



Kelp ME ASAP

A curriculum guide for teaching K-5
students about aquaculture



October 2016

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Lesson plans: Erin Love, Island Institute Fellow; Marci Train, Long Island Teacher;
Yvonne Thomas, Island Institute Education Director

Document design: Maren Granstrom, Island Institute

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Introduction

Welcome to the Kelp ME ASAP Aquaculture Curriculum Guide! We would like to share a few notes about the making of the guide. We hope that this context will help you modify the activities in the guide to meet your program's needs.

The After-School Approach

The guide is a collection of the activities used during the Kelp ME After-School Aquaculture Program (Kelp ME ASAP) on Long Island, Maine in the spring of 2016. Because this was an after-school program, we focused on engaging students and sparking enthusiasm for the topic of aquaculture rather than adhering strictly to standards. However, many activities could be aligned with learning standards and used as part of an in-school program. We included some examples of possible standards from the Common Core, Maine Learning Results, and Next Generation Science Standards that activities could be aligned with as a starting point.

A Focus on Seaweed

We chose to focus on seaweeds, specifically sugar kelp (*Saccharina latissima*), during Kelp ME ASAP, but many of the activities can be adapted to an aquaculture species of your choice. For example, if you know a local oyster grower who is willing to help out with an aquaculture program at your school, then you may wish to focus on oysters. For simplicity's sake, we do not always indicate when a species modification is possible. But with a little creativity, wherever you see seaweed or kelp mentioned in this guide, you can probably come up with a modification of the activity for another species.

Ocean Access

We are fortunate to have easy access to the ocean because we are an island school. We understand that this may not be the case for your school. We encourage you to think about your level of access to the ocean when deciding how to incorporate activities that require water samples or seaweed specimens. Teachers can collect materials from the ocean ahead of time, or group all the activities that require ocean access together into one field trip session, or choose to omit or modify activities that require ocean access. There are many activities that do not require coastal access at all, and our hope is that this guide will be relevant to all schools interested in teaching about the fascinating topic of aquaculture.

Session Outline

We found ourselves following a similar flow of activity at Kelp ME ASAP each week. After the first few sessions, you will find a rhythm that works for you and your participants. Here is what worked for us: In an hour and a half session, we spent the first 15 minutes letting the kids eat a snack while we watched a relevant YouTube video or had an informal warm-up conversation about the day's topic. This allowed for a transition period between school and after-school. Then we dove into the main activity for about an hour. We made every effort to finish that activity 10-15 minutes early in order to have time for our photo journal reflection before parents came for pick-up. This was challenging because activities often ran longer than anticipated. We found the photo journal to be a worthwhile component of the program and would highly recommend making time for it.

Session Order and Activity Combination

With the exception of Session 14: Reflection and Assessment, each session can stand alone. We arranged the 14 sessions in a way that seemed logical to us. We encourage you to customize your program by mixing and matching activities (the "parts" within each session) and changing up the session order in a way that makes sense to you. More experienced educators may wish to pick and choose which activities suit their purposes on a certain day, while people with less experience may find it helpful to have fully planned sessions to guide them. The guide is designed to be flexible enough that educators of various experience levels and facilitation styles are comfortable using it.

Community Involvement

One goal of Kelp ME ASAP was to expose the Long Island community to the idea of aquaculture. We hosted evening kick-off and culminating events at the beginning and end of the program to give parents and community members a chance to be more involved. We also had an open door policy and invited any parent or community member to attend any after-school session. We live in a small community where this policy makes sense, but individual schools and groups will want to adopt whatever community involvement practices are needed to keep participants safe and comfortable.

Aquaculture Rig

All of the activities in this guide can be done without putting an aquaculture rig in the water, and we hope this fact makes the guide useful to any school that wants to introduce its students to the world of aquaculture. That being said, an exciting component of Kelp ME ASAP was installing an actual aquaculture rig in the water and growing and harvesting sugar kelp. While the rig was a rewarding addition to our program, we understand it is not realistic for everyone. It takes time and money to apply for an aquaculture permit, choose a site, design a rig appropriate for that location, install the rig, monitor it, and harvest a product. If you want more information about what that process entails, please contact the Education or Marine Programs at the Island Institute (contact information available on the Island Institute website: www.islandinstitute.org).

Resources

BOOKS



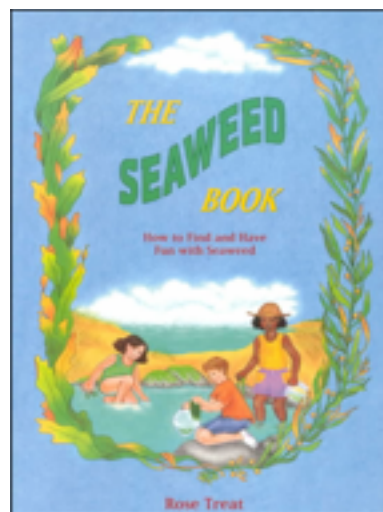
Seaweeds: Edible, Sustainable, & Available
Ole G. Mouritsen
ISBN: 9780226044361 (cloth)
ISBN: 9780226044538 (e-book)



