

Focus: Conducting an Investigation
Grade Level: Fifth Grade
Module Length: 2-3 hours

Driving Questions

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

NGSS Links

- Planning & Conducting Investigations

Systems Thinking Characteristics

- Hidden Dimensions of Systems

In this fifth module of Project Crystal, students collect data for the Project Crystal mulch experiment.

First, students explore how to use science ideas like replication, randomization, and control to set up an experiment. Next, students take part in a Video Field Trip, where they help collect data live at our research site in Moro Canyon. Afterwards, they continue to collect data using a Thinglink. 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
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 set up their science journal so that they are ready for data collection.</p>	15-20 minutes	Whole class or individual
Explore	<p>Video Field Trip: Collecting Data</p> <p>Students take part in a live Video Field Trip to Moro Canyon, where they explore the research site and help to collect data via video.</p>	30-45 minutes	Whole class
	<p>Collecting Data</p> <p>Students explore a Thinglink and continue collecting data for additional plots.</p>	20-25 minutes	Individual
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: <http://bit.ly/2WEfvla>
- Module 5 Explore: Submitting Data: <http://bit.ly/3rltcDA>
- Module 5 Explore: Data Collection Thinglink: <http://bit.ly/3nJb6cs>
- Module 5 Share Slideshow: <http://bit.ly/2KOEKys>
- Module 5 Explore at Home Slideshow (English): <http://bit.ly/3azjlE5>
- Module 5 Explore at Home Slideshow (Spanish): <http://bit.ly/3kkf5v5>
- Module 5 Explore at Home Family Directions (English): <https://bit.ly/2KzcRKX>
- Module 5 Explore at Home Family Directions (Spanish): <https://bit.ly/39wMKwG>
- Module 5 Reflection Video Prompt:
 - **Option 1:** Flipgrid: <http://bit.ly/38wLWaD>
 - **Option 2:** Padlet: <http://bit.ly/2WDUiaP>
 - **Option 3:** Video to host on the private platform of your choice: <http://bit.ly/3pbQRnS>

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 want to structure the data collection. You can have your class participate in a Video Field Trip with a Crystal Cove Conservancy staff member, collect data via the Thinglink, or both.
- As students collect data, decide how you want them to share the data with Crystal Cove Conservancy. Students can submit it via [Google Forms](#) or send it to you so that you can email it to Kaitlin directly.
- 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: <http://bit.ly/2WEfvla>

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 set up a data table in their science journal so that they are prepared to help record data.

This slideshow can be assigned independently or shared with the whole group. Students can look at the Google Slides presentation and watch videos on their own, or you can choose to present it to the whole class.

Explore

Video Field Trip (30-45 minutes)

During this virtual field trip, students meet a Conservancy educator via video and help record soil moisture and plant height data at the Project Crystal research site.

You can schedule a Video Field Trip program for your class with us at a time that is convenient for you, or have your students join a public livestream on YouTube, which will be scheduled quarterly. All public livestreams will also be available afterwards to watch asynchronously. Contact Kaitlin Magliano at kaitlin@crystalcove.org to schedule your Video Field Trip.

Collecting Data (30 minutes)

Thinglink Link: <http://bit.ly/3nJb6cs>

In this investigation, students explore a Thinglink to continue collecting data at the Project Crystal research site. In the Thinglink, they can access three-dimensional photos of each plot, click on the plants to see photos of their height measurements, and observe videos and photos of soil moisture data collection.

Although students have likely used Thinglink once before, before sharing the link with your students, it will be helpful to introduce the Thinglink to the entire class and give guidance on the process:

1. Tell students that they'll be exploring the Project Crystal site virtually and helping to collect data. We'll be using this data as evidence to help us determine if our hypotheses were supported, so that we can make a recommendation to Crystal Cove State Park about the best type of mulch to use.
2. Pull up the Thinglink overview and demonstrate how to click on one of the plots (which are labeled with numbers). Once you enter the first 360-degree photo, show students how they can use their mouse to scroll around and click on different points of interest to explore the area.
3. At each plot, students will need to record the plot number and the type of mulch. They'll also need to record four soil moisture readings, and the plant species, plant condition, and plant height for each of the eight plants.
4. Give students guidance on how many plots you want them to collect data on and how you want them to share the data with you. (We suggest having them do a full block of three plots, so they are able to see one plot with woody mulch, one with straw-like mulch, and one with no mulch!)
6. Remind students that at the end of the data collection process, we'll be sharing our data with Dr. Kimball and using it as evidence to support or disprove our hypothesis!

Share

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

Slideshow Link: <http://bit.ly/2KOEKys>

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 on Zoom or in the classroom, either as a whole class or in small breakout 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. When we use scientific tools (such as a soil moisture meter) during data collection, we can also perceive parts of the environmental system that are normally invisible to us.

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.
- Scientific tools (such as the soil moisture meter) can help us to measure parts of the environmental system that are normally invisible to us.
- 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: Gardening Scavenger Hunt (30 minutes)**

Slideshow Link (English): <http://bit.ly/3azjIE5>

Slideshow Link (Spanish): <http://bit.ly/3kkf5v5>

Family Directions (English): <https://bit.ly/2KzcRKX>

Family Directions (Spanish): <https://bit.ly/39wMKwG>

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.

Reflect

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

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: <http://bit.ly/38wLWaD>

Padlet Link: <http://bit.ly/2WDUiaP>

Video Link: <http://bit.ly/3pbQRnS>

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.