Variations in Plants and Animals
Supplemental Math Lesson 2: Using Data to Show Variations in the Traits of Sunflowers

Grade 1	**Length of lesson:** 48 minutes	**Placement of lesson in unit:** 2 of 2 supplemental math lessons on variations in plants and animals (sequence after supplemental math lesson 1 and between lessons 2a and 2b)
Unit central question: How do differences (variations) in plants or animals of the same kind help them survive so they can produce young (babies or seeds)?		**Lesson focus question:** How can we use evidence to show that sunflowers are not all alike even though they're all sunflowers?
Main learning goal: The traits of individuals of the same kind of plant or animal can vary, and some of these traits can be measured. We can use the measurements to confirm how much variation exists in a trait.		
Science content storyline: Plants of the same kind, such as sunflowers, have traits that make them similar to one another. All sunflowers have roots, stems, leaves, flowers, and seeds. However, the traits of individual sunflowers, such as petal color, stem length, and seed size, can vary. We can observe, describe, compare, and measure some of these variations. When we measure trait variations in sunflowers, we collect more precise evidence (data) so we can document these variations. After collecting more data, we can display this evidence in a variety of ways, such as using a data table and a bar graph.		
Ideal student response to the focus question: When we look carefully, we can see that all sunflowers aren't exactly alike. For example, the petals and seeds of sunflowers aren't all the same color, some sunflowers are taller than others, and some sunflower seeds are bigger than others. We can describe the differences or variations in sunflowers, but it's better to measure the traits if we want to collect the best evidence. Then we can record our measurements on a data table and create a bar graph to help us compare the data so we can tell exactly how much taller one sunflower is than another sunflower.		

Preparation

Materials Needed
- Student notebooks
- Chart paper and markers

Student Handouts and Teacher Masters
- 1.1 Sunflower Posters (from supplemental math lesson 1)
- 1.2 Trait Variations in a Sunflower—Data Table (from supplemental math lesson 1)
- 2.1 Word Wall (Teacher Master) (laminated , 11 × 17")
- 2.2 Sunflower Bar Graph (1 per student)

Ahead of Time
- Review the content background document.
- Prepare handout 2.2 for display on a document reader or use it as a model to create a bar graph for the sunflower data on chart paper.
- **ELL support:** Meet with ELL students in advance and introduce them to the lesson content, structure, materials, and activities so they know what's expected of them and can participate more fully in the lesson. Identify vocabulary words in the lesson plan to review with students in advance, including *bar graph*, *measure*, *measurement*, *data*, *data table*, *accurate*, *accuracy*, *survive*, *survival,* and *environment*.

Lesson 2 General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	**Link to previous lesson:** The teacher engages students in reviewing the sunflower traits and variations they measured in the previous lesson.	• The traits of individual sunflowers, such as stem length, flower size, and leaf length, can vary, and we can observe and measure these variations.
2 min	**Lesson focus question:** The teacher reviews the focus question from the previous lesson: *How can we use evidence to show that sunflowers are not all alike even though they're all sunflowers?* Then students share how measuring the three sunflowers helped them answer this question.	
5 min	**Setup for activity:** Students review the sunflower measurements they recorded on a data table in the previous lesson. Then they consider other ways they might display their data.	• Variations in the traits of individual sunflowers, such as stem length, flower size, and leaf length, can be measured and recorded on a data table. We can display this data in other ways, such as on a bar graph.
15 min	**Activity:** The teacher and students work together to construct a bar graph using the height measurements of three sunflower plants on the class data table. Then students describe what the bar graph shows about trait variations in sunflowers.	• Variations in sunflower traits, such as stem length, can be measured and recorded on a data table and then displayed on a bar graph. A bar graph shows quantitatively, and therefore more accurately, the variations in sunflower traits.
10 min	**Follow-up to activity:** Using the bar-graph data, students compare variations in the stem length (height) of sunflower plants and make more accurate statements about those variations.	• Variations in sunflower traits, such as stem length, can be measured and displayed quantitatively on a bar graph. Using this data, we can state exactly how much taller one sunflower is than another sunflower. This evidence shows that sunflower traits can vary from one sunflower to another.
10 min	**Synthesize/summarize today's lesson:** Using data from the bar graph, students summarize what they learned about variations in the height trait of three sunflower plants. Then the teacher revisits the focus question, and students use evidence from the sunflower investigations to answer it.	• Plants or animals of the same kind have variations in their traits. Some traits can be measured, and we can use the measurements to confirm how much variation exists in a specific trait.
1 min	**Link to next lesson:** The teacher announces that in the next lesson, students will explore traits and variations in snakes.	