Aquaculture for ME Activity Book
URL: http://teachmefoodandfarms.org/?search-class=DB_CustomSearch_Widget-db_customsearch_widget&widget_number=preset-3&cs-Grade-0&cs-Topic-1&cs-Core_Value-2&cs-all-3&cs-all-4=Aquaculture&search=Search



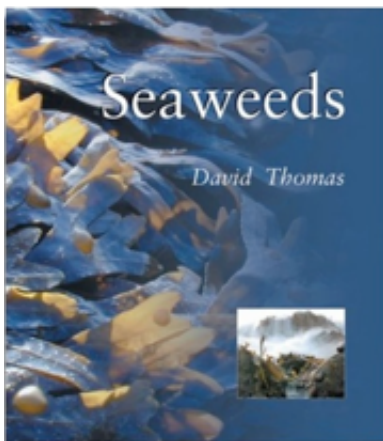
Aquaculture for ME Book
Maine Ag in the Classroom
URL: <http://teachmefoodandfarms.org/wp-content/uploads/Aquaculture-for-ME.pdf>



Seaweed Activity Book
The Seaweed Book: How to Find and Have Fun with Seaweed
Rose Treat
ISBN: 9781887734004

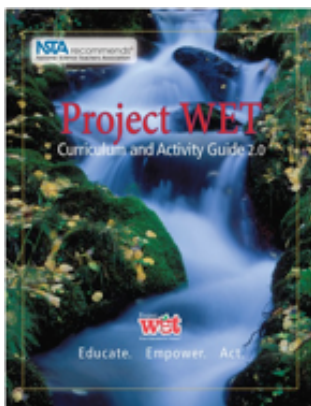


An Ocean Garden: The Secret Life of Seaweed
Josie Iselin
ISBN: 9781419711701



Seaweeds
David Thomas
ISBN: 1588340503

RELATED CURRICULUM GUIDES



Project WET
Project WET Foundation
ISBN: 9781888631807

Climate of Change Curriculum Guide:
<http://www.islandinstitute.org/resource/climate-change-part-iv-educators-guide>
Climate of Change film Part 4: <http://www.islandinstitute.org/media/climate-change-pt-4>



Shelburne Farms Guide
http://www.shelburnefarms.org/sites/default/files/cultivatingjoywonder_all_smaller.pdf

OTHER DOCUMENTS



Kelp Farming Manual: A Guide to the Processes, Techniques, and Equipment for Farming Kelp in New England's Waters
Katie Flavin, Nick Flavin, and Bill Flahive
URL: http://static1.squarespace.com/static/52f23e95e4b0a96c7b53ad7c/t/52f78b0de4b0374e6a0a4da8/1391954701750/OceanApproved_KelpManual-LowRez.pdf



Aquaculture in Shared Waters Fact Sheets

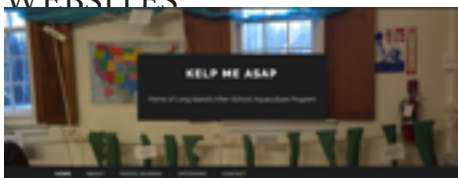
Various authors

URL: <http://www.islandinstitute.org/resource/aquaculture-shared-waters-fact-sheets>

SPEAKERS

We encourage you to get to know your local aquaculture producers and specialists. They have a wealth of knowledge to share, and some people are even willing to do classroom visits. We learned a lot from conversations with local people in the industry. Virtual field trips to aquaculture farms or conversations with aquaculture specialists are also possibilities if it is not feasible to travel to sites or host speakers in person. If you would like more information about connecting with local aquaculturists or arranging site visits to aquaculture operations, please contact the Education or Marine Programs at the Island Institute (contact information can be found on the Island Institute website: <http://www.islandinstitute.org/>).

WEBSITES



Kelp ME ASAP Blog

URL: <https://kelpmeasap.wordpress.com/>



Maine Department of Marine Resources Aquaculture Page

URL: <http://www.maine.gov/dmr/aquaculture/>



Maine Aquaculture Association Teacher Resources
 URL: http://www.maineaquaculture.com/Teacher_Resources/teacher_resources.html



Herring Gut Learning Center

URL: <http://www.herringgut.org/>



Maine Aquaculture Innovation Center Educational Resources
 URL: <http://www.maineaquaculture.org/educational-resources/>



University of Maine SEANET
URL: <https://umaine.edu/seanet/>



Maine Department of Marine Resources Education Page
URL: <http://www.maine.gov/dmr/education/>

Session 1

Introduction to Aquaculture

Objectives

- Students will share their prior knowledge of aquaculture and create a list of topics they would like to learn about.
- Common Core ELA.RS.K-5.1-6

Standards

Duration

30 Minutes

Materials

- List of questions/statements for Part I

Instructor Prep

- Familiarize yourself with aquaculture basics, so you can facilitate discussion with participants in Parts II and III. Quick resources for this are Climate of Change Film #4 (<http://www.islandinstitute.org/media/climate-change-pt-4>) and the Introduction to Aquaculture fact sheet (http://www.islandinstitute.org/sites/default/files/July6_2016AquaIntro_LETTER.pdf).

