

(6.4.1) Learning Episode 3: Water Data Graph Analysis

Standard 6.4.1 Learning Episode 3	
Title: Water Data Graph Analysis	Overview: Students will analyze water data graphs by combining “I see” statements with “it means” inferences to create a caption that summarizes the graphed data.
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 affects organisms in those ecosystems. Examples could include water, food, and living space in Utah environments.	
Lesson Performance Expectations: Students presented with a graph will identify patterns that they see and infer an explanation that interprets the data. CCC: patterns, cause and effect SEP: Analyzing and Interpreting Data	

GATHER	
Student Purpose	Teacher Guidance
<p>1. Students look at the graph on their papers titled, <u>Graph 1: Water Temperature</u>. Students think of one thing they can “see” on the graph. When students have figured out an observation they will raise their hands to let the teacher know they can describe 1 thing about the graph.</p> <p>2. Three students will write their examples on the board for everyone to reference as a model. The rest of the class will write three “I see” statements on their own papers next to Graph 1. These “I see” statements should reflect the patterns seen on the graph, i.e., changing slopes, comparisons between amounts, highest point, lowest point, what the points represent.</p> <p>3. Students add arrows connecting “I see” statements to the spot on the graph that is being referenced.</p> <p>4. Students will further share observations in a class discussion.</p>	

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Projection of Graphs that can be written on for class to see as a model.

Management Strategies

This site gives examples for how to use the BSCS I² strategy to analyze data on a graph.

https://bscs.org/sites/default/files/_legacy/BSCS_PDI_Notebooking_Student_Version_NSTA_2012.pdf Notes for setting up this unit

REASON	
Student Purpose	Teacher Guidance
<ol style="list-style-type: none">1. Students write an “it means” inference next to one of their “I see” statements.2. Students share these ideas with each other.3. Students who heard thoughtful examples will nominate these students to write their answers on the projected class model.4. All students fill in “it means” statements on their own papers, using the class model as an example.5. Start with one student and ask if they agree or disagree with the class projected model statements. If possible, the student provides evidence for why they agree or disagree with the “It means” statement. 4 to 5 more students will provide feedback on the classroom graph.	<ol style="list-style-type: none">1. Have students think of one “it means” statement to write next to one of their “I see” statements. Have students turn and share these statements with one another. Examples: I see that the temperature increases more slowly at the beginning of the year as compared to the decrease of temperature in the fall months. It could mean that the snowmelt may have slowed the warming of the water. Or it could mean the weather was cooler in the spring than in the fall.2. Have students who listened to “it means” statements nominate students to fill in the “it means” statements on the board while the rest of the class fills these in on their own papers.3. Facilitate a class discussion using the Agreements strategy* see link below for description. 5 to 6 students are asked if they agree or disagree with the “it means” statements written on the board model. More advanced students may be able to add evidence for why they agree or disagree.
Teacher Preparation: Projection of Graph 1: Water Temperature that can be written on for the class to see as a model.	
Management Strategies: https://www.edutopia.org/blog/make-class-discussions-more-exciting-richard-curwin use this website that describes 5 ways to make classroom discussions better. In this lesson incorporate the agreements strategy	

