Lesson 16

Data Analysis

Cognitive Demand:

Interpreting Concepts (C)

Recalling Science (R)

Overview:

Students will learn how to record the data that they collected into a data sheet. Then, they will combine all the class data into an excel spreadsheet; they will also learn how to analyze it, looking for trends and correlations.

Materials:

- Vernier LabQuest* with
- Temperature probe
- Dissolved oxygen probe
- Turbidity probe
- pH probe
- Or Water quality test kits
- Internet-accessible computer with web browser
- Printer, for off-line completion of data entry forms in the field

Setting the Stage

How do we know whether our streams, rivers and lakes and ocean are healthy? Or, if they are not, in which way are they unhealthy? One thing we can do is to observe with our eyes and ears, and sometimes fingers. For other ways to measure the health of these waters, we use instruments like a thermometer to measure and provide us numbers called "data" that tell us just how good, or bad, things are. Here are some examples of things we can learn -- and questions we can answer -- with water quality data:

- Temperature - Is the water too hot or too cold for some aquatic creatures?
- Turbidity - How “murky” (like coffee or pop) is their water?
- Oxygen in the Water [Dissolved Oxygen] - Is there enough oxygen for aquatic animals to breathe? Or will they be in distress and suffocate [like we do] underwater?
- pH - is the water too acidic (like vinegar) or too basic/alkaline (like egg white) for aquatic animals and plants to live comfortably?

After we record our data, if we type it into an excel spreadsheet, then we can keep it, and compare today's measurements with measurements from before or later. That way, we can tell if things are getting better or worse. Also, if we were to put our data on the internet, then others could get a copy of the data and compare or results, and see how things are different in different places near and far from here. This gives us a better picture of what's happening all over -- in one small stream or across the watershed of an entire river!

Tool to help students create graphs online: https://nces.ed.gov/nceskids/createagraph/

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Acquisition of Learning

1. Hand out copy of the blank data entry form (from booklet or in your Internet browser, navigate to www.mwcd.org/mwee).
2. Put students into cooperative groups. Explain that each group is going to collect data from their schoolyard and record it on their data sheet.
3. Take the students into schoolyard where they can sample water. If there isn't a place that has easy access to the water, samples can be collected ahead of time from a water supply that is close to the schoolyard.
4. Have the students complete the first part of the data sheet including date, time, weather.
5. Once they have recorded that information. Have them take out the temperature probe and take the air temperature.
6. Now, have the students place the probe into the water to take the water temperature. Record that data on the data sheet.
7. Repeat the procedure with the pH probe, dissolved oxygen probe, and turbidity tube.
8. Back in the classroom transfer the data to an excel spreadsheet. Teach the students how to plot a graph on excel, along with some basic data analysis concepts such as outliers (a data point on a graph or in a set of results that is very much bigger or smaller than the next nearest data point), correlation, trend, median, mean, mode etc. -visit our website for background information, and resources.

   Note: Have teacher keep the hard copies. Scientists always keep a back up to avoid data loss.

Closure

Have the students make a class graph (on excel) from the data they collected. Have them analyze the data, and results. What did the results show about the water quality? Are there any outliers? What is the median for each parameter? Compare their class data to other classes' data. It is important to understand how to enter and save data into the collaborative form. By completing the tasks above, students will gain experience in collecting and transcribing data for analysis. Local, state and federal government agencies (e.g. EPA) rely on

Student Page

data that is collected, analyzed and uploaded to make decisions on environmental

Student Data Sheet for Watershed Investigations

Your Name: _____ **Date:_____**

School / Class: _____ **Time:_____ (e.g., 11:35 am)**

Location: _____ **Air Temperature (°C): _____**

Weather Conditions (circle one): (sunny, partly cloudy, overcast, raining)

Date of last rain (if you know it): _____ How much precipitation fell? * _____

- Visit https://www.wunderground.com/ for accurate data.

Soil Moisture

Press your hands into the surrounding ground to detect **Soil Moisture** level (circle one):

(soggy, slightly moist, dry & crumbly, dry & hard, so dry the soil has cracked)

Color: Circle the color that describes most of the ground in a 20m radius from where your group is standing (brown, tan, yellow, light green, dark green)

Grass Texture: Bend a few grass blades to determine: (crispy, dry, soft, cool, flexible)

Observations of your Environment: Look around you, and under your feet. Describe what sorts of different plants, animals and other living organism that you see. Close your eyes for 30 seconds and record what types of nature sounds you hear.

_____

_____

_____

_____

_____

Evidence of Erosion: Examine all areas not covered with buildings, sidewalks or asphalt. Circle what percent of vegetated areas look eroded.

Excellent	Good	Fair	Poor
0 - 10 %	11 - 40 %	41 - 80 %	81 - 100 %

Water Quality

Water Appearance: Color_____

Clarity (circle one): clear, cloudy, muddy

Water Odor: Smells like: _____

Intensity (circle one): faint, distinct, strong

Water Temperature (°C): _____

Enter your water quality data below. Circle the range where your value falls for each parameter.

	Your Data	Excellent	Good	Fair	Poor
Dissolved oxygen ppm (mg/L)		7-11	5-6	3-4	0-2
pH		7	6 or 8		4, 5, 9, 10, 11
Turbidity (NTU)		0	0 to 40	40 to 100	100