Directions

Part I: Spectrum Game

Ask students the degree to which they agree or disagree with statements made by a moderator. They demonstrate their agreement/disagreement by standing along a continuum. Designate one point in the room as the agree area and another as the disagree area. Students can stand anywhere between the two points based on the statement. There are no right or wrong answers in this activity. It is a conversation starter. Encourage students to elaborate on answers or share opinions in an organized way.

This activity is a modified version of the School Reform Initiative protocol titled Continuum Dialogue: http://schoolreforminitiative.org/doc/continuum_dialogue.pdf.

Possible statements:

- I like to eat seafood.
- Someone in my family goes fishing or works on a boat.
- I have been fishing (fish, lobster, clams, etc.).
- I know a lot about seaweed. (Follow up: What do you know?)
- I think seaweed is gross.
- I have eaten seaweed. (Remind them that nori, used in sushi, is a type of seaweed. See if anyone changes their answer.)
- I can name a type of seaweed. (Follow up: What type of seaweed can you name?)
- I think it would be fun to grow seaweed.

Part II: YouTube Video and Discussion

Before watching the video, ask “What do you know about aquaculture?” Discuss. Watch the video and then ask students what they learned about aquaculture from the video. Feel free to pause the video as important points come up.

Introduction to aquaculture video: <https://www.youtube.com/watch?v=nHtx5bNxORw>

Part III: Seaweed-Specific Discussion

As you discuss each of these questions, use a Smart board or projector to show relevant pictures or YouTube clips to spark the conversation.

You are encouraged to familiarize yourself with some basic facts about the organism you have chosen to focus on so you can facilitate an introductory discussion. We chose seaweed with an emphasis on sugar kelp. You may find the following kelp fact sheet helpful: http://www.islandinstitute.org/sites/default/files/July6_2016_Kelp_8x11.pdf. More suggested reading material can be found on the Resources page. Some questions you might ask about seaweed are:

- What do you know about seaweed?
- Where can we find it?
- What does it need to grow?
- Is it a plant or an animal? (Neither! It's an algae.)
- What is seaweed used for?

Session 2

Aquaculture Equipment

Objectives

- Students will become familiar with the equipment used in a kelp longline.

Standards

- Next Generation Science Standards K-2-ETS1-2, K-2-ETS1-3, 3-5-ETS1-1, 3-5-ETS1-2;
- Common Core ELA.RS.K-5.1-6

Duration

1 - 1½ hours

Materials

- Rope
- Buoy
- Weights (or materials that represent those items)

Instructor Prep

- You may find it helpful to practice tying knots or assembling the rig ahead of time, or you may wish to wing it with your participants. It depends on your facilitation style! You will need to know how basic aquaculture rigs are assembled. Check out pages 5-10 of the Kelp Farming Manual that is listed on the Resources page to learn more.

Directions

Part I: Truth or Consequences

What equipment do we need to grow seaweed? This brief game familiarizes students with common pieces of equipment used in an aquaculture rig. It works best with at least two facilitators.

Both facilitators make statements about how the same piece of equipment could be used. The statements can be as serious or as silly as you like, but one should be true and one should be false. For example, when describing a buoy, Instructor A might say, “Kelp farmers use this object to feed juvenile kelp in a nursery setting,” and Instructor B might say, “Kelp farmers use this object to mark their longlines, so boaters can see them.” Students have to guess which instructor is telling the truth (in this case, Instructor B). Keep in mind that many pieces of equipment have multiple uses. Basic items to describe are buoys, rope, weight. You can expand the activity to include other pieces of equipment if you want. You can also break the students into teams and make the game competitive by keeping track of which team guesses more answers correctly.

Part II: Design and Aquaculture Rig

You can do this activity together on a white board or Smart board, or you can break the students into small groups, depending on age and ability to work independently. Students draw a diagram of what they think a kelp rig looks like.

Some guiding questions are:

- How do you think we would grow seaweed?
- What kind of equipment do we have? (see above)
- What does kelp need to survive? Where can it find those things?

Discuss the diagram(s). See if you can think of ways to improve the design. What are some potential problems with the design and ways to fix those problems?

Optional: Show them a diagram of a real aquaculture rig. Compare it to the participants’ diagram(s). What are the similarities and differences in design? Ask them if they have any new ideas for improving their design(s).

Part III: Assemble the Rig

Depending on the availability of materials and whether or not you plan to put a working aquaculture rig in the water, you may choose to do this activity in either life-size or diorama format. Students should use their final diagram(s) from Part II to put together a life-size or diorama version of an aquaculture rig. If you are planning to install a functioning rig as part of your program, this is a great opportunity for students to see how it looks and works before you are in an unfamiliar setting, such as a wharf. Once it is assembled, participants can take turns “pulling it out of the water” or “checking the kelp” by tugging the correct rope. If you are making a diorama version, have students label the parts of the rig with sticky notes to reinforce the terms. Even if you are doing a life-size rig assembly, the diorama is a great way to review.

Some questions to ask at the end of the rig assembly:

- Do the students have confidence in their rig?
- What might happen if a storm comes?
- Would they make any changes to their design now that they have worked with the materials?
- How did they work together as a team?



