

**Focus:** Analyzing Data

**Grade Level:** 3-5

**Session Length:** 45-60 minutes

### Driving Questions

- How can we use graphs to represent our data?
- Do the patterns in our data support or not support our hypothesis?

### NGSS Links

- Analyzing Data
- Using Mathematics & Computational Thinking
- Constructing Explanations

### Systems Thinking Characteristics

- Identifying Hidden Dimensions of the System
- Proposing Explanations Based on Data
- Thinking Temporally & Making Predictions

*In the sixth session of Project Crystal, student research teams analyze their data to look for differences in caterpillars with bird attack marks between plants with different adaptations, and decide if their original hypotheses were supported or not supported by their data.*

Research teams use the data they collected in the garden in the last session of Project Crystal to create a graph that can visually display trends in the data and help us answer our research question. They then look back on their original hypothesis to see if the trends they observed in the data are consistent with their original hypothesis, or if the data showed an unexpected trend. Finally, they look back at their original model and decide if they want to make any changes based on their findings.

### Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
<p><b>1. Create</b> a graph that compares experimental treatments, and use it to support inferences.</p>	Science journals
<p><b>2. Use</b> data as evidence to determine if their original hypothesis is supported or not supported.</p>	Science journals; Group discussions

Session Overview

Section	Description	Length	Format
<b>Launch</b>	Kaitlin introduces students to the task for the day: they will be analyzing their data to see if there is a difference in the amount of caterpillars attacks by birds between the two plants with differing traits	5 minutes	Whole group
<b>Explore</b>	<p>Research teams graph the bird attack mark data in their science journals to answer their research question.</p> <p>After, the teams look back on their original hypothesis and determine if the trends observed in their data support or do not support their initial ideas.</p>	<p>20-25 minutes</p> <p>10-15 minutes</p>	Research teams
<b>Share</b>	Students share their findings with the whole class.	5-10 minutes	Whole class
<b>Reflect</b>	Students reflect on their experience during Session 6.	5 minutes	Individual

## Materials

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- *Session 6 Google Slides Presentation*
- Science Journals and pencils (1 per student)
- Rulers (Optional) (1 per student)
- Access to research team models from Session 3

## Before You Start Teaching

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- Copy over the Session 6 Slideshow to your own Google Drive account. Test to make sure that the videos work. (If not, you may have to check the permissions on the Crystal Cove Conservancy Youtube Account.)

## Learning Sequence

### Launch

#### Preparing to Analyze Data (5 minutes)

1. Open the [Session 5 Slideshow](#) and play the video on [Slide 2](#) for your group. In this video, Kaitlin will introduce the tasks for Session 6: analyzing the data that they collected in the garden in the last session to determine if the plant trait they chose to compare had an impact on the number of caterpillars that were attacked by birds.
2. After watching the video, move on to [Slide 3](#), which gives an overview of what students will do and learn during Session 6.

### Explore

#### Part 1: Collecting Data (25-35 minutes)

1. Advance to [Slide 4](#) and play the video. Kaitlin introduces what data we will need in order to answer our research questions: the plant adaptations that we are comparing, and the number of caterpillars attacked on each of those plant types.
2. Move on to [Slide 5](#), which has instructions to set up a simple table in their science journal with the summarized data they will need to graph. Ask the students to look back at their data sheets in their journal from the previous session, and transfer the data into the new table on a blank page in their science journal. An example of this table for data in Moro Canyon is below:

Plant Trait	Number of Attacked Caterpillars
Big Leaves	2
Small Leaves	6

3. When students are ready, advance to [Slide 6](#). There, in a video, Kaitlin will talk about why scientists use graphs to display their data, and introduce 3 common graphs that scientists will use, and ask students which they think would be the best choice to graph their caterpillar data.

4. After watching the video, move again to **Slide 7**, which lists the three common types of graphs, line graphs, bar graphs, and pie charts, and poses the question, “Based on the research question, what do we want the graph to show?”

Ask the students to share their ideas about which graph type is the best option for their data. Do we have trends over time, distinct categories that we’re comparing, or are we looking at fractions of a whole?

Because we are comparing two categories -- in this case, two different species of plants with different adaptations -- a bar graph is the best choice here!

5. Once the group has come to a consensus about the best type of graph to use, advance to **Slide 8** to watch Kaitlin demonstrate how to set up a graph in their science journals. Then advance to Slide 9 with the written directions, split the students into their research teams, and give the groups 10-15 minutes to work on creating a graph in their notebooks with the data that they collected. If available, hand out rulers to each student to help with the drawing the graphs.

### **Part 2: Interpreting Our Data and Updating Our Models (15-20 minutes)**

6. Once the groups have completed their graphs, advance to **Slide 10** and play the video where Kaitlin introduces the next step in the scientific process and think about what our findings mean. Students will determine if the data supports their original ideas, or if they need to shift their thinking and model to incorporate new information.

7. Advance to **Slide 11** and make sure each team has the hypotheses they made in their science journals in Session 4. Then give them time to discuss the questions on the slide as a team to interpret their data.

Students will need to answer:

- What was your original hypothesis?  
*Students can look back at the hypothesis they wrote in Session 4.*
- Based on your data, which type of plant had the most caterpillars attacked on it?  
*Students can look at their bar graphs and see which bar was higher between the two plant traits they were comparing.*

- Was your original hypothesis supported or not supported based on your data? Why or why not?  
*If student's predictions in their hypothesis matched what they observed in the data, we say the hypothesis was "supported," or their initial idea was the same as what their data showed. If the data showed the opposite trend than they predicted, we say the hypothesis was "not supported." You can remind the students that we use this language because we are never 100% certain of what is true or not true, but so far, the data we have can tell us what happened this one time.*
- Based on your data, is there anything you want to change or update in your model to make it more accurate?  
*If data does not support the original hypothesis, research teams may want to update their model. They can describe any changes here.*

8. If there is time, pass out the models that students created in Session 3. Give the research teams time to update or make any changes to their models to make sure they reflect the evidence from their data.



Share

*Sharing Our Findings (Optional) (5-10 minutes)*

1. If there is time, bring the whole class back together. Move on to [Slide 12](#) and ask students to share what they found. As different groups share, encourage them to explain their reasoning and ask questions of each other.

Some students may have different results than others, and this is ok! You can ask the students if they think any other factors could have affected our results. These could be other factors in the environment, like some plants being in different locations than others, or even random chance that birds ate caterpillars more in one side of the garden than another. This is why we never say our results are "right" or "wrong." We can only describe what we saw in our data!



Reflect

Reflecting on Session 6 (5 minutes)

1. At the end of the discussion, advance to **Slide 13** in the slideshow and play the video, where Kaitlin will ask students to spend a few minutes reflecting on their experiences today.
2. Advance to **Slide 14**, which will share reflection questions. Ask students to spend five minutes reflecting on their experiences today in their science journals.
3. Finally, thank the class for their time today. Let them know that now that they have interpreted their data, the next step will be to make a recommendation to the State Park Land Managers based on their findings, and create a presentation to share what they learned!