

Focus: Pollution & Engineering Design
Grade Level: 3-5
Session Length: Four activities of 25-30 minutes each

Driving Questions

- What kind of trash is found on Crystal Cove State Park's beach?
- How can we design a tool to help clean it up?

During Week 2: Trash Engineers, students design a tool to help clean up trash on Crystal Cove State Park's beaches!

On Day 1, a breaking news story introduces students to the trouble with trash on Crystal Cove's beach. They investigate which types of trash are most common by sorting and counting a sample. On Day 2, they test whether different kinds of trash sink or float. On Day 3, students design and build a tool to help pick up or filter trash. Finally, on Day 4, they take an excursion around their school to help look for any trash.

Learning Outcomes and Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
1. Create a bar graph comparing which type of trash is the most common on Crystal Cove's beach.	Reporter notebooks on Day 1
2. Determine if different types of trash sink or float.	Reporter notebooks on Day 2
3. Design and build a tool that can be used to pick up one particular type of trash.	Student-created tools on Day 3
4. Compare and contrast the trash found at their school to trash at Crystal Cove State Park.	Student discussions on Day 4

Weekly Sequence

Section	Description	Length	Format
Day 1	<p>Trash Investigation: Sorting Samples</p> <p>Students are introduced to the problem with plastic pollution on Crystal Cove State Park’s beach during a breaking news story. Afterwards, they sort a trash sample into different categories and create a bar graph to see what kind of plastic trash is the most common.</p>	25-30 minutes	Classroom
Day 2	<p>Trash Investigation: Sink or Float?</p> <p>Students use tubs of water to determine whether different categories of trash sink or float, and then choose one type of trash to focus on for their tool design.</p>	25-30 minutes	Outside or Inside Classroom
Day 3	<p>Trash Investigation: Designing a Tool</p> <p>Students create a plan for a tool to help them pick up their chosen kind of trash.</p>	25-30 minutes	Classroom
Day 4	<p>Trash Investigation: Trash Hunt</p> <p>Students take a walk around the school and look for trash. They compare the types of trash they find at school to what they’ve learned about trash at Crystal Cove State Park.</p>	25-30 minutes	School Campus

Big Science Idea

Nothing ruins a beach day like seeing plastic bags, bottle caps, and other trash scattered across the beach. But plastic pollution and other trash is more than just unsightly: it can be deadly to the marine creatures and birds that call beaches like Crystal Cove home.

Once trash gets into the marine waterway and becomes marine debris, it can be extremely challenging to clean it up. Depending on its density, different kinds of trash may float at different levels in the ocean's water column or even settle to the depths of the ocean floor.

If you want to learn more...

- *National Geographic: Beach Clean-Up Study Shows National Scope of Plastic Pollution*
- *Ocean Health Index*
- *California Coastal Commission: The Problem with Marine Debris*

If you want to share more with students...

- *How Big the Great Pacific Garbage Gyre Really Is*
- *Kids Take Action Against Ocean Plastic*

Day 1

Sorting Trash Samples
(30 minutes)

Each teacher will need...	Each student will need...
<ul style="list-style-type: none"> <input type="checkbox"/> Day 1 Slideshow <input type="checkbox"/> Computer, projector, and speakers 	<ul style="list-style-type: none"> <input type="checkbox"/> Reporter notebooks <input type="checkbox"/> Pencil <input type="checkbox"/> Beach trash sample

Before you start teaching...

- Open the day's slideshow and check to make sure that the videos play with sound.
- Decide how you will distribute the plastic trash samples to students. You might divide the samples ahead of time and pass them out, or ask each student to come to the front of the class to collect their sample.
- Decide how you want students to create a bar graph comparing the different categories of trash. Depending on what you're doing in math, you might have students create a bar graph together as a class or have them work individually to create a bar graph in their notebooks.
- Make sure to collect trash samples back from the students after today's activity. You'll need to hand them off to the K-2 teachers for their Week 4. (Note that you will be using a different trash sample for Day 2!)

Instructional Learning Sequence

1. Open the slideshow and play the video on **Slide 2** for the class. Kaitlin will give a breaking news report and explain the problem with plastic pollution on Crystal Cove's Beach. Today, students are tasked with determining what kind of trash is the most common on the beach.
2. Advance to **Slide 3**, where Kaitlin will demonstrate how to sort the trash samples into four different categories: Hard Plastic, Soft Plastic, Foam, and Other.
3. Pass out the trash samples to each student. Move on to **Slide 4**, which has written directions for sorting the plastic trash.
4. Give students time to sort the trash samples on their desks.

5. Once students have had a chance to sort the trash, bring the class back together. Advance to [Slide 5](#) and play the video, where Holly will ask students to think about how they could display the data that they collected.

6. Move on to [Slide 6](#). Either in pairs or as a whole class, ask students to reflect on how they might display their data.

7. Advance to [Slide 7](#), where Kaitlin will introduce the idea of using a bar graph to compare the total number of items in different categories.

8. Move on to [Slide 8](#), and give students instructions on how to create a bar graph. Depending on the level of your class, you may want to create the graph together, or have students work independently to create one in their reporter notebook.

9. Once students have finished creating their graphs, move on to [Slide 9](#) and ask students to share out loud:

- Which type of trash was the most common in your sample?
- Which type of trash was the least common in your sample?
- What type of trash do you think would be important to clean up?
- What might we do next to solve the problem of trash on our beach?