Session 3

Kelp Anatomy

Objectives

- Students will learn kelp's basic anatomical parts and their functions.
- Next Generation Science Standards K-2.ETS1-2, 4.LS1.1

Standards

Duration

1 hour

Materials

- Costume for species that you are dressing up as
- Piece of kelp to label (real or paper/foam version)
- Mural paper
- Marker
- Floating protozoa supplies

Instructor Prep

- Be familiar with your chosen species' anatomy

Directions

Part I: Plankton Races

Organisms' body parts serve various functions. This activity demonstrates how anatomy affects a creature's movement and habitat. In the activity students build a floating plankton using classroom materials. This activity was designed by Herring Gut Learning Center. (see following two pages)

Part II: Dress up as Kelp

Bring in a costume for an aquaculture species you are focusing on. Choose one student to dress up as Kelsey Kelp or Oliver Oyster and have others brainstorm body parts the species has. As students name those parts, add elements to the demonstrating student's costume. More detailed instructions for this activity can be found on pages 78 and 104 of the Shelburne Farms Cultivating Joy and Wonder activity guide: http://www.shelburnefarms.org/sites/default/files/cultivatingjoywonder_all_smaller.pdf.

Part III: Label a Specimen

Lay your piece of kelp on a large sheet of mural paper and label its parts. Discuss the function of each.

Part IV: Song

If you want to get the kids moving, you can teach them this short song and invite them to do the "kelp dance" while they sing. To do the kelp dance, they imagine they are a piece of kelp and move as they think a piece of kelp would move in the water.

(To the tune of Head, Shoulders, Knees, and Toes)

Blade, stipe, and strong holdfast, strong holdfast

Blade, stipe, and strong holdfast, strong holdfast

Swing in the water eating nutrients

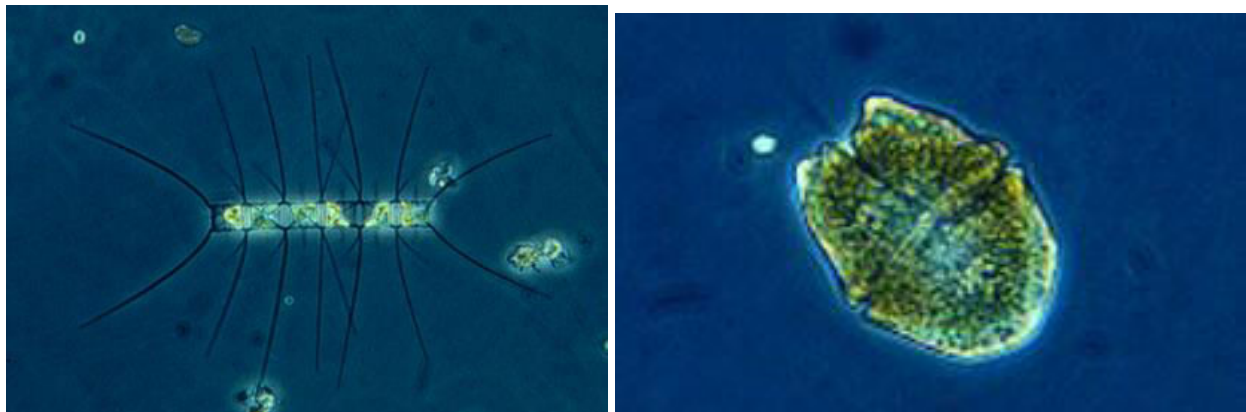
Blade, stipe, and strong holdfast, strong holdfast!

Plankton Races

Background Information

Phytoplankton (phyto = plant, plankton = drifters) are microscopic, single-celled plants that drift with the ocean currents. There are thousands of types of phytoplankton. Phytoplankton live near the surface of the sea. This is important because they need access to light in order to conduct photosynthesis and make their own food. Light, heat, carbon dioxide, and nutrients (which are mixed upwards from storms and waves) are other essential elements that are needed for phytoplankton to survive.

Because phytoplankton need to stay near the surface to survive, they have developed adaptations to be buoyant. Some have tails (flagella) that keep them near the surface. Others store oil which allows them to float near the surface of the water. Others have waterwings, which also help them to stay near the surface. Some even form chains of cells to prevent from sinking.



(Images from <http://www.serc.si.edu/labs/phytoplankton/primer/phyto.aspx>)

Phytoplankton are essential to the health of our ecosystems. They form the base of the food chain. They use carbon dioxide in the atmosphere during photosynthesis and produce half of the world's oxygen. In addition, they have the potential to be a source of biofuel, nutritional supplements, and other materials.

Plankton Races

Purpose: Students will learn about buoyancy, density and surface area. Students also learn about biodiversity and the relationship between the structure and function of organisms by examining phytoplankton.

Materials

- Various sizes of washers (representing heavy parts of the cell)
- Cloth
- Pipe cleaners
- Styrofoam shapes
- Beads
- Felt
- Straws
- Toothpicks
- Screens or meshes of various sizes
- Tape
- Large container of water
- Any other materials can be used

Procedure

- 1.) Lay out all materials
- 2.) Students create a phytoplankter with the materials
- 3.) The goal of the “race” is to see who can make a phytoplankter that can sink the slowest or hover just below the surface of the water.
- 4.) Students test their plankton in the “ocean” tank to see if it floats or sinks.
- 5.) Students continually modify their plankter until they are satisfied.
- 6.) 2 students “race” their plankton to see who sinks the slowest. (If a plankter floats on the surface, it is disqualified.)
- 7.) A “winner” is determined, and all students keep their creation.

