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Oklahoma State Department of Education

Water Detectives: A Study in Water Quality

AREA OF SERVICE	Health and Public Safety
COMMUNITY NEED	Clean Water and Conservation
TYPE OF SERVICE	Direct, Indirect, Advocacy
SUBJECT AREA/LEVEL	Geography 6/12; Science/5-12
CONCEPT	Analysis



SERVICE-LEARNING PROJECT SUMMARY

This middle and secondary school project uses student learning from a study of science processes and inquiry to address the need for clean water and conservation. Participating students will paint community storm drains, host a hazardous waste collection day, and advocate for clean water.

LEARNING STANDARDS

Oklahoma Priority Academic Student Skills

Science

Process Standard 1: Observe and Measure

Process Standard 3: Experiment

Process Standard 4: Interpret and Communicate

Standard 5.2: Structures of the Earth and the Solar System – Water, which covers the majority of the Earth’s surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle.

Geography

Standard 3: the student will examine the interactions of physical systems that shape the patterns of the earth’s resources.

Standard 5: The student will evaluate the interaction between humans and their environment.

Standard 6: The student will analyze problems and issues from a geographic perspective using the tools and skills of geography.

Water Detectives: Implementation Outline



- 1. Under teacher direction, students will taste and examine a variety of water samples.**
- 2. Teacher will guide students to analyze water samples.**
- 3. Teacher will guide students to visualize the world's limited availability of fresh water.**
- 4. Teacher will present information related to the concept of analysis through lecture, text assignments, experiments, and guest speakers. Topics will include the scientific process and inquiry, water characteristics, and water conservation.**
- 5. Under teacher direction, students will practice and demonstrate their new learning and understanding of topics outlined in #4.**
- 6. Students will identify a need in their community and design service project(s) that utilize the knowledge and skills developed in #4 and #5.**
- 7. Students will refine their service project(s), identify any local, state, or national laws, agencies, or policies that relate to the identified community need and their proposed service, and articulate the civic and public meaning of their proposed service.**
- 8. Students will implement their service project and share their accomplishments with the community.**

TEACHER'S GUIDE Water Detectives

Teacher's Note

Using the concept of “analysis,” the teacher will engage students in an active unit of study around the science topic of “water” to solve a student identified community problem. Teachers may collaborate with others to broaden student understanding of the concept including government policy analysis, mathematical analysis of variance, and analysis of literary works.



- 1. Under teacher direction, students will taste and examine a variety of water samples.**

Activity: Prior to class the teacher will collect a variety of water samples e.g. bottled water, tap water, water fountain water, and clear flavored water, distilled water. Teacher will remove all labeling from the bottles and present unmarked samples to students. Teacher will ask students to taste four different samples.

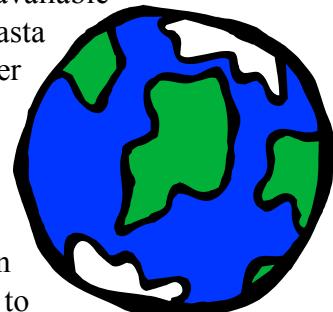
2. Teacher will guide students to analyze water samples.



Activity: Students will write a description of each of the water samples that they tested and hypothesize the likely source of the water. Students will then individually rank order their samples from 1 to 4 with 1 being most preferred and 4 least preferred. Students will orally report their preference rankings to a class recorder to determine the group's preference. Once the preferences are determined, the teacher should reveal the source of each of the samples. Ask students to compare their individual rankings to the class ranking and to compare their hypotheses with the actual data. Discuss the various sources of available drinking water.

3. Teacher will guide students to visualize the world's limited availability of fresh water.

Activity: On a table, place 100 pieces of ziti pasta. One of the 100 pieces should be colored red. Color two of the pieces green. Explain to the students that the pasta represents the world's water supply. Ask the students to hypothesize what each color represents (fresh water, salt water, or frozen water). Following the hypothesis, inform the students that the red pasta represents the available fresh water; the green pasta represents frozen water, and the remaining pasta represents salt water. Ask them to calculate what percent of the world's water supply is fresh water, salt water and frozen water based upon the ziti illustration. Create a pie chart or bar graph to illustrate these percentages. Ask students to compare their hypotheses with the actual data. Ask students to discuss the possible implications of this data on their daily lives. Remove the red pasta from the display. Ask students to imagine what would happen if the world's fresh water was eliminated or compromised. Ask students to imagine possible events, policies, or habits that could impact the world's fresh water supply. Explain to the students that while water is a necessity for living, it is a scarce resource.



