

**Focus:** Biomimicry & Plant Adaptations

**Grade Level:** K-2

**Session Length:** Four activities of 25-30 minutes each

### Driving Questions

- What adaptations do plants have to survive in the hot and dry conditions in Southern California?
- How can we use adaptations found in nature as the inspiration to solve problems humans encounter in their daily lives?

**During Week 3: Biomimicry, students use plant adaptations as inspiration to design a solution to a problem faced by hikers at Crystal Cove State Park.**

On Day 1, students think about problems they have had when spending time outdoors in hot weather. They are also introduced to some problems hikers at Crystal Cove State Park have faced, and they decide on a problem that they want to help solve. On Day 2, students go on a plant adaptation scavenger hunt to learn about different adaptations plants have to survive in the hot and dry climate of Southern California. On Day 3, students brainstorm ideas for solutions for the hikers' problem based on what they learned about plant adaptations. On Day 4, students make a video with Flipgrid to share the solution they designed with Crystal Cove Conservancy.

### Learning Outcomes and Assessments

<i>By the end of this module, students will be able to...</i>	<i>You can assess this using...</i>
<b>1. Explain</b> at least one problem that people have while spending time outdoors in hot and dry conditions.	Class discussion; Reporter notebooks on Day 1
<b>2. Explain</b> at least one adaptation plants use to survive in hot and dry environmental conditions.	Class discussion on Day 2
<b>3. Use</b> plant adaptations as inspiration for designing a solution for a problem people have when they spend time in hot and dry environmental conditions.	Class discussion; Reporter notebooks on Day 3; Flipgrid video on Day 4

Weekly Sequence

Section	Description	Length	Format
Day 1	<p><b><i>Biomimicry: Breaking News!</i></b></p> <p>Students are introduced to some of the challenges that people face when spending outdoors in hot and dry conditions. They think about their own experiences outdoors, learn about some of the problems that hikers have had at Crystal Cove State Park, and then choose one problem that they want to help solve.</p>	25-30 minutes	Classroom
Day 2	<p><b><i>Biomimicry: Plant Adaptation Scavenger Hunt</i></b></p> <p>Students are introduced to the concept of biomimicry and then go on a scavenger hunt on their school grounds to learn about adaptations that help plants survive in hot and dry conditions.</p>	25-30 minutes	Classroom and School Grounds
Day 3	<p><b><i>Biomimicry: Design Your Solution</i></b></p> <p>Students use what they learned about plant adaptations as inspiration to design a solution for the problem they chose on Day 1.</p>	25-30 minutes	Classroom
Day 4	<p><b><i>Biomimicry: Share</i></b></p> <p>Students create a video using Flipgrid to share the solution that they designed with Crystal Cove Conservancy.</p>	25-30 minutes	Classroom

## Big Science Idea

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While all plants have similar needs in order to grow, they can't all live in the same habitat. Each species of plant has certain environmental conditions in which it can survive. If the environmental conditions are outside of the plant's range (e.g., it gets too hot), that plant won't be able to survive there. There are a wide range of environmental conditions across the planet. Some places get very hot in the summer and very cold in the winter. Some places have a lot of rain each year and some places get almost no rain all year. Some places have milder conditions and don't experience extreme changes in temperatures throughout the year. In order for plants to survive in the area where they live, they have special adaptations that help them deal with the environmental conditions they experience.

Adaptations include a plant's size; its root system; and the color, size, and shape of its leaves just to name a few types of adaptations. For this activity, students will focus on adaptations plants use to survive in a coastal sage scrub habitat in Southern California, which is a hot and dry environment. Since it is a hot and dry environment, plants that live in this area have water-saving adaptations to help them survive. Examples include waxy leaves, light colored leaves, small hairs on leaves, and the ability to store water inside the plant. Roots are an adaptation that allow plants to take in water from the soil and also anchor the plant in the soil.

These adaptations help plants survive, and the strategies plants use can also inspire solutions to problems that people encounter in their daily lives. Using nature as the inspiration for solutions for human problems is called biomimicry. Scientists and engineers can create designs that mimic what they see in the natural world when trying to solve problems. Velcro is an example of a solution that was designed through biomimicry. A scientist noticed how burrs from a plant stuck to his pants and his dog's fur and designed a way for people to use a similar strategy to stick things together.