(Lesson adapted from MARE Ocean Immersion Program, Lawrence Hall of Science
<http://mare.lawrencehallofscience.org/>)

Herring Gut Learning Center ~ P.O. Box 286, Port Clyde, ME 04855 ~ (207) 372-8677

Session 4

Identification and Taxonomy of Seaweed

Objectives

- Students will identify different species of seaweed found in their area at low tide
- Maine Learning Results Science and Technology.E1.K-5

Standards

Duration

Varies

Materials

- Identification cards

Instructor Prep

- Be able to identify seaweeds local to your area

Directions

Part I: Identify Specimens

Collect wild grown seaweed at low tide and identify specimens. Guide students as much or little as needed. You may choose to focus on a limited number of species during a guided identification session, or you may choose to turn your students loose on the beach with their field guides. You may start out working together as a group and then let participants strike out on their own or in small groups. As always, safety is a priority.

Part II: Name that Species Game

After the students have practiced identifying seaweeds, hold up a specimen and ask them to identify it. You can make this a little more open ended and ask students to justify their answers (“What physical characteristics led you to that conclusion?”) or you can break students into teams and make it into a competition. You can also set it up like a game show where a team of students needs to “click in” as soon as they recognize the species. If they answer correctly, they get a point and the student or team with the most points “wins.”

Session 5

Seaweed Habitat and Photosynthesis

Objectives

- Students will understand some of the basic needs of seaweeds.

Standards

- Next Generation Science Standards K.LS1.1, K.ESS3.1, 3.LS4.3, 5.PS3.1
- Common Core ELA.RS.K-5.1-6

Duration

1 hour

Materials

- Posters
- YouTube videos about photosynthesis
- Relay race materials
- Mural paper
- Coloring utensils

Instructor Prep

- Be familiar with the habitat and natural history of kelp, along with the process of photosynthesis

Directions

Part I: Habitats and Needs

Talk about what living things need to grow. Discuss photosynthesis and how algae uses this process to make food. If students are familiar with photosynthesis in plants, you may find it helpful to talk about similarities and differences between plants and algae. Talk about seaweed's habitat. Ask how the species' anatomy helps it live in this habitat.

Part II: Watch Photosynthesis YouTube Videos

There are many YouTube videos about photosynthesis to choose from. You can pick your favorite to share with participants, or you can teach them about photosynthesis in another way of your choosing. After the photosynthesis lesson, students can make their own skits or videos about photosynthesis to demonstrate their understanding of the process.

Part III: Photosynthesis Relay Race

Instructions for the Photosynthesis Relay Race can be found at:

<http://www.serc.si.edu/education/k-8/explorenat/photosynthesis%20relay.pdf>.

Part IV: Kelp Mural

Put a piece of mural paper up on the wall and allow students to draw a kelp line and the surrounding habitat. You may also have students take turns adding to a smart board drawing. Prompt them to incorporate concepts you talked about earlier in the lesson as a review.

Session 6

Water Quality Monitoring



Objectives

- Students will be able to name and explain seven components of water quality and how to test for each.
- Common Core MAT.K.MD.1-2, MAT.1.MD.4, MAT.2.MD.10, MAT.3.MD.3, MAT.4.MD.4, MAT.5.MD.2

Standards

Duration

30 minutes

Materials

- Water test kit. We used the LaMotte EarthForce Low Cost Estuary & Marine Monitoring Kit (available at <http://www.lamotte.com/en/education/water-monitoring/5911.html>).
- Water to test (clean container to hold it in)
- Datasheet.

Instructor Prep

- Be familiar with the components of water quality.

Directions

Go through each water quality test, explain its purpose and procedure, and demonstrate how to perform the test and read the results. Record the results on a data sheet. If you choose to monitor water quality on an ongoing basis, you can have participants perform the tests and record data in small groups. You may assign one group to one water test for the duration of the monitoring program so they become “experts” at that test and can track changes over time, or you may have groups perform different tests on a rotating basis so everyone has a chance to perform every test. If you monitor water quality over an extended period of time, it would be interesting to graph the data and look for trends.

The tests you have will depend on the water quality test kit you order, but some commonly tested components of water quality are:

- Temperature
- Salinity
- Dissolved oxygen
- pH
- Turbidity
- Nitrogen (saltwater)
- Phosphorous (freshwater)

Discuss how components of water quality impact the ability of different species to survive in an environment.

Session 7

Seaweed Products and Marketing



Objectives

- Students will identify a variety of uses for seaweed and create a commercial for one consumer product that contains seaweed.

Standards

- Common Core ELA.RS.K-5.1-6
- Maine Learning Results Theater.A1-2, B1-3.K-5

Duration

1 hour

Materials

- Costumes
- Props (empty bottles/jars with seaweed lotion or itch/burn gel labels taped to the front)

Directions

Part I: YouTube Video about Seaweed Products

Here is one option for a YouTube video: https://www.youtube.com/watch?v=_AG1AHOnoXA.

