

Learning Targets:

- Categorize a seaweed as red, brown, or green.
- Identify the different parts of a seaweed.
- Use a biological key to identify a seaweed.

Length: 45 - 60 minutes

Essential Questions:

1. What are seaweeds?
2. How do seaweeds differ from plants?
3. What are the functions of each seaweed part?
4. How are seaweeds classified?

Enduring Understandings:

1. Seaweeds are marine plants also known as algae. They are found in a marine environment and have specialized parts that allow for photosynthesis.
2. Plant parts are stems, roots, and leaves. Corresponding seaweed parts are stipe, holdfast, and blade or frond.
3. Holdfast: anchors seaweed to the surface.
4. Blade or frond: gives surface to absorb sunlight.
5. Stipe: acts like a stem in plants.
6. Float: air-filled bladder to keep seaweed afloat, not present in all seaweeds.
7. Seaweeds are classified by color: red, brown, or green.

Background for Facilitator:

This exercise familiarizes youth with the photosynthetic organisms of the Maine coast, and also introduces them to taxonomy and classification of organisms. Seaweeds can be broadly categorized based on growth form, shape, or color. The youth will examine epoxy seaweed specimens to make observations and categorize the seaweeds on their own. Once the youth are familiar with the structures and vocabulary, they will identify seaweeds through the use of a guide. A species guide has been included for the facilitator to aid in accurate student identification. Each seaweed sample is numbered on the epoxy frame (and is provided in this toolkit), and the number corresponds to the species number on your facilitator's guide.

If readily available, use of live, real seaweed would add another level of authenticity for scientific exploration and discovery. If you are planning to collect seaweed, be sure to be aware of local

regulations for seaweed harvesting. <http://www.seaweedcouncil.org/wp-content/uploads/MSC-Field-Guide-Aug-2014-FINAL-reformatted-new-url.pdf> (Harvester's Field Guide to Maine Seaweeds): includes details on where to find seaweed, appropriate times to harvest seaweed, how to harvest seaweed, and how to handle seaweed.

Vocabulary List:

Blade: Flattened part of a seaweed that resembles a leaf.

Holdfast: Base of a seaweed that attaches it to a rock; this resembles roots.

Stipe: Stalk of a seaweed between holdfast and blade; this resembles a stem.

Froned: Term used to refer to stipe and blade together.

Float: Air-filled bladder to keep seaweed afloat, not present in all seaweeds.

Seaweed: Marine plants that grow in the sea and do not have true roots, stems, or leaves; also known as "algae."

Habitat: Place where a plant or animal lives (its home).

Photosynthesis: a process used by plants and other organisms to convert light energy from the sun into energy that can be stored for later use.

Materials:

- 4-6 wooden framed, epoxy seaweed samples (with 10 different species)
- 5 Gulf of Maine Seaweed Guides
- Seaweed Sample Answer Key
- 10 Portable microscopes

Methods:

Engage

1. Engage youth in a discussion about identifying seaweeds: *Note: you may have to explain what a seaweed is. See vocabulary list above.
 - a. **Who can describe what seaweed looks like?**
 - b. **How do you recognize seaweed when you see it?**
 - c. **What are the differences between seaweeds and land plants?**
2. Ask youth to spend 10 minutes drawing a picture of a seaweed. They can draw the first seaweed that comes to their mind, even if it's not accurate.
3. As they draw, walk around and ask youth to discuss the following things with their neighbor:
 - a. **Where does your seaweed live?**
 - b. **What color is your seaweed?**
 - c. **Describe the shape of your seaweed.**
 - d. **How does your seaweed stay attached to the shore? Or does it float free?**
 - e. **What makes your seaweed different from a plant on land?**
 - f. **What else should we know about your seaweed?**
4. After approximately ten minutes, tell the youth to finish up their drawings and ask for 2-3 volunteers to describe their seaweeds out loud to the group.
 - a. **Everyone should listen carefully as the volunteers describe their seaweed to us.**

5. Explain that they will now explore the different types of seaweed that are common on the Coast of Maine.

Explore

6. Divide the group into 4-5 cooperative learning groups.
7. Pass out 2-3 portable microscopes to each group.
 - a. **Scientists often use microscopes to get a closer look at seaweeds when identifying them.**
 - b. **First, let's learn how to use the microscopes.**
8. Aid the youth in using the microscopes. They can practice by looking at the table, their hands, a piece of paper, etc. *Note: it helps to practice this yourself before facilitating the activity.
9. Once everyone has been introduced to the microscopes, pass an Epoxy Seaweed Sample to each group.
 - a. **These are samples of real seaweeds that have been collected by researchers at the University of Maine.**
 - b. **They have been preserved by allowing them to air dry, and then set in epoxy to help keep the color and shape longer. Another way to preserve seaweed is by pressing and drying, similar to how leaves can be pressed and dried.**
10. Encourage the youth to explore the different seaweed specimens in front of them using their microscopes.
11. Let each group get a chance to see the different samples and see if they can separate them into groups based on any criteria of their choosing. Each category must share a similar characteristic.
 - a. **Which of these samples would you group together based on similarities?**
 - b. **What makes the samples similar to each other?**
 - c. **What makes the groups different from each other?**

