Lesson 6: Visualizing Data, Part II: Two or More Variables

Learning Goal

I can use CODAP to create a visualization of two or more variables from a data set and use it to describe the data, (i.e. shape, distribution, measures of center).

Question(s) of the Day:

How do data visualizations help us understand and describe data with two or more variables?

Timing

- Warm Up (5 min)
- Activity 1 (10 - 15 min)
- Activity 2 (10 - 15 min)
- Lesson Synthesis (10 - 15 min)
- Wrap Up (5 min)

Standards Addressed:

- **2-DA-08** Collect data using computational tools and transform the data to make it more useful and reliable.
- **MP2** Reason abstractly and quantitatively

Preparation

All lessons presume students have the following (1) a journal, and (2) a Chromebook or other computer

- ☐ Preview Teaching Slides
- ☐ Review & practice procedures for getting started with CODAP, creating visualizations of the imported cake data, and saving the visualizations to Google Drive.
- ☐ Print copies of the following Student Handouts:
  - Getting Started with CODAP
  - Saving Visualizations to Google Drive
- ☐ Review procedures for the Think, Pair, Share, Notice & Wonder, and Co-Craft Questions (MLR5) instructional routines

Language Routines

- **Think Pair Share**
- **Notice and Wonder**

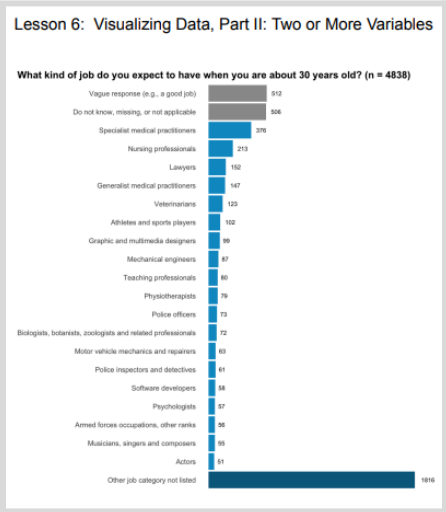
Assessment Opportunities

To assess the lesson objective, review students' answers to the Question(s) of the Day in their journal.

Key points to look for:

- When creating data visualizations, choices about how to display the data are made
- Effective visualizations present the data in a way that helps answer questions about data

Teaching Guide



Warm up

Invite students to participate in a Data Talk. Let students know that today's data visualization is from the *same data set* as the previous ones.

Distribute copies and display the Data Visualization for the Lesson 6 Data Talk. Facilitate a Data Talk about this visualization. *(Refer to the Data Talk Language Routine Card for more details on facilitating a Data Talk and the Data Talk Teachers' Guide for information about this particular visualization, including possible noticings, wonderings, and key takeaways).*

Data Talk

1. Arrange students in groups of two.
2. Display an image, table, graph, expression, equation, . . .
3. Give students 1 minute of quiet think time.
4. Ask students to give a signal when they have noticed and wondered something.
5. Give students 1 minute to share what they noticed with a partner.
6. Chart student responses on a two-column table with labels "I notice" and "I wonder".
7. After all responses have been recorded without commentary or editing, ask students, "Is there anything on this list that you are wondering about?

Remind students that in their last lesson, they learned that data is "cleaned" by data scientists before creating visualizations, and that to clean data, data scientists have to make difficult choices about how to represent the data.

Today, you're going to be making even more choices as you learn how to create data visualizations of more than one **variable**, or attribute, from a data set. Add the word "variable" to the Word Wall (if it's not already there.)

Introduce and post the Learning Goal, saying: our Learning Goal today is: ***I can use CODAP to create a visualization of two or more variables from a data set and use it to describe the data, (i.e. shape, distribution, measures of center).***

You'll know that you've met the Learning Goal if by the end of the lesson, you can answer the Question of the Day:

How do data visualizations help us understand and describe data with two or more variables?

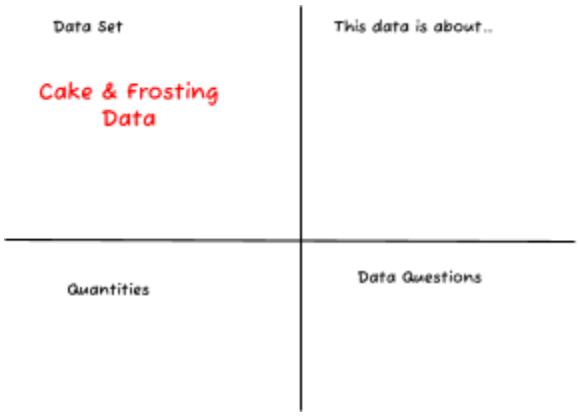
Have students record this question in their journal.

