

Focus: Conducting an Investigation

Grade Level: Fifth Grade

Module Length: 1-3 hours plus 5 hour field trip

Driving Questions

- How do we design an experiment to test our hypothesis?
- How can we collect data to answer our research questions?

NGSS Links

- Planning & Conducting Investigations

Systems Thinking Characteristics

- Hidden Dimensions of Systems

In this fifth module of Project Crystal, students visit Crystal Cove State Park and collect data at The Bowl research site.

First, students explore how to use science ideas like replication, randomization, and control to set up an experiment. Next, students take part in a field trip to Moro Canyon in Crystal Cove State Park, where they help collect data at The Bowl research site. Finally, students reflect on the role of data and evidence in the scientific process and prepare for their next steps.

Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
1. Describe how scientists set up an experiment.	Science journals; Observations of class discussion
2. Follow protocols to record measurements and share their data with Crystal Cove Conservancy.	Science journals; Observations of class discussion
3. Reflect on how and why scientists use data as evidence to support their claims.	Observations of class discussion; Individual reflections

Module Overview

Section	Session Title	Length	Format
Launch	<p>Planning Our Experiment</p> <p>Kaitlin introduces students to some of the science ideas that scientists use when planning an experiment. After learning about the experimental design, students watch a few short videos to introduce them to how they will collect data at Crystal Cove State Park.</p>	15-20 minutes	Whole class or individual
Explore	<p>Field Trip to Crystal Cove State Park</p> <p>Students visit The Bowl research site on a field trip to Crystal Cove State Park, and collect data on insect populations and bird activity to help answer their research questions.</p>	5 hours	Whole class
Share	<p>Reflecting on Data Collection</p> <p>In a group discussion, students reflect on the process of setting up an experiment, collecting data, and the role that evidence plays in the process of science.</p>	15-20 minutes	Whole class or small groups
Extend	<p>Explore at Home: Recording Data (Optional)</p> <p>Students design a simple observational study that they can conduct from home and use their science journals to practice recording data.</p>	30 minutes	Individual
Reflect	<p>What are our next steps?</p> <p>Students reflect on their experiences collecting data and share their ideas for next steps.</p>	15 minutes	Individual

Virtual Materials

- **Module 5 Launch Slideshow**
- **Module 5 Share Slideshow**
- **Module 5 Explore at Home Slideshow (English)**
- **Module 5 Explore at Home Slideshow (Spanish)**
- **Module 5 Explore at Home Family Directions (English)**
- **Module 5 Explore at Home Family Directions (Spanish)**
- **Module 5 Reflection Video Prompt**
 - Option 1: Flipgrid**
 - Option 2: Padlet**
 - Option 3: Video to host on the private platform of your choice**

Each student will need...

- Science journal and pencil

Before You Start Teaching

- Copy over the over the **Launch Slideshow**, the **Share Slideshow**, and the **Explore at Home Slideshow** to your own Google Drive account.
- Decide how you will host the Share discussion for this module. If your class already has established science communication norms, open your copy of the Share Slideshow and update **Slide 3** with your discussion guidelines and **Slide 4** with any sentence starters.
- Decide how you want students to share their reflections. They can post their thoughts publicly on Crystal Cove Conservancy's Flipgrid or Padlet, or you can host the discussion prompt video on the platform of your choice. We recommend sticking to the same format as the previous module.

Learning Sequence

Launch

Planning Our Experiment (20-30 minutes)

Slideshow Link

In this slideshow, Kaitlin introduces students to the ideas of replication, randomization, and control, and then walks them through the design of our experiment. Students use their science journals to reflect on how replication, randomization, and control have been incorporated into the Project Crystal experiment. Finally, they watch a few short videos to help prepare them to collect data at Crystal Cove State Park!

Explore

Field Trip (5 hours)

On the second trip to Crystal Cove State Park, students will visit the research site at The Bowl and collect data on the number of insects and the number of attack rates on clay caterpillars in our water-saver, water-spender, and non-native plant treatments.

Contact Kaitlin Magliano at kaitlin@crystalcove.org to schedule your Field Trip to Crystal Cove.

Share

Discussion: Reflecting on Data Collection (20-30 minutes)

Slideshow Link

Once students have collected data, this discussion lets them reflect on the process of designing an experiment and collecting data. It is also a chance to make connections between the idea of data collection and the broader idea of how scientists use evidence to support or disprove their claims. This discussion can take place as a whole class or in small groups.

Before diving into the Module 5 discussion questions, you can remind students again of the science communication norms. Suggested norms and sentence starters are included in the Google Slides presentation, although you can edit them or use your own!

During the discussion, there are a few key ideas that you can emphasize to help students think about the broader process of science. Although data collection often seems very focused on procedure, data plays an important role in the scientific process because scientists use it as evidence to support or disprove our claims and hypotheses.

As you facilitate the discussion for students, some key ideas that you will want to highlight include:

- Scientists use ideas like replication, randomization, and control to design experiments in order to help us collect evidence that we can trust.
- Data is one type of evidence that we can use to support or disprove our hypothesis.
- Once we have collected our data, our next step in the scientific process is to look for patterns in the data. We can do this by creating a mathematical or visual representation of our data set to help us compare our different treatments.

Extend

Explore at Home: Recording Data (30 minutes)

Slideshow Link (English)

Slideshow Link (Spanish)

Family Directions (English)

Family Directions (Spanish)

During this optional Explore at Home Investigation, students step away from the screen and design an observational study that they can conduct at home, in their neighborhood, or online by watching a nature camera. They come up with a question, plan their observation, and then use their science journal to record data.

As an extension, you might choose to have students create a graph or other visualization and present what they found to the class!

Reflect

Reflection Question: What was it like to collect data? What did you notice? Now that we have collected data, what are you planning as your next step? (15 minutes)

Flipgrid Link

Padlet Link

Video Link

At the end of the module, students reflect on their experiences collecting data virtually and share their plans for their next step. Students can share their reflections with the broader Project Crystal community on our public Padlet or Flipgrid pages, or you can host the video reflection prompt on your own discussion platform of choice.