Explain

12. Ask each group to share the criteria they used to categorize their seaweed.
 - a. **Listen carefully as we hear from each group.**
13. After each group shares, explain that scientists categorize seaweed in many different ways, and one of the easiest ways is sorting by color.
 - a. **What color seaweeds do we have in these samples from the coast of Maine?**
14. The youth should be able to identify the three major colors: red, brown and green.
15. Explain to the youth that there are important parts of each seaweed that make them very different from plants on land.
 - a. **Point to the part of your seaweed that looks most like a leaf. In seaweed, this is called a "Blade."**
 - b. **Point to the part of your seaweed that looks most like a stem. In seaweed, this is called a "Stipe."**
 - c. **Point to the part of your seaweed that looks most like roots. In seaweed, this is called a "Holdfast," and they help attach the seaweed to rocks.** *Note: not all samples have holdfasts since they are difficult to press and laminate. You may have to point out the holdfasts in the next part of the activity.

- d. **Point to a part of your seaweed that allows it to stay afloat. These are air-filled bladders called floats. Not all seaweeds have floats.**
- e. **Why do you think these seaweed structures have different names than the structures of land plants?**

Elaborate

16. Now that the youth are familiar with the three major colors and the parts of a seaweed, they will work in groups to identify the names of their seaweeds using the Gulf of Maine Seaweed Guide.
17. Pass out a Gulf of Maine Seaweed Guide to each group.
18. Have youth record all observations in their Seaweed Journals. Draw a picture of your seaweed in your journal as you would if you were a scientist in the field.
 - a. **Can you identify the common and scientific name of your seaweed?**
 - b. **What color is this seaweed?**
 - c. **What is this seaweed used for?**
 - d. **Where does this seaweed live?**
 - e. **What is your favorite thing about this seaweed?**
19. Each group will then introduce their seaweed species to everyone else. They will discuss what characteristics they used to determine the name of the species, describe what it looks like, and share the facts that they learned about that species.

Evaluate

20. Engage the youth in a discussion of their experience:
 - a. **Which was your favorite seaweed species and why?**
 - b. **What seaweed fact was most surprising to you?**
 - c. **How do you think the seaweed structures help them to function in their environment?**
 - d. **Why do you think it is important to be able to identify organisms?**
 - e. **Why are seaweeds really not weeds?** (Seaweeds have many benefits – they act as food and habitat for marine creatures; they provide vitamins, minerals, and fiber to people; used as a thickening agent; used as fertilizer, etc.)
 - f. Have students go back to their original drawings and explain any differences between their first drawing and final drawing. They can now label the parts of their seaweed.

Extension Ideas:

- If you have access to the coast, collect some fresh seaweed for comparison and examination. <https://www.youtube.com/watch?v=RvDalUK5M2w> Video from CA. (Explains edible vs nonedible sea vegetables and how to harvest and store them.)
- <http://www.seaweedcouncil.org/who-owns-the-seaweeds-of-maine/> Maine Seaweed Council. (Laws related to seaweed harvesting in Maine)
- If you have fresh seaweed, you can facilitate a seaweed pressing activity! Encourage youth to get creative with their designs. A quick internet search will lead to some resources for how to press seaweed.

- A fun alternative to seaweed pressing is to create solar prints using fresh seaweed. Purchase solar paper and follow the directions on the box for making prints. We recommend using a piece of Plexiglas to assemble seaweed designs on top of, in order to prevent the solar paper from becoming too wet.
- Many of the pressed species are cultivated and available for purchase. Having “store-bought” samples alongside the pressed or fresh samples could inspire some great discussion about how to process seaweed that will be sold in stores. These can be found in many major grocery stores and health food stores.
- Even students who live near the ocean may not realize that seaweed is an important health food source. Seaweed is now being made into forms like Kelp Crunch Bars in order to promote eating healthy seaweeds. <https://www.youtube.com/watch?v=WAMxRMtjicc>



Microscopes are most stable when placed on top of a sample resting on the table.

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