You may choose another if you wish. Discuss which uses of seaweed surprised people and which they already knew about.

Part II: Introduce Products

Lay out all of the seaweed “product” props on a table and introduce each. Invite participants to explain what the products are and the role seaweed plays in the products if they already know.

You may wish to supplement Part II with the following activity:

http://ma-marine-ed.org/wp-content/uploads/2014/10/Kelp_in_the_Cupboard_Activity.pdf.



Introducing seaweed products

Part III: Commercials

Break participants into groups of two or three people. Invite each group to draw the name of a product out of a hat. They will create a commercial that sells that product.

Participants may find it helpful for the instructors to demonstrate the process of brainstorming ideas, assigning lines and choreography, doing a walk-through without costumes, and rehearsing with costumes in a mini-commercial. This gives them an idea of what the process will be like and may help get their creativity flowing.

If there is extra time, participants can decorate the labels for their props.

When each group is ready (this usually happens at different times), instructors can take the group aside and make a video recording of the commercial. Alternatively, you can give groups a set amount of time to work and then have each small group perform for everyone at the end of the day.

We found that the following products worked well in commercials with our students:

- Treatment for cuts and burns (Ancient Romans used seaweed for this.)
- Fertilizer (On gardens and farms.)
- Vitamin supplements (High iodine, calcium, and vitamin C content. Some species are high in protein. Nori has 1.5 times the amount of vitamin C of oranges. 1 dried gram of seaweed has more than the recommended daily amount of iodine.)
- Ice cream (Keeps it smooth and creamy by preventing ice crystals from forming on it. And it makes ice cream melt more slowly.)
- Make-up/lotion/bath salts (Beneficial effects on skin. Not backed up by conclusive research but common in traditional medicine in many cultures.)
- Biofuel (Seaweed is cheap and easy to grow. Does not detract from existing food sources. But not very efficient right now. Research ongoing to improve efficiency.)
- Food: nori in sushi, dried and eaten like potato chips, in smoothies

Source:

http://www.huffingtonpost.com/2010/04/14/9-incredible-uses-for-sea_n_526746.html?slideshow=true#gallery/5757/0

The science behind the benefits of some of these products is inconclusive. You may wish to limit your selection of products based on a certain caliber of research. Or you may wish to include products that people used historically, whether or not the science behind their use is solid. It all depends on your learning goals.

If you would like to focus this lesson on marketing, advertising, and media awareness, here are a few resources to help you do that:

- <https://www.admongo.gov/lesson-plans.aspx>
- <http://lessonplanspage.com/ossartlamarketproductmakecommercials48-htm/>
- http://pbskids.org/dontbuyit/advertisingtricks/createyourownad_flash.html

Session 8

General Knowledge about Aquaculture



Objectives

- Students will demonstrate their general knowledge of aquaculture with trivia and fun facts.

Standards

- Common Core CCSS.ELA-RL-K-10, CCSS.ELA.RL.K-5.1, CCSS.ELA.RI.K-5.1-3

Duration

1 hour

Materials

- Jeopardy game board and link
- Two small white boards or chalkboards and writing utensil
- Stopwatch
- Aquaculture for ME book and Aquaculture for ME activity book (2 copies of each)

Directions

Part I: Read Aquaculture for ME

Read through the Aquaculture for ME book with students. Stop and ask questions while you read.

Part II: Aquaculture Jeopardy

Navigate to the following link on a Smart Board or a computer with a projector: <https://jeopardylabs.com/play/aquaculture10>. Or create your own version of Aquaculture Jeopardy. Split your participants into two groups (try to distribute ages and abilities evenly). Have students elect one person to be the spokesperson for the group. Flip a coin to see which team goes first. The first team to go is Team 1, and the second team is Team 2. Invite Team 1 to choose a question from the Jeopardy board and ask them to talk through their answer quietly. Set a timer for 30 seconds. When time is up, the spokesperson (and only the spokesperson!) presents the team's answer on the white board. If it is correct, Team 1 gets the point, and it is Team 2's turn to choose a question. If the answer is incorrect, Team 2 gets 10 seconds to come up with an answer. If Team 2 comes up with the correct answer (presented on the whiteboard by their spokesperson), they get the points for that question. Then it is Team 2's turn to choose a question. Play continues with each team allowed an opportunity to answer the other team's question if the original team gets the answer incorrect.

Jeopardy questions are based on the Aquaculture for ME book and Aquaculture for ME activity book. You may find it helpful to give each group copies of both books to reference, or you may wish to see what they can remember. Some of the questions in our version of jeopardy do ask for specific numbers, so it may be helpful to allow students to use the books for those questions only.

Adjust the time limits based on your group's abilities.

It can be a challenge to ensure that the youngest members of a team feel included during a competitive game where the most outspoken (and usually oldest) students tend to participate the most. We found it helpful to assign the youngest member of each team to be the spokesperson so that they would have the role of presenting their team's answer, even if they had help thinking of the answer and writing it down.