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COMMUNICATE	
Student Purpose	Teacher Guidance
<p>Student Purpose</p> <ol style="list-style-type: none"> 1. Student groups work together to create a detailed caption for <u>Graph 1: Water Temperature</u>. Since this is their first graph, students can simplify this process by choosing their favorite “I see”, “it means” combination for a caption statement. 2. Students who understand the I² approach continue to practice their analysis with <u>Graph 2: pH</u>. 3. When students have finished <u>Graph 2: pH</u>, they should share their ideas with a partner. If they discover new facts from sharing, these facts can be added to their graphs and incorporated into the captions. 4. Direct students who finish early to write their ideas on the class model for other students to reference. 5. Have students evaluate their first two graphs by using the graph scavenger hunt check list. 6. Students will first review the check list, one student from each group can alternate reading the criteria to the class while the students evaluate their first two graphs by coloring in the smiley face they think represents how well they matched the criteria. 7. <u>Graph 3: Oxygen and Temperature</u> will be used as a student assessment. Students may do this on their own or with their practice group. 8. When students complete Graph 3 they will exchange their graphs with another group for editing. If more details are needed student groups will advise one another what can be added to make the caption more complete. Editors should ask students to define what is meant by “it” and “they” pronouns. More and less should be defined by specific measurement numbers. Patterns should be identified and inferences should infer why the pattern is 	<p>Teacher Guidance</p> <ol style="list-style-type: none"> 1. Offer a challenge to student groups. Have them work together to create a caption statement that combines the “I see” with the “it means” statements to best explain the patterns seen on <u>Graph 1: Water Temperatures</u>. If groups are struggling to combine the three statements, have them choose their favorite “I see”, “it means” combination to put together a caption. 2. Students will practice the I² approach on <u>Graph 2: pH</u>. If students need this simplified start again with “I see” statements. After these are completed, students can then focus on the “It means” inferences. At this point students may be able to do both simultaneously. 3. Direct groups to share ideas they have about graph 2. Select students to write examples on the board for <u>Graph 2: pH</u>. 4. Pass out the graph scavenger hunt check list so students can evaluate their first two graphs. Direct one student to read each part to the class (in case students have questions about the meaning of the descriptions) while students color in the smiley face that indicates how they think their graph analysis compares to the criteria. 5. <u>Use Graph 3: Oxygen and Temperature</u> as an assessment. Students can work alone or in groups to complete the analysis. 6. Students exchange graphs for peer review. Have the group critique captions by determining if the caption is a detailed description of the graph (i.e. the description includes the names of both x and y axis, titles, and numbers to analyze and infer the relationships between variables). Have peer editors use the Graph Caption Scavenger Hunt check list to help guide their critique.

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present. Editors will identify this on the Graph Caption Scavenger Hunt check list. Graphs are then returned to the original students so they can review edits and make corrections.	7. Have groups exchange graphs with checklists back to the original author for review and corrections.
Teacher Preparation: Projection of Graphs that can be written on for class to see the writing of a caption as a model.	
Copies of <u>Graph 3: Oxygen and Temperature</u>	
Copies of Graph Scavenger Hunt checklist Management Strategies: Use a Graph checklist as a scavenger hunt tool for self and peer editing. See copy below.	

Assessment of Student Learning: Use Graph 3: Oxygen and Temperature as an assessment. Students should work on these individually. Collect Graph papers when students are finished editing. Students with an advanced understanding (4) will use the axis labels to describe the relationship between variables. They will notice oxygen goes up when temperature goes down and/or vice versa. These students will include numbers when comparing measurements. Students at grade level (3) will identify the pattern of the relationship, up or down, but may not use specific numbers to compare. They will still be able to identify the variables being measured. Students at the basic level (2) will notice the up and down patterns but will explain these using pronouns (if and they) instead of using specific axis labels. Students not meeting standard (1) will reference parts that are not on the graph or are not in context with what is being graphed.

Return papers and scaffold as needed. Match 4's and 3's with 1's and 2's to help students modify their examples. Give 1's and 2's a chance to analyze a different graph to reach grade level understanding.

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Name: _____

- Instructions:
1. Observe the graphs.
 2. Write down 3 “I see” statements.
 3. Next to the “I see” statements interpret what “it means”.
 4. Combine “I see” statements & “it means” to write detailed caption.

