

Teacher Led POST Activity: Math Watershed Program

Subject Area: Math

Grade Level: 5th-8th

Duration: 1 hour

Unit Title: *Watersheds: Through the Mountain to the Valley*

Lesson Title: Graphing the Field Trip Data

Objectives

Students will be able to:

- Organize pH and temperature readings from 4 water collection sites: 2 at Deer Creek Center and 2 at Oregon Caves NM.
- Create a bar graph revealing pH and temperature data.
- Note differences in pH and temperature between field trip sites and between collection sites within the same field trip site.
- Understand the changes in water's pH and temperature as it travels further from its source.

Materials/Resources

- Lined paper
- Graph paper
- Pencils
- Ruler
- Chalk board and/or overhead
- Optional: calculator

Anticipatory Set

Ask Students:

- What water quality measurements did you collect during your field trip?
- Do you notice any trends within the data?
- How could you organize the data collected?

Objective/Purpose

Data is most useful when organized in a way that is easy to read and understand. Collecting data over a period of months or years will allow us to recognize and track any changes or trends

in temperature or pH taking place at the field trip sites. Explain to students that they will compare pH and temperature readings collected during the field trips to Oregon Caves National Monument (OCNM) and Deer Creek Center (DCC).

Input

Monitoring is the process of collecting and organizing measurements from one location over a long period of time. In order to understand the changes that are taking place in local streams and forests, scientists must first measure the original levels of pH and temperature at specified locations. This is called setting a baseline.

You are one of the first students to participate in the *Watershed Program*, during which you collected pH and temperature readings at four collection sites. Now you will organize and display your results. Each group of students that participates in this program will add to the data which you have collected and this data will be posted on Oregon Caves NM's website. These measurements, taken over the following years, will allow us to identify any changes or trends in temperature or pH that occur in the waters of DCC and OCNM.

Model

1. Use a table like the one below to organize pH and temperature readings from the field trip.

<u>Location</u>	<u>DCC: Deer</u>	<u>DCC: Squaw</u>	<u>Caves: Inside Cave</u>	<u>Caves: Outside Caves</u>
pH				
Water Temp.				

2. Have students fill in the chart.
3. As a class, review the measurements which are displayed on the blackboard.
4. Identify any unreasonable numbers in this group of measurements (called outliers). They should be disqualified. For example, a pH reading of 2 should be disqualified since water's normal range is pH 6.5-8.5. Students would not have been able to measure the water if it was that acidic.
5. Ask students to calculate the average of the measurements within each column.

<u>Location</u>	<u>DCC: Deer</u>	<u>DCC: Squaw</u>	<u>Caves: Inside Cave</u>	<u>Caves: Outside Caves</u>
<i>pH readings</i>				
<i>pH average</i>				
<i>Temp. readings</i>				
<i>Temp. average</i>				

6. Ask students to choose either temperature or pH for the graph they will create.
7. Review the parts of a bar graph: title, labels, scale, and bars.
8. Students will create a bar graph for either the pH or temperature with 4 bars, one for each of the water collection sites.

X-axis label= water collection sites

X-axis= 4 collection sites, see labels on table above

Y-axis label= water pH or water temperature

Y-axis units= pH scale, or C⁰

Check for understanding

1. Is there a difference between temperature or pH of the creeks within one site? If so, how much is the difference?
2. Is there a difference between temperature or pH of the two field trip sites? If so, how much is the difference?
3. Remind students that they have observed water flowing out of the surface of the Earth during the field trip to Oregon Caves NM. Based on your graph, what conclusions could someone draw about water quality as it travels further from its source?

Closure

Discuss with students:

- Now you have created a graph of the data collected during your one day field trip(s). Can we identify trends from just one or two days of collecting data? How many days would we need to draw conclusions about changes in temperature and pH?
- What would happen if students in the next class did not collect water in the same locations or ways that you did? In order to use this data it must be done exactly the same way over and over again. What advice would you give to the next group of students doing this project to make sure that the data you collected is useful?

Oregon State Standards: Math (2007)

5th Grade

5.1.2

Use decimal models, place value, and number properties to add and subtract decimals (to the thousandths).

5.1.7

Construct and analyze double bar, line, and circle graphs to solve problems involving fractions and decimals.

6th Grade

6.1.2

Use and analyze a variety of strategies, including models, for solving problems with multiplication and division of fractions.

6.3.5

Represent, analyze, and determine relationships and patterns using tables, graphs, words and when possible, symbols.

7th Grade

7.2.1

Represent proportional relationships with coordinate graphs and tables, and identify unit rate as the slope of the related line.

7.2.3

Use coordinate graphs, tables, and equations to distinguish proportional relationships from other relationships, including inverse proportionality.

8th Grade

8.1.1

Translate among contextual, verbal, tabular, graphical, and algebraic representations of linear functions.

8.2.1

Organize and display data (e.g., histograms, box-and-whisker plots, scatter plots) to pose and answer questions; and justify the reasonableness of the choice of display.

8.2.3

Interpret and analyze displays of data and descriptive statistics.

Oregon State Standards: Science (2009)

5th Grade

5.3S.1

Based on observations and science principles, identify questions that can be tested, design an experiment or investigation, and identify appropriate tools. Collect and record multiple observations while conducting investigations or experiments to test a scientific question or hypothesis.

5.3S.2

Identify patterns in data that support a reasonable explanation for the results of an investigation or experiment and communicate findings using graphs, charts, maps, models, and oral and written reports.

5.3S.3

Explain the reasons why similar investigations may have different results.

5.4D.1

Using science principles describe a solution to a need or problem given criteria and constraints.

6th Grade

6.1P.1

Describe physical and chemical properties of matter and how they can be measured.

6.3S.1

Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct an investigation that uses appropriate tools and techniques to collect relevant data.

6.3S.2

Organize and display relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions.

6.3S.3

Explain why if more than one variable changes at the same time in an investigation, the outcome of the investigation may not be clearly attributable to any one variable.

7th Grade

7.3S.1

Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools and techniques to collect relevant data.

7.3S.2

Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions including possible sources of error.

8th Grade

8.3S.1

Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools, techniques, independent and dependent variables, and controls to collect relevant data.

8.3S.2

Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of a scientific investigation, and communicate the conclusions including possible sources of error. Suggest new investigations based on analysis of results.