

Module 2: Designing Our Model

Focus: Designing a Model
Grade Level: Fifth Grade
Module Length: 2-4 hours

Driving Questions

- What is our project research question?
- How does mulch affect the growth of a plant in Moro Canyon?

NGSS Links

- 5-LS1-1
- 5-LS1-2
- Developing & Using Models

Systems Thinking Characteristics

- Identifying System Components & Processes
- Identifying Simple Relationships Between System Components
- Organizing System Components & Processes within a Framework of Relationships
- Identifying Hidden Dimensions of the System

In the second module of Project Crystal, students are introduced to the driving question: How does mulch affect the growth of a native plant in Moro Canyon?

During a Video Field Trip to Moro Canyon, they explore the Project Crystal research site and make a list of all the factors and processes that could affect the growth of a native plant in Moro Canyon. They then use their list to build a model that shows their initial ideas about how the factors and processes might interact to impact plant growth in our mulch experiment.

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 the Project Crystal research project.	Science journals, Observations of class discussion
2. Share three reasons why gardeners or land managers might use mulch.	Observations of class discussion
3. Compare and contrast woody mulch and straw-like mulch.	Science journals, Observations of class discussion
4. Generate a list of components and processes that affect the growth of plants in Moro Canyon.	Science journals
5. Design a model that shows the interaction between different parts of the ecosystem at our mulch research site and their effect on plant growth.	Student models

Module Sequence

Section	Session Title	Length	Format
Launch	<p><i>Introduction to our Research Project</i></p> <p>Students are introduced to our Project Crystal research questions. After, they compare the two types of mulch that we will be investigating in our experiment: woody mulch, and straw-like mulch.</p>	30 minutes	Whole class or individual
Explore	<p><i>Video Field Trip: Exploring our Research Site</i></p> <p>On a live videoconference call, students explore the Project Crystal research site, and develop a list of components and processes that might affect the growth of the plants in our Moro Canyon experiment.</p>	45 minutes	Whole class
	<p><i>Building a Model</i></p> <p>Using their list of components and processes from the Video Field Trip, students build a model on paper or on the SageModeler web platform to show how mulch affects the growth of native plants.</p>	30-45 minutes	Whole class or individual
Share	<p><i>Sharing Thoughts on Moro Canyon</i></p> <p>In a group discussion, students share their initial ideas about the mulch experiment and what factors they think will impact plant growth.</p>	20-30 minutes	Whole class or small groups
Extend	<p><i>Explore at Home: Exploring with Seek by iNaturalist (Optional)</i></p> <p>Students use their science journal to make observations about a nature object that they find at home.</p>	30 minutes	Individual
Reflect	<p><i>Based on your model, will seedlings grow more in areas with mulch or without mulch?</i></p> <p>Students share their initial ideas about how mulch will affect plant growth.</p>	15 minutes	Individual

Virtual Materials

- Module 2 Launch Slideshow: <https://bit.ly/2K14LKv>
- Building a Model Slideshows: **Computer Modeling:** <https://bit.ly/3njfbmO>
Paper Modeling: <https://bit.ly/38y6zVx>
- Module 2 Share Slideshow: <https://bit.ly/3lpy3A3>
- Module 2 Explore at Home Slideshow: <https://bit.ly/2lqMq92>
- Module 2 Explore at Home Family Directions (English): <https://bit.ly/32C7nET>
- Module 2 Explore at Home Family Directions (Spanish): <https://bit.ly/2UQuFTTr>
- Module 2 Reflection Video Prompt:
 - Option 1:** Flipgrid: <https://bit.ly/2GXXZ7a>
 - Option 2:** Padlet: <https://bit.ly/3lrjb4j>
 - Option 3:** Video to host on the private platform of your choice: <https://bit.ly/3loWxJZ>

Each student will need...