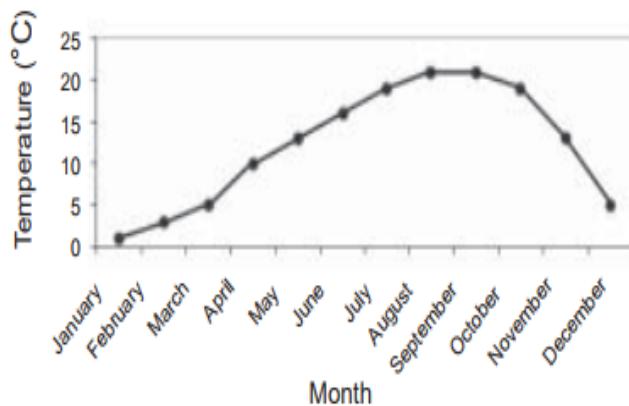
GRAPH 1: Water Temperature

I See

It Means

I See

It Means



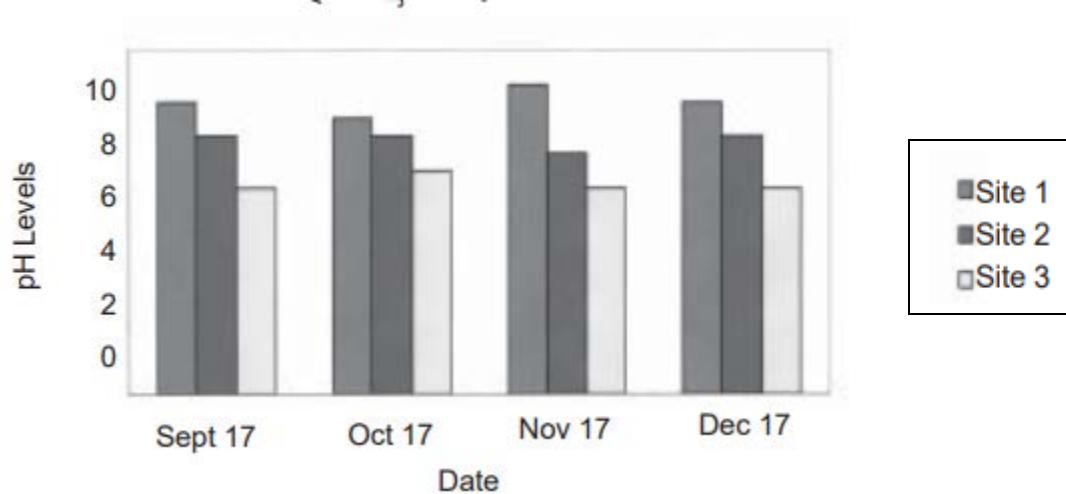
I See

It Means

Caption: (combine the “I see” and “It means” statements to write an analysis of the graph)

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Graph 2: pH

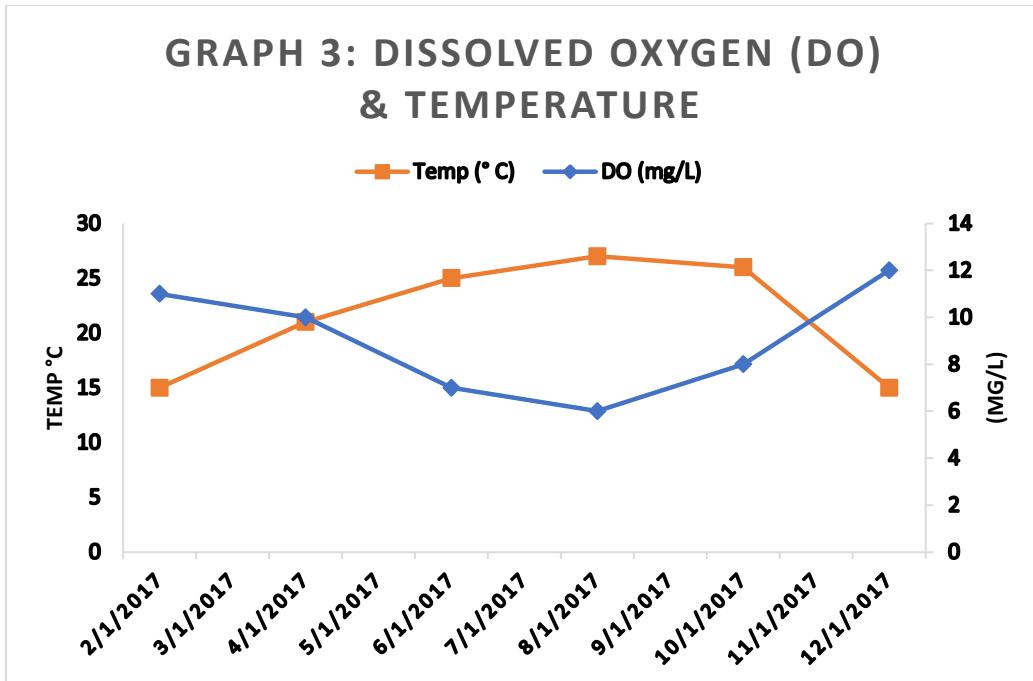


I See	It Means

I See	It Means

Caption: (combine the “I see” and “It means” statements to write an analysis of the graph)

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I See	It Means
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I See	It Means
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I See	It Means
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Caption: (combine the “I see” and “It means” statements to write an analysis of the graph)

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Graph 1: Water Temperature Caption Scavenger Hunt Check List				
Are patterns explained using words from axis labels? <i>(or are it and they used)</i>				
Are specific measurement numbers used to explain differences and comparisons? <i>(or is the description general, using the words more or less and up & down)</i>				
Is information about the whole graph described? (or is only one section mentioned)				
Are inferences made from facts found on the graph? (or do they include information we are unsure about)				

