

Learning Targets:

- Understand that seaweeds are edible plant-like organisms that people consume in processed food products.
- Recognize and/or identify seaweed-based ingredients when reading product ingredient lists.
- Observe how seaweed acts as a binding/thickening agent in food.

Length: 45 - 60 minutes

Essential Question:

- Why is seaweed added to the foods we eat?

Enduring Understandings:

- Seaweed is added to foods to help keep our bodies healthy and to thicken foods and to keep them from separating.

Key Concepts:

- Seaweed can be used in many ways.
- Seaweed is found in many products we use every day.
- Adding seaweed to products can thicken/bind/stabilize/emulsify the ingredients.
- We can use the unique properties of seaweed to help us solve problems (such as protecting ice cream from freezer burn).

Background for Facilitator:

Seaweed is used in many products we use and eat because the properties of seaweed make it useful as an **emulsifier**, **thickener**, and **stabilizer**. It is an emulsifier because it keeps ingredients like mayonnaise, salad dressing, and chocolate milk in suspension. It is a thickener because it absorbs water and keeps things like pie filling from softening the pastry crust. It is a stabilizer for things like ice cream to keep them from forming large ice crystals when frozen. Seaweed stabilizes the emulsion and prevents breakdown of the emulsion. These properties are useful in other products like toothpaste. They are also important in the textile industry to thicken pastes containing dye. In this activity, we search the ingredients labels of common products and investigate how seaweed can emulsify, thicken, and stabilize the ingredients in the products we use.

We will explore one of these seaweed products, alginate, to investigate the “slimy” properties of seaweed that allow it to emulsify, thicken, and stabilize the ingredients in the products we use. Depending on the seaweed species and the extraction process, the alginate powder may have different properties for use in different kinds of products. For example, *Macrocystis* (a type of kelp) can give either a medium-viscosity alginate, or a higher viscosity alginate when extracted at a lower temperature. *Sargassum* (a free-floating brown algae) usually gives a low viscosity alginate. These are

some of the reasons why alginate producers prefer to have a variety of seaweed sources. Different seaweeds match the needs of the particular application.

Vocabulary List:

Emulsifier (ih-muhl-suh-fahy-er): promotes the formation and stabilization of a mixture of liquids. Emulsifiers are used to keep liquids from separating and to bind liquids together.

Stabilizer: a substance added to another substance to prevent it from altering its physical state. Stabilizers prevent the breakdown of emulsions and keep them stable.

Thickener: a substance that makes something thick or thicker.

Alginate (al-juh-neyt): a substance derived from marine brown algae (such as Kelp) used especially as a stabilizing, emulsifying, or thickening agent in foods (such as ice cream), pharmaceuticals, and cosmetics.

Carrageenan (kar-uh-gee-nuhn): a gelatinous substance extracted from various red algae (such as Irish Moss) and used especially as a stabilizing or thickening agent.

Beta Carotene (bey-tuh kar-uh-teen): a natural substance that is found in dark green and dark yellow fruits and sea vegetables that helps your body grow and be healthy.

Hypothesis (hahy-poth-uh-sis): an idea or theory that is not proven but that leads to further study or discussion.

Materials:

- 5 “Seaweed in your cupboard” data sheets (1 per group)
- 15 Dry erase markers
- 25 Laminated photos of common products (1 set per group)
- 3-5 bags of different types of dried seaweed (enough for each group to have one of each sample type)
- 5 aluminum trays (1 per group)
- 5 containers of Sodium Alginate powder (1 per group)
- 15 Craft sticks (not-dyed or colored)
- 15 Mini cups
- 5 Alginate experiment data sheets (1 per group)
- 2 Tablespoons
- Paper towels
- Pitcher/water bottle for water transport
- Water [not included]

Methods:

Engage

1. Ask youth to recall the information they learned about cooking with seaweed in the previous activity:
 - a. **What are some things that humans can do with seaweed? Refer back to Gulf of Maine Seaweed guide in Activity 1: as a food in salads, soups, wraps; as fertilizer; in skin care products**
 - b. **Do you remember which seaweed species can be used for cooking? Rockweed: clambakes for steaming food, added to soup; Kelp: noodles, salad, sushi wrap; Dulse: chips; Irish Moss: pudding)**

2. Explain that you are going to start this activity with a guessing game called “Seaweed or No Seaweed?”
 - a. **The object of the game is to guess which of these common products have seaweed ingredients in them.**
 - b. **I will show you the products one at a time, and ask “Seaweed or No Seaweed?”**
 - c. **If you think the product has seaweed in it, put your THUMBS UP.**
 - d. **If you think the product does not have seaweed in it, put your THUMBS DOWN.**
3. Show youth the laminated seaweed products, one at a time, while also describing the product in case the photo is hard to see from their seats. For example:
 - a. **This common product is ICE CREAM. Seaweed or No Seaweed?**
4. Encourage the youth to write down their guesses, and/or ask for a volunteer to keep track of the number of “thumbs up” and “thumbs down” for each product.

