

Session 4: Revising Your Model

Focus: Defining the Problem

Grade Level: 7-12

Session Length: 45-60 minutes

Driving Questions

- How can we refine our systems model of Crystal Cove's North Beach?
- What can we measure or monitor to see if the assumptions in our model are correct?

NGSS Links

- Designing and Using Models
- Using Mathematics and Computational Thinking
- Planning & Carrying Out Investigations

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 fourth session of the Coastal Dynamics Program, students work with their project teams to revise and update their model.

At the start of the session, students divide into their project teams and set up their field notebooks for the unit. Next, project teams are tasked with defining the problem we want to solve at Crystal Cove State Park. As they explore the Crystal Cove Historic District virtual, project teams gather information on the problem created by the changing beach and develop a short problem statement that will drive the rest of the unit.

Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
1. Develop and implement a plan to update their project team's model to incorporate new understandings about beach systems.	Updated team models
2. Identify what they can measure to test and validate their assumptions about the relationships in their model.	Class discussion; Field notebooks

Session Overview

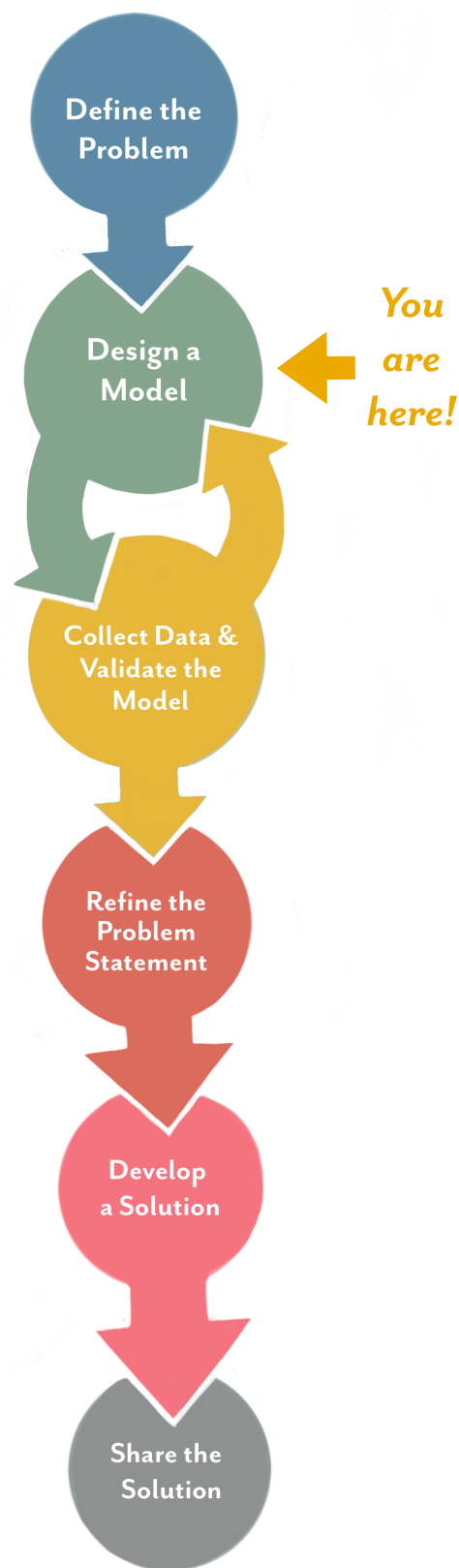
Section	Description	Length	Format
Launch	Students watch a short video that introduces the topic of the day: revising their model to incorporate the ideas from their research.	5 minutes	Whole class
Explore	<p>Project teams use what they've learned during Session 3 to revise their model of the environmental system at Crystal Cove's North Beach.</p> <p>Optionally, students then use their models to identify what they can measure over time to test and validate the assumptions in their model.</p>	<p>20-30 minutes</p> <p>10 minutes</p>	<p>Project teams</p> <p>Project teams</p>
Share	Students share how they have updated their model and discuss their ideas for real-world monitoring.	5-10 minutes	Whole class
Reflect	Students reflect on their experience during Session 4.	5 minutes	Individual

The Environmental Engineering Process: Refining the Model

In Session 4, students complete the last iterative step involved in developing a model: using what they've learned during their background investigations to revise and refine their initial model.

This step offers the first real chance for students to practice metacognition: thinking about how their own thinking has changed. By going through the process of looking back at their initial questions, sharing what they've learned, and assessing how their understanding has changed, students will become more aware of their own thought processes. It is helpful to intentionally scaffold this act, so that students pay careful attention to how their understanding of the environmental system is changing over time.

