

6.4.1 Learning Episode 5 Graphing Environmental Interactions within the Water Body

Standard 6.4.1 Episode 5	
Title: Graphing Environmental Interactions within the Water Body	Overview: Students use scientific questions to create water data graphs. Students analyze water data looking for patterns and/or cause and effect relationships.
<p>Overarching Performance Expectations (Standard): 6.4.1 Analyze data to provide evidence for the effects of resource availability on organisms and populations in an ecosystem. Ask questions to predict how changes in resource availability affect organisms in those ecosystems. Examples could include water, food, and living space in Utah environments.</p> <p>Math Standard 6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.</p>	
<p>Lesson Performance Expectations: Using a spreadsheet program, students will create graphs based on questions they have asked related to field water data measurements. Students will interpret graphs using “I see” and “It means” statements to write captions that interpret the patterns and or cause and effect relationships inferred about the data.</p> <p>CCC: Patterns, cause and effect, stability and systems</p> <p>SEP: Asking questions, Defining Problems, Analyzing and Interpreting data</p>	

GATHER	
<p>*If students were <u>unable</u> to collect field data to use for this activity, or if students want to be able to access water data collected from sites throughout the state of Utah, go to Utah Water Watch database https://uww.usu.edu. See instructions at the end of this episode that explain how to access and download this data.</p>	
<p>What are students doing?</p> <ol style="list-style-type: none"> 1. Students move into new assigned groups with two to three in a group. These students are together because they wrote the same type of question on their exit slips in the last episode. 2. Each student will need a upload a spreadsheet program. 3. Students will create a field data table that contains all the water factors that were measured. To do this they will follow teacher prompts and reference a smartboard model that is being created as the teacher prompts are being said. (or reference a table made by the teacher). 	<p>Teacher Support</p> <ol style="list-style-type: none"> 1. Organize students into new groups based on the question subject they wrote on Exit Slips. 2. Make sure students have a computer. Have them load up a spreadsheet program. 3. Project a blank spreadsheet image that the class can see. Show students how to create a table using all the field data collected by students. (If a lot of data was collected from multiple sites the teacher may want to prepare this chart ahead of time.) 4. Show students how to enhance a chart with borders, colors, font changes,

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<p>4. Modify the chart using chart tools, borders, font, colors.</p>	<p>give them time to discover these tools.</p> <ol style="list-style-type: none">5. Before students choose the data that they will graph that is specific to their question, model the selection of data on the field data table to create a smaller table.6. Read one of the student's questions written on exit slips collected at the end of the previous episode. Reference the field data table on the smartboard and ask the students which data they would select to answer this question?7. If the data selection isn't clear model rewriting the question so that the independent and dependent variables are clearly identifiable.8. Model the creation of a smaller table by copying the data on the main field data table into a smaller table. *If using Google Sheets, the x-axis value should be on the leftmost column of the table. The y value/s should be listed next to the x value. That is how Google Sheets "reads" a table to make a graph. This will make graphing straight forward when the students select insert chart to make a graph.9. Provide time for students to decide which data they will select that relates to their own group questions.10. Have students verify the selection with the teacher and then direct them to create their new charts.11. Remind students to make charts with all the bells and whistles so that are ready to be presented to the class.
<p>Teacher Preparation Sort questions collected on exit slips into categories so that students are in groups of 2-3 people based on question content. Set up projector to model how to create tables in a spreadsheet program. Computers for each student. Type and print a copy of an organized chart containing the field data that was collected. The chart will be used as a reference to copy when the teacher models and talks through the steps to create another reference chart in a spreadsheet program for students to view.</p>	
<p>Management Strategies</p>	

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Teacher talks through the steps of making a table in a spreadsheet, while someone models on a screen in front of the class. That way the teacher can better monitor student's progress and help students who are having trouble following the steps.

