5. monitoring,
6. nitrate and phosphate
7. pathogenic monitoring
8. pH

Activities

Activity 1: Choosing a Site and Running Chemical Tests

Key Question:

How do you use the equipment to test for temperature, pH, and DO?

Demonstration and Discussion

The teacher must review the procedure for water chemical analysis. Explain the safety issues related to working with chemicals. Indicate specific locations for students to test. Review temperature, pH and Dissolved Oxygen and ask students to explain what each indicates about water quality. Each group must discuss water testing procedures and outcomes at the specific location. Observe students' conversation. Ask the chaperones and other participants to join this conversation. The basic activities are below.

1. Collect **water** samples from at least two areas of the stream or two different streams.
2. Test the **water** samples at the designated sites.
3. Record all observable data in the Field Book.

Activity 2: Evaluation

Key Questions:

What do your results indicate?

Discuss what might affect the analysis of stream quality.

Discuss the relationship between the concept of clean water and good scientific fieldwork, teamwork, and documentation.

Discuss what they have observed and what they have learned by pooling results. Each group will share their results on a chart. Class will compare findings.

Chemical analysis gives us a momentary glimpse of water quality in time. Students should consider the time of day and weather, as well as how these factors could affect the results. Students should be able to explain all findings in their journal. Ask students to cite evidence for who/what uses the stream, when they use it, and what impact it has had on the stream environment.

1. *What kinds of wild life use this stream?*
2. *How do people use the stream?*
3. *Can a street, a park or a group of nearby houses affect results?*
4. *Does it change at different times, days of the week or seasons?*
5. *Discuss how human impact is effecting the stream environment.*
6. *Does it change at different times, days of the week or seasons?*

Clean up

Carefully place all used chemicals and wastewater in the waste bottles to take them back to the school for proper disposal. Students need to wash hands with antiseptic.

http://3r2n.cfa.cmu.edu/new/education/brownfields/pdf/Module_3_Stream_environment/Module_3-3.pdf