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5 min	**Link to Previous Lesson** **Synopsis:** The teacher engages students in reviewing the sunflower traits and variations they measured in the previous lesson. **Main science idea(s):** • The traits of individual sunflowers, such as stem length, flower size, and leaf length, can vary, and we can observe and measure these variations.	Make explicit links between science ideas and activities.	**Show slides 1 and 2.** In our last lesson, we measured a trait in three sunflower plants and recorded our measurements on a data table to find out whether that trait showed any variations. What trait did we measure? **NOTE TO TEACHER:** *Encourage students to use the word* trait *in their responses (e.g., "We measured the stem-length or height trait in the sunflowers").* What variations did we find in that sunflower trait? **NOTE TO TEACHER:** *Encourage students to use the word* variations *in their responses (e.g., "There were variations in the height trait of the sunflowers. One sunflower was taller than the*	We measured the tallness of the sunflowers. We measured how tall the sunflowers are. The height trait. The stem. One of the sunflowers was really tall, one was short, and one was in the middle.	What do you mean by "tallness"? What trait were we measuring? When we measured the height trait of the plant, what part of the plant did we measure? Can you use our

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			others, one was shorter, and one was in between. None of the sunflower was exactly the same."). If students also measured the other traits (flower size and leaf length), have them respond the same way. Today we'll explore another way we can display our sunflower evidence so we can describe the height variations we observed more accurately.	We found variations in the height of the sunflowers. One was tall, one was short, and one was in the middle.	science word *variations* in your answer?
2 min	**Lesson Focus Question** **Synopsis:** The teacher reviews the focus question from the previous lesson: *How can we use evidence to show that sunflowers are not all alike even though they're all sunflowers?* Then students share how measuring the three sunflowers helped them answer this question.	Set the purpose with a <u>focus question</u> or goal statement.	**Show slide 3.** Today's focus question is the same as the previous lesson: *How can we use evidence to show that sunflowers are not all alike even though they're all sunflowers?* How did measuring the three sunflowers help us answer this focus question last time? In this lesson, we'll learn more about how evidence can help us show that all sunflowers aren't the same even though they share many	It helped us compare the heights of the sunflowers so we could show that sunflowers aren't exactly alike.	

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			traits.		
5 min	**Setup for Activity** **Synopsis:** Students review the sunflower measurements they recorded on a data table in the previous lesson. Then they consider other ways they might display their data. **Main science idea(s):** • Variations in the traits of individual sunflowers, such as stem length, flower size, and leaf length, can be measured and recorded on a data table. We can display this data in other ways, such as on a bar graph.	Make explicit links between science ideas and activities **before** the activity. Engage students in analyzing and interpreting data and observations.	**Show slide 4.** Let's look at our data table from last time. What did we record on our table? **NOTE TO TEACHER:** *If you recorded flower sizes and leaf lengths on the data table, review those results as well.* What does our data table show us about one trait of the sunflowers and variations or differences in that trait? What does our data or evidence tell us about the height of the three sunflowers?	We recorded how tall the sunflowers are. Our table showed that the sunflowers are different heights. One sunflower is tall, one is short, and one is in the middle. The numbers aren't all the same. The numbers	Say more about the numbers not being the same. What do those numbers represent?

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				represent our measurements. The numbers represent the height of the sunflowers. Maybe we could use a number line. Could we use a graph?	Who can explain how numbers can be the same as measurements?
			Do you think there's another way we could show our measurements so we can compare them? Think about what we've done in math class to compare numbers. Good idea! To help us compare our height measurements for the sunflower plants, we could a graph. The kind of graph we'll use today is called a *bar graph*.		
15 min	**Activity** **Synopsis:** The teacher and students work together to construct a bar graph using the height measurements of three sunflower plants on the class data table. Then students describe what the		**NOTE TO TEACHER:** *If students have constructed bar graphs before, engage them in the process as much as possible. If not, help them understand what each axis represents on the graph and how the bars show their measurements (data/evidence). If students have recently used bar graphs in math or reading, you might begin the activity by showing them an example they're familiar with.*		