### *If you want to learn more...*

- [\*Biomimicry Institute\*](#)
- [\*YouTube Video: Eight Useful Technologies Inspired by Nature\*](#)
- [\*Coastal Sage Scrub Habitat\*](#)
- [\*Video from California State Parks: Coastal Sage Scrub Adaptations at San Clemente State Beach\*](#)

### *If you want to share more with students...*

- [\*YouTube Animated Video: Biomimicry 101 - Examples of How We Copied Nature\*](#)
- [\*YouTube Animated Video: Plant Adaptations\*](#)

Day 1

**Breaking News: Biomimicry**  
(25-30 minutes)

Each teacher will need...	Each student will need...
<input type="checkbox"/> <b>Day 1 Slideshow</b> <input type="checkbox"/> Computer, projector, and speakers	<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.

**Instructional Learning Sequence**

**1.** Open the slideshow and play the video on **Slide 2** for the class. Erick will share the breaking news that there have been reports of hikers having a variety of problems while on the trails at Crystal Cove State Park. Problems include slipping as they hike, not having enough shade, wearing clothing that absorbs too much heat, getting thirsty, and getting sunburned. He shares that he is asking for help from your students to come up with a solution for one of these problems.

**2.** Advance to **Slide 3** where Erick encourages students to share their own experiences of playing outdoors and problems they have encountered. He directs students to talk about their experiences with their classmates and create a list of problems. Tell the students that you will facilitate a discussion around the questions that Erick brings up in the video.

**3.** Move on to **Slide 4**, and facilitate a class discussion by reflecting on the following questions:

- Where do you have experience playing or hiking outdoors?
- What problems have you experienced while outdoors?
- Are there any problems that seem very common?

**4.** Move on to **Slide 5** and play the video. Erick will explain that students will decide on which common hiking problem they want to solve and will write it in their reporter notebooks.

5. Move to *Slide 6*, which gives students directions for selecting a hiking problem to solve. They may choose a problem from the list below, or another that they think go on their own:

- Slipping while hiking.
- Not getting enough shade.
- Wearing dark clothes that are too hot.
- Not having enough water.
- Not protecting themselves from the sun.

When students decide on their problem, they can apply it to the following sentence frame in their notebooks:

- I want to solve the problem of \_\_\_\_\_.

Give students time to decide which problem they want to solve and make sure they write the sentence frame in the reporter notebook and that they add their problem to the end of the sentence.

6. Once students have finished writing in their notebooks, move to *Slide 7*, which lists two questions:

- Which problem did you choose to focus on solving this week?
- Why did you choose that problem?

Facilitate a class discussion so students can share which problem they chose and explain why they chose that problem.

Day 2

## Plant Adaptation Scavenger Hunt (25-30 minutes)

Each teacher will need...	Each student will need...
<input type="checkbox"/> <i>Day 2 Slideshow</i> <input type="checkbox"/> Computer, projector, and speakers	<input type="checkbox"/> Reporter notebooks <input type="checkbox"/> Pencil <input type="checkbox"/> <i>Plant Adaptation Checklist</i>

### *Before you start teaching...*

- Open the day's slideshow and check to make sure that the videos play with sound.
- Make copies of the plant adaptation checklist.
- Decide where you want to take students on their scavenger hunt. Ideally, you'll want an area like a school garden or a playground field, where there are lots of plants. Native plants work best, but others are okay too!

### *Instructional Learning Sequence*

**1.** Open the slideshow and play the video on *Slide 2*. Erick will explain that humans aren't the only species that has problems with living in the hot and dry environment at Crystal Cove State Park. Plants also have challenges with getting too hot and not getting enough water, so the students will learn about how plants find a way to solve those problems. This will help the students later in the week as they design solutions for the hikers.

**2.** Move on to *Slide 3* and play the video for the class. Erick explains that the students will use a plant adaptation checklist to go outside and go on a scavenger hunt to find examples of plants that use adaptations to survive in the hot and dry environment in Southern California.

