**Partnership for Reform through Investigative Science and Math**

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**Limu in your lunch (optional lesson)**

**Summary**

Not only do fish and turtles eat limu, humans do too! Did you eat your algae today? In this lesson students will learn about the various types of algae (or limu in Hawaiian) that are found in Hawaii. Additionally, students will research species in the three different groups of limu (red, green and brown). They will also learn about the native limu and uses such as for food and medicine. They will also learn about limu morphology and be able to draw and identify species from each group (red, green and brown).

**Objectives**

In this lesson students will be able to:

- Identify the three different classification groups of algae (chlorophyta, phaeophyta and rhodophyta)
- Research the morphology (structure) and uses of the algae available

**Materials**

Limu notebook (print two sheets per student)
Fresh limu (if possible) or Store bought limu
Limu products list
Edible limu poster
Tape
Velcro
Limu products
Poster board

**Making Connections**

This lesson introduces the idea that humans are also a part of the ocean food web. Through this lesson students will learn that the ocean provides a variety of resources and that even the most microscopic plants can provide great energy and nutrition.

**Teacher Prep for Activity**

If you have time a day or two ahead of this lesson to go to the beach, look along the rocks at low tide for limu. Print the poster from: http://www.hawaii.edu/reefalgae/publications/ediblelimu/index.htm

Use the edible limu poster to identify species that you can use to cook with (some species are seasonal and hard to find during certain times of the year). If you can find limu pick them by pinching the ends but leaving the base, this will allow new growth to form. Bring it back to the classroom, rinse it off and store in the refrigerator.

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**Concepts**

Algae is seaweed and seaweed is limu. Algae is an important part of the ocean food web and is also very important for medicine and nutrition in humans.

**HCPS III Benchmarks**

SC 6.1.1
SC 6.1.2

**Duration**

2-1 hour classes

**Source Material**

PRISM
Monterey bay aquarium

**Vocabulary**

Agar
Algin
Caregeenan
Chlorophyta
Macro-algae
Micro-algae
Phaeophyta
Rhodophyta

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**Limu in your lunch**

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If you don’t have time to collect your own limu you can probably find it at the grocery store. Codium (Limu Wa’waiolo), Gracilaria (Ogo) and Asparagopsis (Limu Kohu) are often available in the deli/meat/seafood section of local grocery stores. The package should indicate if it was either grown at an aquaculture center or hand picked from the beach.

Additionally, look around your house for items that contain agar, algin and caregeenan. These are all processed forms of algae and will make an interesting display and great way to grab the interest of the students. (See the attached Limu products list)

**Background**
Hawaii has about 500 species of marine algae. Limu has been a part of the Hawaiian diet since ancient times, the Hawaiian name for algae is limu. Hawaiians also used it limu in ceremonies and for medicine. Now algae is used not only for food but algae extracts can be used to thicken products such as toothpaste and ice-cream.

Algae can be classified based on size such as micro-algae or macro-algae and they can also be classified by the pigments that give them specific colorations. Scientist also classify algae by the color, red algae are rhodophyta, green is chlorophyta and brown is phaeophyta.

**Vocabulary**

**Agar:** a jellylike substance extracted from red algae, used as a substitute for gelatin and is used as an anti-drying agent for foods like cheese, ice cream and canned meats.

**Algae:** photosynthetic organisms that occur in freshwater and saltwater habitats. There are three major groups. Also known as Limu in Hawaiian.

**Algin:** a slippery substance extracted from brown algae, used in paint, toothpaste, ice cream, and many other products because it thickens liquids and binds oily and watery liquids together.

**Carrageenan:** an edible substance extracted from red algae, used as a thickener in ice cream, food, cosmetics, and other products.

**Chlorophyta:** the group of green algae

**Macroalgae:** large aquatic algae that can be seen without the aid of a microscope.

**Microalgae:** small microscopic algae that requires the aid of a microscope to be seen.

**Phaeophyta:** the group of brown algae

**Rhodophyta:** the group of red algae

**Procedure**
Part one:
1. Set out the fresh limu from the beach or store and separate them by colors (red, green, brown)
2. Hand out the limu notebooks
3. Review the vocabulary and discuss as a class
4. Have students compare the different limu and make observations on the morphology
5. Identify them using reference books
6. Draw them in their limu notebook
7. Have them research information to include in their notebooks such as the uses and where it can be found.
8. Now start off the second part of the lesson by asking the students if they ate any limu today? If they say no, say Are you sure? It is very likely that they have had some form of algae in their mouth everyday.
9. If you have samples from the limu products list, hold them up and ask if they ate or used any of the items today?
10. Ask the students what all these items have in common? The answer is they all contain algae!

Part two (optional class project that will require them to do some homework -1 hour):

1. Have students go home and look for products in their kitchen and bathroom that contain agar, algin and carrageenan.
2. Combine all the products and make a limu products list, on that list have the students indicate which products have agar, which have algin, which have carrageenan.
3. Then as a class make a display poster board of the different products with limu in them.
4. You can make a cupboard like display board using two large folding poster boards
5. Cut the two small sides off folding poster board #1 these will be the shelves
6. Cut two slits in poster board #2 the fit the size of the shelves
7. Slip the shelves into the slits and secure with tape
8. Attach Velcro to each item and the other side to the shelves to attach the products
9. Display the board in the classroom (or for your limu luncheon with recipes)
Assessments
Correct identification of different products containing algae
Completion of the limu notebook

Resources
Books:
Abbott, Isabella. Limu an ethnobotanical study of some Hawaiian seaweeds.
Includes photos and description that can be used to identify seaweeds
Includes recipes that can be used for the limu luncheon (optional)


Commonly found edible limu in Hawaii:
http://www.hawaii.edu/reefalgae/publications/ediblelimu/index.htm

Products with limu in them: (to bring in as a display)
Look in your kitchen and bathroom for items with algae in them (they may be listed as
carrageenan, alginate, algin, alginic acid, agar)
- Puddings
- Toothpaste
- Ice-cream
- Vitamins
- Whipping cream
- Salad dressings

Extension Activities
Have a limu luncheon: Select multiple recipes that would be fun to prepare and eat in class.
Limu notebook:

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