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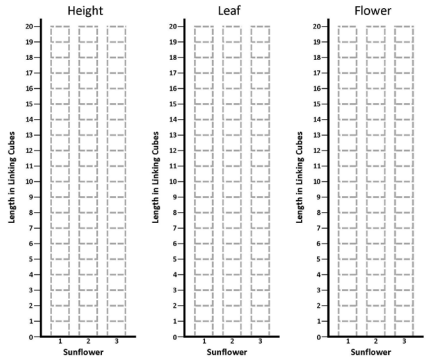
	bar graph shows about trait variations in sunflowers. **Main science idea(s):** • Variations in sunflower traits, such as stem length, can be measured and recorded on a data table and then displayed on a bar graph. A bar graph shows quantitatively, and therefore more accurately, the variations in sunflower traits.	Select content representations and models matched to the learning goal and engage students in their use. Make explicit links between science ideas and activities **during** the activity.	**Show slide 5.** The bar graph we'll make today looks like the bar graphs on this slide. First, we'll use the height measurements we recorded on our data table to make a bar graph showing the heights of the three sunflower plants. Then we'll compare our results. **NOTE TO TEACHER:** *Display a copy of handout 2.2 (Sunflower Bar Graph) on a document reader and have students help you complete it using the height measurements from the data table. (Alternatively, create a bar graph on chart paper.) If time allows, have students draw the bar graph for the height data in their science notebooks and walk them through the activity.* 		

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		Engage students in analyzing and interpreting data and observations.	Let's look at the height measurement for Sunflower 1 on our data table. How tall is Sunflower 1 in number of units? How tall should I make the bar on our graph? **NOTE TO TEACHER:** *Ask the same questions for Sunflowers 2 and 3 to complete the bar graph.* Now that we've constructed our bar graph, let's talk about what it shows us. What does the graph tell us about the height of each sunflower? Do the bars on the graph show traits or variations? How do you know? **NOTE TO TEACHER:** *If time allows and you recorded measurements for flower size and leaf length on the data table, create bar graphs for these variations as well and discuss the results with students.*	Sunflower 1 is *X* units tall. The bar should be *X* units high. Sunflower 2 is the tallest, and Sunflower 3 is the shortest.	How do you know? What's your evidence?

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			 Listen to students' ideas. What's visible about student thinking?		
10 min	**Follow-Up to Activity** **Synopsis:** Using the bar-graph data, students compare variations in the stem length (height) of sunflower plants and make more accurate statements about those variations. **Main science idea(s):** • Variations in sunflower traits, such as stem length, can be measured and displayed quantitatively on a bar graph. Using this data, we can state exactly how much taller one sunflower is than another sunflower. This evidence shows that sunflower traits can vary from one sunflower to another.	Make explicit links between science ideas and activities **after** the activity. Engage students in analyzing and interpreting data and observations. Engage students in constructing explanations and arguments.	**Show slide 6.** **NOTE TO TEACHER:** *Post the three sunflower posters near the bar graph so that students can compare them.* Before we use our bar-graph results to help us describe variations in the height trait, let's look our three sunflowers again. How do you know all of the plants on these posters are sunflowers? **ELL support:** ELL students may find it confusing to jump back and forth between similarities and variations, so make sure to ask questions separately and help them transition between these contrasts. What traits are the same? Are these sunflowers *exactly* alike?	Because they look like sunflowers. They have a pretty yellow flower and a tall stem. The flower color and shape traits are the same. No. The sunflowers aren't the same	What do you mean by "they look like sunflowers"? Tell me more about the traits that are the same.

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				height. Variations. The bar for Sunflower 2 on the graph is bigger than the others. The graph shows us variations in the height trait.	What do we call traits that aren't the same? What evidence do you find on the bar graph that shows the sunflowers aren't the same height? What do you mean by "bigger"? How much bigger?
			So what variations in a sunflower trait does the bar graph show us? Yes, the sunflowers have variations in the height trait. **Show slide 7.** Now let's use our bar graph to help us accurately describe variations in the height trait of sunflowers.		

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			What do the bars on this graph show us? What evidence does the bar graph provide?	The bars show us the different heights of the sunflowers. A short bar on the graph means that the sunflower is short, and a tall bar means the sunflower is tall. We can see how tall the sunflowers are by looking at the numbers on the graph.	What does each bar show? Any other ideas?
		Engage students in analyzing and interpreting data and	Before we measured our sunflowers, we could look at the posters and say that Sunflower 2 is the tallest and Sunflower 3 is the shortest. But now we can say *how much* taller Sunflower 2 is than Sunflower 1 and 3 because we measured the variations in height. **Show slide 8.** What does the graph tell us about these variations? Exactly how tall is each sunflower? **ELL support:** Be explicit about representing variations in specific units as opposed to more	Sunflower 2 is *X* units tall. Sunflower 3 is *X*	