**3.** Move to *Slide 4*, which shows the plant adaptation checklist so that you can review it with the students. Handout the plant adaptation checklist to the students and review it with them so they understand how to use it and what to look for on the plants during the scavenger hunt.

**4.** Once you feel like all of the students are comfortable with the checklist, move on *Slide 5*, which has the directions for the scavenger hunt:

- Find a plant.
- Look at the leaves, stems, and size of the plant. Is there anything that you notice?
- Use your checklist to see if any of the plant adaptations are present.
- Find another plant and repeat steps 2-3!

Review the directions with the students. Provide the necessary directions for safety and logistics for how they will walk around the school grounds. For example, you may want to make sure they know that they should walk at all times and should always be within eyesight of you and any other adults who may be accompanying them. Give explicit directions for boundaries so they know which areas of the school grounds they are allowed to explore. Let them know if you want them to work individually, in pairs, in small groups, or if you will do the activity as a class and all visit the same plants at the same time.

5. Once all instructions are given, head out onto the school grounds and assist students as necessary as they observe plants. Make sure to give them updates on how much time is remaining as they go through the activity so that they can allocate their time accordingly in order to observe several plants. When time is up, gather all of the students together and return to the classroom.

6. Once you return to the classroom, move to *Slide 6*, which lists five questions. Use the questions to facilitate a class discussion:

- As you explored, what plant adaptations did the plants in your area use?
- How did plants deal with the heat?
- How did plants stop themselves from slipping?
- Was there anything else interesting that you noticed? Did you find any plant adaptations that were not on your checklist?
- How could these adaptations help you solve the outdoor problem that you chose?

7. Once you feel that the students have a good understanding of the plant adaptations they saw and you have a sense that they see the connection between plant adaptations and the outdoor problem they will solve, move to *Slide 7* and play the video. Erick will wrap up the scavenger hunt and introduce the term biomimicry and the idea that students will use the idea of biomimicry and plant adaptations to solve the problem for the hikers.

Day 3

**Design Your Solution!**  
(25-30 minutes)

Each teacher will need...	Each student will need...
<input type="checkbox"/> <b>Day 3 Slideshow</b> <input type="checkbox"/> Computer, projector, and speakers	<input type="checkbox"/> Reporter notebooks <input type="checkbox"/> Pencil <input type="checkbox"/> <b>Plant adaptation checklist</b> <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.
- Gather the plant adaptation checklists.
- Give students colored pencils.

### *Instructional Learning Sequence*

1. Open the slideshow and play the video on *Slide 2*. Erick will explain that students will now use what they learned during the plant adaptation scavenger hunt to design a solution for the problem they chose to solve.
2. Move on to *Slide 3* and play the video. Erick will explain that students will brainstorm ideas for how to solve the problem they chose by thinking about the plant adaptations that they observed.
3. Move on to *Slide 4*, which shows the directions for how students will brainstorm their ideas.

After reviewing the instructions on the slide, remind students to look at their reporter notebook to see the problem they chose to solve. Handout the plant adaptation checklist and review the checklist as a class. Facilitate a discussion with the students to help them see the connection between the hikers' problems and the adaptations the plants have used to solve the same problem. Ask students to share their thoughts on ideas they can borrow from plants to solve the problem they chose. During the discussion, you can bring up questions Erick asked in the video to help the students think of ideas.

- If you want to help a hiker stay cool, could your solution help store water?
- Does it need to create shade or block the sun, or keep the hiker cool in another way?
- If you want to stop people from slipping, is there something that a hiker could carry with them or wear, or is there something that you could build on the hiking trail to keep them safe?

Write students' ideas for each problem on a whiteboard.



4. Move to *Slide 5*, which lists questions for students to answer:

- What problem did you choose to solve?
- Are there any plant adaptations that could help you create a solution?
- What could you design as a solution?

Give students some time to consider the ideas that came from the brainstorming session and how they relate to the problem they chose to solve. Give them time to think about how those ideas relate to a solution. Depending on your students, you may want them to work with a partner to talk about the questions to help them think through their answers.