Explore

5. Tell the youth that they will now have the opportunity to figure out whether or not these products have seaweed ingredients.
6. They must look for one of three seaweed names in the ingredients list of each product: **ALGINATE** (al-juh-neyt) (sometimes referenced as **ALGIN**), **CARRAGEENAN** (kar-uh-gee-nuhn), and **BETA CAROTENE** (bey-tuh kar-uh-teen). They will be given a data sheet with these ingredients spelled out for them, so they can look for them in the products.
7. Divide into five cooperative learning groups of 2-3 youth per group.
8. Distribute one set of laminated “products” and one “Seaweed in your cupboard” data sheet to each group.
9. Ask each person in the group to read the definitions of the three seaweed ingredients aloud.
 - a. **One person reads the description on the datasheet for “Alginate” aloud. Another person reads the description for “Carrageenan.” A third reads the description for “Beta Carotene.”**
 - b. **These are the names you will look for in the ingredients list for each product.**
10. Tell the youth to keep track of which products have “Seaweed” or “No Seaweed” on their data sheet.
11. Encourage the groups to discuss with each other:
 - a. **How do your findings compare with your “Seaweed or No Seaweed” guess in the beginning of this activity?**
 - b. **Why do you think seaweed has been added to these products?**
Answer: Either to help bodies be healthy or to thicken foods and keep them from separating.
 - c. **Which product with seaweed ingredients was most surprising to you?**
12. Encourage the groups to exchange “products” so everyone has a chance to determine “Seaweed or No Seaweed?”

Explain

13. When the groups are finished with their investigations, play the “Seaweed or No Seaweed?” game again, and ask another volunteer to keep track of the number of “thumbs up” and “thumbs down.”
14. Use this opportunity to clarify any confusion over whether a product has Seaweed or No Seaweed.
15. Besides the fact that seaweed is healthy for our bodies, it can also be added to help thicken foods. Explain to the youth that there are three ways that seaweed is used in this way.
 - a. **Seaweed is used in many products we use and eat because its properties make it useful as a thickener, stabilizer, and emulsifier.**
 - b. **It is a thickener because it absorbs water and keeps things like pie filling from softening the pastry crust.**
 - c. **It is a stabilizer because it absorbs water in things like ice cream to keep it from forming large ice crystals when frozen and prevents the breakdown of emulsions.**
 - d. **It is an emulsifier because it keeps ingredients like mayonnaise, salad dressing, and chocolate milk in suspension so the ingredients do not separate.**
16. Explain that the youth will be performing some seaweed experiments to understand how seaweed is useful as a thickener, stabilizer, and emulsifier and why it is added to many common food products.

Elaborate

17. Divide into five cooperative learning groups of 2-3 youth per group. Give each group a few pieces of dried seaweed.
 - a. **Do you remember the name of these seaweeds from the previous activities?**
 - b. **What does this seaweed feel like?**
 - c. **How might it be different from live seaweed?**
 - d. **How do you think this seaweed became so dry?**
 - e. **What if we were to wet this piece of seaweed? What would you expect it to feel like then?**
18. Distribute an aluminum tray containing about 1 inch of water to each group.
19. Encourage youth to play with the dried seaweed in the tray of water and discuss their observations within their groups, and/or write them down.
 - a. **What happened to the dried seaweed?**
 - b. **What does it feel like? What does it look like?**
 - c. **What are some differences between dried seaweed and wet seaweed?**
20. Explain that seaweed is often dried and ground into a fine powder before it is added as an ingredient to food products.
 - a. **What do you think would happen if we took dried seaweed, ground it into a fine powder, and then added water?**
 - b. **In your groups, brainstorm what would happen to the powdered seaweed using your observations of what happened to the dried seaweed when it was added to the tray of water.**
21. Ask each group to make a **hypothesis** and write it down.
 - a. **We will test your hypotheses by experimenting with seaweed powder and water.**
22. Distribute 1 mini cup and 1 stirring stick to each person.

23. Distribute 1 alginate experiment datasheet to each group.
24. Introduce the alginate:
 - a. **Alginate is powdered brown seaweed for sale in gourmet food stores. In fact, this product is often made from Maine seaweed!**
 - b. **Each person in the group is going to mix different amounts of alginate and water to test your hypothesis.**
 - c. **Circle the amount of alginate and water you would like to test. Everyone should have different amounts of alginate and water so you can compare the effects of water on the alginate.**
25. Walk around to each group with the alginate and water; have the youth measure the amount of alginate and water they requested. *Note: Use your discretion to determine if youth can measure ingredients themselves, or if the facilitator should walk around and measure for them.
26. If time allows, continue changing the proportions of alginate and water and encourage youth to describe their observations and evaluate their hypothesis.

Evaluate

27. Engage the youth in a discussion of their experience:
 - a. **What happened to the powdered seaweed when water was added?**
 - b. **How does your cup differ from others in your group?**
 - c. **What can you say about the effect of water on powdered seaweed?**
 - d. **Was your hypothesis correct? How do you know?**
 - e. **What would your next seaweed experiment look like?**
 - f. **Can you describe how this mixture is helpful for products like ice cream, toothpaste, and pudding? Keep in mind what it feels like and what happened to the water.**

Extension Ideas:

Additional Resource: <https://www.youtube.com/watch?v=7I8GXmpKrVg> Explains in kids' language what an emulsifier is. (note, the narrator has a British accent)

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