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<b>Lesson Plan Title:</b> Comparing levels, temperature, and pH of rainwater samples taken from various areas around the schoolyard while applying the scientific method.	<b>State:</b> TX
<b>Lesson Time Frame:</b> 1 week	<b>Inspired by an Earthwatch Expedition:</b> Mountain Waters of Bohemie=a
<b>Student Level:</b> Elementary	

Academic Standards

Texas TEKS

4.2 Scientific processes

The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to:

- (A) Plan and implement descriptive investigations including asking well defined questions, formulating testable hypothesis, and selecting and using equipment and technology:
- (B) collect information by observing and measuring
- (C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence:
- (D) communicate valid conclusions and
- (E) construct simple graphs, tables, maps, and charts to organize, examine, and evaluate information.

4.4

The students know how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

- (A) collect and analyze information using tools including calculators, safety goggles, microscopes, sound recorders, computers, land lenses, rulers, thermometers, meter sticks, timing balances, and compasses; and

(B) demonstrate that repeated investigations may increase the reliability of results.

Abstract

Fourth grade students will gather rainwater from 6 Rain gauges located on the school grounds. Amounts, temperature, and pH of rainwater will be recorded. Students will determine if “canopy” above the gauges has any effect on the amount of rain, pH, or temperature of the rain water.

Goal

The goal of this lesson is to apply the scientific method in experimenting with rain water samples. Each student will form his own hypothesis, make observations, record data, and draw a conclusion. Students will use lab equipment to gather data.

Performance Indicators

The student will:

- be able to explain that pH is the amount of acid found in a substance
- define “canopy” as the area above the rain gauge
- measure rainwater using a graduated cylinder
- measure temperature of rainwater
- measure pH of rainwater
- compare amounts of rainfall
- compare amounts of pH
- compare temperatures
- record data using tables or graphs
- draw conclusions based on collected data

Background Information

Students will review steps of the scientific method. Acid rain and its effects will be introduced via Earthwatch presentation of the Mountains Waters of Bohemia power point.

Materials

thermometers, rain gauges, graduated cylinders, Pocket Pal pH tester

Technology

Microsoft Power Point  
EPA Acid Rain Website  
[www.epa.gov/acidrain/site\\_kids/lucy11htm](http://www.epa.gov/acidrain/site_kids/lucy11htm)

Instructional Procedure

**Introduction**  
Students will view the EPA acid rain interactive website which introduces a story about wild life and a lake that are affected by acid rain.

### Activities

1. Put a penny in a beaker of lemon juice, observe
2. Discuss that lemon juice contains acid
3. Discuss that pH is found in water and relate to EPA website presentation
4. Inform students that they will be collecting rainwater samples at 6 sites on the school grounds. They will be testing the water for pH, temperature, and amount.
5. Discuss “canopy”.
6. Introduce question: Will rain samples from gauges set in various areas of the schoolyard all have the same pH, temperature and amount?
7. Students will form a hypothesis.
8. Train students in the use of a thermometer, rain gauge, graduated cylinder, and pocket pH tester.
9. Place rain gauges in 6 areas of the school and collect samples after a significant rainfall.
10. Test and record the samples for pH, temperature, and amount.
11. Students use tables or graphs to record data.
12. Repeat process two more times.
13. Compare results.

### Closure

#### Scientific Convention

Students share their data and conclusions with class members. Students will develop posters to encourage activities which reduce acid rain.

### Assessment

### Rubric

Students are rated from 1 – 3

1 = needs improvement

2 =needs assistance

3 =mastered

The student:

reads a thermometer

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uses a graduated cylinder

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uses a Pocket pH tester

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is able to follow the scientific method

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is able to form a hypothesis

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keeps a journal of data	-----	-----	-----
is able to form a conclusion	-----	-----	-----
is able to explain acid rain	-----	-----	-----
is able to explain canopy	-----	-----	-----
is able to apply information by creating a poster which encourages actions which reduce acid rain	-----	-----	-----

**Connections**

This experiment could be added to water system unit which would include the water cycle.

**Extensions**

Students may create a power point to encourage activities which would reduce acid rain. The power point could be presented during the school's Open House.