- Science journal and pencil
- Access to the **SageModeler Template** on a computer (if using the computer modeling option)
- Paper, and colored crayons, pencils, or markers (if using the paper modeling option)

Before You Start Teaching

- Copy over the **Launch Slideshow**, the appropriate **Explore Slideshow** (see more details below), **Share Slideshow**, and **Explore at Home Slideshow** to your own Google Drive account.
- Decide how you want students to build their models: on paper or using the **SageModeler** web platform.
- In the **Explore Slideshow**, choose the slideshow option appropriate for your class.
 - If you are creating models on paper, copy over the **Paper Modeling slideshow** to your Google Drive account.
 - If you are creating models on SageModeler, copy over the **Computer Modeling slideshow** to your Google Drive account.
 - If you participated in the Video Field Trip, delete **Slides 7 and 8** from your copy of the slideshow. Delete the red text on **Slides 5 and 6**.
 - If you did not participate in the Video Field Trip, delete **Slides 5 and 6** from your copy of the slideshow. Delete the red text on **Slides 7 and 8**.
- 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

Introduction to our Project Crystal Research Question (20-30 minutes)

Slideshow Link: <https://bit.ly/2K14LKv>

In this slideshow, Dr. Sarah Kimball, the project scientist for Project Crystal, introduces her research interests in Crystal Cove State Park. The students are then introduced to the two testable research questions for Project Crystal about plant growth and soil moisture. Finally, they compare the two types of mulch in their science journals using a series of pictures and videos of the mulch to make observations.

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: Changing Landscapes (45 minutes)

During this virtual field trip, students explore the mulch experiment site in Moro Canyon and work together as a group to come up with a list of all the biotic components, abiotic components, and processes that might affect the growth of the plants in our 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.

Investigation: Building a Model (30-45 minutes)

Computer Modeling Slideshow Link: <https://bit.ly/3njfbmO>

Paper Modeling Slideshow Link: <https://bit.ly/38y6zVx>

In this investigation, students use their list of components and processes from the Video Field Trip to build a model of the ecosystem at the Project Crystal research site to show how mulch can affect the growth of a native plant.

For this step, you have the choice to either have your students build their models by writing and drawing in their science journal or on paper, or you can have them build their models using the online modeling platform, SageModeler. SageModeler allows students to build a computer model of the ecosystem by adding components and defining the relationships between them. It also allows you to run simulations to help students predict what will happen in different conditions. You can spend some time playing with the platform and watch through the tutorials in this session's slideshow to decide if it will be a good fit for your students, or if you think building a model on paper would work best.

If you are unable to schedule a Video Field Trip for this module with your students, there are two slides that are modified to give time for students to develop their list of components and processes here before diving into building their models. Before sharing the slideshow with your students, go to [Slides 5-8](#), and remove the slides that do not apply to your class.

- If your class *did attend* a Video Field Trip, *delete slides 7 and 8*. Delete the red text on slides 5-6.
- If your class *did not attend* a Video Field Trip, *delete slides 5 and 6*. Delete the red text on Slides 7-8.



Share

Discussion: Sharing Thoughts on Our Project Crystal Experiment (20-30 minutes)
Slideshow Link: <https://bit.ly/3lpy3A3>

Once students have taken part in the Explore activities, this discussion lets them share what they've noticed and learned about our Project Crystal research project and their initial ideas about their model. 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 2 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!

Extend

Explore at Home: Exploring with Seek (30 minutes)

Slideshow Link: <https://bit.ly/2lqMq92>

Family Directions (English): <https://bit.ly/32C7nET>

Family Directions (Spanish): Coming Soon

During this optional Explore at Home Investigation, students step away from the screen and practice using the mobile app Seek by iNaturalist to identify plant and animal species around their own home, neighborhood, or backyard. They can then pick a new species that they have identified to create a field guide entry in their science journal.

As an extension, you might choose to have students share their field guide with their classmates, either during a small group discussion or by filming a video for Flipgrid or another platform. You can also encourage them to share their field guide with a family member or friend.

Reflect

Reflection Question: Based on your model, will native plants grow more in areas with mulch or without mulch? (15 minutes)

Flipgrid Link: <https://bit.ly/2GXXZ7a>

Padlet Link: <https://bit.ly/3lrjb4j>

Video Link: <https://bit.ly/3loWxJZ>

At the end of the module, students reflect on the Project Crystal experiment and their models by sharing their initial ideas about mulch and how it will affect the growth of the plants in our study. 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.