Activity 1

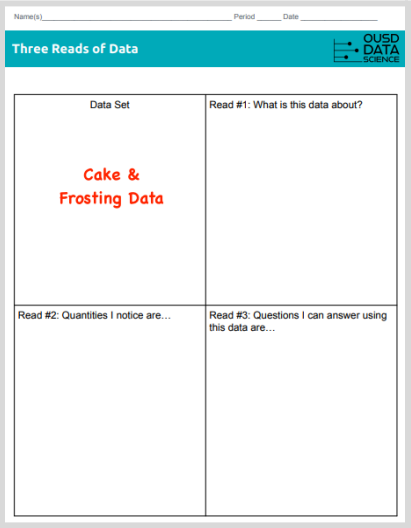
Present the following scenario. Their class has been so helpful generating and cleaning data for a school-wide party, that the school leaders/principal used their methods to get information about what kind of cake to order for the end of year party.

Prepare for a Three Reads of Data by distributing the Handout - Cake & Frosting Data Set and having students prepare their journals by either drawing a labeling a T-chart (recommended), or distributing copies of the Three Reads of Data - Student Activity Sheet.

Journal Option 1: Student-Created Graphic Organizer



Journal Option 2: Handout



Facilitate a Three Reads of Data about this data set. Encourage students to refer to the Spreadsheet Anchor Chart and "Answering a Data Question" poster for language to use. *(Refer to the Three Reads of Data Routine Card for more details on facilitating a Three Reads).*

Teaching Note: Since this is students' third time participating in a Three Reads of Data, it should go very quickly. The emphasis should be on routinizing the procedure, as well as building fluency with unit vocabulary, (i.e. There are 4 attributes/ variables in the data, but only 2 are about cake.)

Three Reads of Data

Read 1: Context - What is this data about?
- *This data is from...*
- *I know that...*
- *A pattern I see is...*
- *The data is organized...*

Read 2: Quantities - What quantities do you notice?
- *There are __ cases*
- *The sample size is __*
- *There are __ attributes*
- *The range is...*

Read 3: Questions - What questions can I answer using this data?
- *A question I could answer is...*
- *This data could show...*

Activity 2 - Creating a Visualization

Invite students to focus on the Data Question: *What kind of cake & frosting should we get for our school party?* Draw attention to the fact that choosing cake actually requires making a decision about two variables, or attributes, at the same time--cake flavor AND frosting flavor.

Model how to:

- drag attributes to the x-axis, y-axis, or legend
- remove attributes from the x-axis, y-axis, or legend

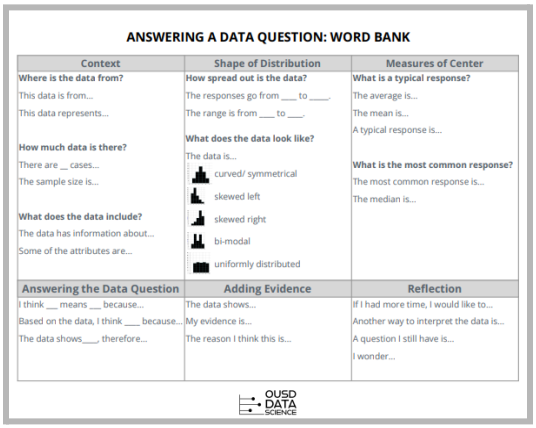
Add **x-axis**, **y-axis**, and **legend** to the Word Wall.

Let students know that there is not a single "right" way to represent the data so we can answer the Data Question: *What kind of cake & frosting should we get for our school party?* , but that some visualizations will make sense, and others will not. They should keep playing around with ways to visualize the data until they can "see" the answer to what kind of cake and frosting to get.

Share the link to Cake & Frosting Data Set.

As students finish, use the Student Handout: Saving Data Visualizations in Google Drive to guide students through saving their work.

Lesson Synthesis - Stronger, Clearer Each Time



ANSWERING A DATA QUESTION: WORD BANK

Context	Shape of Distribution	Measures of Center
Where is the data from? This data is from... This data represents... **How much data is there?** There are __ cases... The sample size is... **What does the data include?** The data has information about... Some of the attributes are...	**How spread out is the data?** The responses go from ___ to ____. The range is from ___ to ___. **What does the data look like?** The data is... curved/ symmetrical skewed left skewed right bi-modal uniformly distributed	**What is a typical response?** The average is... The mean is... A typical response is... **What is the most common response?** The most common response is... The median is...
Answering the Data Question	**Adding Evidence**	**Reflection**
I think ___ means ___ because... Based on the data, I think ___ because... The data shows____, therefore...	The data shows... My evidence is... The reason I think this is...	If I had more time, I would like to... Another way to interpret the data is... A question I still have is... I wonder...

