

Reading the River 2004

Water – A Unit for 3rd Grade

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Grade Level: 3rd

Objectives

In this lesson, students will:

- 1) identify aquatic organisms
- 2) assess the relative environmental quality of a pond based on indicators of pH, water temperature and the presence of a diversity of organisms.

Program of Studies

Scientific Inquiry

- Ask simple scientific questions that can be answered through observations.
- Use simple equipment (e.g. water chemistry kits), tools (nets), skills (e.g., observing, pouring), and mathematics in scientific investigations.
- Communicate ...results of scientific investigations

Conceptual Understandings

- Organisms' patterns of behavior are related to the nature of organisms' environments. There are many different environments (e.g., ponds, deserts, rain forests) on Earth that support different types of organisms.

Applications/Connections

- Recognize how science helps to understand characteristics of (e.g., density, size) and changes in populations.
- Examine how science fosters understanding of issues (e.g., use, misuse, availability, distribution) related to natural resources.
- Demonstrate how the study of science (e.g., ecology, chemistry) helps explain changes in environments (e.g., pollution).

Core Content

The Characteristics of Organisms

- SC-E-3.1.2 Organisms have basic needs. For example, animals need air, water, and food; plants need air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met.
- SC-E-3.1.3 Each plant or animal has structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.

Organisms and Their Environments

- SC-E-3.3.2 The world has many different environments. Distinct environments support the lives of different types of organisms. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

- SC-E-3.3.3 All organisms, including humans, cause changes in the environment where they live. Some of these changes are detrimental to the organism or to other organisms; other changes are beneficial (e.g., dams built by beavers benefit some aquatic organisms but are detrimental to others).

Materials

Identification books (e.g., *The Golden Guide to Pond Life*)

Habitat survey checklists

Water monitoring kits and/or equipment (temperature probes, pH kits, DO kits)

Nets and tubs

Magnifying glasses

Tweezers

Student copies of Macroinvertebrate Keys

Student worksheets

Activity Procedure

1. Assemble students at the outdoor pond. Instruct students on how to minimize the potential for damaging the habitat and encourage care in their collecting techniques. Emphasize that all wildlife is to be returned to its habitat unharmed.
2. Begin the activity by observing the water. Identify organisms on the surface and in the depths. Using the sampling equipment (nets, tubs, etc.), have the students collect as many different forms of animal life as possible. Place the animals to be observed in white tubs for viewing and identification.
3. Using the keys, have students record the number of macroinvertebrates found in the sample
4. Now it is time to test the water for other indicators of quality. Using the water quality test kit, have the students determine the pH and the temperature of the water as well as the air temperature and the dissolved oxygen.
5. Students return to classroom to share results. Assist the students in understanding that the values for pH, water, and air temperature affect the diversity of life forms found in aquatic environments. Help them to understand that predictions of animal diversity can be made from measurements of pH and water temperature.

Definition/Explanation of Concepts

In streams and ponds, the presence or absence of certain organisms, called indicator species, reveals much about water quality. These creatures comprise a biotic index, or number of living organisms found in an ecosystem. The absence or presence of these organisms is an indicator of water quality.

Water with numerous aquatic species is usually a healthy environment, whereas water with just a few different species usually indicates conditions that are less than healthy. The word healthy is used to indicate an environment supportive of life. Pollution generally reduces the quality of the environment, and in turn, the diversity of life forms. In some cases the actual biomass will increase due to population, but the diversity inevitably goes down.

It is important for students to recognize the tight connection between the physical characteristics of a habitat and the ability of an animal to survive in that habitat. Students also need to recognize the interdependence between organisms. They should understand that a widening circle of consequences results from harm to even one population of organisms. If students appreciate how sensitive organisms are to changes in environments, they will recognize important human responsibility to preserve conditions that are supportive of all organisms' survival.

Assessment

1. Monitor students during water sampling to help them with equipment and procedures.
2. Collect student worksheets that reflect sampling results and notes.

Extensions:

1. Based on information collected, students could research and identify plants or animals that could be introduced into our pond to improve the habitat quality.
2. Have students visit the website www.kentuckyawake.org to research an animal that is found in our area and prepare a report on it.