Graph 2: pH Caption Scavenger Hunt Check List				
Are patterns explained using words from axis labels? <i>(or are it and they used)</i>				
Are specific measurement numbers used to explain differences and comparisons? <i>(or is the description general, using the words more or less and up & down)</i>				
Is information about the whole graph described? (or is only one section mentioned)				
Are inferences made from facts found on the graph? (or do they include information we are unsure about)				

Graph 3: Oxygen and Temperature Caption Scavenger Hunt Check List				
Are patterns explained using words from axis labels? <i>(or are it and they used)</i>				
Are specific measurement numbers used to explain differences and comparisons? <i>(or is the description general, using the words more or less and up & down)</i>				
Is information about the whole graph described? (or is only one section mentioned)				
Are inferences made from facts found on the graph? (or do they include information we are unsure about)				

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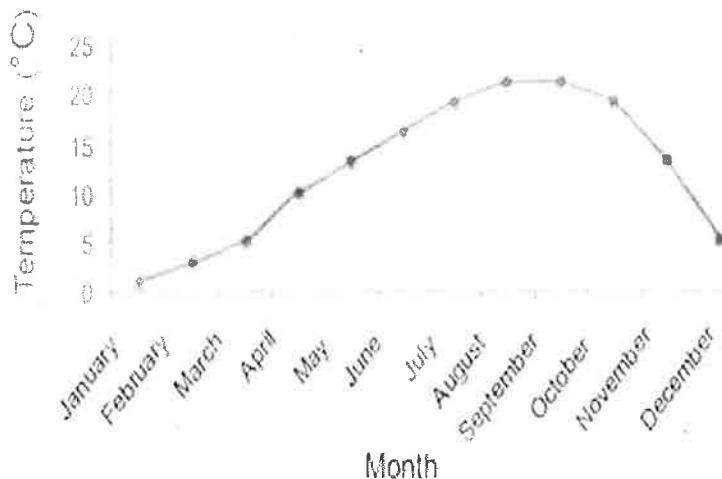
Name: _____

- Instructions:
1. Observe the graphs.
 2. Write down 3 "I see" statements.
 3. Next to the "I see" statements interpret what "it means".
 4. Combine "I see" statements & "it means" to write detailed caption.

GRAPH 1: Water Temperature

I See	It Means
<p>It is a line graph. It compares the increase and decrease of the temperatures.</p>	<p>It compares the increase and decrease of the temperatures.</p>

I See
<p>The highest part of the graph is leaning to the right.</p>
<p>It is skewed right.</p>



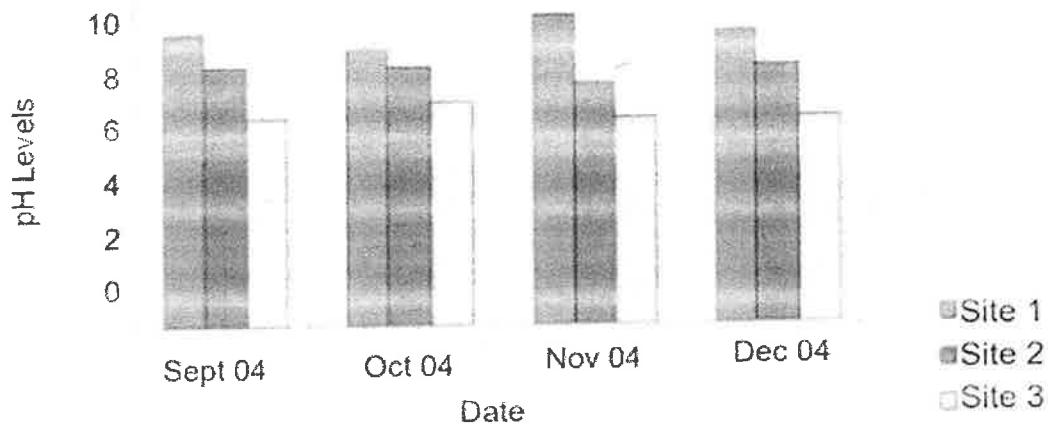
I See	It Means
<p>In the beginning and the end of the graph, the line drops.</p>	<p>It gets colder during the winter.</p>

Caption: (combine the "I see" and "It means" statements to write an analysis of the graph)

I see that this is a line graph so it means it compares the increases and decreases of the temperatures.