4. Teacher will present information related to the concept of analysis through lecture, text assignments, experiments, and guest speakers. Topics will include science process and inquiry, water characteristics, and conservation.

Activity 1: Teacher will read *A River Ran Wild* by Lynne Cherry to encourage students to think about the value of our natural resources and what can be done to restore them.

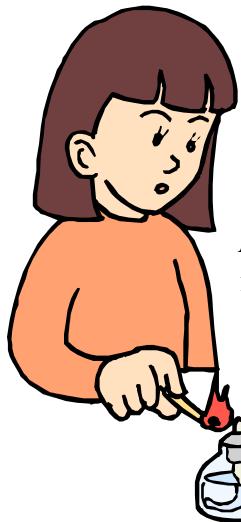
Activity 2: Teacher will lecture on characteristics and uses of water and provide information about the water cycle. Teacher will present information related to local, state, and federal water quality specifications, water pollution, waste disposal, and water conservation. Teacher will invite an employee from the local water treatment plant to discuss local water management issues or take a field trip to the plant. Teacher will conduct an experiment with students to test various water sources including the samples used in Step One.

Activity 3: The teacher will obtain a city map from the water department that clearly shows the location of storm drains in the community for student analysis of inflow and outflow of water.

5. Under teacher direction, students will practice and demonstrate their new learning and understanding of topics outlined in #4.

Activity: Students will bring three water samples from their home, neighborhood, or community for testing. Students will interpret findings and record experiment results. Students will take an objective test on characteristics and uses of water including the water cycle and laws that govern water quality and conservation. Students will write a paragraph or story about the importance of fresh water.

6. Students will identify a need in their community and design service project(s) that utilize the knowledge and skills developed in #4 and #5.



Activity 1: Students may identify a need in their community related to water to design a service project that utilizes their knowledge and skills of water, water conservation, and resource management. For assistance in designing a service or action project refer to the resources listed at the end of this unit.

Activity 2: Divide the class into groups of four or five students. Each group will plan a multimedia presentation or display board on the importance of water conservation and the hazards of dumping waste into local storm drains. Each group presentation must include a stencil design for local storm drains, which warns against hazardous waste dumping. The class will select one presentation to submit to the city council with a request for city approval to paint storm drains in the community.

Activity 3: Groups will plan or assist city officials in a local community hazardous waste collection drive to ensure proper disposal of materials.

7. Students will refine their service project(s), identify any local, state, or national laws, agencies, or policies that relate to the identified community need and their proposed service, and articulate the civic and public meaning of their proposed service.

Activity 1: Groups will create and refine multimedia presentations. Students will analyze a city map to determine actual locations of storm drains that will be painted by student groups. The teacher will assign a section of the community to each group for painting. Students will refine plans to participate in the hazardous waste collection drive. Teacher will guide students in reflection about their knowledge and skills to determine if they are included in the presentations and plan for action.

Activity 2: Students will explore the deeper civic and public meanings of their service and synthesize any formal or informal government structures or laws related to the causes or effects of the community need addressed in their project. Students will write a paragraph, essay, or journal entry that reflects their understanding of the concept of symbols related to literacy, government, and personal responsibility.

8. Students will implement their service project and share their accomplishments with the community.

Activity 1: Students will implement their project(s).

Activity 2: Each student will write a journal entry that describes any changes that have occurred as a result of participating in the service projects. Students should also estimate the number of individual hours of service in the journal entry.

INTERNET and OTHER RESOURCES

Agencies and Web sites

www.epa.gov

www.deq.state.ok.us

www.youroklahoma.com

www.owrb.state.ok.us

www.okcc.state.ok.us

Books

A River Ran Wild by Lynne Cherry