Once students have had the time to consider each question, facilitate a class discussion so students can share their answers to these questions with the class. Some examples of solutions are specialized shoes that have features like tree roots to keep hikers from slipping on the trail or a t-shirt that can change from a dark color to a light color when a hiker moves from the shade to the sun.

5. Move to *Slide 6* and play the video. Erick will ask students to draw a design of their solution in their reporter notebook.

6. Move to *Slide 7* which shows directions for designing the solution:

- Turn to a blank page in your reporter notebook.
- Write down the problem you are trying to solve. Use the sentence frame, *“I want to solve the problem of \_\_\_\_\_.”*
- Think about what plant adaptations you could use to solve the problem.
- On the same page, draw what your solution to the problem looks like! Make sure to include any inspiration from nature (biomimicry).

Give students time to find where they wrote the problem that they chose in their reporter notebook, consider the ideas that came from the brainstorming session, and draw their solution. Give students crayons, colored pencils, or markers if you want them to use them in their drawing. Walk around the room to check on progress and answer any questions.

7. Once the students have finished their drawings, move to *Slide 8*, which lists questions students can answer to share their solutions.

- What problem did you choose to solve?
- What did the design of your solution look like?
- What plant adaptation or other experiences and ideas helped you come up with your design?

Ask students to share their answers to the questions with the class. Depending on how much time you have, you could lead a class discussion and ask for students to share with the entire class, or have them share with a partner or within a small group.

Day 4

**Share!**  
(25-30 minutes)

Each teacher will need...	Each student will need...
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Day 4 Slideshow</b></li> <li><input type="checkbox"/> Computer, projector, and speakers</li> <li><input type="checkbox"/> <b>Biomimicry Flipgrid</b></li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Reporter notebooks</li> <li><input type="checkbox"/> Pencil</li> <li><input type="checkbox"/> Computer, tablet, or phone with access to the internet</li> </ul>

**Before you start teaching...**

- Open the day's slideshow and check to make sure that the videos play with sound.
- Make sure you have enough computers, tablets, or phones for students to use to create their videos.
- In this session, students will use **Flipgrid** to create a short video. Flipgrid is a free platform that allows students to film and share short videos in response to a prompt. If you haven't used Flipgrid before, spend some time signing up for a free account and becoming familiar with how to use it.

**Instructional Learning Sequence**

1. When you open the slideshow, advance to **Slide 2** and play the video. Erick will explain that Crystal Cove Conservancy wants to hear about the solutions they designed.
2. Move to **Slide 3** which shows written instructions for how students will make a video using Flipgrid to share their designs:
  1. Click on the Flipgrid link (<https://flipgrid.com/a6537ad3>) to join the Flipgrid. Or you can visit Flipgrid's main website (<https://info.flipgrid.com/>) and under "Enter your Join Code" use join code: **a6537ad3**

2. Once you have joined, you'll see your educator's Topic, or discussion prompt. Follow the instructions and when you're ready to record, click the red Record a Response button or the Flipgrid logo for the camera to start.
3. When you're in the Flipgrid camera, you can record a video in these 3 easy steps:
  - A. **Tap Record:** Tap the record button on the bottom to start. Add fun stickers, filters, text, and more. Tap the arrow on the bottom right to advance.
  - B. **Review Your Video:** Trim, split, rearrange, or add more. Tap the arrow in the bottom right to advance.
  - C. **Submit Your Video!:** Edit your cover image, name, add a title, or attach a link. Then submit!

Review the directions with the students and ask if anyone has any questions.

3. Move on to **Slide 4**, which shows the questions students should answer in their videos.
  - What is the problem that you are trying to solve?
  - What is your solution? How does it work?
  - How did you use the plant adaptations you learned about to help create a solution to that problem?

Give students time to work on their videos. Walk around the room to check on progress, answer any questions, and help film the videos if necessary. Students may need to spread out to other spaces so that they can make their videos without interference from other students making their videos. If they need to leave the room to do this, make sure they have adult supervision and understand the boundaries for where they can and cannot go.