Aquatic Water Sensor Project Lesson Plan

Investigating Streams and Water Quality

Lesson Objectives:

1. The students will design and build a river system.
2. They will manipulate the flow of water in the system to study the biotic and abiotic factors that influence water quality.
3. Students will understand how environmental factors can affect the well-being of the river system.

Target Grade Level: Middle school through high school; this lesson could be modified for grades K-5th by modifying the levels of questions and hands-on activities.

Science TEKS;

- 6th Strand E - Organisms & Environments; Knowledge & Skills, #12 - Organisms & Environments, E - Describe Biotic and abiotic parts of an ecosystem in which organisms interact.
- 7th Strand B- Matter & Energy, Strand E- Organisms & Environment; #5- Matter & Energy- (C) Diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids; #8- Earth & Space-(C) Model the effects of human activity on groundwater and surface water in a watershed; #13- Organisms & Environments...living organisms must be able to maintain balance in stable internal conditions in response to external and internal stimuli.
- 8th Strand E- Organisms & Environments; #11- Organisms & Environments... interdependence occurs among living systems and the environment and those human activities can affect these systems.
- Aquatic Science- (C) Knowledge and skills: 2.G-H; 3.A,E; 4.B; 5.A-D; 6.A; 9.A-C; 10.A-C; 11.A-B; 12.A
- Biology- (C)Knowledge and skills:11.A-C; 12.A-F
- Chemistry-(C)Knowledge and skills: 10A-b & I

Materials Needed:

A. **Project Supplies**
   a. Plastic tubs
   b. Plastic tubing
   c. epoxy
   d. ½ horse pump
   e. gravel
   f. water
   g. vinyl gutter

B. **Water Testing**
    a. Water conditioner
    b. Sensors, probes or water quality kits which are used to measure: temperature, pH, dissolved oxygen (DO)
    c. water sample containers

Engagement:

A. Videos:

Watershed:
http://video.google.com/videoplay?docid=-856176073243460523
water quality:
http://www.youtube.com/watch?v=nh7Ye3c4o9c
Middle School Level Water quality:
http://www.youtube.com/watch?v=xeH0uklc7ns

B. Student directed questions:

a. How could I build a river system using plastic tubs, tubing and a pump.?
b. What kind of design would be best for testing water quality in the stream?
c. What biotic and abotic factors will I use?
d. What supplies will I need?
e. What kind of test should I run to test water quality?
f. What factors do I think will influence water quality?

Exploration:

A. Students will research river systems:
    a. They will design and construct a simple river system.
    b. The river system will provide a place for the students to see what factors influence water quality.
    c. Students will use water quality sensors, probes or kits to monitor this system with the goal of collecting data on the water quality of their stream.
    d. The student will collect data over a two week period to see what factors are changing in their river system.
    e. Students will change variables and predict outcomes.
B. Questions which may be used to encourage and/or focus students' exploration :
    a. What type of fish would be best suited for the river system model?
    b. What type of substrate will be best suited for our river system?
    c. Which water quality tests should be used to test our system?
    d. How will the number of fish effect the water quality of our system?

Explanation:

A. Use at least 2 higher order thinking questions to solicit STUDENT explanations and help them to justify their explanations.
    a. What impact do the environmental factors monitored have on an aquatic system?
    b. How does the abiotic and biotic factors influence the water quality of the system?
    c. What were some of the factors that influenced the data collected/
    d. How does water quality in a stream impact you?

Elaboration:

A. Students will develop a more sophisticated understanding of the concept through the following activities:
    a. Students will research river systems, design and build a river system in the classroom and collect water quality data.
    b. Students will change variables(number and kinds of fish, substrate, flow of water, and temperature) and predict outcomes.

B. Scientific terminology to be introduced and to enhance/connect to students' observations;
    a. Water quality
    b. pH, temperature, DO
    c. river system
    d. Rate of flow
    e. watershed

C. Application of this scientific knowledge in our daily lives:
    a. How could the simple river system affect the way you use water?
    b. Why is water quality important to our everyday lives?
    c. What benefits to our watershed would obtained by studying water quality?

Evaluation:

How will students demonstrate that they have achieved the lesson objective?

a. Build a river system that can model a real river with abiotic and biotic factors.
b. Keep a detailed lab journal with pictures, drawings and recorded data.
c. Complete a formal lab report
d. Students will present their project to the class