Session 9

Policy and Management

Objectives

- Students will understand the importance of managing resources and that there are regulations surrounding aquaculture.
- Next Generation Science Standards K.ESS3.3, 5.ESS3.1
- Common Core ELA.RS.K-5.1-6

Standards

Duration

Varies

Materials

- Simplified lease applications
- Map printouts of local area
- Extra paper
- Writing utensils

Instructor Prep

- Familiarize yourself with your state's aquaculture regulations and prepare mock lease applications.

Directions

Part I: Regulations and Policy

Talk about your state's regulatory agency for aquaculture (In Maine it is the Department of Marine Resources.) and why it is important to manage common resources.

Part II: Lease Application

Each student/group picks a location and species and fills out a simplified aquaculture lease application. In Maine it would be a simplified limited-purpose aquaculture (LPA) application. This activity is best for older students who can write, but you can focus more on pictures or maps with younger students.

If you plan to install a functioning aquaculture rig as part of your program, have the students fill out a mock application for the site and species you will actually use (assuming you have already submitted the real application).

If you have plenty of time (several months) before you plan to install your rig, have the students participate in the actual lease application writing process. The lease application process can be lengthy and time-consuming, so be sure to get an accurate understanding of what the process entails before deciding to take it on as part of your program, with or without student involvement.

Part III: Guest Speaker

This session is ideal for a guest speaker. Consider inviting someone from your state environmental regulatory agency or a community member who has been through the aquaculture lease application process to speak to the group. Encourage students to brainstorm questions ahead of time to help keep the conversation going.

Session 10

Art and Music



Objectives

- Students will experience aquaculture in a new way, through the lens of art and music.

Standards

- Common Core ELA-RL-K-4;
- Maine Learning Results Visual Arts.A2, B1-2.K-5, Visual Arts.B4.3-5

Duration

Varies

Materials

- Song lyrics, YouTube karaoke version of “Let it Go” from Disney’s Frozen
- Bookmark supplies
- Sun print paper (<http://www.amazon.com/SunPrint-W330-Paper-Kit/dp/B001KOGY3M>)
- Selection of seaweed
- Access to hose or watering can

Directions

Part I: Let it Grow Song

Learn the “Let it Grow” song together. Come up with hand motions to accompany the lyrics. Modify the lyrics if needed to fit your location or situation. Sing along to a karaoke version of “Let it Go” from Disney’s Frozen. A video of ASAP students rehearsing the song is available here: <https://youtu.be/Xolof8Sjonw>.

“Let It Grow”

To the tune of “Let it Go” from Disney’s Frozen

The kelp hangs brown on the line tonight
Not a plant, it’s an algae
Saccharina latissima
Oh it looks so tasty

Our fear is fouling as the water warms this spring
Take it out on time, that’s the main thing

Maine’s the perfect place, I’ve heard people say
There’s such clean water in Casco Bay
If we don’t try, then we’ll never know
So here we go!

Let it grow, let it grow
It once was a tiny spore
Let it grow, let it grow
Drop the line and go ashore!

DMR
Gave us our LPA
And three months later
We’re so glad you’re eating our kelp today!

Part II: Seaweed bookmarks (Created by Herring Gut Learning Center).

Most of the time when we find interesting things we want to save them in some way. This fun activity shows us how to preserve a species.

MATERIALS

- 4x6 index cards or cardstock
- Markers/pencils/pens
- Scissors
- Circle template with 1 1/2 diameter circle
- Field guides to algae
- Clear packing tape

DIRECTIONS

- Find several different specimens of seaweed (algae)
- Dry on paper towels
- Using a field guide identify the species type
- Using your template, cut a hole on one side of the index card about 1 1/4 down and 3/4 in. On the other side, put a piece of packing tape over the hole so that when you turn the card over, the sticky side of the tape is up.
- Place your specimen on the tape. Take a second piece of packing tape and put it over the specimen. (If the specimen isn't dry first, it may mold in the packing tape.)
- Print the following information on the card next to the specimen: The common name for your species; The scientific name; Date you found it; Where you found it; Description with three or more observable things about your species, such as color, texture, smell, anything you notice that makes your specimen stand out.

Part III: Seaweed Sun Prints

Follow the directions that come with the Sun Print paper to make seaweed prints. A few helpful tips:

- It is helpful to place the seaweed on the paper in a dark room.
- It is best not to do this activity on a windy day (weigh down your papers while they are processing if you do).
- For the type of paper we used, we needed a water source. Be sure to read the instructions on your photo paper ahead of time and plan accordingly.



Session 11

Physical Activities and Games



Objectives

- Students will reinforce their understanding of basic aquaculture terms and ideas through movement and games. These games and activities can be used as formal parts of lessons, to pass the time on a day when you sped through your planned activities, or as a move-around break. We included some of them as activities in other sessions.

Standards

- Maine Learning Results Health and Physical Education.G2-3, H3, I1-3.K-5

Duration

Varies

Materials

- Large piece of paper
- Marker
- Foam or paper cut into the shape of a kelp blade
- Tape
- Blindfold
- Photosynthesis Relay Race materials
- Seaweed specimens
- Kelp blade
- Hot water

Directions

Spore Off: Students stand in a group, “spore off” by running to a designated point, and “attach to the line” by running back to their original location and pretending they are holding onto a rope like a kelp blade would.