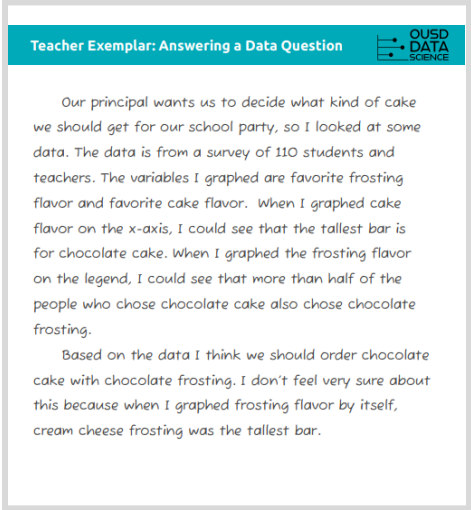
OUSD DATA SCIENCE

Students will now use their data visualization to describe the data and answer the Data Question: *What kind of cake & frosting should we get for our school party?*

Remind students that when data scientists communicate about data, they tell:

- Where the data is from
- What the data is about
- What the data looks like
- What a typical response is

Share with students the Stronger, Clearer Each Time WORD BANK Poster. Handout copies of the Stronger, Clearer Each Time Activity Guide, so students can follow along. Spend a few moments reviewing the language altogether.



Teacher Exemplar: Answering a Data Question OUSD DATA SCIENCE

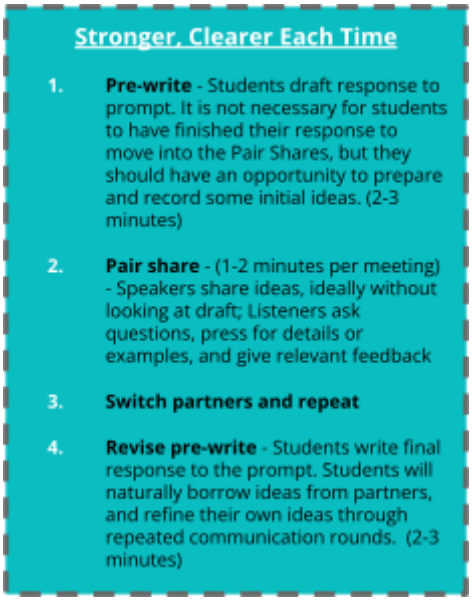
Our principal wants us to decide what kind of cake we should get for our school party, so I looked at some data. The data is from a survey of 110 students and teachers. The variables I graphed are favorite frosting flavor and favorite cake flavor. When I graphed cake flavor on the x-axis, I could see that the tallest bar is for chocolate cake. When I graphed the frosting flavor on the legend, I could see that more than half of the people who chose chocolate cake also chose chocolate frosting.

Based on the data I think we should order chocolate cake with chocolate frosting. I don't feel very sure about this because when I graphed frosting flavor by itself, cream cheese frosting was the tallest bar.

Then share with students the Teacher Exemplar of a response to a data question. You may choose to read it aloud to the class and have students follow along, or read it together chorally. Time permitting, have students look for words or phrases from the Word Bank and highlight them on the Teacher Exemplar poster.

After reviewing the exemplar, let students know that it is their turn to answer the data question, based on their data visualization.

Teaching Note: If you are concerned about students copying off the exemplar, you may consider removing it from view temporarily.



Stronger, Clearer Each Time

1. **Pre-write** - Students draft response to prompt. It is not necessary for students to have finished their response to move into the Pair Shares, but they should have an opportunity to prepare and record some initial ideas. (2-3 minutes)
2. **Pair share** - (1-2 minutes per meeting) - Speakers share ideas, ideally without looking at draft; Listeners ask questions, press for details or examples, and give relevant feedback
3. **Switch partners and repeat**
4. **Revise pre-write** - Students write final response to the prompt. Students will naturally borrow ideas from partners, and refine their own ideas through repeated communication rounds. (2-3 minutes)

Facilitate the **Stronger, Clearer Each Time Language Routine**. (Refer to the Stronger, Clearer Each Time Language Routine Card for more details on facilitating this routine.)

Cool Down

To wrap up the lesson, invite students to reflect on their learning by responding to one of the following prompts. You may choose to do this orally, or have students add ideas to their journal.

- *Something I heard today..*
- *Something I saw today...*
- *Something I wonder about...*

Adapted from Code.org "CS Discoveries" Unit 5 - Data & Society, Lesson 12: Making Decisions with Data & Utilizing Mathematical Language Routines from Illustrative Mathematics CC BY Illustrative Mathematics ® This material is based upon work supported by the National Science Foundation under Grant No. 2122485. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.