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Graph 2: pH



I See Site 1 has the highest bar.	It Means it has the most acidity.
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I See each month the data is different.	It Means each month the pH level changes.
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I See each month none of the sites are the same.	It Means all the sites have different pH level.
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Caption: (combine the "I see" and "It means" statements to write an analysis of the graph)

I see that site 1 has the highest pH level, which means it had the most acidity. I also see that each month the data is different, so each month the pH level changes. I also noticed that each month, none of the sites are the same, so each site has different acidity levels.

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Name: _____ 

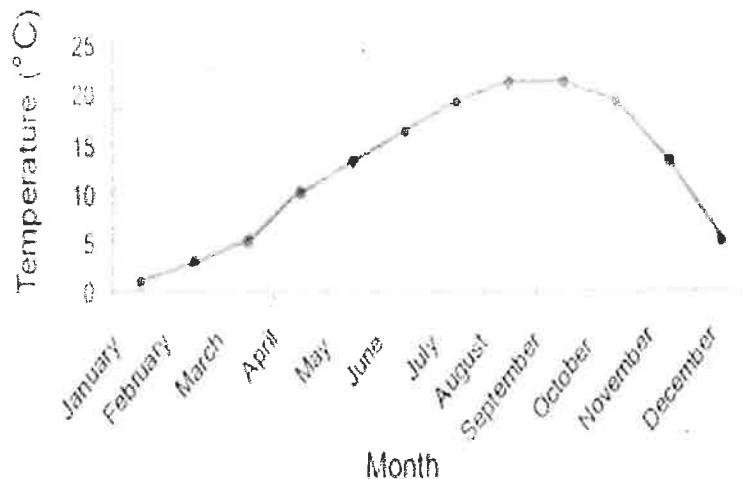
- Instructions:
1. Observe the graphs.
 2. Write down 3 "I see" statements.
 3. Next to the "I see" statements interpret what "it means".
 4. Combine "I see" statements & "it means" to write detailed caption.

GRAPH 1: Water Temperature

I See	It Means
that it is skewed left.	that it is like pulled out on the left.

I See
that the temp goes to 25°C
It Means

that 25°C is the high temp that year



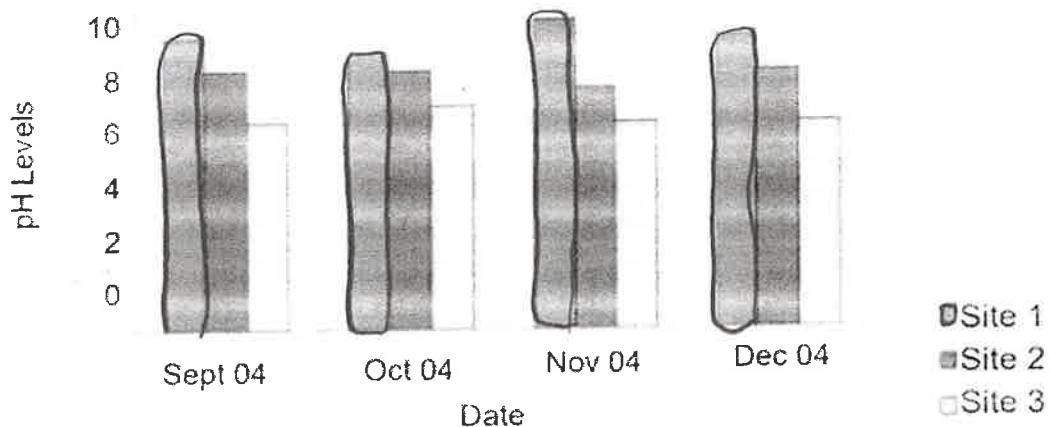
I See	It Means
that it has the months of the year.	that they are measuring the temp of the different months.

Caption: (combine the "I see" and "It means" statements to write an analysis of the graph)

I see that the months of the year. It means that they are getting hotter and then it drops really fast.

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Graph 2:



I See that it only shows 4 months of the year	It Means that they only tested for months of the year
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I See that Site one is the most every time	It Means the site on had the most acidity.
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I See ph Levels	It Means acidity Levels
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Caption: (combine the "I see" and "It means" statements to write an analysis of the graph)

I see ph levels at different sites over 4 months. It means that the acidity levels are different over 4 months.