Day 2

Sink or Float
(30 minutes)

<i>Each teacher will need...</i>	<i>Each student will need...</i>
<ul style="list-style-type: none"> <input type="checkbox"/> Day 2 Slideshow <input type="checkbox"/> Computer, projector, and speakers 	<ul style="list-style-type: none"> <input type="checkbox"/> Reporter notebooks <input type="checkbox"/> Pencil <input type="checkbox"/> Plastic trash sample <input type="checkbox"/> Access to a mason jar with water

Before you start teaching...

- Open the day's slideshow and check to make sure that the videos play with sound.
- Decide how you want to set up the jars and fill them with water. If possible, you may want to set them up outside or in an area of your classroom where it's okay for students to splash.
- Collect mason jars at the end of the activity. Grades K-2 will need them for Week 4. Sink or float trash samples can be thrown away or recycled. (But make sure not to throw away your Beach trash samples! Grades K-2 will need those, too.)

Instructional Learning Sequence

1. Open the slideshow and play the video on *Slide 2*. Kaitlin will review what the students did on Day 1, and will tell them that their next task is to learn more about the different types of plastic trash today so that they can design a tool to help collect them on Day 3.
2. Move on to *Slide 3*, and ask students to get out their reporter notebooks. Have them copy the data table on the slide into their notebook.
3. On *Slide 4*, Kaitlin will demonstrate how to use a jar of water in order to test if different types of plastic trash sink or float in the water column.

Have students watch the video, and then move on to *Slide 5*, which gives written instructions. Give students time to conduct the investigation. After they test the plastic trash from the samples, if there is time, they can test other plastic items from around the classroom as well.

4. Once students have finished testing if the different types of plastic sink or float, move on to *Slide 6* and ask them to share their findings as a class:
 - Which types of trash sank? Which ones floated?
 - Was there anything else you noticed?
 - Tomorrow, you'll design a tool to help us clean up one specific type of trash. Which type of trash might you want to focus on? Why?

Day 3

Design a Trash Tool
(30 minutes)

Each teacher will need...	Each student will need...
<ul style="list-style-type: none"> <input type="checkbox"/> Day 3 Slideshow <input type="checkbox"/> Computer, projector, and speakers 	<ul style="list-style-type: none"> <input type="checkbox"/> Reporter notebooks <input type="checkbox"/> Pencil <input type="checkbox"/> Colored pencils

Before you start teaching...

- Open the day's slideshow and check to make sure that the videos play with sound.
- Decide how you want students to share their trash tool designs. If there is time, you may have them present to the class, participate in a gallery walk, or something else.

Instructional Learning Sequence

1. Open the slideshow and play the video on **Slide 2**. Kaitlin will introduce the task for the day, where students will be invited to choose one specific type of trash to focus on, and will then be asked to design a tool to help collect it.
2. Move on to **Slide 3**, and ask students to look back at their notes from Day 1 and Day 2 and choose one specific type of trash to focus on. Give them a few minutes to review their reporter notebook and make a decision.
3. After minute or two, ask the class to come back together. Advance to **Slide 4**, and invite a few students to share what they've decided to focus on and why.
 - What type of trash did you decide to focus on?
 - Why did you choose that type of trash? Why do you think it might be a problem at Crystal Cove? Make sure to mention evidence from your reporter notebook.
4. Move on to **Slide 5**, where Kaitlin will introduce the next task: designing a specific tool to prevent their chosen type of trash from ending up on the beach.

5. After playing the video, move on to *Slide 6*, which has written instructions. Ask students to start working to design a plan for their tool in their reporter notebook. They should also respond to the following prompts:

- What is your trash collection tool called?
- What type of trash is it designed to pick up?
- How does it work?

6. Once students are done designing, if there's time, invite a few to share what they've designed!

Day 4

Trash Hunt
(30 minutes)

<i>Each teacher will need...</i>	<i>Each student will need...</i>
<ul style="list-style-type: none"> <input type="checkbox"/> Day 4 Slideshow <input type="checkbox"/> Computer, projector, and speakers <input type="checkbox"/> Trash grabber 	<ul style="list-style-type: none"> <input type="checkbox"/> Reporter notebooks <input type="checkbox"/> Pencil

Before you start teaching...

- Open the day's slideshow and check to make sure that the videos play with sound.
- Decide how you want to conduct the trash hunt. You might think about timing, where you want to go, and how you will give students boundaries or assign tasks. Since there is only one trash grabber per class, you can designate one student to carry it.

Instructional Learning Sequence

1. When you open the slideshow, advance to *Slide 2* and play the video. Kaitlin will thank students for their help this week and invite them to help pick up around the school.
2. Advance to *Slide 3* and give students guidelines for the trash hunt.
 - Designate one student to use the trash grabber and another to carry the trash bag.
 - Choose another 1-2 students to help keep track of what you find in their reporter notebooks.
 - Everyone else can help as spotters and keep their eye out for trash.
3. As a group, go outside and begin your trash hunt. Go over any safety rules, such as staying together as a group. Stay with students as they hunt for and pick up trash in the area that you've designated.
4. When you're done, return to the classroom. Ask the reporter(s) to share what kind of trash was found and ask the class to discuss the following questions on *Slide 4*:
 - What types of trash did you find?
 - Was the trash at your school similar or different from the trash on Crystal Cove's beach?
 - Why do you think it's important to pick up trash? How can this help places like your school or Crystal Cove State Park?
5. Finally, move on to the final *Slide 5*, where Kaitlin will thank students for all of their help this week!