This step in the process may be longer or shorter depending on how many background investigations that your class has participated in. If you have only participated in one or two short investigations, then it may take student project teams only 10 or 15 minutes to update and make changes to their model. That is okay! It is still helpful to go through the process and make updates to the model, even if those updates are minor.



Virtual Materials

- Session 4 Google Slides Presentation: <http://bit.ly/37ub7uF>
- Session 4 Field Notebook Template (optional): <http://bit.ly/2NITTT9>

Each student will need...

- A device with internet access (a computer, smartphone, or tablet will all work!)
- Field notebook and pencil
- Access to models from Session 2

Before You Start Teaching

- Copy over the [Session 4 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

Getting Started (10 minutes)

1. Open the [Session 4 Slideshow](#) and play the video on [Slide 2](#) for your class. In this video, Erick briefly introduces Session 4. Now that students have learned more about the science involved in their model and answered their own questions, they will get an opportunity to revise their model to incorporate their refined knowledge.
2. After watching the video, move on to [Slide 3](#), where you will find a graphic of the environmental engineering process with a marker pointing at Design a Model. Tell students that today they are returning back to the Design a Model step within the environmental engineering process to incorporate the ideas that they have learned and refine their model about what might affect the amount of sand on Crystal Cove's North Beach.
3. Once you have informed students that they will revisit their model from Session 2, advance to [Slide 4](#) to give students an overview of what they are going to do and learn during Session 4.

Explore

Part 1: Revising Your Model (20-30 minutes)

1. Advance to [Slide 5](#) and play the video. Here, Erick challenges the project teams to identify the changes that they want to make within their model.
2. Once the video is done, advance to [Slide 6](#) and reiterate the task for students: They should start by looking back at their original questions from their model. Next, they will share their Diving Deeper charts from Session 3 with their project team members. They will plan out how to revise their model (which may involve help from provided sentence starters). Finally, once they come up with a plan, they can proceed and make the changes.
3. Break students into their project teams so that they can discuss how they would incorporate their newfound knowledge from the questions they investigated back into their model.

Move on to *Slide 7*, which gives some example sentence starters that students can use to plan their updates. Encourage students to record their plan in their field notebooks so that they have an example of how their thinking has changed over time.

4. Give students ten minutes to talk and develop a plan. After they have identified the changes they want to make, move on to *Slide 8* and give them additional time to revise their model to incorporate those changes.

Part 2: Testing & Validating Our Models (optional) (10 minutes)

1. If there is time after students have made changes to their system models, move on to *Slide 9* and play the video for students. There, Erick introduces their next task, which is to identify what factors they might be able to measure or monitor in order to test whether the assumptions that they've included in their model are accurate.

2. After you've played the video, move on to *Slide 10* and reiterate their task: project teams will need to review their model to identify what we can measure in the real world to see if the assumptions in their model are correct.

As a discussion starter, ask the project teams to respond to two questions and record their thinking in their notebook:

- What relationships between two factors could you examine in the real world to see if the ideas in your model are accurate?
- What sort of data could you measure to see if your assumption about each of those relationships are correct?

3. Ask students to break back into their project teams. Give them 5-7 minutes to review their models and think about what they might measure or monitor to test the assumptions in their model.

As they're thinking, encourage students to think about how we might realistically measure or monitor those factors in the real world. For instance, although it would be helpful to monitor the amount of sand sitting offshore, that information would be really difficult to acquire. It would be easier to monitor something like the volume of sand on the beach or the average velocity of ocean waves.

Share

Sharing Our Revisions and Monitoring Plans (5-10 minutes)

1. Open *Slide 11* and bring the class back together. Ask students to briefly respond to each of the following questions:
 - How did your project team update your model?
 - Are there any parts of your model that you are still unsure about? Where do you still have questions?
 - What relationships could you study in the real world to see if the assumptions in your model are correct?
 - What data could you collect or measure to test your assumptions?
2. After students have described the changes they made within their model, and shared their ideas for data collection, invite them to spend a few minutes reflecting on why we might want to collect monitoring data over time. How will data help us understand how the North Beach is changing? How does this help us to refine our model and address our problem?

Reflect

Reflecting on Session 4 (5 minutes)

1. At the end of the discussion, advance to *Slide 12* in the slideshow and play the video, where Erick invites them to spend a few minutes reflecting on their experiences today.
2. Move on to *Slide 13*, which will share reflection questions. Ask students to spend five minutes reflecting on their experiences today in their field notebook.
3. Finally, thank the class for their time today. Tell them that when you gather again, they will go on a virtual field expedition back to Crystal Cove to help collect data on the ongoing monitoring projects!