

Focus: Developing Solutions
Grade Level: 7-12
Session Length: At least one session of 40-60 minutes

Driving Questions

- How can we solve the problem?

NGSS Links

- Developing a Solution
- HS-ETS1-1

In the ninth session of the Coastal Dynamics Program, student project teams develop a solution to the problem that they have identified related to beach change at Crystal Cove.

First, students brainstorm ideas on how to solve the problem that is described by their problem statement individually. Afterwards, they work in their project teams to develop a plan for a solution. This session can be customized to meet the needs of your class, based on the time and resources that you have available.

Learning Outcomes & Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
<p>1. <i>Brainstorm</i> possible solutions to the problem that they have identified related to beach change at Crystal Cove State Park.</p>	Field notebooks
<p>2. <i>Collaborate</i> with their project team to expand on a solution to the problem that meets design criteria and design constraints.</p>	Class discussion; Field notebooks

Session Overview

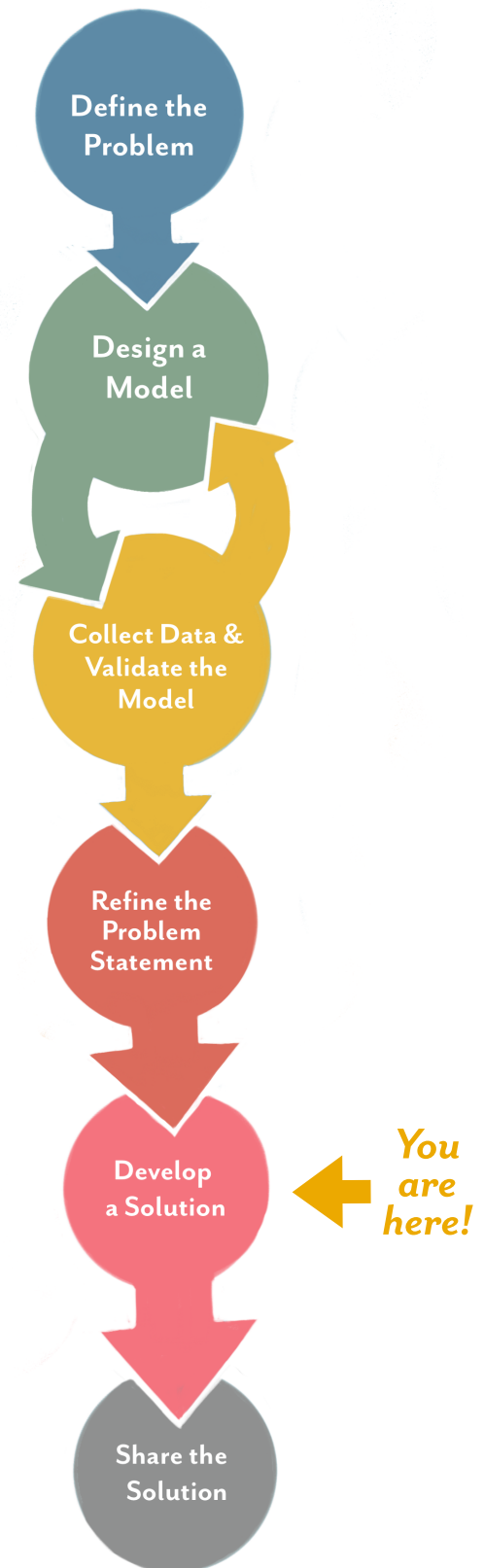
<i>Section</i>	<i>Description</i>	<i>Length</i>	<i>Format</i>
Launch	Erick welcomes the students to Session 9 and explains that they will develop a solution to address the problem statement that they wrote in Session 8.	5 minutes	Whole class
Explore	Students will brainstorm ideas for a solution to the problem statement and work with their team to develop an idea for a solution that meets the design criteria and design constraints.	30-45 minutes	Project teams
Share	Students share their ideas for solutions with their classmates and provide feedback on solutions.	5-10 minutes	Whole class
Reflect	Students reflect on their experience during Session 9.	5 minutes	Individual

The Environmental Engineering Process: Develop a Solution

In Session 9, students work together to propose and expand on a solution to the problem identified in their problem statement.

This session can be customized depending on your class needs. If you are short on time, you might give students one class session to brainstorm and refine an idea for a solution, which they can share in Session 10. If you have more time, you could ask students to expand on their plans by developing and testing small scale physical models, creating computer simulations to demonstrate sediment flow, or creating more in-depth logistical reports to share their solution with Crystal Cove State Park.

The work that students do during this session will prepare them for Session 10, when they'll collaborate to share their solution with others.



Virtual Materials

- [Session 9 Google Slides Presentation](#)
- [Session 9 Field Notebook Template](#) (optional)

Each student will need...

- A device with internet access (a computer, smartphone, or tablet will all work!)
- Field notebook and pencil
- Other supplies may vary depending on what you want students to accomplish during the session.

Before You Start Teaching

- Copy over the [Session 9 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.)
- Decide what you want students to include in their final product and assess how much time you have to teach this session.
- In the [Session 9 slideshow](#), update [Slide 8](#) with any specific information for your class.

Learning Sequence

Launch

Introduction to Session 9 (5 minutes)

1. Open the [Session 9 Slideshow](#) and play the video on [Slide 2](#) for your class. In this video, Erick will explain that students will work with their teams to design a solution to the problem statement they created in Session 8.
2. After watching the video, advance to [Slide 3](#), where you will find a graphic of the environmental engineering process with a marker pointing at “Develop a Solution.” Tell students that today, they will move on to the next step in the Environmental Engineering process by working together to develop a solution to the problem that they identified in their problem statement.
3. Once you’ve gone over this step in the engineering design process, advance to [Slide 4](#) to give students an overview of what they will do and learn during Session 9.

Explore

Developing a Solution (40-45 minutes)

1. Advance to [Slide 5](#) and play the video. In the video, Erick will explain that the students will review their problem statement, design criteria, and design constraints as a team. Then, they will brainstorm ideas for a solution to the problem statement that meets the design criteria and design constraints.
2. After watching the video, advance to [Slide 6](#). This slide has written instructions that tells the students to review their problem statement from Session 8 and then brainstorm ideas for solutions. While students are brainstorming ideas, walk around the room to monitor progress and encourage students to include all ideas at this point in the process.
3. Once teams have a list of ideas, move to [Slide 7](#). Play the video where Erick will ask the students to work in their team to narrow down their list of ideas to one that will meet the design criteria, design constraints, and be the most effective solution for Crystal Cove State Park. They should keep in mind that they will prepare a presentation to convince natural resource managers that their solution will be effective.

4. After watching the video, advance to *Slide 8*. This slide provides questions that the students can consider as they develop their solution. As students work together to design a solution, walk around the room to monitor progress and provide assistance when necessary.



Share

Sharing Our Model Updates (5-10 minutes)

1. After all of the groups have developed a solution, move to *Slide 9*. This slide includes questions that students can answer as they share their solutions with their classmates. Facilitate the discussion by encouraging students to share their solutions and provide feedback to the other teams.

Present your solution to other teams:

- What is your solution?
- Why is your solution compelling?
- What logistical challenges might State Park face in implementing them, and how can you solve those?

Present your solution to other teams:

- What is compelling about the presented solution?
- Why are your concerns?
- What would you do to improve the presented solution?



Reflect

Reflecting on Session 9 (5 minutes)

1. At the end of the discussion, advance to **Slide 10** in the slideshow and play the video, where Erick will recap the experience today and ask students to spend a few minutes reflecting.
2. Move on to **Slide 11**, 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 they will create a presentation to share their solution with stakeholders.