Reference:

This lesson was adapted from “*Water Canaries*” found in:

Council for Environmental Education. (2000). *Project Wild aquatic education activity guide (Rev. ed.)*. Bethesda, MD: Author

Lesson Context

The lesson above is sequenced near the end of a unit on Water designed for 3rd graders. The unit outline and descriptions follow.

Properties of Water

Lesson 1 – What do you know about water? Students create individual webs to indicate what they know about water. Then we will get together and share those ideas as a class and fill out a KWL chart.

Lesson 2 – How does water react on different surfaces? Students will predict and test the results of water dropped on the following surfaces: wax paper, paper towel, aluminum foil, and computer paper.

Lesson 3 – What is surface tension? Students will predict how many drops of water will fit on a penny and then test their prediction.

Lesson 4 – How does water move on a slope? Students will conduct experiments to see what happens when water moves down a slope.

Lesson 5 – What happens to water when it is heated? When it is cooled? Students will construct a thermometer and observe what happens when it is placed in hot water and cool water.

Lesson 6 – Which is more dense – hot or cold water? Students will perform experiments to show which is denser.

Lesson 7 – What happens to water as it freezes? Students freeze water in plastic vials to observe the increase in volume.

Lesson 8 – Evaporation – Students investigate the effect of surface area and air temperature on evaporation.

Why Is Water So Important?

Lesson 1 – Where does water come from? Students will take the role of a water molecule flowing through the water cycle.

Lesson 2 – Students will listen to the story *The Drop In My Drink: The Story of Water on Our Planet* by Meredith Cooper. They will write/illustrate their own stories about the water in their cup and where it has been.

Lesson 3 – How do we use water? How can we conserve? Students will keep track of how much water they use each day and develop conservation measures.

Where Does Our Water Come From?

Lesson 1 – What is a watershed? Students will look at maps of our watershed area and view a power point presentation of pictures from my Reading the River trip.

Lesson 2 – Water quality? What kinds of things affect our water? Students will brainstorm possible pollutants and their sources.

Lesson 3 – Presentation from the Sanitation district with Envirosapes to show the students exactly what is going into their water.

Lesson 4 – Testing Water Quality of school pond. Discuss the pond as a wetland habitat. What lives in the pond? How can you tell if it is healthy and safe? Students test water and identify macro invertebrates.

Lesson 5 – Field trip to the Sanitation District outdoor classrooms to have the students test the waters and see hands-on demonstrations for water conservation.

Lesson 6 – Read *A River Ran Wild* by Lynne Cherry – try to get students/parents involved in and excited about community involvement by supporting the local Doe Run Lake Clean-up in April

Lesson 7 – Culminating Projects

Sources for this Unit

Council for Environmental Education (2000). *Project WILD Aquatic education activity guide (Rev. ed.)* Bethesda, MD: Author

Delta Education (2000). *Full Option Science System (FOSS)*

Student Worksheet 1
Macroinvertebrate Tally

Group 1 Taxa		Group 2 Taxa		Group 3 Taxa	
Water Penny Larvae		Damselfly Nymphs		Blackfly Larvae	
Mayfly Nymphs		Dragonfly Nymphs		Aquatic Worms	
Stonefly Nymphs		Crane Fly Larvae		Midge Larvae	
Dobsonfly Larvae		Beetle Larvae		Pouch Snails	
Caddisfly Larvae		Crayfish		Leeches	
Riffle Beetle Adults		Scuds			
Other Snails		Clams			
		Sow Bugs/Isopods			
Number of taxa present		Number of taxa present		Number of taxa present	
Times index value of (3)=		Times index value of (2)=		Times index value of 1=	

Instructions: Put a 1 next to every macroinvertebrate that you find. Total them up under the number of taxa present and then multiply that by the times index value of 3,2,or 1. Then add each of those values to find the Cumulative Index Value below.

Cumulative Index Value = _____

Overall Quality Assessment

0-11	Poor
11-16	Fair
16-21	Good
21-30	Excellent

Other Test Results

Date _____

Time _____

Water Temperature _____

Air Temp. _____

pH _____

DO _____