Kelp Dance: Participants imagine they are a piece of kelp and move as they think a piece of kelp would move in the water.

Pin the Holdfast on the Longline: Draw a line on a large piece of paper, and tape the paper to the wall. Participants take turns being blindfolded and spun around and then trying to tape a foam or paper kelp blade to the longline.

Photosynthesis Relay Race: Instructions can be found at <http://www.serc.si.edu/education/k-8/explorenat/photosynthesis%20relay.pdf>.

Name That Species: Students identify seaweed specimens. You can make this competitive or keep it loose and freeform. You can collect specimens prior to the session or go on a field trip. As always, please keep safety in mind if you venture out into the field.

Hot Water Dip: Dip a piece of sugar kelp in boiling hot water and watch its color change from olive brown to bright green. Please be cautious with hot water and heating implements. Only adults should handle these items.

Session 12

Cooking



Objectives

- Students will experience aquaculture in a new way, through the lens of cooking and eating farmed seaweed products. You can make a snack during every session or have one session focused solely on cooking. We cooked the day of our culminating event so that parents, siblings, and community members could partake of our seaweed treats as well. Please keep in mind your time constraints and the availability of adult supervision when choosing the number and difficulty of recipes you attempt.

Standards

- Common Core
MAT.K.CC.6,
MAT.3.NF.1, 3,
MAT.4.NF.2

Duration

Varies

Materials

- Recipes
- Ingredients
- Cooking utensils and appliances
- Eating utensils and plates/napkins

Directions

Be sensitive to food allergies of students, teachers, staff, parents, and anyone who will come into contact with the food, and be aware of safety in the kitchen. Be sure to have ample adult supervision during the cooking process.

Seaweed Pizza

Buy pre-made pizza dough, marinara sauce, and mozzarella cheese. Follow instructions on package for making pizza. Top pizza with sugar kelp after adding cheese but before baking.

Seaweed Smoothies

Make fruit kelp smoothies. We used frozen strawberries, frozen pineapple, frozen sugar kelp, plain yogurt, maple syrup, and ice.

Seaweed Salad

2-3 medium cucumbers sliced thin

Rehydrated dried kelp, cut into thin strips (You can use as much or as little kelp as you like. I rehydrate it by boiling it for about 10 minutes.)

3 Tablespoons rice vinegar

1 Tablespoon soy sauce (low sodium)

1 Tablespoon toasted sesame oil

2 teaspoons freshly grated ginger

1 clove crushed garlic

1/8 cup toasted sesame seeds

Mix vinegar, soy sauce, sesame oil, ginger and garlic in a bowl. Add cucumbers and kelp and toss together. Garnish with sesame seeds.

Kelp Crunch Bars

Kelp crunch bars can be ordered from Maine Coast Sea Vegetables online at http://www.seaveg.com/shop/index.php?main_page=index&cPath=14. As of this writing, Maine Coast Sea Vegetables uses wild-harvested seaweed in their products. Eating this snack is a good opportunity to talk about the similarities and differences between wild-harvested and farmed seaweed.

Kelp Cornbread

Use your favorite cornbread recipe, but blend the sugar kelp into the buttermilk with a food processor. Then proceed as normal. Serve warm with butter.

Popcorn Topping

Use a dehydrator to dry out some sugar kelp the night before you want to use it. Use a mortar and pestle to grind the dehydrated seaweed into a powder. Sprinkle onto air popped popcorn.

Session 13

Reflection and Assessment

Objectives

- Students will document and reflect on their aquaculture learning experience with a weekly photo journal blog and a one-time survey.

Standards

- N/A

Duration

5 - 15 minutes

Materials

- Camera
- Cord to connect camera to Smart Board or projector
- Computer with Internet access (or other blogging/sharing format)
- Survey tool (Google Forms, Survey Monkey, etc.)

Directions

Part I: Photo Journal

Facilitators take pictures throughout a session. The last 10-15 minutes of every session are dedicated to reviewing the pictures and having the participants narrate the day's activities, using the pictures to jog their memories. This is a great way to review what you learned each session, keep parents updated, and report to funders or program directors at the end of the program. You can view Kelp Me ASAP's photo journal at <https://kelpmeasap.wordpress.com/category/photo-journal/>.

Part II: Survey

We surveyed participants during the last two sessions of the program to get a sense for how the program was received. If you are confident that you can fit all of the surveys into a single session, then it may make sense to wait until the final session to administer surveys. We asked students to agree or disagree with the following statements as they applied to Kelp ME ASAP using a 1-5 scale:

- I learned about aquaculture.
- If you are in 3-5th grade please answer this question: What is your favorite thing you learned? (If you are in Kindergarten-2nd grade, you can skip this question.) [This question was open-ended, not ranked on the 1-5 scale.]
- I want to learn more about aquaculture.
- I want to learn about aquaculture during the school day.
- I have shared something I learned about aquaculture with someone in my family or a friend.
- I had fun.

In retrospect, a Yes/No answer system might have been simpler than the 1-5 scale. You can tailor the questions to your program objectives and potential future directions for your program. It is always helpful to know how participants received the program and give them an opportunity for feedback.



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