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		observations.	general terms (e.g., "Sunflower 2 is taller than Sunflower 1"). How does the height of each sunflower compare to the heights of the other sunflowers? **NOTE TO TEACHER:** *Model the math and then invite students to use the data on the bar graph to do the same computations. For example, "Sunflower 2 is* X *units taller than Sunflower 1," and so on. You might record on the bar graph the differences in the measurements* between *the bars to show the variations from one plant to another (i.e., how much taller one plant is compared to another).* **Show slide 9.** Is it more accurate to say that Sunflower 2 is *taller* than Sunflower 1 or that Sunflower 2 is exactly *X* number of units taller than Sunflower 1? Why do you think so? How does our bar graph help us describe variations in a trait more accurately?	units tall. Sunflower 1 is *X* units tall. It's better to say that Sunflower 2 is *X* units taller. It's what a scientist would say. We can say exactly how much taller a	Tell me more about that.

<table>
<tr><th>Time</th><th>Phase of Lesson and How the Science Content Storyline Develops</th><th>STeLLA Strategy</th><th>Teacher Talk and Questions</th><th>Anticipated Student Responses</th><th>Possible Probe/Challenge Questions</th></tr>
<tr><td></td><td></td><td></td><td></td><td>sunflower is than another sunflower, and that’s better.

The bar graph shows us the size and the numbers.</td><td>What do you mean by “better”?</td></tr>
<tr><td>10 min</td><td>Synthesize/Summarize Today’s Lesson

Synopsis: Using data from the bar graph, students summarize what they learned about variations in the height (stem-length) trait of three sunflower plants. Then the teacher revisits the focus question, and students use evidence from the sunflower investigations to answer it.

Main science idea(s):
• Plants or animals of the same kind have variations in their traits. Some traits can be measured, and we can use the measurements to</td><td>Engage students in making connections by synthesizing and summarizing key science ideas.

Engage students in analyzing and interpreting data and</td><td>Show slide 10.

  Embedded Assessment Task

Draw this chart in your science notebooks and make sure it fills the whole page.

<table><tr><th>Sunflower Trait</th><th>Variations in This Sunflower Trait</th></tr><tr><td>Height (stem length)</td><td></td></tr></table>
Next, I’d like you to draw pictures showing the variations in the height trait of the three sunflower plants.

Use the measurement from the data table or bar</td><td></td><td></td></tr>
</table>

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	confirm how much variation exists in a specific trait.	observations.	graph for each sunflower to label each drawing. Then write a sentence that describes your drawing. **Show slide 11.** Let's look at the example on the slide: **Labels:** • Sunflower 2 is [X units] taller than Sunflower 1. • Sunflower 2 is [X units] taller than Sunflower 3. **Sentence:** My drawing shows that the three sunflowers have variations in the trait of height. They aren't exactly alike even though they're all sunflowers. **NOTE TO TEACHER:** *If appropriate, encourage students to compute the variations in height (e.g., Sunflower 2 is 4 units taller than Sunflower 1). Help them make sense of the variations mathematically by doing something like this: Sunflower 2 is 6 units tall, and Sunflower 1 is 2 units tall. 6 − 2 = 4, so the difference is 4. That means Sunflower 2 is 4 units taller than Sunflower 1.* **Show slide 12.**		

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		Highlight key science ideas and focus question throughout.	Our focus question is *How can we use evidence to show that sunflowers are not all alike even though they're all sunflowers?* What evidence did we collect to show that sunflowers aren't exactly alike? How did we display our evidence? What two ways did we show the variations in our three sunflowers? How did the bar graph help us show variations in the height trait of the sunflowers?	We measured how tall the sunflowers are. We measured the trait of height in the sunflowers. We used a data table to record our measurements and then we showed our data on a bar graph. It helped us see how much taller or shorter one sunflower is than another sunflower.	Can you use the word *trait*?
1 min	**Link to Next Lesson** **Synopsis:** The teacher announces that in the next lesson, students will explore traits and	Summarize key science ideas.	Today we learned more about how evidence can help us show variations in the traits of sunflowers. We already knew that sunflowers aren't all the same, but the bar graph we created today showed us *exactly* how much sunflower traits can vary.		

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	variations in snakes.		So instead of saying that one sunflower is taller than another sunflower, we can say *how much* taller and use the data from our bar graph as evidence. **Show slide 13.** In our next lesson, we'll look at some slithery snakes and explore how they're alike and different. We'll also think about how variations in their traits might help them survive so they can have baby snakes.		
		Link science ideas to other science ideas.			