REASON	
<p>Student Purpose</p> <ol style="list-style-type: none"> 1. Highlight data in data table to create a graph, choose a type of graph (line, bar, pie chart) that best represents the data that relates to the question. 2. Review the graph to make sure it showcases what you are trying to graph. Modify as needed. 3. Copy graph into a word or google document. 4. Analyze and interpret the data using the “I see” followed by “it means” method to create your explanation or inference about the data. 5. Write the explanation next to your graph. 	<p>Teacher Guidance</p> <ol style="list-style-type: none"> 1. When students are ready, show students how to select a chart type and highlight the data from their table that will create the graph. 2. Students will have to decide if the graph the computer made makes sense. Questions students need to ask themselves are; <ul style="list-style-type: none"> • Is the graph type (bar, line) the best graphic to show what I was trying to test? • Are the labels in the right place? • Is all the data from the table represented? • Is the independent variable on the x-axis and the dependent variable/s on the y-axis? 3. Many graphs will not make sense, allow students time to learn from their mistakes and adjust. This is a great time for everyone to learn the nuances of a spreadsheet from one another.
<p>Teacher Preparation: https://streamsidescience.usu.edu/ou-files/SEEd-lessons/Who-What-In-the-water/Ex_data_and_chart_for_graph.pdf</p>	
<p>Management Strategy Here is a how to card for spreadsheets, these can be placed at student work stations for students who need to work at their own pace.</p>	

COMMUNICATE	
<p>Student Purpose</p> <ol style="list-style-type: none"> 1. Students combine their “I see” statement with the “it means” statement to write a caption for their graphs. 	<p>Teacher Guidance</p> <ol style="list-style-type: none"> 1. Once graph is finished have students copy the graph to a slide. 2. Have students add their question and analysis of the graph to the slide.

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<ol style="list-style-type: none">2. Students will prepare a slide from the group that shares their question, graph and conclusion with the class.3. These slides will be combined with the other groups' slides.4. Present the slide show to the class. Students will choose one representative from their group to explain to the class, the question they were asking and how they analyzed the data to explain the patterns or cause and effect relationships they discovered.	<ol style="list-style-type: none">3. Students share slides with the teacher so the teacher can create a class slideshow.4. While the teacher is preparing the slideshow, groups should select a representative to present the groups' question, graph, and analysis to the class. Students can first practice presenting to their own group members before presenting to the class.
<p>Teacher Preparation: Create a blank slideshow to insert student slides. Prepare a way students can share slides with you to create a class slideshow.</p>	
<p>Management Strategy: Ask critical questions of student presenters and their group. http://primas.mathshell.org/pd/modules/4_Asking_questions/pdf/4_Handouts.pdf pgs. 4 & 5 of this document address how to ask inquiry type questions to encourage deeper thinking.</p>	

Assessment of Student Learning: As students present slides assess that student questions are testable and match the data represented on the graph. In the analysis of the graph determine if students are describing the patterns they have identified using the specific names of factors being graphed. Determine if they can infer a causal relationship either based on graph data or other observations and/or research they have incorporated to help explain their analysis. An example graph could be air temperature as compared to water temperature. Students will recognize that when air temperature rises, so does water temperature. They would add that water temperature does not rise as quickly or cool as quickly as the air. Why the different rates could be explained if students research properties of liquids and gases as related to heat capacity.

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Example of data chart for collection of water data from Pineview Reservoir.

North End of Pineview Water Tests	9/22/2017	10/2/2017	10/16/2017	10/24/17
pH	7	7	6.5	7
Water Temperature °F	74.6	59.2	57.1	51.6
Air Temperature °F	77	52.1	48.6	47
Oxygen (mg/L)	8	8	9	9
Nitrate (mg/L)	0	0	0	0
Algae types	green	green	blue-green algae (lots)	Blue-green algae
Turbidity (NTU's)	16	12	13	14
Weather during Collection	mostly sunny	rainy and cloudy	sunny and cold	sunny
Weather Day Before	sunny	cloudy	sunny and cold	sunny

Using Data

1. Open Utah Water Watch Database (<https://uww.usu.edu>). Select “Monitoring Locations Map” on the left under Information and navigate to a site of interest. Write down the Site Name and Site ID. You will use these to find the data in the database.
2. Go to “View and Download Data” under Data Management.
 - a. Select a Tier: If your site is a stream or river, select “Tier 1 Stream”; if your site is a lake, pond or reservoir, select “Tier 1 Lake”.
 - b. Select the data range of interest.
 - c. Select the “Site ID” using the site you found on the map.
 - d. Click “Download CSV” button at the bottom
3. You will get a CSV file that you can now open in an Excel or Google spreadsheet.
4. Once you open the file, there will be a table with many fields. Select the date and additional data of interest (i.e. temperature or dissolved oxygen) and copy these to a blank worksheet.
5. Use this data to make graphs.