Is our water healthy?

Time Period: 2-3 class periods over several weeks
National Benchmarks: Benchmarks 5A: Diversity of Life; 5D Interdependence of Life; 5E: Flow of Matter and Energy; 9B:Symbolic Relationships; 9D:Uncertainty; 12B:Computation and Estimation; 12D:Communication Skills; 12E:Critical-Response Skills.
National Science Content Standards: *Science as Inquiry: A*; *Life Science: C*: Biological Evolution; The Interdependence of Organisms; Matter, Energy, and Organization in Living Systems; *Science and Technology: E:* Abilities of Technological Design; Understandings about Science and Technology; *Science in Personal and Social Perspectives: F:* Population Growth; Natural Resources: Environmental Quality; Natural and Human-induced Hazards; Science and Technology in Local, National, and Global Challenges
New York State Standards: 1, 2, 3, 4, 5, 6, 7

Objective: Students will decide whether their local stream or the larger Hudson River are healthy, using chemical and physical characteristics, and be able to collect data to support or negate their hypotheses.

Lesson Outline:

1. Students test water quality parameters at a local stream, pond, or other aquatic system.
2. Students return to the aquatic ecosystem to take repeat measurements.
3. Students compare their data with current HR-ECOS data.

Materials:

Metersticks
Measuring tape
Thermometers (air and water)
Orange
Stopwatch
Waders or appropriate shoes
Dissecting trays, tweezers, nets to observe benthic material (optional)
Test kits for DO, phosphates, nitrates, pH, chloride and other appropriate tests
Goggles, gloves
Data sheets- stream/river, pond/lake, chemistry, hypothesis sheets

Preparation: Prepare the students using lesson 1 in this module. You should also decide whether you want to include macroinvertebrates in your survey. If so, use the collection techniques in the lesson titled "An Aquatic Ecosystem" in Module 1.

Engage: Show students a map of the local watershed and/or the Hudson River watershed. Ask: What do you know about the water quality here? How could you find out? How often do you have to test? Where? What else would you have to know? Together with students, define baseline data. Review safety procedures for outdoor work.
Explore 1: In groups, students will test the water quality and make observations about the physical characteristics of a stream or pond (optional: macroinvertebrate collection). Data sheets

are provided for both types of ecosystems. Based on the size of your class, you will want to assign groups different variables to test. Decide as a class how you want to sample the stream; do you want to split groups up to sample different areas, or will everyone work in one area? Visit the stream and allow the students to gather their respective data for about 20 minutes (or when all groups seem finished with the survey). All students should do a detailed site drawing.
Explain 1: After you return to the classroom, discuss student findings. What did students notice? If students collected macroinvertebrates, discuss the connections between the organisms that live in/near stream with the physical characteristics of that stream.

Explore 2: When students have discussed the initial surveys, allow time in their groups to develop hypotheses. Have the group hypothesize how each stream characteristic that they observed might change (or not) over the course of the year, at different locations, or whatever other variable you decided to use. Conduct the second and subsequent testing during the remainder of the school year.
Explain 2: Students may or may not be able to measure physical changes or chemical changes. If possible, return to the stream a few more times to collect more data. Encourage students to determine the validity of their data based on the limitations of a school setting (ie limited class time, inability to measure during a storm, at the source of pollution, etc). While students are writing up their lab reports, they are asked to think about the difference between a 'bend' and a 'break' in an ecosystem (a temporary vs a permanent change). If this is a difficult concept for students, spend some time discussing what this might mean for a stream versus a larger ecosystem such as a river. Ask students to classify different environmental problems as 'bends' or 'breaks'.
Extend: Students can create a presentation on their research for community members or other audiences within the school.
Evaluate: Students turn in the completed hypotheses and data sheets, along with a lab report.

Comments: