

In this unit students will plant and care for kalo (taro), 'uala (sweet potato), 'ulu (breadfruit), kī (ti leaves), and one or more species of native Hawaiian plants, and discuss the significant role of these plants in Hawaiian culture and history. Throughout the school year they will care for their gardens, then harvest, prepare, and enjoy edible crops during the spring semester. Each lesson begins with the offering of a Hawaiian chant (oli) as protocol and introduces a different Hawaiian value for students to practice, including pono, kuleana, aloha, lokomaika'i, laulima, mālama, ha'aha'a, and ho'omaui. Additional key concepts include 'āina, ahupua'a, mahi'ai, makana, plant varieties, nutrients, native (endemic, indigenous), introduced (Polynesian-introduced, recent introduction), endangered, extinct, and invasive species.

RECOMMENDED GRADE LEVEL

Grade 4

This unit is easily adaptable for other grade levels.

LESSON DELIVERY

This unit consists of eight 60-minute lessons to be taught at 3 to 5 week intervals (about one lesson per month) over the course of the school year (four lessons per semester). Regular garden care and observations should take place between lessons, and teachers are encouraged to use the Lesson Extensions or create their own extension activities in order to connect the gardens with other classroom learning. All of the Hawaiian Garden plants may be planted year-round. **NOTE:** Schools should only select the types of plants they are committed and prepared to care for; not all of the suggested plant types (kalo, 'uala, 'ulu, kī, native Hawaiian plants) need to be planted.

GARDEN CARE

- Teachers and students are responsible for watering and weeding their gardens. Regular applications of organic nutrients (vermicast) are scheduled as part of each lesson.
- Add **Garden Monitor** to the list of classroom jobs assigned; these students should visit the garden daily to water the soil, check on the gardens, and make observations.
- Set up a shared weekly watering schedule amongst grade level teachers and/or parents and garden docents to make sure the garden receives adequate moisture.
- Please do not use synthetic chemicals (pesticides, herbicides, and/or fertilizers) in or around school and home gardens. If necessary, use "OMRI" (organic certified) products only.
- Post the **Garden Agreements** in the classroom and review them often with students.

PRE & POST UNIT SURVEYS, TAKE HOME LETTERS, & STUDENT WORKBOOKS

- Pre and Post Unit Surveys measure student progress related to content knowledge, attitudes, and behavior change related to 'ĀINA Lessons.
- Take Home Letters contain suggested questions/activities for each lesson for families to help reinforce, engage, and learn along with their child.
- Student Workbooks include Student Worksheets and Take Home Letters, available for download at www.kokuahawaiifoundation.org/aina.
- Regular student observation time in the garden is encouraged with the use of individual Garden Journals or Folders, where drawings and writings can be kept by each student, or a Class Journal where weekly garden observations can be recorded by Garden Monitors.
- Plan to review and select examples of student work to be shared with the Kōkua Hawai'i Foundation.

LESSON EXTENSIONS

Gardens offer infinite, engaging learning opportunities, and teachers are encouraged to utilize them beyond these lessons. The lesson plans include a number of suggested activities (Lesson Extensions) designed for teachers and students to make the most of the gardening experience!



NEED HELP?

Contact the Kōkua Hawai'i Foundation with any questions or comments about this unit:

- aina@kokuahawaiifoundation.org
- (808) 638-5145

THE HAWAIIAN GARDEN - FALL SEGMENT

Lesson 1	Lesson 2	Lesson 3	Lesson 4
The Kalo Garden	The 'Uala Garden	The 'Ulu Tree (Planting or Care)	Kī (Ti) Plants
SUGGESTED DELIVERY TIMES FOR FALL SEMESTER (3 to 5 weeks apart)			
September	October	November	December
LESSON OVERVIEW			
Key Concepts <ul style="list-style-type: none"> • Ahupua'a • Āina • Kalo • Mahi'ai • Pono 	Key Concepts <ul style="list-style-type: none"> • 'Uala • Kuleana 	Key Concepts <ul style="list-style-type: none"> • 'Ulu • Ho'okupu • Laulima 	Key Concepts <ul style="list-style-type: none"> • Kī • Makana • Lokomaika'i
Introduction Compare and discuss ancestral and modern day Hawai'i, then discuss what students know and want to know about kalo (taro). Introduce kalo plant parts and planting instructions.	Introduction Discuss what students know and want to know about 'uala (sweet potato). Introduce 'uala plant parts and planting instructions.	Introduction Discuss what students know and want to know about 'ulu (breadfruit). Introduce 'ulu tree planting or care instructions.	Introduction Discuss what students know and want to know about kī (ti leaf plants). Introduce kī planting instructions.
Activity 1: Kalo Planting: Prepare garden soil and work together to plant kalo huli. Clearly label the different kalo varieties with signs.	Activity 1: 'Uala Planting: Prepare garden soil and work together to plant lau ('uala slips) in circular mounds or mounded rows. Clearly label the different 'uala varieties with signs.	Activity 1: 'Ulu Tree Care OR Planting Preparation: Care for the school's existing 'ulu tree OR prepare for planting a new tree by digging the planting hole and making other preparations.	Activity 1: Kī Planting: Work together to plant kī cuttings horizontally, in or near the Hawaiian Gardens.
Activity 2: Ti Leaf Plates and Poi Snack Preparation: Make ti leaf plates and poi snack.	Activity 2: Kalo Care: Weed, water, and feed (with vermicast) the kalo garden. Cover bare soil with mulch. Make ti leaf plates.	Activity 2: Kalo and 'Uala Care: Weed, water, feed, and mulch the kalo and 'uala gardens. Fold running 'uala vines. Make ti leaf plates.	Activity 2: Kalo, 'Uala, and 'Ulu Care: Weed, water, feed, and mulch the kalo and 'uala gardens and the 'ulu tree. Fold running 'uala vines.
Closing and Snack: Enjoy a snack of poi served on ti leaf plates.	Closing and Snack: Enjoy a snack of cooked 'uala (two or more varieties) served on ti leaf plates.	'Ulu Tree Dedication and Snack: All participating classes gather to (plant and) dedicate the 'ulu tree and enjoy a snack of cooked 'ulu served on ti leaf plates.	Makana: Students create makana using lā'ī (ti leaves) and tī cuttings as well as pū'olo (parcels) using and locally grown food items to give to teachers/staff.
Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Review kalo plant parts • Student Worksheet: Kalo Reflection & Plant Parts • Journaling and discussion • Lesson Extensions • Take Home Letter 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Review 'uala plant parts • Student Worksheet: 'Uala Reflection & Plant Parts • Journaling and discussion • Lesson Extensions 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Student Worksheet: 'Ulu Reflection • Journaling and discussion • Lesson Extensions 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Student Worksheet: Kī Reflection and Hawaiian Canoe Plants • Journaling and discussion • Lesson Extensions • Submit examples of student work to Kōkua Hawai'i Foundation

THE HAWAIIAN GARDEN - SPRING SEGMENT

Lesson 5	Lesson 6	Lesson 7	Lesson 8
'Uala Leaf Harvest	Native Hawaiian Plants	'Uala Harvest	Kalo Harvest
SUGGESTED DELIVERY TIMES FOR SPRING SEMESTER (3 to 5 weeks apart)			
February	March	April (6 months after Lesson 2)	May (9 months after Lesson 1)
LESSON OVERVIEW			
Key Concepts <ul style="list-style-type: none"> • Nutrients • Community • Aloha 	Key Concepts <ul style="list-style-type: none"> • Native: endemic, indigenous • Introduced: Polynesian, recent • Endangered, extinct • Invasive • Mālama 	Key Concepts <ul style="list-style-type: none"> • Kō'elepālau • Mindful • Ha'aha'a 	Key Concepts <ul style="list-style-type: none"> • Ho'omau
Introduction Discuss the nutrients and health benefits found in 'uala leaves. Discuss the importance of working as a community.	Introduction Discuss what students know and want to know about native Hawaiian plants, including details on the kind(s) being planted and/or cared for on campus.	Introduction Review the importance of 'uala in Hawaiian culture and history, as well as its nutritional benefits and plant parts.	Introduction Review the importance of kalo in Hawaiian culture and history, as well as its nutritional benefits and plant parts.
Activity 1: 'Uala Leaf Harvest, Washing, and Cooking: Harvest and wash 'uala leaves and remove stems. Saute 'uala leaves with a small amount of oil, salt, and chopped garlic.	Activity 1: Planting OR Care: Care for the school's existing native Hawaiian (endemic/indigenous) plants, or work in groups to plant native Hawaiian plants on campus.	Activity 1: 'Uala Harvest and Kō'elepālau Preparation: Harvest 'uala roots and prepare slips for planting. Mash cooked 'uala and mix with coconut milk to make kō'elepālau.	Activity 1: Lau and Kalo Harvest: Harvest and wash healthy lau (kalo leaves). Harvest the kalo and have an adult carefully cut the corm from the huli of each plant.
Activity 2: Garden Care Work in groups to weed, water, feed, and mulch the kalo and 'uala gardens, 'ulu tree, and kī plants. Fold running 'uala vines. Make ti leaf plates.	Activity 2: Garden Care Work in groups to weed, water, feed, and mulch the kalo and 'uala gardens, 'ulu tree, and kī plants. Fold running 'uala vines.	Activity 2: Garden Care Work in groups to weed, water, feed, and mulch the kalo and 'uala gardens, 'ulu tree, kī and native Hawaiian plants. Fold running 'uala vines. Make ti leaf plates.	Activity 2: Garden Care: Work in groups to weed, water, feed, and mulch the 'ulu tree, kī and native Hawaiian plants. Make ti leaf plates.
Closing and Snack: Enjoy a snack of cooked 'uala greens served on ti leaf plates.	Closing and Snack: Enjoy a beverage of mamaki tea.	Closing and Snack: Enjoy a snack of kō'elepālau served on ti leaf plates.	Cooking, Closing, and Snack: Cook the lau and kalo and enjoy the snack served on ti leaf plates.
Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Student Worksheet: Edible Leaves • Journaling and discussion • Lesson Extensions • Take Home Letter 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Student Worksheet: My Native Plant • Journaling and discussion • Lesson Extensions 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Student Worksheet: Edible Roots and Stems • Cure, cook, and enjoy harvested 'uala • Journaling and discussion • Lesson Extensions 	Follow Up Activities <ul style="list-style-type: none"> • Continue to care for the gardens. • Student Worksheet: My Hawaiian Garden Reflection • Journaling and discussion • Lesson Extensions • Submit examples of student work to Kōkua Hawai'i Foundation

ACADEMIC STANDARDS GUIDE: GRADE 4 ALIGNMENT

Common Core Standards (CCSS), Language Arts		
4.RL.2	Reading Literature: Key Ideas and Details: Determine a theme of a story, drama, or poem from details in the text; summarize the text.	Lessons 1, 3
4.RL.3	Reading Literature: Key Ideas and Details: Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text (e.g. a character's thoughts, words, or actions).	Lesson 3
4.RL.4	Reading Literature: Craft and Structure: Determine the meaning of words and phrases as they are used in a text, including those that allude to significant characters found in mythology (e.g., Herculean).	Lessons 1, 3
4.W.1	Writing: Text Types and Purposes: Write opinion pieces on topics or texts, supporting a point of view with reasons and information.	Lessons 1-8
4.W.3	Writing: Text Types and Purposes: Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.	Lessons 1-8
4.W.7	Writing: Research to Build and Present Knowledge: Conduct short research projects that build knowledge through investigation of different aspects of a topic.	Lessons 2, 3, 4
4.W.8	Writing: Research to Build and Present Knowledge: Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	Lessons 1-8
4.W.10	Writing: Range of Writing: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	Lessons 1-8
4.SL.1	Speaking and Listening: Comprehension and Collaboration: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.	Lessons 1-8
4.SL.4	Speaking and Listening: Presentation of Knowledge and Ideas: Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	Lessons 2, 3, 4
4.SL.5	Speaking and Listening: Presentation of Knowledge and Ideas: Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.	Lesson 3, 4

(Academic Standards Guide continues on page 5)

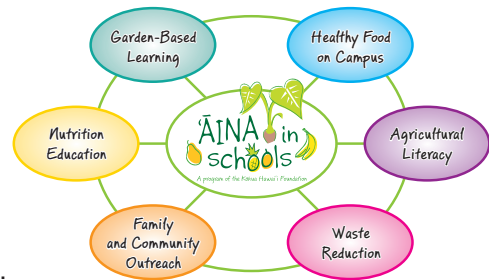
ACADEMIC STANDARDS GUIDE: GRADE 4 ALIGNMENT (CONTINUED)

Hawai'i Content & Performance Standards III (HCPS III)		
HE.3-5.1.1	Mental and Emotional Health: Describe the relationship between physical and emotional health.	Lessons 1-8
HE.3-5.1.2	Healthy Eating and Physical Activity: Describe the importance of physical activity and exercise as part of a healthy lifestyle.	Lessons 1-8
HE.3-5.1.3	Healthy Eating and Physical Activity: Explain the importance of a healthy diet as part of a healthy lifestyle.	Lessons 1-8
HE.3-5.5.1	Communication Skills Across Topic Areas: Use appropriate strategies for effective verbal and nonverbal communication skills for a variety of situations.	Lessons 1-8
HE.3-5.5.2	Communication Skills Across Topic Areas: Use strategies to avoid inappropriate communication.	Lessons 1-8
SS.4.1.1	Historical Change and Continuity: Describe both change and continuity of aspects of Hawaiian culture (including religion, land use, and social systems).	Lessons 1-8
SS.4.3.1	Early Hawaiian Society: Explain the origins and culture of early Hawaiians.	Lessons 1-8
SS.4.3.2	Early Hawaiian Society: Explain the history of Hawai'i's early economy.	Lessons 1-8
SS.4.3.3	Early Hawaiian Society: Describe the cultural contributions of different groups to the development of Hawai'i.	Lesson 3
SS.4.3.10	Events in Hawaiian History: Describe how significant people, including those of legend (including Papa and Wakea, Pele, and Pa'ao) affected pre-contact Hawai'i.	Lessons 1, 2, 3
SS.4.6.1	Cultural Systems and Practices: Explain how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.	Lessons 1-8
SS.4.6.3	Cultural Dynamics/Change and Continuity: Describe the changes in Hawaiian culture through contact with Westerners.	Lessons 1-8
SS.4.7.3	Environment and Society: Analyze the consequences of human modification of the physical environment in Hawai'i using geographic representations (including lo'i kalo and loko i'a).	Lesson 5

Next Generation Science Standards (NGSS)	
Science and Engineering Practices	
Analyzing and Interpreting Data: Use observations to describe patters in the natural world in order to answer scientific questions.	Lessons 1-8
Crosscutting Concepts	
Patterns: Patterns in the natural and human designed world can be observed and used as evidence.	Lessons 1-8
Systems and System Models: Systems in the natural and designed world have parts that work together.	Lessons 1-8

ABOUT 'ĀINA IN SCHOOLS

'ĀINA In Schools is a farm to school initiative that connects children to their local land, waters, and food to grow a healthier Hawai'i. In addition to encouraging the use of locally grown fruits and vegetables in school meals and snacks, the program includes standards-based nutrition, garden, and compost curricula that empower children to grow their own food, make informed food decisions, and reduce waste. 'ĀINA In Schools also provides field trips to local farms, chef cooking demonstrations in classrooms, as well as waste reduction, garden, and cooking educational opportunities for families and community members.



PUBLISHING INFORMATION

The 'ĀINA In Schools curriculum includes Nutrition Education, Garden-Based Learning, and Waste Reduction lessons for kindergarten through sixth grade students.

All 'ĀINA In Schools curriculum and materials are property of the Kōkua Hawai'i Foundation and are distributed to trained educators for use at schools participating in the 'ĀINA In Schools program. The curriculum and materials may be reproduced for individual classroom use by schools participating in the 'ĀINA In Schools program or by registered users approved by the Kōkua Hawai'i Foundation. Reproduction of the curriculum and materials is not permitted by unregistered users without the express written consent of the Kōkua Hawai'i Foundation.

The registration and training process helps Kōkua Hawai'i Foundation to gather educator feedback on the curriculum and to document how many children and schools are being reached through the lessons. Visit our website to become a registered user, sign up for trainings, and gain access to all Kōkua Hawai'i Foundation curriculum and resource guides. If you receive a copy of the curriculum via other means, we ask that you please email aina@kokuahawaiifoundation.org to share your plan for use of the materials. Please direct questions about the 'ĀINA In Schools program and curriculum to aina@kokuahawaiifoundation.org.

MAHALO

The Kōkua Hawai'i Foundation thanks the following organizations and individuals who have assisted with the development of the 'ĀINA In Schools curriculum and materials:

- **Kōkua Hawai'i Foundation:** Kaliko Amona, Lydi Morgan Bernal, Sarah Gelb, Kim Johnson, Julius Ludovico, Summer Maunakea, Debbie Millikan, Deanna Moncrief, Kelly Perry, www.kokuahawaiifoundation.org
- **The Green House:** Betty Gearen and Tia Meer, www.thegreenhousehawaii.com
- **GrowingGreat:** Marika Bergsund and Lori Sherman, www.growinggreat.org
- **Food for Thought:** Marty Fujita, www.foodforthoughtojai.org

Special thanks to the students, teachers, and volunteers who have participated and taught lessons in previous years and provided their valuable feedback to improve them.

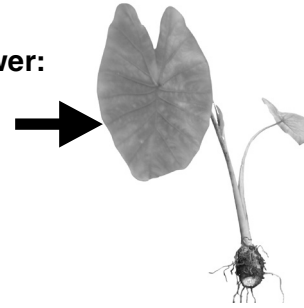
Mahalo nui!

I have been at this school since grade: K 1 2 3 4 (circle one)

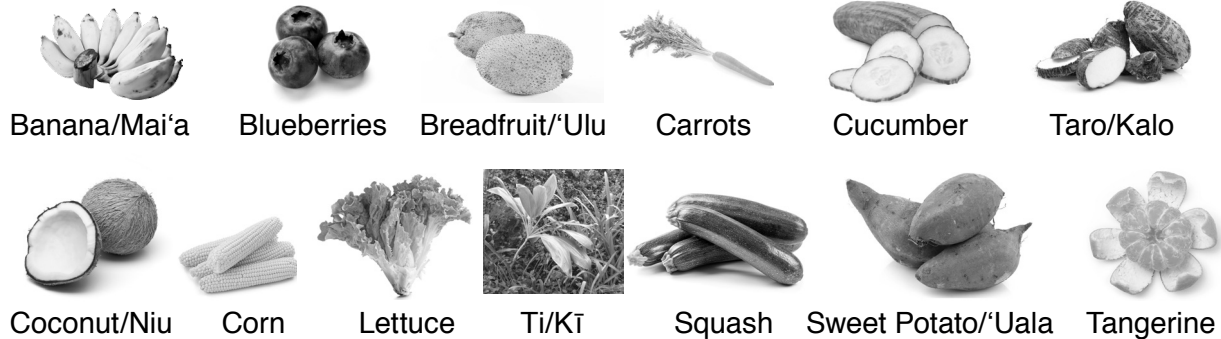
This Pre-Unit Survey is to see what you already know about these topics. It is ok if you don't know any of the answers. You will be learning about these topics this year. Try your best and have fun!

1. What part of the kalo is the arrow pointing to? Circle ONE answer:

- a. Kohina
- b. Lau
- c. Huli
- d. 'Oha



2. Circle the plants that were brought to Hawai'i in canoes by Polynesian voyagers:



3. Draw a line to match each word to its correct definition:

- | | |
|--------------------------|---|
| a. Polynesian-Introduced | 1. Plants that evolved in Hawai'i and can only be found in Hawai'i |
| Canoe Plants | 2. Plants at risk of extinction |
| b. Ahupua'a | 3. Non-native species that were brought to Hawai'i by Polynesian voyagers |
| c. Endangered | 4. To take care of, preserve, and protect |
| d. Mālama | 5. A common subdivision of land, usually extending from the top of the mountains to the sea |
| f. Endemic | |

4. How would you practice the Hawaiian value of ho'omau in the garden? Circle ONE answer:

- a. Continue growing native Hawaiian plants at school and home
- b. Work together with others to harvest, prepare, and cook food from the garden
- c. Give vegetables you grew as a gift to your teacher
- d. Water all the plants as fast as you can

5. What are two uses for the Kī (Ti) plant? Circle TWO answers:

- a. Garden signs
- b. Ti leaf plates
- c. To wrap food and gifts in a pū'olo (bundle)
- d. Butterfly host plant

6. Do you like gardening? Circle ONE answer:

- a. I do not like
- b. unsure
- c. I like a little
- d. I like a lot

7. Do you like eating fruits and vegetables? Circle ONE answer:

- a. I do not like
- b. unsure
- c. I like a little
- d. I like a lot

8. Do you like cooking? Circle ONE answer:

- a. I do not like
- b. unsure
- c. I like a little
- d. I like a lot

9. Do you like making compost? Circle ONE answer:

- a. I do not like
- b. unsure
- c. I like a little
- d. I like a lot

10. Do you like 'ĀINA Lessons? Circle ONE answer:

- a. I do not like
- b. unsure
- c. I like a little
- d. I like a lot

11. Do you and your family grow any food at home? Circle: Yes or No

If yes, please list the foods you grow at home: _____

12. Do you compost at home? (compost pile, worm bins, or bokashi bucket) Circle: Yes or No

13. How often do you eat fruits and vegetables? Circle ONE answer:

- a. I don't eat fruits and vegetables
- b. 1-2 times a week
- c. 3-5 times a week
- d. Every day

14. Circle the fruits and vegetables that you like to eat:

- Apple Cantaloupe Banana/Mai'a Blueberries Avocado Coconut/Niu Guava Dragonfruit
- Mango Passionfruit/Liliko'i Honeydew Rambutan Tangerine Strawberry Blackberries
- Lemon Starfruit Breadfruit/'Ulu Lychee Orange Papaya Pineapple Watermelon
- Radish Spinach Basil Beans Broccoli Squash Zucchini Sweet Potato/'Uala Corn Tomato
- Lettuce Watercress Taro/Kalo Cucumber Green Beans Asparagus Carrots Celery Kale

Other: _____

15. Describe what 'āina means to you: _____

16. List two ways that you take care of the 'āina:

- 1. _____
- 2. _____

17. Complete the following sentence:

My favorite thing about 'ĀINA In Schools Lessons is _____

Dear Parent or Caregiver:

This semester, 4th graders will be participating in the first four of eight Hawaiian Garden lessons being delivered by volunteers of ĀINA In Schools, a program of Kōkua Hawai'i Foundation. ĀINA In Schools is a farm to school initiative that connects children to their local land, waters, and food to grow a healthier Hawai'i. Program components vary from school to school and include nutrition education, garden-based learning, healthy snacks, farm field trips, chef visits, waste reduction, and family and community outreach.

Although the lessons are delivered once a month, the students will be continually engaged in between lessons with regular garden activities that include watering, weeding, making observations, spending time in the garden and learning about Polynesian - introduced and native plants.

Photos and Media Releases: By now each of you should have received a Kōkua Hawai'i Foundation Media Release Form. We hope that you have this form and have submitted it to your child's classroom teacher. From time to time, KHF takes photos/videos of our lessons to highlight activities that are noteworthy.

To keep yourself up to date on what your child is doing in ĀINA, we suggest putting this up on your refrigerator or bulletin board and follow up as the lessons are delivered. You can help reinforce, engage, and learn along with your child by going over the lessons and activities after each lesson. A unit summary and suggested questions/activity for each lesson are listed below.

Mahalo!

In The Hawaiian Garden

students will plant and care for kalo (taro), 'uala (sweet potato), 'ulu (breadfruit), kī (ti leaves), and one or more species of native Hawaiian plants, and discuss the significant role of these plants in Hawaiian culture and history. Throughout the school year, they will care for their gardens, then harvest, prepare, and enjoy the edible crops during the spring semester. Each lesson begins with the offering of a Hawaiian oli (chant) as protocol and introduces a different Hawaiian value for students to practice, including pono, kuleana, aloha, lokomaika'i, laulima, mālama, ha'aha'a, and ho'omau. Additional key concepts include 'āina, ahupua'a, mahi'ai, makana, plant varieties, nutrients, native (endemic, indigenous), introduced (Polynesian-introduced, recent introduction), endangered, extinct, and invasive species.



Lesson 1 - The Kalo Garden

In this lesson, students discuss ancestral and modern day life in Hawai'i, the significant role of kalo (taro) in Hawaiian culture and history, and the Hawaiian value pono. They plant their kalo garden, prepare their 'uala (sweet potato) garden for planting, and enjoy a snack of fresh poi served on ti leaf plates.

Questions to discuss with your child:

- What new information did you learn about kalo?
- What does pono mean and how did you practice this Hawaiian value today?

Suggested home activity:

- Learn more about the kalo by visiting the website: www.canoeplants.com/kalo.html
- Visit your neighborhood lo'i or check the KHF Field Trip destination for a list at kokuahawaiifoundation.org/fieldtrips/
- If feasible, connect with a kalo farmer and grow some kalo.



Lesson 2 - The 'Uala Garden

In this lesson, students discuss the significant role of 'uala (sweet potato) in Hawaiian culture and history, and the Hawaiian value kuleana. They plant their 'uala garden, care for their kalo garden, and enjoy a snack of cooked 'uala served on ti leaf plates.



Questions to discuss with your child:

- What new information did you learn about 'uala?
- What does kuleana mean and how did you practice this Hawaiian value today?

Suggested home activity:

- Plant 'uala in a garden bed or bucket.
To learn more, visit the website:
www.canoeplants.com/uala.html

Lesson 3 - The 'Ulu Tree (Planting or Care)

In this lesson, students discuss the significant role of 'ulu (breadfruit) as a food crop with a variety of other important uses, and the Hawaiian value laulima. They will care for their kalo and 'uala gardens and prepare for the 'ulu tree planting or dedication and enjoy a snack of cooked 'ulu served on ti leaf plates.



Questions to discuss with your child:

- What new information did you learn about 'ulu?
- What is laulima and how can you practice this Hawaiian value?

Suggested home activity:

- Learn more about 'ulu by visiting the website:
www.canoeplants.com/ulu.html
- Make or prepare an 'ulu dish or use it as substitute for potatoes. See 'ono 'ulu recipes from 'ĀINA Chefs and KHF Staff at kokuahawaiifoundation.org/resources/category/recipes

Lesson 4 - Kī (Ti) Plants

In this lesson, students discuss the significant role of kī (ti plants) in Hawaiian culture and history, and the Hawaiian value lokomaika'i. They will plant their kī plants and care for their kalo and 'uala gardens and their 'ulu tree. They will learn to use ti leaves as wrapping, and take home a ti leaf cutting to share and plant with their families.



Questions to discuss with your child:

- What new information did you learn about kī today?
- How did you practice being lokomaika'i?

Suggested home activity:

- Learn more about kī by visiting the website:
www.canoeplants.com/ki.html
- Your child will be bringing home a kī cutting after the lesson. Plant horizontally or vertically at least 2 inches deep in a pot or in your garden.

If you have any questions or are interested in becoming an 'ĀINA In Schools docent, please do not hesitate to ask.

To learn more about 'ĀINA In Schools at your child's school, please contact your school's 'ĀINA Team Coordinator, or contact:



'ĀINA In Schools
aina@kokuahawaiifoundation.org

DESCRIPTION

Students will discuss ancestral and modern day life in Hawai'i, the significant role of kalo (taro) in Hawaiian culture and history, and the Hawaiian value, pono. They will plant their kalo garden, and enjoy a snack of fresh poi served on ti leaf plates.

TIME: 60 minutes

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Recognize several key differences between ancestral and modern day life in Hawai'i.
- Discuss the role and significance of kalo in Hawaiian culture and around the world.
- Treat their gardens, plants, tools, self, and others with respect.
- Practice proper planting of kalo in a māla (dryland garden) and identify the parts of the kalo plant.

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.RL.2, 4.RL.4, 4.W.1, 4.W.3, 4.W.8, 4.W.10, 4.SL.1

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1., HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.3.10, SS.4.6.1, SS.4.6.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Protocol
 2. Ancestral and Modern Day Hawai'i
 3. Kalo Discussion
 4. Planting Instructions
 5. Group Activities Overview
- II. Group Activities (30 minutes)
 1. Kalo Planting (15 minutes)
 2. Ti Leaf Plates (15 minutes)
- III. Closing and Snack (15 minutes)
 1. Poi



KEY TERMS AND CONCEPTS

Ahupua'a - A common subdivision of land, usually extending from the top of the mountains (mauka) to the sea (makai) and containing the resources required for survival; a watershed

Āina - Land; that which feeds, nourishes, and sustains us (e.g., food, water, air)

Huli - Portion of the kalo that is planted, includes the hā (stem) and top 1/4 to 1/2 inch of the makua (corm)

Kalo - Hawaiian word for taro; a staple Hawaiian food and symbolic of the elder sibling of the Hawaiian people; parts of the plant include lau/lū'au (leaf), hā (petiole/stalk), kohina (top of corm), piko (where hā connects to lau), 'ohā (keiki or offshoots), huluhulu (roots), makua/kalo (corm)

Mahi'ai - Farmer

'Ō'ō - Digging stick, used for farming

Oli - Chant

Poi - Cooked, pounded kalo, mixed with water

Pono - Excellence, wellbeing, correct or proper procedure, to behave respectfully

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

LESSON MATERIALS

Community Supplies:

- 2 clean scissors (for making ti leaf plates)
- Vermicast (about 1 cup per class)
- Optional: Clam shells (5 to 10, for digging)

Lesson Supplies:

- Kalo Plant Parts Sign
- Kalo Mo'olelo Sign
- Garden Agreements Sign
- Ahupua'a Poster (Kamehameha Schools Press)
- Kalo o Hawai'i Poster (Hālau Kū Mana)
- Kalo huli (planting material, 10 or more per class, ideally of 2 or more known Hawaiian varieties that are kept accurately labeled)
- Water key with lanyard
- Student Workbook



Kalo o Hawai'i Poster

Teaching Team To Provide:

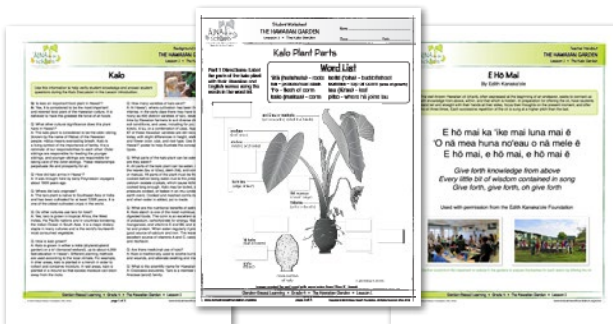
- Kalo signs (see Advance Preparation)
- 1 lb. bag fresh poi, salt
- 5 to 6 large ti leaves per class
- 6 to 8 serving spoons (for snack preparation)

School To Provide:

- Garden Journals (if not using Student Workbook)
- Buckets and cups for watering and snack waste
- Optional: 'Ō'ō (digging stick)

Background Information: Kalo

Teacher Handout: E Hō Mai



Student Worksheet: Kalo Plant Parts and Reflection

ACCOMPANYING DOCUMENTS

- 'ĀINA Pre-Unit Survey
- Take Home Letter: Grade 4 Lessons 1-4
- Teacher Handout: E Hō Mai
- Background Information: Kalo
- Kalo Mo'olelo Sign
- Guided Notes
- Student Worksheet: Kalo Plant Parts and Reflection

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Confirm teachers have administered 'ĀINA Pre-Unit Surveys prior to the first lesson.
- Review the Kalo Background Information and Kalo Mo'olelo Sign in preparation for the kalo discussion with students.
- Research kalo varieties prior to the lesson to share unique characteristics. www.ctahr.hawaii.edu/Site/Taro.aspx, www.digital.library.manoa.hawaii.edu/collections/show/44, www.canoeplants.com/kalo.html
- Make copies of the Student Worksheets and Take Home Letter, if not using the Student Workbook.
- Get to know the garden! Allow students to explore the soil in their Kalo Garden by having them dig with hands and tools and make careful observations. How does the soil feel and smell? What creatures live in our garden? In preparation for planting, loosen the soil and remove any weeds. Water the soil thoroughly one day before the lesson.
- If variety types are known for the kalo to be planted, have students create long-lasting signs before the lesson to be placed in the garden during the planting so that varieties remain accurately labeled.
- Purchase fresh poi (or harvest and cook kalo and make the poi) for the snack.
- Harvest and clean ti leaves for ti leaf plates.
- Have students learn and practice E Hō Mai (see Teacher Handout or Student Workbook), the oli (chant) to be offered at the beginning of each Hawaiian Garden lesson.
- Have students ready to take notes in their Student Workbook or Garden Journals.

INTRODUCTION

15 MINUTES

“Aloha! We are... (state docents' names) with the 'ĀINA In Schools program. The 'ĀINA In Schools program connects us to our food and land so we can live healthy lives and be great stewards of the environment.”

“Do you know what 'ĀINA means?” Desired answer: 'ĀINA is the Hawaiian word for land and that which feeds, nourishes, and sustains us all, including food, water, and air.”

“When we visit you we will garden together and learn to take care of plants and grow our own food.”

Get to know which 'ĀINA components are being implemented at your school so you can briefly refer to them in this section. For example, “Some other classes are exploring nutrition and food choices, some are reducing waste through composting, and some are visiting local farms to learn about where our food comes from.”



“Our garden theme for this year is the Hawaiian Garden. We will plant a variety of important Hawaiian plants; some that were brought here by the early Polynesian voyagers, and others that made it here without the help of humans.”

“Each time we visit we will discuss and practice a new Hawaiian value, work together in the Hawaiian Gardens, and enjoy a healthy snack together!”

“Before each discussion we will also observe an important Hawaiian protocol, which is to offer an OLI, a chant, called E Hō Mai, asking for guidance and wisdom in preparation for our important tasks today.” Share the Hawaiian and English translations of the oli with students.

PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their OLI (chant), E Hō Mai, three times. Have students be seated.

ANCESTRAL AND MODERN DAY HAWAII

During the following discussion, write key terms on the board and have students take notes in their Student Workbooks or journals. “Imagine what Hawai'i was like hundreds of years ago in Hawaiian ancestral times before contact with Western society. Without stores how did the people get their food and other things they needed to survive?” Desired answers: Entirely by farming, fishing, hunting, and making things by hand, using only what was available locally from nature.

“In ancestral times, everything the people needed came from the land and sea, and people worked as a community within their AHUPUA'A.” Ask students to define the term ahupua'a (see Key Terms & Concepts). Use the Ahupua'a Poster to illustrate the concept that each ahupua'a reaches from the mountains (mauka) to the sea (makai), containing all that is needed for communities to thrive within its boundaries.



Ahupua'a Poster

“How does this way of life differ from the way we live now? Our water still comes from our islands. Are we doing our best to protect this precious resource? About 80 to 90% of our food and energy is imported from outside of Hawai'i. Is it important to grow more of our own food and be aware of the resources we use every day? Is it important to work together as a community? Why?” Accept a few student answers.

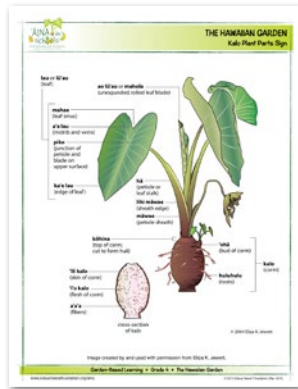
INTRODUCTION

CONTINUED

KALO DISCUSSION

“Today we are going to plant a KALO (taro) garden! KALO is the Hawaiian word for taro. Each one of you is a farmer, a MAHI‘AI. Farmers are also scientists because they make careful observations in nature. You will be scientists by observing your gardens as they grow, and recording observations in your journals (or Class Journal).”

Ask students: “What do you know or want to know about kalo?” Use the Kalo Background Information to help verify student knowledge and answer student questions. Spend about 5 to 7 minutes on this discussion. Use the Kalo Plant Parts Sign to introduce students to the Hawaiian and English names of the kalo plant parts. Refer to the Kalo Mo‘olelo Sign for a story about the cultural significance of kalo.



Kalo Plant Parts Sign

PLANTING INSTRUCTIONS

“Kalo plants grow for 9 to 12 months before they are harvested, cooked, and eaten. Is kalo planted from seed? No. Kalo is planted from a vegetative cutting called a HULI.” Show students the kalo huli (planting material). “It is important to know that kalo grows up instead of down! This is why we plant the base of the huli deep in the soil (at least 6 inches deep) so that the corm will have room to grow upward. If you see the corm showing above the soil as it grows, cover it with soil. Each of you will work in groups of 2 or 3 to plant your kalo huli. The distance from your elbow to your fingertip is the proper measurement for spacing each kalo huli during planting.” Share with students about the source of their kalo huli (e.g., donated from a nearby kalo farmer; if possible, plan for ways to give back/express thanks to the farmers for their gift).

If specific VARIETY types of the kalo are known, share the names with students and describe each variety’s special characteristics. Explain that the

signs (created by students before the lesson) will be placed in the garden during the planting in order to clearly and accurately label each variety. Show the Kalo o Hawai‘i Poster to demonstrate the different characteristics and uses of the kalo varieties shown.

Optional: Describe and show the digging tools that come from nature, the clam shells and the ‘ō‘ō, which may be used in the gardens today. “An ‘Ō‘Ō is a digging stick that in ancestral times was practically the only farming tool needed and used by MAHI‘AI.”

GROUP ACTIVITIES OVERVIEW

“In our gardens today, one group will plant kalo and the other will prepare make ti leaf plates for the snack, then we will switch.

Hawaiian Values and Garden Agreements

“Planting is an important and sacred act. Each time we are together we will discuss and practice a different Hawaiian value to bring greater emotional and physical health to our lives and our environment. Our Hawaiian value for today is PONO, which means excellence, wellbeing, correct or proper procedure, and to behave respectfully.” Have students repeat the Hawaiian value and share examples of how they will practice PONO in the gardens today.

“Our Garden Agreements will also help to guide our practice in being PONO.” Have students take a deep breath, then repeat and discuss the Garden Agreements as listed on the Garden Agreements Sign. Spend some time during this first lesson to review with students the examples on page 2 of the sign.

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



GROUP ACTIVITIES

30 MINUTES

Divide the students into two groups before going outside. If the class knows an OLI (chant), please have them offer it before entering the garden to work. During the Group Activities, help students in their practice of PONO.

Rotate groups after 15 minutes. Regroup for closing.

KALO PLANTING (15 minutes)

Students will prepare the garden soil by loosening it with their hands or natural digging tools, then work in groups of 2 or 3 to plant their kalo huli. Have students determine the proper spacing between kalo plants by measuring the length of their elbow to fingertip between each huli (approximately 1 to 1.5 feet apart). Plant the base of each huli at least 6 inches deep. Optional: Have an adult in charge of making holes for the huli using the 'ō'ō. Have students place a small handful of vermicast in the bottom of each planting hole, and mix the vermicast gently into the soil. Have students take turns watering their garden thoroughly.

Place the signs (see Advance Preparation) in the garden in order to clearly mark each kalo variety with its correct name, and be sure students understand the importance of keeping the kalo varieties clearly and accurately labeled. Different variety types may also be separated with a length of twine laid over the soil and anchored securely at both ends with chopsticks or rocks.



Keep kalo varieties accurately labeled with signs.

SNACK PREPARATION:

TI LEAF PLATES & POI (15 minutes)

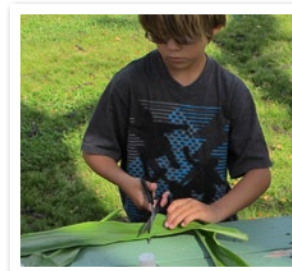
Have the first rotation of students wash their hands thoroughly with soap and water, then prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (about 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean. These students may join the other group activities when finished with their task.

Have the second rotation of students wash their hands thoroughly with soap and water. Have the students use serving spoons to prepare one scoop of poi on each ti leaf plate.

All students must wash their hands thoroughly with soap and water after working in the gardens and before eating their snack.



Students work in groups or 2 or 3 to plant each kalo huli at least 6 inches deep.



Ti leaf plates

CLOSING AND SNACK

15 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

Discuss with students:

- Describe several differences between ancestral and modern day Hawai'i.
- What new information did you learn about KALO today?
- What does PONO mean and how did you practice this Hawaiian value today?

Have students share what they are thankful for before enjoying the snack. Explain that POI is cooked, pounded kalo with water added, nothing else! Sprinkle poi with salt if desired.

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.



"Please take good care of your gardens and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). It is very important that the soil stays moist. Remember, you are the MAHI'AI (farmers) responsible for these plants that will grow for months, storing energy from the sun, air, water, and soil, and providing it to us in the form of delicious and nutritious food!"



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Assign one or more **Garden Monitors** to visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Use the Kalo Plant Parts Sign to review with students the different parts of the kalo plant and their names.
- Have students complete the Kalo Reflection and Plant Parts Student Worksheet in their Student Workbook.

- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc. in their Student Workbook.



LESSON EXTENSIONS

Hāloa by Kimo Armitage

(4.RL.2, 4.RL.4)

1. Read the book *Hāloa* by Kimo Armitage with students.
2. Review the kalo fun facts with students (page 36).
3. Review the taro vocabulary words with students (pages 42-44).
4. Prepare one or more of the recipes with students (pages 38-41).
5. Have students complete the worksheet (page 34/35).
6. Have students learn and practice the mele (songs) and oli (chants) on pages 31, 33, 45, and 46.
7. Learn and practice other mele and oli with students, especially those related to agriculture.

Aloha 'Āina

(4.W.1, 4.SL.1)

1. Continue the discussion with students about the similarities and differences between ancestral and modern day Hawai'i.
2. Discuss the fact that during ancestral times, land was not owned, bought, sold, or traded, but rather cared for as a right and responsibility (kuleana).
3. Have students write opinion pieces on how and why this change has affected Hawai'i's environment.

Oli Mahalo

(SS.4.3.1, SS.4.6.1)

1. Discuss with students the importance and role of OLI in ancestral and modern day Hawai'i. Oli were and are offered as a means to connect spiritually, give thanks, ask permission, and more.
2. Have students learn and share the Oli Mahalo, a well-known Hawaiian oli used to express thanks (e.g., sing before harvesting, eating).

'Uhola 'ia ka makaloa lā
Pū 'ai i ke aloha lā
Kū ka'i 'ia ka hā loa lā
Pāwehi mai nā lehua
Mai ka ho'oku'i a ka hālāwai lā
Mahalo e Nā Akua
Mahalo e nā kūpuna lā, 'eā
Mahalo me ke aloha lā
Mahalo me ke aloha lā

The makaloa mat has been unfurled
In love, (food is/was shared) we share
The great breath has been exchanged
Honored and adorned is the Lehua
From zenith to horizon
Gratitude and thanks to our Akua
Gratitude and thanks to our beloved ancestors
Gratitude, admiration, thanks, and love
To all who are present, both seen and unseen

E Hō Mai

By Edith Kanaka'ole

This well-known Hawaiian oli (chant), often expressed at the beginning of an endeavor, seeks to connect us with knowledge from above, within, and that which is hidden. In preparation for offering the oli, have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, and offer the oli three times. Each successive repetition of the oli is sung at a higher pitch than the last.

E hō mai ka 'ike mai luna mai ē
'O nā mea huna no'eau o nā mele ē
E hō mai, e hō mai, e hō mai ē

*Give forth knowledge from above
Every little bit of wisdom contained in song
Give forth, give forth, oh give forth*



Gather in the classroom or outside in the gardens to prepare for each lesson by offering the oli.

Used with permission from the Edith Kanaka'ole Foundation

Kalo



Use this information to help verify student knowledge and answer student questions during the Kalo Discussion in the Lesson Introduction. See the Kalo Mo'olelo Sign for a story about the cultural significance of kalo.

Q: Is kalo an important food plant in Hawai'i?

A: Yes, it is considered to be the most important and revered food plant of the Hawaiian culture. It is believed to have the greatest life force of all foods.

Q: What other cultural significance does this plant have in Hawai'i?

A: The kalo plant is considered to be the older sibling (known by the name of Hāloa) of the Hawaiian people. Hāloa means everlasting breath. Kalo is a living symbol of the importance of family. It is a reminder of our responsibilities to each other: Older siblings are responsible for feeding the younger siblings, and younger siblings are responsible for taking care of the older siblings. These relationships perpetuate life and prosperity for all.

Q: How did kalo arrive in Hawai'i?

A: It was brought here by early Polynesian voyagers about 1,500 years ago.

Q: Where did kalo originate?

A: The taro plant is native to Southeast Asia or India and has been cultivated for at least 7,000 years. It is one of the oldest cultivated crops in the world.

Q: Do other cultures use taro for food?

A: Yes, taro is grown in tropical Africa, the West Indies, the Pacific nations and in countries bordering the Indian Ocean in South Asia. It is a major dietary staple in many cultures and is the world's fourteenth most consumed vegetable.

Q: How is kalo grown?

A: Kalo is grown in either a māla (dryland/upland garden) or a lo'i (terraced wetland), up to about 4,000 feet elevation in Hawai'i. Different planting methods are used according to the local climate. For example, in drier areas, kalo is planted in a trench in order to collect and conserve moisture. In wet areas, kalo is planted in a mound so that excess moisture can drain away from the roots.

Q: How many varieties of kalo exist?

A: In Hawai'i, where cultivation has been the most intense, in the early days there may have been as many as 400 distinct varieties of taro, developed over time by Hawaiian farmers to suit diverse climates, soil conditions, and uses, including for poi, table taro, kūlolo (a dessert made of mashed kalo with coconut meat/milk), lū'au (cooked kalo leaves), or a combination of uses. Approximately 87 of these Hawaiian varieties are still recognized today, with slight differences in height, stalk color, leaf and flower color, size, and root type. The "Kalo o Hawai'i" poster by Halau Ku Mana is a helpful visual aid for illustrating the concept of variety types.

Q: What parts of the kalo plant can be eaten? How are they eaten?

A: All parts of the kalo plant can be eaten, including the leaves (lau or lū'au), stem (hā), and corm (kalo or makua). All parts of the plant must be thoroughly cooked before being eaten due to the presence of calcium oxalate crystals, which cause itching if not cooked long enough. Kalo may be boiled, steamed, pressure cooked, or baked in an imu (underground earth oven). Cooked and mashed corms make pa'i'ai, and when water is added, poi is made.

Q: What are the nutritional benefits of eating kalo?

A: Kalo starch is one of the most nutritious, easily digested foods. The corm is an excellent source of potassium, carbohydrate for energy, fiber, manganese, and vitamins E and B6, and is low in fat and protein. When eaten regularly it provides a good source of calcium and iron. The leaves are an excellent source of vitamins A and C, calcium, fiber, and riboflavin.

Q: Are there medicinal use of kalo?

A: Kalo is traditionally used to soothe burns, heal cuts and wounds, and alleviate swelling and insect bites.

Q: What is the scientific name for Hawaiian kalo?

A: *Colocasia esculenta*. Taro is a member of the Araceae (aroid) family.

Kalo - Taro

A Mo'olelo of Papa, Wākea, and Hāloa

In early Hawaiian time there was Wākea (sky father) and Papahānaumoku (earth mother) and where they meet at the horizon the Hawaiian Islands were born. Papa and Wākea also gave birth to Ho'ohōkūkalanī who represents the creation of stars in the sky. When it was her time, Ho'ohōkūkalanī becomes hāpai (pregnant) but sadly her child is born premature and does not survive. They buried the body of the child on the side of their hale (house) and from that spot grew the first kalo plant. They named the kalo plant Hāloanakalaukapalili, which means the long stalk and quivering leaf. Soon after, Ho'ohōkūkalanī becomes hāpai again and this time gives birth to a healthy child. This child was given the name Hāloa, meaning long breath. Hāloa is seen as the first Hawaiian chief and ancestor of all Hawaiian people. The two siblings grow up together, the kalo taking care of and feeding Hāloa, the child, and Hāloa taking care of his older sibling, Hāloanakalaukapalili, the kalo plant.

Two of the lessons this mo'olelo teaches us are mālama 'āina (to respect and care for all that



nourishes) and kuleana (responsibility) to care for our elders. Older than the Hawaiian people is Hāloa, older than Hāloa is the kalo plant, older than the kalo plant are the Hawaiian Islands, and older than the Hawaiian Islands are the elemental forces of nature: the earth, sky, and stars. We must mālama and practice our kuleana to all of these things.

SOURCES:

Handy, E. S., Handy, E. G., & Pukui, M. K. (1972). *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Honolulu: Bishop Museum Press.

Malo, D. (1951). *Hawaiian Antiquities: Mo'olelo Hawai'i*. Honolulu: Bishop Museum Press.

Pukui, M. K., & Elbert, S. H. (1986). *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. Honolulu: University of Hawaii Press.

Background Information about Mo'olelo:

Mo'olelo and ka'ao are what we understand today as Hawaiian stories and legends. Mo'olelo comes from the words mo'o and 'ōlelo which mean a continuum of talk, as all stories in ancient times were oral, not written.

Today the sharing of mo'olelo can help us connect to our place by uncovering the behaviors and patterns of the people of old Hawai'i. In mo'olelo there is always kaona— the hidden lessons and deeper meanings within stories. What can stories of plants and animals, valley walls and mountain peaks, and the winds and the rains teach us?



KEY TERMS AND CONCEPTS

Ahupua'a - A common subdivision of land, usually extending from the top of the mountains (mauka) to the sea (makai) and containing the resources required for survival; a watershed

'Āina - Land; that which feeds, nourishes, and sustains us (e.g., food, water, air)

Huli - Portion of the kalo that is planted

Kalo - Hawaiian word for taro; a staple Hawaiian food and symbolic of the elder sibling of the Hawaiian people

Mahi'ai - Farmer

'Ō'ō - Digging stick used for farming

Oli - Chant

Poi - Cooked, pounded kalo mixed with water

Pono - Excellence, wellbeing, correct or proper procedure, to behave respectfully

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

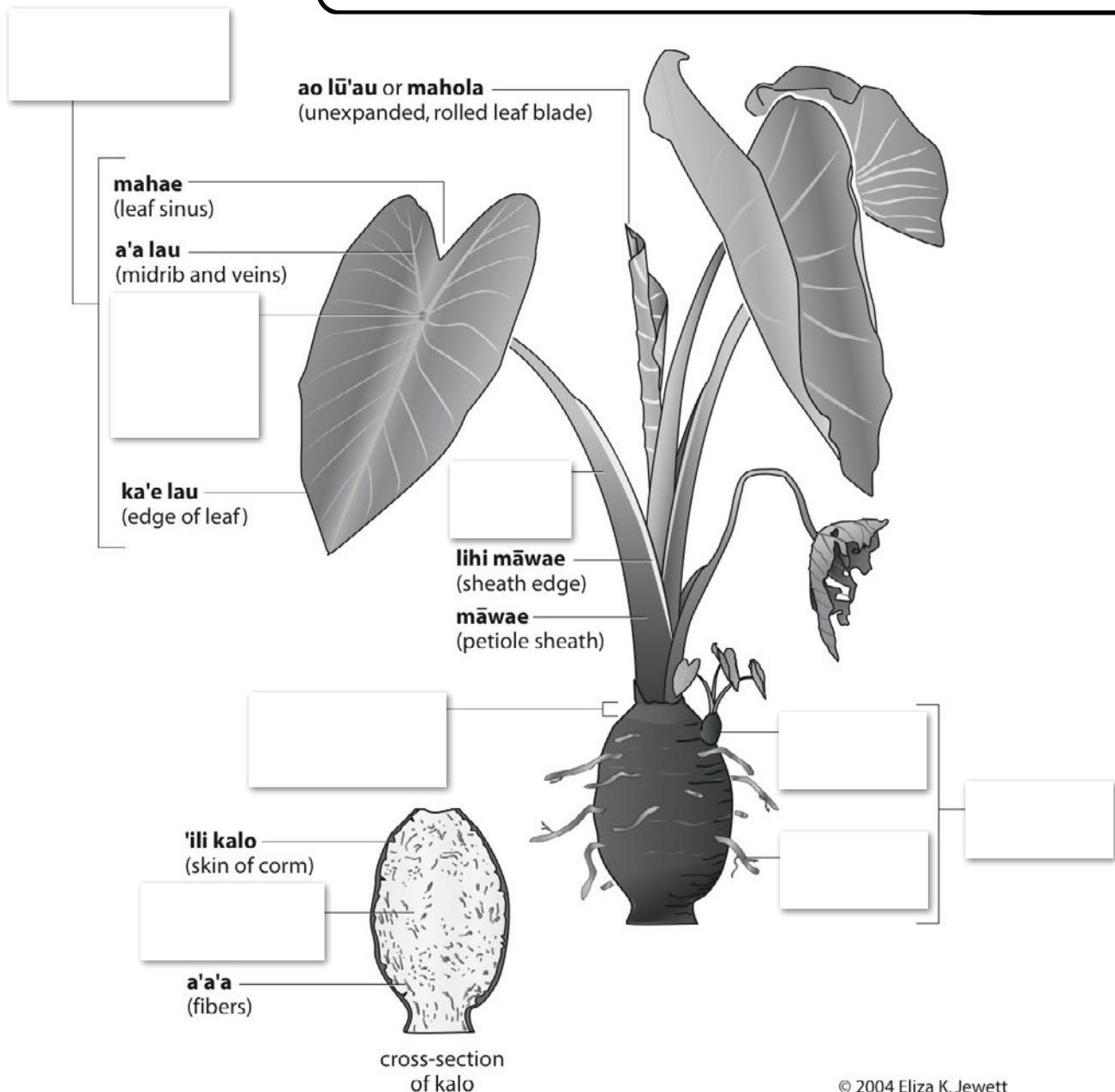
Directions: Use this space to record your notes, drawings, and observations.

Kalo Plant Parts

Part 1 Directions: Label the parts of the kalo plant with their Hawaiian and English names using the words in the word list.

Word List

- 'ā'ā (huluhulu) - roots
- hā - petiole/leaf stalk
- 'i'o - flesh of corm
- kalo (makua) - corm
- keiki ('oha) - bud/offshoot
- kohina - top of corm (area of growth)
- lau (lū'au) - leaf
- piko - where hā joins lau



© 2004 Eliza K. Jewett

Image created by and used with permission from Eliza K. Jewett.



Kalo Reflection

Part 2 Directions: Fill in your answers to the questions below.

1. Describe the importance of kalo in Hawai'i: _____

2. Describe your opinion of how the poi tasted: _____

3. What does PONO mean? _____

4. Describe at least one specific example of how you or someone else practiced PONO today:

5. What was your favorite part about The Kalo Garden lesson? _____

DESCRIPTION

Students will discuss the significant role of 'uala (sweet potato) in Hawaiian culture and history, and the Hawaiian value, kuleana. They will plant their 'uala garden, care for their kalo garden, and enjoy a snack of cooked 'uala served on ti leaf plates.

TIME: 60 minutes

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the role and significance of 'uala in Hawaiian culture and around the world.
- Treat their garden, plants, tools, self, and others with respect.
- Practice proper planting of 'uala in a māla (dryland garden).

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.W.1, 4.W.3, 4.W.7, 4.W.8, 4.W.10, 4.SL.1, 4.SL.4

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.3.10, SS.4.6.1, SS.4.6.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Protocol
 2. 'Uala Discussion
 3. Planting Instructions
 4. Group Activities Overview
- II. Group Activities (30 minutes)
 1. 'Uala Planting (15 minutes)
 2. Kalo Care (15 minutes)
 3. Ti Leaf Plates
- III. Closing and Snack (15 minutes)
 1. Steamed 'Uala



KEY TERMS AND CONCEPTS

Kuleana - Privilege, responsibility, area of responsibility

Lau - Leaf; vegetative cutting or slip of the 'uala plant, used to propagate 'uala

Mahi'ai - Farmer

Node - The part of a plant stem from which one or more leaves emerge, often forming a slight swelling or knob on the stem

'Uala - Hawaiian word for sweet potato; refers to Hawaiian varieties of sweet potato; parts of the plant include the ka ('uala vine), lau (leaf), maka (root bud from node), pua (flower), 'uala (sweet potato root)

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

LESSON MATERIALS

Community Supplies:

- 2 clean scissors (for making ti leaf plates)
- Vermicast (about 1 cup per class)
- Optional: Clam shells (5-10, for digging)

Lesson Supplies:

- 'Uala Plant Parts Sign
- 'Uala Mo'olelo Sign
- Garden Agreements Sign
- 'Uala slips (planting material, 1 slip per 2 students, ideally of 2 or more known Hawaiian varieties that are kept accurately labeled)
- Student Workbook

Teaching Team To Provide:

- 'Uala signs (see Advance Preparation)
- Uncooked 'uala for demonstration (1 of each variety)
- Cooked 'uala for snack (see Advance Preparation and Recipe)
- 5 to 6 large ti leaves per class

School To Provide:

- Garden Journals (if not using Student Workbook)
- Buckets and cups for watering and snack waste
- Optional: 'Ō'ō bar (digging stick)

STEAMED 'UALA RECIPE

1. Wash the 'uala. Remove the skins with a peeler if desired (skin may also be left on).
2. Chop 'uala into 1/2 to 1 inch cubes.
3. Steam the cubes until soft (about 10 minutes).
4. Cool and keep refrigerated. No seasoning necessary!

ACCOMPANYING DOCUMENTS

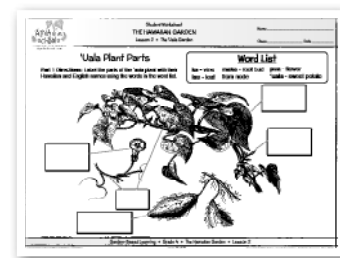
- Background Information: 'Uala
- 'Uala Mo'olelo Sign
- Guided Notes
- Student Worksheet: 'Uala Plant Parts and Reflection

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the 'Uala Background Information and 'Uala Mo'olelo Sign in preparation for the 'uala discussion with students.
- Make copies of the Student Worksheet, double sided, one per student if not using the Student Workbook.
- If specific variety types are known for the 'uala to be planted, have students create signs before the lesson to be placed in the garden during the planting so that varieties remain accurately labeled.
- Harvest or purchase and prepare (see 'Uala Recipe) at least two different varieties (colors) of 'uala for the snack. Save one of each variety uncooked for display during the lesson.
- Harvest and clean the ti leaves for the ti leaf plates.
- Have students practice E Hō Mai.
- Have students ready to take notes in their Student Workbooks or Garden Journals.



Background Information: 'Uala



Student Worksheet: 'Uala Plant Parts and Reflection

INTRODUCTION

15 MINUTES

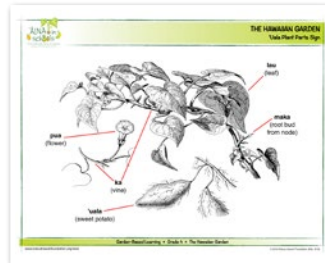
PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

‘UALA DISCUSSION

During the following discussion, write key terms on the board and have students take notes in their Student Workbooks or journals. “Today we are going to plant an ‘UALA (sweet potato) garden! As MAHI‘AI (farmers) we will also care for our kalo garden.” Ask students to share some of the observations they have made in the garden since the last lesson, including those recorded in their Student Workbooks or Garden Journals (or the Class Journal).

“‘UALA is the Hawaiian word for sweet potato.” Ask students: “What do you know or want to know about ‘uala?” Use the Background Information to help verify student knowledge and answer student questions. Spend about 5 to 7 minutes on this discussion. Use the ‘Uala Plant Parts Sign to introduce students to the Hawaiian and English names of the ‘uala plant parts. Refer to the ‘Uala Mo‘olelo Sign for a story about the cultural significance of ‘uala.



‘Uala Plant Parts Sign

PLANTING INSTRUCTIONS

“Does ‘uala grow from seed? No, ‘uala is planted from a vegetative cutting called a slip, or LAU in Hawaiian. The lau are planted in mounds because this plant likes deep, loose soil so it has room for the roots to grow.” Show the students the ‘uala cuttings and demonstrate how to prepare and plant them by carefully removing all but the top two or three leaves and covering the vine with soil except for the top leaves. Roots will form at each NODE (the place on the stem where leaves emerge).

If specific VARIETY types of the ‘uala are known, share the names with students and describe each variety’s special characteristics. Explain that the signs (created by students before the lesson) will be placed in the garden during the planting in order to clearly and accurately label each ‘uala variety.

GROUP ACTIVITIES OVERVIEW

“In our gardens today, one group will plant ‘uala and the other will care for our kalo garden, then we will switch. We also need two volunteers to make ti leaf plates for the snack.”

Hawaiian Values and Garden Agreements

“Our Hawaiian value for today is KULEANA, which means privilege *and* responsibility. To have a garden is both a privilege and a responsibility!” Have students repeat the Hawaiian value and share examples of how they will practice KULEANA in the gardens today.

“Our Garden Agreements will also help to guide us in practicing KULEANA.” Have students take a deep breath, then review the Garden Agreements:



- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL

Divide the students into two groups and select the two ti leaf plate volunteers before going outside.

GROUP ACTIVITIES

30 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students practice KULEANA.

Rotate groups after 15 minutes. Regroup for closing.

'UALA PLANTING (15 minutes)

Students will prepare the garden soil by loosening it with their hands or natural digging tools. They will work together to create circular mounds or mounded rows for their plantings. Be sure to create a crater/ trench at the peak of the mounds/rows where water can collect and flow down to the roots.

Have students work in pairs to plant 1 lau ('uala slip) per pair. Optional: Have an adult in charge of making holes for the lau using the 'ō'ō. Have students place a small handful of vermicast in the bottom of each planting hole, and mix the vermicast gently into the soil. Plant each lau at least 4 to 6 inches deep, vertically or at a 45 degree angle, with the growing tip showing above ground. Have students take turns watering their garden thoroughly.

Place the signs (see Advance Preparation) in the garden in order to clearly mark each 'uala variety with its correct name, and be sure students understand the importance of keeping the 'uala varieties clearly and accurately labeled. Different variety types may also be separated with a length of twine laid over the soil and anchored securely at both ends with chopsticks or rocks.



Tiny roots have begun to form at the nodes on these 'uala slips (lau).

KALO CARE (15 minutes)

Students will work in their kalo garden to weed, water, and feed the soil with vermicast. Bare soil may be covered with organic mulch (e.g., decomposing leaves or wood chips) and/or compost to protect it from the sun. Have the students observe the health of their plants and garden soil.

TI LEAF PLATES

Have the two student volunteers wash their hands thoroughly with soap and water, then prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (about 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean. These students may join the other group activities when finished with their task.

All students must wash their hands thoroughly with soap and water after working in the gardens and before eating their snack.



CLOSING AND SNACK

15 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

Discuss with students:

- What new information did you learn about 'UALA today?
- What does KULEANA mean and how did you practice this Hawaiian value today?
- Why is it important to keep our kalo and 'uala varieties clearly and accurately labeled?

Have students share what they are thankful for before enjoying the snack. Give a ti leaf plate to each student. Place one or more cooked cubes of each variety of 'uala onto each student's ti leaf plate.

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.

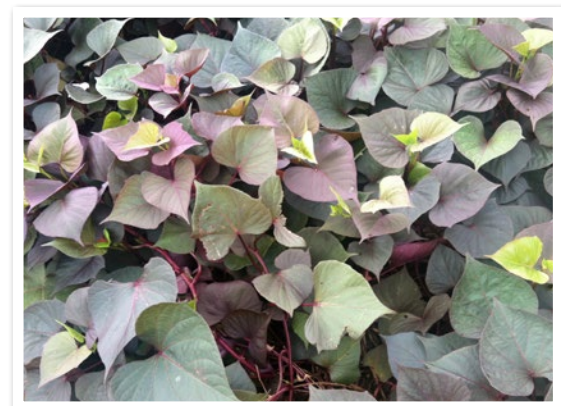
"Please take good care of your gardens and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). It is very important that the soil stays moist. Remember, you are the MAHI'AI (farmers) responsible for these plants that will provide us with food!"



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

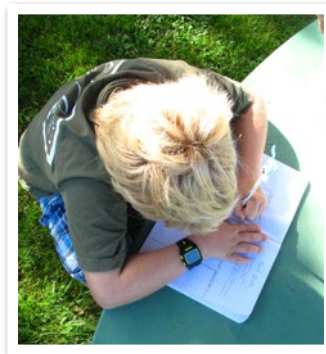
- Continue to have Garden Monitors visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Use the 'Uala Plant Parts Sign to review with students the different parts of the 'uala plant and their names.
- Have students complete the 'Uala Reflection and Plant Parts Student Worksheet.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.



LESSON EXTENSIONS

In Depth 'Uala Explorations

(4.W.7, SS.4.3.1)

1. Have students research and share about the many other uses of the 'uala plant in addition to its importance as a nutritious staple food.
2. Have students research the many different varieties of 'uala traditionally and currently grown in Hawai'i and around the world.
3. Have students research and share about the history and legends associated with 'uala in Hawai'i.



Quality Garden Time

(4.W.10, 4.SL.4)

1. Have students spend time in the garden for reflection and to draw pictures and write poems or stories about their gardens.
2. Have students share their work with the class.
3. Post student work in the classroom and around campus.



'Uala

Use this information to help verify student knowledge and answer student questions during the 'Uala Discussion in the Lesson Introduction. See the 'Uala Mo'olelo Sign for a story about the cultural significance of 'uala.

Q: Is 'uala an important food plant in Hawai'i?

A: Yes, 'uala was a major dietary staple of the early Hawaiians, second in importance to kalo. 'Uala is the Hawaiian word for sweet potato and refers to Hawaiian varieties of the plant.

Q: What other cultural significance does this plant have in Hawai'i?

A: 'Uala is associated with the Hawaiian god Kamapua'a.

Q: How did the sweet potato arrive in Hawai'i?

A: It was brought here by early Polynesian voyagers about 1,500 years ago.

Q: Where did sweet potatoes originate?

A: The sweet potato is native to Central or South America. It is thought that Polynesian voyagers traveled to the Americas and brought the sweet potato back with them.

Q: Do other cultures use sweet potatoes for food?

A: Yes. Sweet potato is the seventh most important food crop in the world.

Q: How many varieties of sweet potato exist?

A: About 400 varieties have existed worldwide. The skin and flesh of different varieties may be white, cream, yellow, orange, pink, or deep purple, and the leaves have many different shapes. In Hawai'i, it is estimated that about 200 varieties of 'uala were developed and cultivated by Hawaiian farmers. Today, only about 24 Hawaiian varieties remain. The loss of diversity is related to the decline of Hawai'i's population and separation of people from the land after Western contact, along with efforts by the University of Hawai'i in the early 1900s to hybridize different varieties, and poor documentation.

Q: What parts of the sweet potato plant can be eaten? How are they eaten?

A: All parts of the sweet potato plant can be eaten. The "root tubers" ('uala) may be cured for four to seven days after being harvested and before being eaten or stored, in order to increase the total sugar content and improve flavor and shelf life. Steaming is the best cooking method for preserving nutrients, and the beta-carotene in orange or yellow colored sweet potatoes will be better absorbed when eaten with a bit of fat (e.g., olive oil, coconut milk, etc.). The 'uala may also be boiled, fried, processed into chips, or baked in an oven or imu (underground earth oven). The stems and tips may be steamed, boiled, sauteed, or fried for use in soups, salads, and as a vegetable dish. Both roots and foliage can be grown as animal feed.

Q: What are the nutritional benefits of eating sweet potatoes?

A: Sweet potatoes are an excellent source of vitamin A (in the form of beta-carotene). They are also a very good source of vitamin C and manganese. In addition, sweet potatoes are a good source of copper, dietary fiber, niacin, vitamin B5, and potassium. Purple sweet potatoes are especially prized for their high levels of antioxidants (which guard against cardiovascular disease and cancer). The antioxidant known as anthocyanin is the pigment responsible for the purple color, which is the same pigment and antioxidant contained in blueberries, red grapes, and red cabbage.



Q: Are sweet potatoes related to regular potatoes?

A: Yes, but not closely related. In fact, potatoes are more closely related to tomatoes, eggplants, and peppers. All three (sweet potatoes, potatoes, and yams) come from different plant families. The moist-fleshed, orange-colored root vegetable that is often thought of and sold as a “yam” in the United States is actually a sweet potato. Botanically, yams (which are monocots) form a stem tuber (a modified stem) that is eaten, while sweet potatoes and potatoes (which are dicots) form root tubers (a modified root).

Q: How are sweet potatoes grown?

A: The sweet potato is a hardy plant that can grow in a variety of climates, and generally needs less water than other crops. Good soil drainage is important for successful growth of the crop. Sweet potato slips called “lau” in Hawaiian (vegetative cuttings from the growing tip of vines, about 12” to 14” long) are typically planted in mounds or ridges by laying them horizontally (with irrigation) or vertically or at a 45 degree angle (without irrigation), about 4” to 9” below the surface. Root sprouts may also be planted. Root growth is encouraged by trimming or turning vines back into the patch (instead of allowing them to sprawl). Roots can be harvested for food in four to six months. Rotating the location of sweet potato plantings is important for discouraging pests; do not plant sweet potatoes in the same location for at least one year (preferably three to four years). The best planting period in Hawai'i is March to May. Lowest yields occur when sweet potatoes are planted from October to December, due to the shorter days and to the higher rainfall during that time of the year.

Q: Are there other uses for 'uala besides food?

A: Yes. Medicinally, 'uala helps to heal a sore throat (cooked and eaten or made into a gargle), or it can be mixed with kī (ti leaves) to induce vomiting. Cooked 'uala can be used as bait for fishing. In Hawai'i, old vines and leaves were placed beneath floor mats as padding, and plant leftovers were used as pig food.

Q: What is the scientific name for sweet potatoes?

A: Ipomea batatas. Sweet potatoes are members of the Convolvulaceae (morning glory) family.



'Uala - Sweet Potato

A Mo'olelo of Kamapua'a the Hawaiian Pig God

Kamapua'a is from the valley of Kaliuwa'a, Kaluanui on the island of O'ahu. Kamapua'a is a pig-god who is able to change his body into many kinolau which are forms of nature a supernatural being can take. Supernatural beings that possess magical powers are known throughout Hawaiian mo'olelo as kupua. Kamapua'a could change from a boar to the humuhumunukunukuapua'a fish, from plant forms such as a kūkui tree to even a handsome man. Kamapua'a is known around Hawai'i for his mischievous nature.

A well known mo'olelo of Kamapua'a tells of his many battles against the O'ahu chief 'Olopana. Kamapua'a desired to steal 'Olopana's kapu (sacred) chickens reserved only for the chief. In one night it was said that Kamapua'a could steal all 'Olopana's sacred chickens in an entire district. 'Olopana, furious that a pig was stealing his kapu chickens, sent his people from all over O'ahu to capture and bring Kamapua'a to him to be killed for his wrongdoings. Each time Kamapua'a was captured his grandmother Kamaunuanoho chanted his name-chant and each time Kamapua'a broke free and escaped.



Kamaunuanoho called forth the many kinolau (body forms) of Kamapua'a such as the kūkui tree, ama'uma'u fern, the shark and the fish.

Did you know that a kinolau of Kamapua'a also exists in the sky? The big, dark, and round clouds that sit low on the mountain tops are called ao (cloud) pua'a (pig) because they resemble the heavy belly of Kamapua'a. 'Uala (sweet potato) is also known as a kinolau of Kamapua'a. If you look at the leaf it resembles the shape of his head and snout.

SOURCES:

Fornander, A. (1916-1920) *Collection of Hawaiian Antiquities and Folklore, Vol. 5*. Honolulu: Bishop Museum.

Kame'elehiwa, L.K. (1996). *A Legendary Tradition of Kamapua'a The Hawaiian Pig-God*. Honolulu: Bishop Museum Press.

Background Information about Mo'olelo:

Mo'olelo and ka'ao are what we understand today as Hawaiian stories and legends. Mo'olelo comes from the words mo'o and 'olelo which mean a continuum of talk, as all stories in ancient times were oral, not written.

Today the sharing of mo'olelo can help us connect to our place by uncovering the behaviors and patterns of the people of old Hawai'i. In mo'olelo there is always kaona— the hidden lessons and deeper meanings within stories. What can stories of plants and animals, valley walls and mountain peaks, and the winds and the rains teach us?



KEY TERMS AND CONCEPTS

Kuleana - Privilege, responsibility, area of responsibility

Lau - Leaf; vegetative cutting or slip of the 'uala plant, used to propagate 'uala

Mahi'ai - Farmer

Node - The part of a plant stem from which one or more leaves emerge, often forming a slight swelling or knob on the stem

'Uala - Hawaiian word for sweet potato; refers to Hawaiian varieties of sweet potato; parts of the plant include the ka ('uala vine), lau (leaf), maka (root bud from node), pua (flower), 'uala (sweet potato root)

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

'Uala Plant Parts

Part 1 Directions: Label the parts of the 'uala plant with their Hawaiian and English names using the words in the word list.

Word List

ka - vine maka - root bud pua - flower
lau - leaf from node 'uala - sweet potato





'Uala Reflection

Part 2 Directions: Fill in your answers to the questions below.

1. Describe the importance of 'uala in Hawai'i: _____

2. Describe your opinion of how the 'uala tasted: _____

3. What does KULEANA mean? _____

4. Describe at least one specific example of how you or someone else practiced KULEANA today: _____

5. What was your favorite part about The 'Uala Garden lesson? _____

DESCRIPTION

Students will discuss the significant role of 'ulu (breadfruit) as a food crop with a variety of other important uses, and the Hawaiian value, laulima. They will care for their kalo and 'uala gardens and the school's 'ulu tree, then dedicate their 'ulu tree together with all participating classes and enjoy a snack of cooked 'ulu served on ti leaf plates.

TIME: 40 minute Lesson; 20 minute 'Ulu Tree Dedication and Snack (all participating classes)

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the role and significance of 'ulu in Hawaiian culture and around the world.
- Treat their garden, plants, tools, self, and others with respect.
- Practice proper care for their school's 'ulu tree.

ACADEMIC STANDARDS*

CCSS, Language Arts:

4.RL.2, 4.RL.3, 4.RL.4, 4.W.1, 4.W.3, 4.W.7, 4.W.8, 4.W.10, 4.SL.1, 4.SL.4, 4.SL.5

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.3.3, SS.4.3.10, SS.4.6.1, SS.4.6.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

I. Introduction (15 minutes)

1. Protocol
2. 'Ulu Discussion
3. Care Instructions
4. Group Activities Overview

II. Group Activities (20 minutes)

1. 'Ulu Tree, Kalo, and 'Uala Care
2. Ti Leaf Plates

III. Closing (5 minutes)

IV. 'Ulu Tree Dedication and Snack (20 minutes)

1. Steamed 'Ulu



KEY TERMS AND CONCEPTS

Ho'okupu - Offering

Kumulā'au or Lā'au - Tree

Laulima - Cooperation, to work together

Mahi'ai - Farmer

Ulu - To grow, increase, spread

'Ulu - Hawaiian word for breadfruit



Background Information: 'Ulu



Student Worksheet: 'Ulu Reflection

LESSON MATERIALS

Community Supplies:

- Vermicast (about 3 cups)

Lesson Supplies:

- Garden Agreements Sign
- 'Ulu Mo'olelo Sign
- Student Workbook

Teaching Team To Provide:

- Sign making materials (e.g., wooden sign and post, paints, brushes; or cement, mold, decorative stones or tiles)
- 5 to 6 large ti leaves per class

School To Provide:

- Garden Journals (if not using Student Workbooks)
- Garden gloves (1 pair per student, if needed)
- Wheelbarrow
- 6+ weeding tools
- 2+ garden hoes
- Compost (about 1/2 bucket full)
- Mulch (about 1 wheelbarrow full)
- Buckets and cups for watering, mulch, and snack waste

STEAMED 'ULU RECIPE

1. If 'ulu are freshly harvested, place them upside down (on stem end) outside for 1-2 hours to drain the sap.
2. Rinse off the 'ulu. Cut the 'ulu into quarters or eighths. Cut away the inner core.
3. Steam the pieces (with skin on) until they are soft and can easily be pierced with a fork (about 15 to 20 minutes for large pieces).
4. Remove from pot and allow to cool. Remove skin if desired.
5. Cut into bite-sized pieces.
6. Serve plain or with any desired toppings (e.g., salt, garlic butter, dressing)

ACCOMPANYING DOCUMENTS

- Background Information: 'Ulu
- 'Ulu Mo'olelo Sign
- Guided Notes
- 'Ulu Tree Planting Sign
- Student Worksheet: 'Ulu Reflection

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the 'Ulu Background Information and 'Ulu Mo'olelo Sign in preparation for the 'ulu discussion with students.
- Make copies of the Student Worksheet, one per student if not using the Student Workbook.
- Work with participating classes and the school's Garden Team to establish a plan for long term care of the tree (watering, mulching, pruning, harvesting, composting of fallen leaves and fruits).
- If needed, have students create a permanent sign for the tree, including the Hawaiian, English, and scientific names, including specific variety, planting date, Hawaiian saying, etc.
- Plan with all participating classes regarding the dedication ceremony (see 'Ulu Tree Dedication and Snack section for details). Have students prepare oli (chants), mele (songs), and ho'okupu (offerings). Optional: Have each class write a song or story about the tree. Invite guests to attend and participate (e.g., story tellers, performers).
- Harvest or purchase and prepare (see 'Ulu Recipe) the 'ulu for the snack.
- Harvest and clean the ti leaves for the ti leaf plates.
- Have students practice E Hō Mai.
- Have students ready to take notes in their Student Workbooks or Garden Journals

INTRODUCTION

15 MINUTES

PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

'ULU DISCUSSION

During the following discussion, write key terms on the board and have students take notes in their journals. "Today we are going to care for our school's 'ulu tree. As MAHI'AI (farmers) we will also care for our kalo and 'uala gardens." Ask students to share some of the observations they have made in the garden since the last lesson, including those recorded in their Student Workbooks or Garden Journals (or the Class Journal).

"ULU (no 'okina) in Hawaiian means to grow, increase, or spread. 'ULU (with 'okina) is the Hawaiian word for breadfruit. The 'ulu tree is a very strong and productive tree that produces a lot of food! The Hawaiian word for tree is KUMULĀ'AU or LĀ'AU."

Ask students: "What do you know or want to know about 'ulu?" Use the Background Information to help verify student knowledge and answer student questions. Spend about 5 to 7 minutes on this discussion. Refer to the 'Ulu Mo'olelo Sign for a story about the cultural significance of 'ulu.

CARE INSTRUCTIONS

"What does our 'ulu tree give us?" Desired answers: Food, shade, fresh air, compost materials, and more!

"What can we give to our tree in return?" Desired answers: Water, nutrients/organic matter, removing weeds from the root zone, harvesting mature fruits, removing dead branches and fallen fruits, adding mulch to protect the soil and provide nutrients.

"It is your responsibility to care for the school's 'ulu tree by doing these things."

The following tasks will take place during the Group Activities: 'Ulu Tree Care section (see section for details), and may be assigned to different classes according to the number of participating classes: 1) Prune and Harvest, 2) Remove Weeds, 3) Create Berm, 4) Add Compost, 5) Add Vermicast, 6) Add Mulch, 7) Add Water.

GROUP ACTIVITIES OVERVIEW

"Today in the garden we are going to care for our kalo and 'uala plants and the school's 'ulu tree. We also need two volunteers to make ti leaf plates for the snack. Then all participating classes will come together to dedicate the 'ulu tree and enjoy a healthy snack together. The dedication ceremony will happen each year as a reminder of the importance of this tree to our school and community, and of our duty to care for it. During the dedication ceremony we will also give our tree the HO'OKUPU (offerings) that we have prepared as a special way to thank our tree for all the wonderful things it provides!"

Hawaiian Values and Garden Agreements

"Our Hawaiian value for today is LAULIMA, which means cooperation and to work together." Have students repeat the Hawaiian value and share examples of how they will practice LAULIMA in the gardens today.

"Our Garden Agreements will also help to guide us in practicing LAULIMA." Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Divide the students into three groups and select the two ti leaf plate volunteers before going outside.

GROUP ACTIVITIES

20 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students to practice LAULIMA.

Students will work in their groups for the entire 20 minutes without switching. Assign one adult to oversee each group.

'ULU TREE CARE (20 minutes)

The following tasks may be assigned to different classes according to the number of participating classes:

- 1. Prune and Harvest:** Inspect the tree for any damage or care needed (such as harvesting mature fruits and removing dead branches and fallen damaged fruits).
- 2. Remove Weeds:** Use the weeding tools to remove weeds and grasses from around the tree trunk, which compete with the tree roots for water and nutrients. If possible, weed the soil from the trunk to the tree's drip line (where the farthest leaf reaches).
- 3. Create Berm:** Have students use the garden hoes to create a low circular berm of soil around the tree, about 2 feet away from the trunk on all sides (or further away for a large tree), to contain the water that is given to the tree so that it filters down to the roots and does not run off away from the tree.
- 4. Add Compost:** Mix about 1/2 bucket compost into the topsoil around the tree.
- 5. Add Vermicast:** Mix about 3 cups vermicast into the topsoil around the tree (or if the vermicast is moist, dissolve it in water and water the soil around the base of the tree).
- 6. Add Mulch:** Place a 4 to 6 inch deep layer of mulch around the tree (to a distance of about a 2 foot radius from the trunk), and be sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room).
- 7. Add Water:** Water the tree thoroughly, making sure the water stays within the berm and soaks down into the soil (instead of running off away from the tree).

KALO CARE (20 minutes)

Students will work in their kalo garden to weed, water, and feed the soil with vermicast. Bare soil may be covered with organic mulch to protect it from the sun. Have the students observe the health of their plants and garden soil.

'UALA CARE (20 minutes)

Students will work in their 'uala garden to weed, water, and feed the soil with vermicast. Bare soil may be covered with organic mulch to protect it from the sun. If 'uala vines are "running" (vines extend outside of the garden bed), have students wrap or fold the vines back into the garden bed (having the plant growth concentrated in the garden bed will help focus the plant's energy on root growth instead of vines). Have the students observe the health of their plants and garden soil.

TI LEAF PLATES

Have the two student volunteers wash their hands thoroughly with soap and water, then prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (about 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean. These students may join the other group activities when finished with their task.

All students must wash their hands thoroughly with soap and water after working in the gardens and before eating their snack.



CLOSING

5 MINUTES

Gather all the students in the garden. Have each group share how their team members practiced LAULIMA while caring for the kalo, 'uala, and 'ulu, and making the ti leaf plates. Review the plan for the upcoming dedication of the school's 'ulu tree. Remind students that each of them has an important role in caring for their 'ulu tree.



'ULU TREE DEDICATION AND SNACK

15 MINUTES

Have students from all participating classes gather together around the 'ulu tree.

Any of the following activities may take place during the dedication ceremony:

1. Place the sign (see Advance Preparation) at the base of the tree.
2. Have students place their HO'OKUPU (small offerings such as artwork, poems, lei, or other seeds and plants to plant with the tree) at the base of the tree.
3. Have students perform mele, oli, hula dances, and/or share their song or story (see Advance Preparation).
4. Tell a mo'olelo about the 'ulu tree, and/or have guests perform.
5. Other activities planned by the participating classes.



Have students share what they are thankful for before enjoying the snack. Give a ti leaf plate to each student. Place one or more cooked pieces of 'ulu onto each student's ti leaf plate.

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.

"Please continue to take good care of your gardens and your 'ulu tree and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). Remember, you are the MAHI'AI (farmers) responsible for these plants that will provide us with food!"



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Thoroughly water the 'ulu tree at least once a week until well established, and during dry periods. Install irrigation if necessary. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens and around the base of the 'ulu tree.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Have students complete the 'Ulu Reflection Student Worksheet.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.
- Discuss with students the significance of their 'ulu tree. If the tree is young it may not provide food this year, but it will provide a great deal of food for years to come. If there are fruits to harvest, have students research recipes and prepare dishes using the 'ulu fruit.
- Discuss the significance of providing sources of healthy living foods in our communities.



LESSON EXTENSIONS

The Legend of the First 'Ulu Tree (4.RL.2, 4.RL.3, 4.RL.4, 4.W.7)

1. Read and discuss the book *No Ke Kumu 'Ulu / The 'Ulu Tree* by Kawehi Avelino with students. Have them write a book report including their own illustrations.
2. Have students research other creation stories for various plants and animals, or have them create their own.

The Importance of Trees and Forests (4.W.7, 4.SL.4)

1. Review and discuss the following “Ōlelo No‘eau” (Hawaiian saying) with students: “Hahai no ka ua i ka ulu la‘au.” The rain follows the forest. Plant trees to protect the watershed, our source of life in these islands.
2. Have students research and report on the uniqueness and importance of native Hawaiian forests and the threats that they face (including over-development and invasive species).



We All Live In A Watershed! (4.W.7, 4.SL.4, 4.SL.5)

1. A watershed is an ahupua‘a, an area of land, such as a mountain or valley, which collects rainwater into a common outlet, such as the ocean.
2. Have students visit the Hawai‘i Association of Watershed Partnerships website, www.hawp.org, to learn more about watersheds and the Ko‘olau and Wai‘anae Mountains Watershed Partnerships on O‘ahu.
3. Discuss the fact that our lives depend on the health of our native forests and watersheds because they provide us with life-giving water, ka wai ola.
4. Take students on a hike in your school’s local watershed, enabling a first-hand experience of this important aspect of their lives.
5. Have students work in groups to draw maps and/or make models of their local watershed and learn the names and locations of local mountains, streams, and rivers. Have the groups share their work with the class.
6. Watch *The Rain Follows the Forest* movie, created by the Hawai‘i Department of Land and Natural Resources (DLNR) for free on YouTube: www.youtube.com/TheHawaiiDLNR/videos. Have students write a journal entry including their opinion of the movie and any reflections on the topic.
7. Other resources related to the movie include:
 - “The Rain Follows the Forest” lesson plan is available online here: www.dlnr.hawaii.gov/rain/files/2014/02/The-Rain-Follows-the-Forest.pdf
 - Additional student resources can be downloaded from: www.dlnr.hawaii.gov/dofaw/kids/

DESCRIPTION

Students will discuss the significant role of 'ulu (breadfruit) as a food crop with a variety of other important uses, and the Hawaiian value, laulima. They will care for their kalo and 'uala gardens and prepare for the 'ulu tree planting. All participating classes will come together to plant and dedicate their 'ulu tree.

TIME: 35 minute Lesson; 25 minute 'Ulu Tree Planting, Dedication, Snack (all participating classes)

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the role and significance of 'ulu in Hawaiian culture and around the world.
- Treat their garden, plants, tools, self, and others with respect.
- Practice proper care for their school's 'ulu tree.

ACADEMIC STANDARDS*

CCSS, Language Arts:

4.RL.2, 4.RL.3, 4.RL.4, 4.W.1, 4.W.3, 4.W.7, 4.W.8, 4.W.10, 4.SL.1, 4.SL.4, 4.SL.5

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.3.3, SS.4.3.10, SS.4.6.1, SS.4.6.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Protocol
 2. 'Ulu Discussion
 3. Planting Instructions
 4. Group Activities Overview
- II. Group Activities (30 minutes)
 1. 'Ulu Planting Preparation
 2. Kalo and 'Uala Care
 3. Ti Leaf Plates
- III. Closing (5 minutes)
- IV. 'Ulu Tree Planting, Dedication, Snack (20 minutes)
 1. Steamed 'Ulu



KEY TERMS AND CONCEPTS

Ho'okupu - Offering

Kumulā'au or Lā'au - Tree

Laulima - Cooperation, to work together

Mahi'ai - Farmer

Ulu - To grow, increase, spread

'Ulu - Hawaiian word for breadfruit



Background Information: 'Ulu



Student Worksheet: 'Ulu Reflection

LESSON MATERIALS

Community Supplies:

- Vermicast (about 3 cups)

Lesson Supplies:

- 'Ulu Tree Planting Sign
- 'Ulu Mo'olelo Sign
- Garden Agreements Sign
- Potted 'ulu tree (1 per school)
- Student Workbook

Teaching Team To Provide:

- Sign making materials (e.g., wooden sign and post, paints, brushes; or cement, mold, decorative stones or tiles)
- 5 to 6 large ti leaves per class

School To Provide:

- Garden Journals if not using Student Workbooks
- Garden gloves (1 pair per student, if needed)
- 2 shovels
- Wheelbarrow
- 6+ weeding tools
- 2+ garden hoes
- Compost (about 1/2 bucket full)
- Mulch (about 1 wheelbarrow full)
- Buckets and cups for watering, mulch, and snack waste

STEAMED 'ULU RECIPE

1. If 'ulu are freshly harvested, place them upside down (on stem end) outside for 1-2 hours to drain the sap.
2. Rinse off the 'ulu. Cut the 'ulu into quarters or eighths. Cut away the inner core.
3. Steam the pieces (with skin on) until they are soft and can easily be pierced with a fork (about 15 to 20 minutes for large pieces).
4. Remove from pot and allow to cool. Remove skin if desired.
5. Cut into bite-sized pieces.
6. Serve plain or with any desired toppings (e.g., salt, garlic butter, dressing)

ACCOMPANYING DOCUMENTS

- Background Information: 'Ulu
- 'Ulu Mo'olelo Sign
- Guided Notes
- 'Ulu Tree Planting Sign
- Student Worksheet: 'Ulu Reflection

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the 'Ulu Background Information and 'Ulu Mo'olelo Sign in preparation for the 'ulu discussion with students.
- Make copies of the Student Worksheet, one per student if not using the Student Workbook.
- Work with participating classes and the school's Garden Team to select and receive approval for a planting site, and to establish a plan for long term care of the tree (watering, mulching, pruning, harvesting, composting of fallen leaves and fruits).
- Have students create a permanent sign for the tree, including the Hawaiian, English, and scientific names, including specific variety, planting date, Hawaiian saying, etc.
- Plan with all participating classes regarding the dedication ceremony (see 'Ulu Tree Planting, Dedication, and Snack section for details). Have students prepare oli (chants), mele (songs), and ho'okupu (offerings). Optional: Have each class write a song or story about the tree. Invite guests to attend and participate (e.g., story tellers, performers).
- Harvest or purchase and prepare (see 'Ulu Recipe) the 'ulu for the snack.
- Harvest and clean ti leaves for ti leaf plates.
- Have students practice E Hō Mai.
- Have students ready to take notes in their Student Workbooks or Garden Journals

INTRODUCTION

15 MINUTES

PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

‘ULU DISCUSSION

During the following discussion, write key terms on the board and have students take notes in their journals. “Today we are going to plant and care for our school’s ‘ulu tree. As MAHI‘AI (farmers) we will also care for our kalo and ‘uala gardens.” Ask students to share some of the observations they have made in the garden since the last lesson, including those recorded in their Student Workbooks or Garden Journals (or the Class Journal).

“ULU (no ‘okina) in Hawaiian means to grow, increase, or spread. ‘ULU (with ‘okina) is the Hawaiian word for breadfruit. The ‘ulu tree is a very strong and productive tree that produces a lot of food! The Hawaiian word for tree is KUMULĀ‘AU or LĀ‘AU.”

Ask students: “What do you know or want to know about ‘ulu?” Use the Background Information to help verify student knowledge and answer student questions. Spend about 5 to 7 minutes on this discussion. Refer to the ‘Ulu Mo‘olelo Sign for a story about the cultural significance of ‘ulu.

PLANTING INSTRUCTIONS

“When we plant a tree, is it important to take our time and do it right? Yes! The ground that we prepare will be the tree’s home for life and the time we take to plant it properly will give it the best start possible. It is very important that we take our time and give 100% of our focus, attention, and care when planting our tree.”



‘Ulu Tree Planting Sign

Use the ‘Ulu Tree Planting Sign to illustrate the correct planting methods:

- Size of the planting hole must be the same depth as the soil inside the container that the tree is in and twice as wide as the container.
- Berm of soil and mulch (e.g., wood chips, 4 to 6 inches deep) should be “doughnut-shaped” and located at the tree’s drip line (the farthest reach of its leaves). Mulch should not come in contact with the trunk.
- Add compost and vermicast to the soil in the planting hole and fill the planting hole with water and allow it to drain completely before planting.

The following tasks will take place during the Group Activities: ‘Ulu Planting Preparation section (see section for details), and may be assigned to different classes according to the number of participating classes: 1) Remove Weeds, 2) Dig the Planting Hole, 3) Add Compost, 4) Add Vermicast, 5) Add Water, 6) Create Berm.

The following tasks will take place during the ‘Ulu Tree Planting, Dedication, and Snack section (see section for details), and may be assigned to different classes according to the number of participating classes: 1) Plant the Tree, 2) Add Mulch, 3) Add Water.

GROUP ACTIVITIES OVERVIEW

“Today in the garden we are going to care for our kalo and ‘uala plants and prepare for the planting of our school’s ‘ulu tree. We also need two volunteers to make ti leaf plates for the snack. Then all participating classes will come together to plant and dedicate the ‘ulu tree and enjoy a healthy snack together. The dedication ceremony will happen each year as a reminder of the importance of this tree to our school and community, and of our duty to care for it. During the dedication ceremony we will also give our tree the HO‘OKUPU (offerings) that we have prepared as a special way to thank our tree for all the wonderful gifts it provides!”

INTRODUCTION

CONTINUED

Hawaiian Values and Garden Agreements

“Our Hawaiian value for today is LAULIMA, which means cooperation and to work together.” Have students repeat the Hawaiian value and share examples of how they will practice LAULIMA in the gardens today.



“Our Garden Agreements will also help to guide us in practicing LAULIMA.” Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Divide the students into three groups and select the two ti leaf plate volunteers before going outside.

GROUP ACTIVITIES

15 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students to practice LAULIMA.

Students will work in their groups for the entire 15 minutes without switching. Assign one adult to oversee each group.

'ULU PLANTING PREPARATION (15 minutes)

The following tasks may be assigned to different classes according to the number of participating classes:

1. **Remove Weeds:** Use the weeding tools to remove weeds and grasses from the planting area (a circle of about 3 feet in diameter), which would compete with the tree roots for water and nutrients.
2. **Dig the Planting Hole:** The size of the planting hole must be the same depth as the soil inside the container and twice as wide as the container that the tree is in. The soil levels inside and outside of the container should be the same (so that the tree is not planted too shallow or too deep).

3. **Add Compost:** Mix about 1/2 bucket compost into the soil at the bottom of the planting hole.
4. **Add Vermicast:** Mix about 3 cups vermicast into the soil at the bottom of the planting hole.
5. **Add Water:** Fill the planting hole with water and allow the water to soak into the ground before the tree is planted. This will encourage the roots to grow downward and deep instead of shallow at the surface (due to light watering).
6. **Create Berm:** Have students use the garden hoes to create a low circular berm of soil around the tree, about 2 feet away from the trunk on all sides (or further away for a large tree), to contain the water that is given to the tree so that it filters down to the roots and does not run off away from the tree.



GROUP ACTIVITIES

CONTINUED

KALO CARE (15 minutes)

Students will work in their kalo garden to weed, water, and feed the soil with vermicast. Bare soil may be covered with organic mulch to protect it from the sun. Have the students observe the health of their plants and garden soil.

'UALA CARE (15 minutes)

Students will work in their 'uala garden to weed, water, and feed the soil with vermicast. Bare soil may be covered with organic mulch to protect it from the sun. If 'uala vines are "running" (vines extend outside of the garden bed), have students wrap or fold the vines back into the garden bed (having the plant growth concentrated in the garden bed will help focus the plant's energy on root growth instead of vines). Have the students observe the health of their plants and garden soil.

TI LEAF PLATES

Have the two student volunteers wash their hands thoroughly with soap and water, then prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (about 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean. These students may join the other group activities when finished with their task.

All students must wash their hands thoroughly with soap and water after working in the gardens and before eating their snack.



CLOSING

5 MINUTES

Gather all the students in the garden. Have each group share how their team members practiced LAULIMA while caring for the kalo, 'uala, and 'ulu, and making the ti leaf plates. Review the plan for the upcoming planting and dedication of the school's 'ulu tree.

Remind students that each of them has an important role in planting and caring for their 'ulu tree. Remind students that it is very important to take their time and give 100% of their focus, attention, and care when planting the 'ulu tree.



'ULU TREE PLANTING, DEDICATION, AND SNACK

15 MINUTES

Have students from all participating classes gather together around the 'ulu tree.

Any of the following activities may take place during the dedication ceremony:

1. Have students perform mele, oli, hula dances, and/or share their song or story (see Advance Preparation).
2. Tell a mo'olelo about the 'ulu tree, and/or have guests perform.
3. Other activities planned by the participating classes.

Planting Instructions:

1. **Plant the Tree:** Gently remove the 'ulu tree from its pot (do not pull it out by the trunk) and place it in the planting hole. Be sure that the tree is completely upright and that the soil levels match exactly (the tree should not be planted too deep or too shallow). Gently fill in the soil around the roots until it is level.
2. **Add Mulch:** Place a 4" to 6" deep layer of mulch around the tree (to a distance of about a 2 foot radius from the trunk), and be sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room).
3. **Add Water:** Water the tree thoroughly, making sure the water stays within the berm and soaks down into the soil (instead of running off away from the tree).
4. **Sign:** Place the sign (see Advance Preparation) at the base of the tree.
5. **Ho'okupu:** Have students place their HO'OKUPU (see Advance Preparation) at the base of the tree.



All students must wash their hands thoroughly with soap and water after planting their 'ulu tree and before enjoying the snack.

Have students share what they are thankful for before enjoying the snack. Give a ti leaf plate to each student. Place one or more cooked pieces of 'ulu onto each student's ti leaf plate.

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.

"Please continue to take good care of your gardens and your 'ulu tree and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). Remember, you are the MAHI'AI (farmers) responsible for these plants that will provide us with food!"



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Thoroughly water the 'ulu tree at least once a week until well established, and during dry periods. Install irrigation if necessary. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens and around the base of the 'ulu tree.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Have students complete the 'Ulu Reflection Student Worksheet.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.
- Discuss with students the significance of their 'ulu tree. If the tree is young it may not provide food this year, but it will provide a great deal of food for years to come.
- Discuss the significance of providing sources of healthy living foods in our communities.



LESSON EXTENSIONS

The Legend of the First 'Ulu Tree

(4.RL.2, 4.RL.3, 4.RL.4, 4.W.7)

1. Read and discuss the book *No Ke Kumu 'Ulu / The 'Ulu Tree* by Kawehi Avelino with students. Have them write a book report including their own illustrations.
2. Have students research other creation stories for various plants and animals, or have them create their own.

The Importance of Trees and Forests

(4.W.7, 4.SL.4)

1. Review and discuss the following “Ōlelo No‘eau” (Hawaiian saying) with students: “Hahai no ka ua i ka ulu la‘au.” The rain follows the forest. Plant trees to protect the watershed, our source of life in these islands.
2. Have students research and report on the uniqueness and importance of native Hawaiian forests and the threats that they face (including over-development and invasive species).



We All Live In A Watershed!

(4.W.7, 4.SL.4, 4.SL.5)

1. A watershed is an ahupua‘a, an area of land, such as a mountain or valley, which collects rainwater into a common outlet, such as the ocean.
2. Have students visit the Hawai'i Association of Watershed Partnerships website, www.hawp.org, to learn more about watersheds and the Ko‘olau and Wai‘anae Mountains Watershed Partnerships on O‘ahu.
3. Discuss the fact that our lives depend on the health of our native forests and watersheds because they provide us with life-giving water, ka wai ola.
4. Take students on a hike in your school's local watershed, enabling a first-hand experience of this important aspect of their lives.
5. Have students work in groups to draw maps and/or make models of their local watershed and learn the names and locations of local mountains, streams, and rivers. Have the groups share their work with the class.
6. Watch *The Rain Follows the Forest* movie, created by the Hawai'i Department of Land and Natural Resources (DLNR) for free on YouTube: www.youtube.com/TheHawaiiDLNR/videos. Have students write a journal entry including their opinion of the movie and any reflections on the topic.
7. Other resources related to the movie include:
 - “The Rain Follows the Forest” lesson plan is available online here: www.dlnr.hawaii.gov/rain/files/2014/02/The-Rain-Follows-the-Forest.pdf
 - Additional student resources can be downloaded from: www.dlnr.hawaii.gov/dofaw/kids/

'Ulu



Use this information to help verify student knowledge and answer student questions during the 'Ulu Discussion in the Lesson Introduction. See the 'Ulu Mo'olelo Sign for a story about the cultural significance of 'ulu.

Q: Is 'ulu an important food plant in the Pacific?

A: Yes. 'Ulu has long been an important staple food in the Pacific where hundreds of named varieties have been cultivated. Breadfruit is one of the highest-yielding food plants, with a single tree producing up to 200 or more fruits per season. The world's largest collection of breadfruit varieties (over 120 varieties) exists outside of Hana, Maui and was established by Diane Ragone from over 20 years of travel in the Pacific. The collection is managed by The Breadfruit Institute (at the National Tropical Botanical Garden), which was founded in 2003. Today, breadfruit is grown in close to 90 countries around the world. This "tree of bread" has the potential to play a significant role in alleviating hunger in the tropics.

Q: When and where did 'ulu originate?

A: This crop was first domesticated over 3,000 years ago in the western Pacific.

Q: When did 'ulu arrive in Hawai'i?

A: One species (*Artocarpus altilis*, the common seedless 'ulu) was brought to Hawai'i from the Society Islands in the late 1300s or earlier. Other varieties were introduced to Hawai'i from Samoa, Tonga, the Society Islands, and Micronesia during the late 1800s and throughout the 20th century.

Q: What cultural significance does this plant have in Hawai'i?

A: A number of Hawaiian legends exist about the origin of the 'ulu tree. One of these relates that the god Kū bid farewell to his earthly wife during a famine and disappeared into the ground. From there a breadfruit tree grew, providing fruit for his wife and child. Upright breadfruit trees were viewed as kinolau (one of the many forms taken by a supernatural body such as a Hawaiian god or goddess) of Kū, one of the four major Hawaiian gods. The "bushlike" or so-called female breadfruit plants were closely associated with the goddess Haumea, mother of Kū and patron of childbirth. Breadfruit is also sacred to Kāne, the Hawaiian deity responsible for introducing cultivated plants to humans.

Q: How are 'ulu trees propagated?

A: 'Ulu is typically propagated vegetatively using root shoots or rarely, root cuttings. (Vegetative propagation is reproduction through asexual means, i.e. not from seed, either naturally through budding, rhizomes, runners, bulbs, etc., or artificially through grafting, layering, or taking cuttings.) Other methods of 'ulu propagation include air layering, grafting, and infrequently, seed propagation. The Breadfruit Institute has developed micro-propagation methods for breadfruit which makes it possible to produce large quantities of healthy, vigorous plants that tend to become compact, low-branching trees. In general, 'ulu grown from seed will fruit in 5 to 10 years or longer, while plants grown from root shoots produce fruit in 3 to 5 years. Micro-propagated plants can begin bearing as soon as 2 to 3 years.

Q: Do 'ulu trees have a beneficial impact on the natural environment?

A: Yes. 'Ulu trees create a lush canopy that shelters a wide range of cultivated and native plants. In the Pacific, the trees are often grown on steep hillsides, protecting the soil from erosion. 'Ulu trees create organic mulch, shade, and a cooler microclimate beneath the canopy. They give shelter and food to important pollinators and seed dispersers such as honeybees, birds, and fruit bats. Bees are attracted to and harvest droplets of latex from the surface of the fruit as well as pollen. However, pollination is not required for fruits to develop.

Q: How do you plant an 'ulu tree?

A: 'Ulu trees prefer light or medium, well drained soils. Plant the tree in full sun or partial shade, preferably at the onset of the rainy season. If the weather is dry, water as needed for the first 3 to 6 months of establishment. Before planting, carefully trim the lower leaves reducing their size by 1/2 to 2/3. Do not remove or damage the growing tip where new leaves develop. Dig a hole the same depth of the container and twice as wide as the container. Add about 1 cup of vermicast to the bottom of the hole and mix it with soil. Carefully remove the tree

from the pot. Place the tree in the hole, add soil no higher than the level of the plant in the pot, top dress with compost, and water well. Place a layer of mulch around the tree, 4 to 6 inches deep and kept away from the trunk to avoid rotting. Mulching young plants is beneficial for helping keep the soil moist, adding a steady supply of nutrients, and controlling weeds around the root system. Do not use herbicides or pesticides on or near the tree or any school gardens.

Q: What kind of care does an 'ulu tree need?

A: 'Ulu is a relatively trouble-free plant to grow. It is best to remove and compost any damaged fruit that has fallen to the ground in order to discourage fruit flies. Keep the tree mulched (e.g., with wood chips) in order to preserve soil moisture and prevent damage to the roots from lawn mowers and other equipment. Feed the tree (e.g., with composted chicken manure placed on the soil and covered with mulch) at the beginning and end of the fruiting season to help maintain health and vigor. Remove any dead and damaged branches from the tree and ground. Have the tree pruned once a year after the fruiting season.

Q: When and how is the fruit harvested?

A: Different varieties of 'ulu have different fruiting seasons. However, in Hawai'i, the fruits are generally most abundant from July to February. Fruits are generally picked when firm and mature but not yet ripe. The skin will be greenish-yellow with slight brown cracking or crusting and a few splotches of dried sap. The flesh will be firm and creamy white or pale yellow in color. (Immature fruits are bright green and bleed the sticky white sap when cut; the flesh is pale green beneath the skin). Cut or twist the stem of the fruit (hua) to snap it from the branch. Use a picking pole (e.g., sharp scythe attached to a sturdy pole with a basket or net attached for catching) for fruits that are higher off the ground. Turn the fruit upside down to let the sap drain from the end of the stem. Immature and mature fruit will soften within 1 to 3 days after harvest. Fallen fruits will soften sooner.

Q: How are 'ulu prepared for eating?

A: 'Ulu is a very versatile food and is prepared and eaten at all stages of development. 'Ulu can easily substitute for starchy root crops, pasta, potatoes, or rice. Small, immature fruit can be boiled, pickled or marinated, and has a flavor similar to that of artichoke hearts. The mature fruit is similar to a potato and can

be baked, steamed, boiled, fried, grilled, barbecued, and more. Soft ripe fruit are sweet and can be eaten raw or used to make smoothies, pies, cakes, and other desserts and sweets. The possibilities for breadfruit are endless! Use it to prepare tasty appetizers, salads, soups, stews, casseroles, main dishes, breads, desserts, and much more. Breadfruit can also be dried and ground into gluten-free flour. The nutritious seeds resemble chestnuts in flavor and texture. They are boiled, roasted, or ground into meal. Even the male flowers can be eaten as a sweet when candied.

Q: Why is 'ulu called breadfruit?

A: The cooked fruit has a texture, fragrance, flavor, and nutritional makeup (carbohydrates and fiber) similar to fresh-baked bread. Similar to bread, which is a dietary staple in many regions around the world, breadfruit is a dietary staple in the Pacific, Caribbean and other tropical regions.

Q: What are the nutritional benefits of eating 'ulu?

A: The fruit is high in complex carbohydrates and a good source of dietary fiber, calcium, copper, iron, magnesium, potassium, thiamine, and niacin. Some breadfruit varieties are also good sources of antioxidants and carotenoids.

Q: Are there other uses for 'ulu besides food?

A: Yes. All parts of the tree are used. A breadfruit tree yields food, construction materials, medicine, cordage, glue, insect repellent, and animal feed. The wood is light and durable and is used in the construction of houses, furniture, and canoes and carved into attractive bowls, statues, handicrafts, and other items. The sticky white sap has been used for glue, caulk, and even chewing gum. The inner bark, or bast, can be made into bark cloth or cordage. The leaves are used as fans, to wrap foods that are cooked in traditional earth ovens, and as biodegradable plates. 'Ulu leaves, petioles, bark, and latex (sap) are all used medicinally.

Q: What is the scientific name for 'ulu?

A: *Artocarpus altilis*. Breadfruit is a member of the Moraceae (fig) family.



'Ulu- Breadfruit

A Mo'olelo of the Gift of Kū

Mary Kawena Pukui tells of a Hawaiian myth which explains the origin of the 'ulu tree as a gift from the god Kū. This story takes place on the south coast of the island of Hawai'i at a place called Kawa'aloa, Kona.

At a time of starvation and famine in Hawai'i, the god Kū buried himself in the earth near his hale (house). Kū told his wife, "My body will be the trunk and branches. My hands will be the leaves, the heart inside the fruit will be my tongue. Roast the fruit, soak it, beat off the skin, and eat some, and feed our children." It was from his head that the tree grew bearing the 'ulu fruit, shaped like a man's head and the leaves shaped like hands. This story is known as the gift from Kū because Kū sacrificed himself to feed his family in a time of famine.

'Ulu is such an important plant to the people of Hawai'i that it has multiple Hawaiian gods associated with it. 'Ulu is also known as Kameha'ikana, a Hawaiian goddess in the form of Haumea—the elemental force and god of regeneration, fertility, and birth.



SOURCES:

Kamakau, S. M. (1964). *Ka Po'e Kahiko: The People of Old*. Honolulu: Bishop Museum Press.

Kamakau, S. M. (1991). *Tales and Traditions of the People of Old: Nā Mo'olelo a ka Po'e Kahiko*. Honolulu: Bishop Museum Press.

Handy, E. C., Handy, E. G., & Pukui, M. K. (1972). *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Honolulu: Bishop Museum Press.

Pukui, M. K., & Elbert, S. H. (1986). *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. Honolulu: University of Hawaii Press.

Background Information about Mo'olelo:

Mo'olelo and ka'ao are what we understand today as Hawaiian stories and legends. Mo'olelo comes from the words mo'o and 'olelo which mean a continuum of talk, as all stories in ancient times were oral, not written.

Today the sharing of mo'olelo can help us connect to our place by uncovering the behaviors and patterns of the people of old Hawai'i. In mo'olelo there is always kaona—the hidden lessons and deeper meanings within stories. What can stories of plants and animals, valley walls and mountain peaks, and the winds and the rains teach us?



KEY TERMS AND CONCEPTS

Ho'okupu - Offering

Kumulā'au or Lā'au- Tree

Laulima - Cooperation, to work together

Mahi'ai - Farmer

Ulu - to grow, increase, spread

'Ulu - Hawaiian word for breadfruit

Directions: Use this space to record your notes, drawings, and observations.

DIG

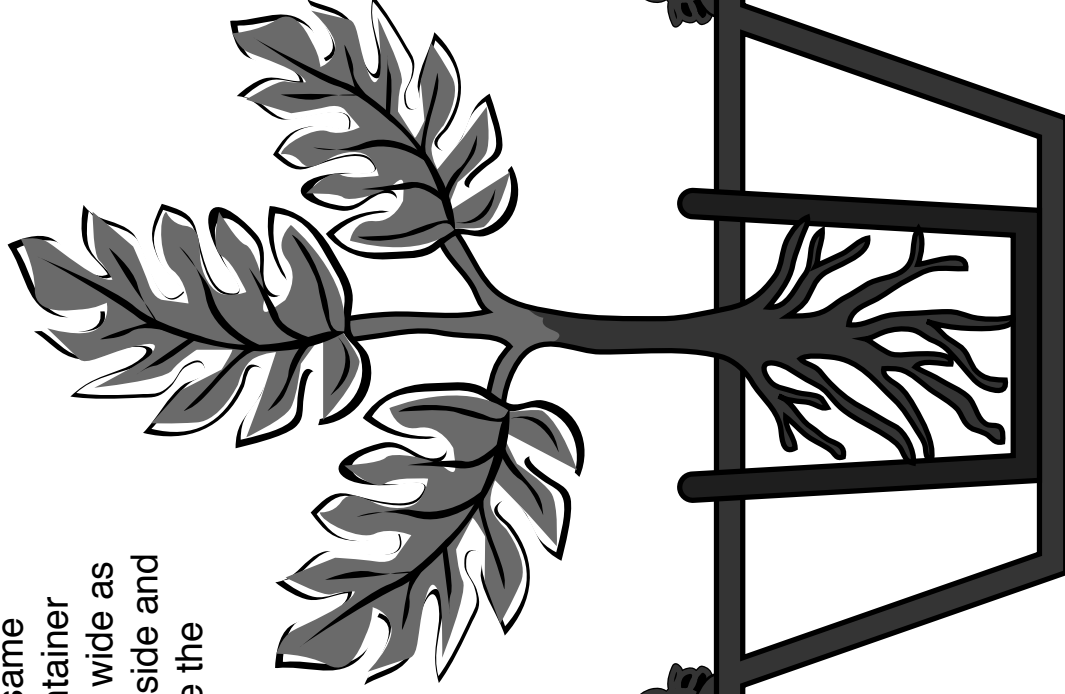
1. Dig the planting hole to the same depth as the soil inside the container that the tree is in, and twice as wide as the container. The soil levels inside and outside the container should be the same, so that the tree is not planted too shallow or too deep.

MIX

2. Mix compost and vermicast into the soil at the bottom of the hole before planting.

WATER

3. Before planting, fill the planting hole with water and allow it to drain into the soil completely before the tree is planted. This encourages downward growth of the roots.



PLANT

4. Gently remove the tree from its container before planting. Place the tree in the planting hole and make sure it is standing completely vertical. Gently and firmly fill the hole with soil.

MULCH

5. Use soil and mulch (e.g., wood chips, about 4" to 6" deep) to form a "doughnut-shaped" berm around the tree at the tree's drip line (the farthest reach of its leaves) in order to form a "water well" and discourage weeds. Be sure that mulch does not come in contact with the trunk, which could cause rotting.





'Ulu Reflection

Directions: Fill in your answers to the questions below.

1. Describe the importance of 'ulu in Hawai'i: _____

2. Describe your opinion of how the 'ulu tasted: _____

3. There is a Chinese proverb that says, "The best time to plant a tree was twenty years ago. The second best time is today." Why is it important to plant trees? _____

4. What does LAULIMA mean? _____

5. Describe at least one specific example of how you or someone else practiced LAULIMA today: _____

6. What was your favorite part about The 'Ulu Tree lesson? _____

DESCRIPTION

Students will discuss the significant role of kī (ti plants) in Hawaiian culture and history, and the Hawaiian value, lokomaika'i. They will plant their kī plants and care for their kalo and 'uala gardens and their 'ulu tree. They will learn to use ti leaves as wrapping, and take home a ti leaf cutting to share and plant with their families.

TIME: 60 minutes

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the role and significance of kī in Hawaiian culture and history.
- Treat their garden, plants, tools, self, and others with respect.
- Practice proper planting and care of kī plants.

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.W.1, 4.W.3, 4.W.7, 4.W.8, 4.W.10, 4.SL.1, 4.SL.4, 4.SL.5

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.6.1, SS.4.6.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Protocol
 2. Kī Discussion
 3. Planting Instructions
 4. Group Activities Overview
- II. Group Activities (30 minutes)
 1. Kī Planting (10 minutes)
 2. Kalo, 'Uala, and 'Ulu Care (10 minutes)
 3. Makana (10 minutes)
- III. Closing & Pū'olo Making (15 minutes)



KEY TERMS AND CONCEPTS

Kī - Hawaiian word for ti plants

Lā'ī - Ti leaves

Lokomaika'i - Kind, generous

Mahi'ai - Farmer

Makana - Gift

Pū'olo - Bundle, parcel



LESSON MATERIALS

Community Supplies:

- Vermicast (about 1 cup per class)

Lesson Supplies:

- Garden Agreements Sign
- Kī Mo'olelo Sign
- Student Workbook

Teaching Team To Provide:

- Kī cuttings (stems of green ti leaf plants, 3 to 6 inches long) for individual makana (1 per student) and for planting (2 or more per class)
- Lā'ī (ti leaves) for individual makana (1 per student) and for pū'olo (8-10 large ti leaves)
- Floral wire and scissors or 4+ strong twist ties for makana/pū'olo
- Fresh, locally-grown food items to supplement student provisions for the makana/pū'olo (e.g., kalo, 'uala, small 'ulu, unripe/underripe bananas; see Advance Preparation)

School To Provide:

- Garden Journals (if not using Student Workbook)
- 2 shovels or trowels (1 per student)
- Mulch (wood chips)
- Buckets and cups for watering and mulch



Background Information: Kī



Student Worksheet:
Kī Reflection and Hawaiian
Canoe Plants

ACCOMPANYING DOCUMENTS

- Background Information: Kī
- Kī Mo'olelo Sign
- Guided Notes
- Student Worksheet: Kī Reflection and Hawaiian Canoe Plants

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the Kī Background Information and Kī Mo'olelo Sign in preparation for the kī discussion with students.
- Make copies of the Student Worksheet, one per student if not using the Student Workbook.
- Determine planting locations for the kī cuttings, either at the ends of the garden beds if there is space, or in another suitable location near the Hawaiian Gardens and/or 'ulu tree.
- Harvest and prepare kī cuttings for planting and makana.
- Harvest lā'ī (ti leaves) for makana/pū'olo.
- Practice making a pū'olo according to the instructions in the Group Activities: Makana section.
- Have each student bring in one food item to contribute to the makana/pū'olo (ideally fresh, locally-grown, e.g., kalo, 'uala, small 'ulu, unripe/underripe bananas)
- Have students practice E Hō Mai.
- Have students ready to take notes in their Student Workbooks or Garden Journals

INTRODUCTION

15 MINUTES

PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

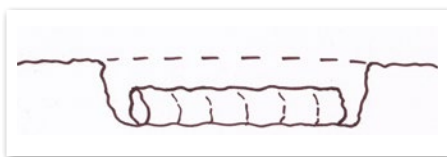
KĪ DISCUSSION

During the following discussion, write key terms on the board and have students take notes in their journals. "Today we are going to plant a very important plant in our gardens, the kī (ti) plant. As MAHI'AI (farmers) we will also care for our kalo and 'uala gardens and our 'ulu tree." Ask students to share some of the observations they have made in the garden since the last lesson, including those recorded in their Student Workbooks or Garden Journals (or the Class Journal).

"Kī is the Hawaiian word for ti leaf plants. LĀ'Ī is the Hawaiian word for ti leaves." Show students a ti leaf. Ask students: "What do you know or want to know about kī?" Use the Background Information to help verify student knowledge and answer student questions. Spend about 5 to 7 minutes on this discussion. Refer to the Kī Mo'olelo Sign for a story about the cultural significance of kī.

PLANTING INSTRUCTIONS

"In the gardens today we will plant cuttings of kī plants." Show cuttings to students and draw a diagram of how they will be planted. Cuttings will be planted horizontally in the soil, just under the soil surface. The cuttings may be planted at the ends of the garden beds if there is space, or in another suitable location near the Hawaiian Gardens and/or 'ulu tree.



Draw a simple diagram to illustrate proper planting of the kī cuttings.

"It is very important that the cuttings stay moist in order to grow. Be sure to continue to visit and water your gardens every day!"

GROUP ACTIVITIES OVERVIEW

"In our gardens today, each group will plant kī cuttings, care for our kalo and 'uala gardens, and our 'ulu tree, and make MAKANA (gifts) using lā'ī (ti leaves).

Hawaiian Values and Garden Agreements

"Our Hawaiian value for today is LOKOMAIKA'I, which means kind and generous." Have students repeat the Hawaiian value and share examples of how they will practice LOKOMAIKA'I in the gardens today, and how we receive kindness and generosity from our garden plants.

"Our Garden Agreements will also help to guide us in our practice of LOKOMAIKA'I." Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Divide the students into three groups before going outside.



Planting near rain gutter downspouts utilizes an available resource to help plants thrive.

GROUP ACTIVITIES

30 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students to practice being LOKOMAIKA'I.

Separate the class into three groups. Each group will plant their kī cuttings (10 minutes), care for their assigned areas (10 minutes), and do the makana activity (10 minutes), then regroup with the entire class for the pū'olo making and closing.

KĪ PLANTING (10 minutes)

Working together in pairs or groups of 3, have students prepare the shallow trenches (about 1 to 2 inches deep) in the designated planting locations. Sprinkle vermicast in each trench. Gently lay one kī cutting horizontally in each trench, cover the cuttings with soil, and water them well. Mark the planting areas so they can be located for watering.

**KALO, 'UALA, AND 'ULU CARE (10 minutes)**

The three groups will work in their respective areas to tend their Hawaiian Gardens.

In the kalo and 'uala gardens students will weed, water, and feed the soil with vermicast. Bare soil may be covered with organic mulch to protect it from the sun. If 'uala vines are "running" (vines extend outside of the garden bed), have students wrap or fold the vines back into the garden bed (having the plant growth concentrated in the garden bed will help focus the plant's energy on root growth instead of vines).

Students should care for the 'ulu tree by removing weeds and grass from around the base of the tree and replenishing/adding a 4 to 6 inch deep layer of mulch (wood chips) around the tree (about a 2 foot radius around the trunk), being sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room). They should water the soil thoroughly and add dissolved vermicast to the soil.

MAKANA (10 minutes)

Gather the students and have them be seated in the shade near the gardens.

"LĀ'Ī, or ti leaves, are a perfect material for wrapping and carrying items. Today we will learn a way to use them as wrapping paper for a MAKANA, a gift. You can use this method to create waste-free gifts this holiday season for your family and friends! The style of wrapping we will practice today is to wrap a small makana. Each of you today will wrap your own kī cutting and take it home to give it to someone you love or plant it yourself."

Demonstrate the creation of the first makana, then have each student wrap their own:

1. Lay a de-boned ti leaf shiny side down and roll the kī cutting tightly until you reach the stem.
2. Split the end of the stem down the middle until it reaches the leaf. The two halves will be used to tie a knot. Carefully twist the stems with your fingers.
3. Wrap the stems around the makana.
4. Tighten with a knot.



1



2



3



4

Visit www.kokuahawaiifoundation.org/video to view a kī makana making demonstration.

CLOSING

15 MINUTES

MAKING PŪ'OLO

Gather the students and have them be seated in the shade near the gardens or at a picnic table.

“The style of wrapping you did was for a small makana. To close, we will demonstrate what is called a PŪ'OLO, which means bundle or parcel. Pū'olo have been used since ancestral Hawaiian times to bundle food and other items. You can wrap food and gifts in a pū'olo too to share with others. When we are done you will be able to give this pū'olo as a gift to a teacher or other staff person on campus.”

1. Gather 8-10 large lā'ī together by their stems, with the bottom of each leaf facing out.
2. Use floral wire or a strong twist tie to hold the stems together. Spread out the ti leaves (bottom side up) so they lay flat on the ground/work surface.
3. Place one food item (e.g., kalo, 'uala, small 'ulu, 2-3 bananas) on each ti leaf, close to the stems.
4. Carefully gather the ends of each leaf together in the center (over the area where the stems are joined) and secure them together with floral wire or a strong twist tie.



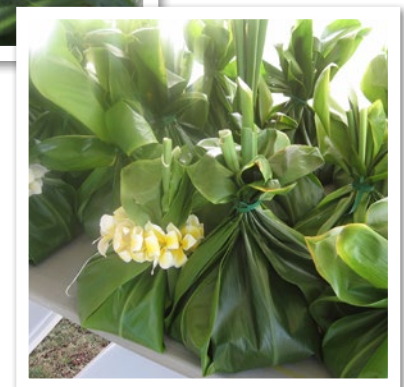
1



2



3



4



Visit www.kokuahawaiifoundation.org/video to view a pū'olo making demonstration.

CLOSING

CONTINUED

Ask students to share about their experience.

Discuss with students:

- What new information did you learn about kī today?
- How can you use your experience today to help you “simplify the holidays” (e.g., give waste-free gifts)?
- How did you practice being LOKOMAIKA'I today?

“Please continue to take good care of your kalo, ‘uala, ‘ulu, and kī plants and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). It is very important that the soil stays moist. Remember, you are the MAHI'AI (farmers) responsible for these plants that will provide us with food and much more!”

All students must wash their hands thoroughly with soap and water after working in the gardens.



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Thoroughly water the ‘ulu tree and kī plants at least once a week until well established, and during dry periods. Install irrigation if necessary. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens and around the base of the ‘ulu tree and kī plants.
- Students must wash their hands thoroughly with soap and water after working in the garden.

FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Review this semester’s garden experience, including the key concepts for the unit.
- Have students complete the Kī Reflection and Hawaiian Canoe Plants Student Worksheet.
- Have students create a final journal entry about their garden experience this semester. Have them share their work with the class.
- Save and submit examples of student work to Kōkua Hawai'i Foundation.
- Have the class select a recipient and present the pū'olo they have created to a teacher or other staff person on campus as a gift of thanks and demonstration of lokomaika'i.



LESSON EXTENSIONS

Lā'ī Crafts: Ti Leaf Lei

1. Knowing how to make a ti leaf lei is a wonderful and important skill to have in Hawai'i!
2. In addition to the directions below, a number of instructional videos are available on YouTube.
3. Harvest healthy green ti leaves (you may have students harvest from home or ask permission to harvest from plants on campus).
4. Wipe the leaves with a damp cloth to clean them, then use scissors to cut away the midrib, leaving two separate halves.
5. Place the cut leaves in a plastic bag in the freezer to soften, at least overnight.
6. Have each student make a lei, bracelet, or anklet. A full length lei will use about 8 pieces (from 4 whole leaves).
7. To begin the lei, twist one piece gently and tightly as if making a rope, then loop it around your toe (or other holder) in the middle of the leaf. You will now have two strands of equal length to work with, as well as a loop (around your toe or other holder) for holding the lei in place and for connecting the other end when finished.
8. Using both hands at the same time, twist both the left and right strands toward the right. Each strand will compress down into a tight, spiraling rope as you continue twisting each side to the right.
9. Cross the right strand over the left strand (in the opposite direction of their individual twist).
10. Continue twisting each individual strand to the right, and continue wrapping the two strands together toward the left.
11. When there are about 2 inches left on a strand, place a new leaf piece over the old one, with about 2 inches of the new leaf protruding from the lei (this protrusion will remain as a decorative touch). Twist the old and new pieces together toward the right to form the extended strand, then continue to carefully twist each individual strand to the right and wrap the strands together to the left. Add new pieces as needed.

12. As the lei lengthens, wrap it around your foot to keep it at an easily workable length.
13. When you obtain the desired length for your lei, twist the two strands together into one and tie them into a simple knot. Hold the lei by the loop and allow it to hang so that the extra twist is removed (this will allow the lei to lie flat when worn). Place the knot through the loop at the beginning of the lei in order to complete the circle!
14. Rinse the lei with water to remove the sticky residue. Pat dry.
15. If desired, students may place their creations in the garden as a gift to the plants and soil, or take them home.

Hawaiian Canoe Plants

(4.W.7, 4.SL.4, 4.SL.5)

1. Have students each choose a canoe plant to research more in depth.
2. Have students write a one page report including interesting facts and legends about their plant and its importance in Hawai'i. Create original stories, poems, and drawings.
3. Have students share their work with the class.
4. Some of the other Hawaiian canoe plants that have not been discussed during these lessons include:
 - Ipu (gourd): Dried fruit used for food containers and making instruments.
 - Niu (coconut): Fronds for baskets and brooms, fruit for food and milk, fiber for cordage.
 - Mai'a (bananas): Leaves used to wrap food and cover imu (underground earth oven) to steam food, fruit used for food, trunk used as a roller to move canoes.



Kī

Use this information to help verify student knowledge and answer student questions during the Kī Discussion in the Lesson Introduction. See the Kī Mo'olelo Sign for a story about the cultural significance of kī.



Q: Is kī (the ti plant) an important plant in Hawai'i?
A: Yes, this is a very important plant in Hawai'i and throughout Polynesia. The plant is used for food, medicine, roof thatching, rain capes, lei, skirts, sandals, cordage, nets, plates, cups, and food wraps. It is also used ceremonially and was planted near heiau (sacred Hawaiian places of worship) and burial sites, as well as around houses and taro patches and to mark boundaries. It is considered to be a sacred plant whose leaves provide protection for people and places against evil spirits. A stalk of kī held upright like a kāhili (feather standard, an object that is supported in an upright position, symbolic of royalty) also served as an actual flag of truce in battle.



Q: Where did kī originate and where is it grown now?
A: It is probably native to the area between the Himalayas and northern Australia. This plant is grown throughout the world and is especially important in Polynesia.

Q: How did kī arrive in Hawai'i?
A: It was brought here by early Polynesian voyagers about 1,500 years ago.



Ti leaf plates (above) and pū'olo (bundles, right) are two of the many uses for lā'i (ti leaves).

Q: What parts of the plant can be eaten or used in food preparation?
A: The roots were occasionally baked in earth ovens, particularly during times of famine. The cooked root is fibrous and sweet and can be eaten like candy. The leaves are used for wrapping food to be cooked in an imu (underground earth oven), and for food storage and transportation.

Q: How is the plant used medicinally?
A: When applied to the body, the leaves can treat fevers, inflammation, headaches, and other body aches. The young unfolded leaf can be used to bandage a wound.

Q: How is the plant grown?
A: Kī is mainly grown vegetatively from cuttings, but may also be grown from air layers, suckers, and seeds. (Vegetative propagation is reproduction through asexual means, i.e., not from seed, either naturally through budding, rhizomes, runners, bulbs, etc., or artificially through grafting, layering, or taking cuttings.) Cuttings should be at least 3 inches long or longer and can be placed directly in soil or in pots, vertically (with correct end up) or horizontally, and kept moist and partially shaded.

Q: What is the scientific name for kī?
A: *Cordyline fruticosa*. Ti plants are a member of the Asparagaceae (asparagus) family.



Kī - Ti

A Mo'olelo of the Menehune of Kaimukī, O'ahu

Have you been to the place of Kaimukī on the south shore of O'ahu? Kaimukī is briefly mentioned in the legendary tale of Pele and Hi'iaka as Hi'iaka is traveling across the islands of Hawai'i in search of Pele's lover, Lohi'au. As Hi'iaka made her way through O'ahu, she reached Kaimukī. Kaimukī was considered a wild region with heavy boulders and chosen by menehune for a special purpose. Menehune were a race of small people who worked at night, building fish ponds, roads, and temples.

It was said that if the work was not finished in one night, it remained unfinished. In this mo'olelo, menehune chose Kaimukī as a stronghold to build their famous imu (underground ovens) for cooking the root of the kī (ti). The root was cooked and eaten like sugarcane. Because of the rocky foundation of Kaimukī, the imu full of kī would remain undisturbed by the mischievous deeds of the pig-god Kamapua'a who loved to steal the fruits of others' labor.



From this mo'olelo we learn how the place of Kaimukī got its name. Ka (the), imu (underground oven), of kī (ti).

Sources:

Emerson, N. B. (1997). *Pele and Hiiaka: A Myth From Hawaii*. Honolulu: 'Ai Pōhaku Press.

Pukui, M. K., & Elbert, S. H. (1986). *Hawaiian dictionary: Hawaiian-English, English-Hawaiian*. Honolulu: University of Hawaii Press.

Find the mo'olelo and historical information about your school's ahupua'a using these sources:

Pukui, M. K., Elbert, S. H., & Mookini, E. T. (1974). *Place Names of Hawaii*. Honolulu: University Press of Hawaii.

Sterling, E. P., & Summers, C. C. (1978). *Sites of Oahu*. Honolulu: Bishop Museum Press.

Background Information about Mo'olelo:

Mo'olelo and ka'ao are what we understand today as Hawaiian stories and legends. Mo'olelo comes from the words mo'o and 'ōlelo which mean a continuum of talk, as all stories in ancient times were oral, not written.

Today the sharing of mo'olelo can help us connect to our place by uncovering the behaviors and patterns of the people of old Hawai'i. In mo'olelo there is always kaona— the hidden lessons and deeper meanings within stories. What can stories of plants and animals, valley walls and mountain peaks, and the winds and the rains teach us?



KEY TERMS AND CONCEPTS

Kī - Hawaiian word for ti plants

Lā'ī - Ti leaves

Lokomaika'i - Kind, generous

Mahi'ai - Farmer

Makana - Gift

Pū'olo - Bundle, parcel

Directions: Use this space to record your notes, drawings, and observations.



Kī Reflection

Part 1 Directions: Fill in your answers to the questions below.

1. Describe the importance of kī in Hawai'i: _____

2. How can you use the makana (gift) wrapping technique to reduce waste? _____

3. What does LOKOMAIKA'I mean? _____

4. Describe at least one specific example of how you or someone else practiced LOKOMAIKA'I today: _____





5. What was your favorite part about Kī (Ti) Plants lesson? _____

Hawaiian Canoe Plants

Word List

kalo kī 'uala 'ulu breadfruit sweet potato taro ti

Part 2 Directions: Next to each canoe plant, list the Hawaiian and English names and 2-3 uses or facts about the plant. Color the diagram of each plant.

Diagram	Hawaiian name	English name	List 2-3 uses or facts
			
			
			
			

Dear Parent or Caregiver:

This semester, 4th graders will be participating in the last four of eight Hawaiian Garden lessons being delivered by volunteers of 'ĀINA In Schools, a program of Kōkua Hawai'i Foundation. 'ĀINA In Schools is a farm to school initiative that connects children to their local land, waters, and food to grow a healthier Hawai'i. Program components vary from school to school and include nutrition education, garden-based learning, farm field trips, chef visits, waste reduction, and family and community outreach.

Although the lessons are delivered once a month, the students will be engaged in between lessons with regular garden activities that include watering, weeding, making observations, spending time in the garden, and learning about native plants.

Photos and Media Releases: By now each of you should have received a Kōkua Hawai'i Foundation Media Release Form. We hope that you have completed this form and have submitted it to your child's classroom teacher. From time to time, KHF takes photos/videos of our lessons to highlight activities that are noteworthy.

To keep yourself up to date on what your child is experiencing in 'ĀINA, we suggest putting this letter up on your refrigerator or bulletin board and talking with your child as the lessons are delivered. You can help reinforce, engage, and learn along with your child by discussing the the lessons and activities after each lesson. A lesson summary and suggested questions/activities for each lesson are listed below.

Mahalo!

In the **Hawaiian Garden** unit, students will plant and care for kalo (taro), 'uala (sweet potato), 'ulu (breadfruit), kī (ti leaves), and one or more species of native Hawaiian plants, and discuss the significant role of these plants in Hawaiian culture and history. Throughout the school year, they will care for their gardens, then harvest, prepare, and enjoy the edible crops during the spring semester. Each lesson begins with the offering of a Hawaiian chant (oli) as protocol and introduces a different Hawaiian value for students to practice, including pono, kuleana, aloha, lokomaika'i, laulima, mālama, ha'aha'a, and ho'omau. Additional key concepts include 'āina, ahupua'a, mahi'ai, makana, plant varieties, nutrients, native (endemic, indigenous), introduced (Polynesian-introduced, recent introduction), endangered, extinct, and invasive species.



Lesson 5 - 'Uala Leaf Harvest

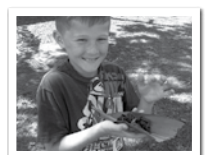
In this lesson, students discuss the benefits of harvesting and eating 'uala leaves, and the Hawaiian value, aloha (love, respect, protect). They will work as a community to care for their gardens and prepare and eat palula (cooked 'uala leaves).

Questions to discuss with your child:

- What does aloha mean and how can you practice this Hawaiian value?
- What are some of the benefits of using locally grown foods instead of imported ones?

Suggested home activity:

- Prepare and make 'Uala Leaf Salad. Recipe and instructions: www.motherearthnews.com/real-food/sweet-potato-leaves-recipe-zb0z11zwar.aspx



Lesson 6 - Native Hawaiian Plants

In this lesson, students discuss Hawai'i's unique natural environment, learn about native Hawaiian and Polynesian-introduced plants, and discuss the Hawaiian value, mālama (to care for). They will plant one or more native plants on campus and care for their kalo, 'uala, 'ulu, and kī plants. They will sample a healing herbal tea made from leaves of the endemic māmaki tree.

Questions to discuss with your child:

- What is the difference between native and introduced plants?
- What does mālama mean and how do you practice this Hawaiian value?

Suggested home activity:

- Learn more about native plants by visiting: www.nativeplants.hawaii.edu/
- Learn more about invasive species in Hawai'i by visiting: www.dlnr.hawaii.gov/hisc/info/



Lesson 7 - 'Uala Harvest

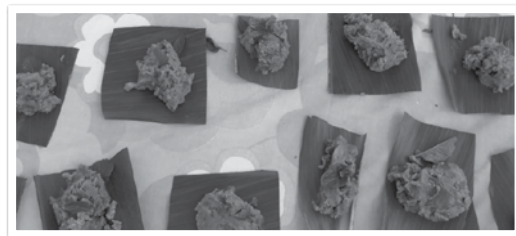
In this lesson, students review the importance of 'uala and discuss the Hawaiian value, ho'omaika'i (grateful; to improve, correct, perfect). They work as a community to care for their gardens and harvest, cook, and eat 'uala roots.

Questions to discuss with your child:

- How did you work as a community today?
- What does ho'omaika'i mean and how do you practice this Hawaiian value?

Suggested home activity:

- Prepare and make koele palau, a treat made from cooked, mashed 'uala mixed with coconut milk. Instructions will be provided to your child after the lesson.



Lesson 8 - Kalo Harvest

In this lesson, students review the importance of kalo and discuss the Hawaiian value, ho'omau (to continue, perpetuate, persevere). They work as a community to care for their gardens and harvest their kalo plants. Kalo corms (kalo or makua) and leaves (lau) are cooked and all participating classes enjoy their snack together.

Questions to discuss with your child:

- Have your child share their most memorable experience with their Hawaiian gardens this school year.
- What does ho'omau mean and how do you practice this Hawaiian value?

Suggested home activity:

- Connect with ku'i 'ai practitioners and sample a taste of pa'i 'ai, hand pounded kalo.



If you have any questions or are interested in becoming an ĀINA In Schools docent, please do not hesitate to ask.

To learn more about ĀINA In Schools at your child's school, please contact your school's ĀINA Team Coordinator, or contact:



ĀINA In Schools
Program



aina@kokuahawaiifoundation.org

DESCRIPTION

Students will discuss the benefits of harvesting and eating 'uala leaves, and the Hawaiian value, aloha. They will work as a community to care for their gardens and harvest, wash, cook, and eat 'uala leaves.

TIME: 60 minutes

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the benefits of eating 'uala leaves and using locally grown (vs. imported) produce.
- Work as a community and treat their gardens, plants, tools, self, and others with respect.
- Harvest and prepare 'uala leaves for cooking and eating.

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.W.1, 4.W.3, 4.W.8, 4.W.10, 4.SL.1; **HCPS III:** HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.6.1, SS.4.6.3
NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document.

LESSON OUTLINE

I. Introduction (15 minutes)

1. Protocol
2. 'Uala Leaves
3. Working As A Community
4. Group Activities Overview

II. Group Activities (30 minutes)

1. Kalo Care
2. Kī Care
3. 'Ulu Care
4. 'Uala Leaf Harvest and Care
5. Ti Leaf Plates
6. 'Uala Leaf Washing and Cooking

III. Closing and Snack (15 minutes)



KEY TERMS AND CONCEPTS

Aloha - Love, compassion; to show kindness, mercy, and affection; a word of greeting or farewell in recognition of life in another; a way of life, connecting us to each other and all that exists

Aloha Spirit - Harmony of soul, heart, and mind within and among all people and things

Community - A social group whose members reside in a specific locality, and share government or common characteristics, interests, culture, and/or historical heritage

Mahi'ai - Farmer

Nutrient - A substance that provides nourishment essential for growth and the maintenance of life, such as protein, vitamins, and minerals

'Uala - Hawaiian word for sweet potato; refers to Hawaiian varieties of sweet potato; parts of the plant include the ka ('uala vine), lau (leaf), maka (root bud from node), pua (flower), 'uala (sweet potato root)

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

LESSON MATERIALS

1. Sauteed 'Uala Leaves

Community Supplies:

- Harvest basket
- 2 garden clippers (for harvesting 'uala leaves)
- 2 plastic dish tubs
- Colander
- Large bowl
- 2 clean scissors (for making ti leaf plates)
- Cooking spoon
- Salt
- Induction heater
- Extension cord
- Sponge and soap (for washing hands and cooking utensils)
- Vermicast (about 1 cup per class)

Lesson Supplies:

- Garden Agreements Sign
- Student Workbook

Teaching Team To Provide:

- Large pot or skillet (MUST HAVE MAGNETIC BOTTOM for use with induction heater; the pot has a magnetic bottom if a magnet sticks to the bottom on the outside of the pot)
- Tongs (for serving cooked 'uala leaves)
- Garlic (1 to 2 cloves per class)
- Garlic press (OR chop the garlic before delivering the lessons)
- Coconut or olive oil (about 2 Tbs. per class)
- 5 to 6 large ti leaves per class

School To Provide:

- Garden Journals if not using Student Workbooks
- Table (4 to 6 feet long; for cooking and serving)
- Access to an electrical outlet
- Bucket and cups for watering and snack waste



Student Worksheet:
Edible Leaves

ACCOMPANYING DOCUMENTS

- Take Home Letter
- Background Information: 'Uala
- Guided Notes
- 'Uala Plant Parts Sign
- Student Worksheet: Edible Leaves

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Make copies of the Student Worksheet and Take Home Letter, one per student if not using the Student Workbook
- Set up the 'uala leaf washing station: Two plastic wash bins filled with clean water.
- Set up the cooking station: Table with induction heater plugged in (use extension cord if necessary), plus other cooking utensils and ingredients (see Lesson Materials).
- Harvest and clean the ti leaves for the ti leaf plates.
- Have students practice E Hō Mai.
- Have students ready to take notes in their Student Workbooks or Garden Journals

SAUTEED 'UALA LEAVES RECIPE

1. Harvest fresh 'uala leaves (especially the new growth from the growing tips of vines).
2. Trim the leaves off of the vines and stems. Compost the vines and stems and wash the 'uala leaves. Use clean hands/scissors to break the leaves into smaller pieces.
3. Heat coconut or olive oil in a pan and saute crushed/chopped garlic for about 30 seconds, then add the 'uala leaves and stir frequently with a wooden spoon on high heat for about 10 minutes until cooked. Add a sprinkling of salt and turn off the heat.
4. Serve with tongs. Enjoy!

INTRODUCTION

15 MINUTES

PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

'UALA LEAVES

“Today we are going to care for our kalo and 'uala gardens, our kī (ti) plants and our 'ulu tree.” Ask students to share some of the observations they have made in the gardens since the last lesson, including those recorded in their Student Workbooks or Garden Journals (or the Class Journal).

“What part of the 'UALA (sweet potato) plant do we eat?” Desired answer: The roots and the leaves!

“Have you ever eaten 'uala leaves? Did you know that 'uala leaves are regularly eaten by people in many parts of the world including Asia, Africa, Central and South America, and throughout the Pacific? This is because they are both delicious and nutritious!”

“'Uala leaves, like other green leafy vegetables, are very healthy for our bodies! They are full of important NUTRIENTS, which are substances that provide nourishment essential for growth and the maintenance of life. Some of the nutrients contained within 'uala leaves include:

- Vitamin K: Needed for normal blood clotting. May help protect against osteoporosis and may inhibit some cancer tumors.
- Vitamin A: Promotes growth and repairs of body tissues, bone formation and healthy skin and hair. Essential for night vision.
- Iron: Necessary for red blood cell formation and function.
- Folic Acid: Needed for normal growth and development and red blood cell formation.
- Fiber: Promotes healthy bowels, lowers cholesterol, helps control blood sugar levels, helps prevent diabetes.
- Sweet potato leaves are known to support lactation in breast-feeding mothers.



'Uala leaves are edible, delicious, and filled with nutrients!

“There are many recipes for preparing 'uala leaves, and the leaves can even be used as a substitute for spinach in any recipe. The spinach that we buy at the grocery store is usually imported from outside of Hawai'i. What are the benefits of using 'uala greens grown locally instead of using imported spinach?” Desired answers:

- The food tastes better and contains more nutrients because it was harvested more recently (nutritional value of produce begins to decline immediately upon harvesting), and at peak ripeness (and therefore peak nutritional value; food destined for shipping is often picked before it is ripe, in addition to being exposed to heat and light, which degrade some nutrients).
- The environment is protected because the food did not travel thousands of miles using fossil fuels to get here.

“Today we will harvest, wash, cook, and eat 'uala leaves! Review the names of 'uala VARIETIES planted and have students describe the special characteristics of each variety's leaves and stems.

INTRODUCTION

CONTINUED

WORKING AS A COMMUNITY

“During our time outside today we will work together as a community. What does the word COMMUNITY mean to you?” Accept a few student responses.

“COMMUNITY means a group of people who have many things in common, such as culture, history, or homeland. In a healthy community, each person does their job and the whole community benefits. In traditional times, Hawaiian people had to do this well in order to survive using the resources available to them. So do we.”

GROUP ACTIVITIES OVERVIEW

“Each of you will be assigned a job. Let’s each do our best while we work toward a common goal. If you finish, see where help is needed. When all groups have finished and cleaned up we will enjoy our snack together!”

Assign students in equal numbers to the following six groups (see descriptions under Group Activities):

1. Kalo Care
2. KT Care
3. 'Ulu Care
4. 'Uala Leaf Harvest and Care
5. Ti Leaf Plates
6. 'Uala Leaf Washing and Cooking



Hawaiian Values and Garden Agreements

“Our Hawaiian value for today is ALOHA, which has many meanings including mutual consideration, or thinking of and caring for others as we care for ourselves. The ALOHA SPIRIT means that we think and act with our minds and hearts.” Have students repeat the Hawaiian value and share examples of how they will practice ALOHA in the gardens today.

“Our Garden Agreements will also help to guide our practice of sharing ALOHA and the ALOHA SPIRIT.” Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL

Have the student groups move to the garden to begin their work.



“To...hear what is not said, to see what cannot be seen, and to know the unknowable, that is Aloha.”
Queen Lili'uokalani, 1917

THE ALOHA SPIRIT LAW

The “Aloha Spirit Law” was passed in Hawai'i in 1986. This official law describes the meaning of Aloha and the Aloha Spirit and directs all Hawai'i citizens, government officials, and visitors to contemplate and reside with the life force and give consideration to the Aloha Spirit.

GROUP ACTIVITIES

30 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students to practice ALOHA.

Each group will spend the entire time on their assigned job. If students finish their assigned job they should assist others. All jobs must be done and cleaned up and all students must wash their hands thoroughly with soap and water before enjoying the snack together.

KALO CARE

Group 1: Weed, water, and feed the kalo with vermicast (added directly to the soil or dissolved in water). Cover any bare soil with mulch or leaves to protect it from the sun. Have the students observe the health of their plants and garden soil.



KĪ CARE

Group 2: Weed, water, and feed the kī plants with vermicast (added directly to the soil or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips, about a 2 foot radius around the plants), being sure that the mulch does not touch the plant stems (give them about a 2 inch radius of breathing room).

'ULU CARE

Group 3: Weed, water, and feed the 'ulu tree(s) with vermicast (added directly to the soil around the base of the tree(s) or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips) around the tree(s) (about a 2 foot radius around the trunk), being sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room).



'UALA LEAF HARVEST AND CARE

Group 4: Harvest fresh 'uala leaves by hand and/or with clippers and scissors. Place harvested leaves into the harvest basket and keep the basket clean by not placing it on the ground. Harvest only the new growth (from the growing tips of vines) and fresh, healthy leaves. Then weed, water, and feed the 'uala plants with vermicast (added directly to the soil or dissolved in water) after all harvesting is finished. Cover any bare soil with mulch or leaves to protect it from the sun.



TI LEAF PLATES

Group 5: Prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (each approximately a 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean.

GROUP ACTIVITIES

CONTINUED

'UALA LEAF WASHING AND COOKING

Group 6: Trim the leaves off of the vines and stems. Compost the vines and stems, and place the leaves in the colander. Wash the 'uala leaves by dunking them into one wash bin with clean water, then the next, then place them in the large clean bowl. Use clean scissors or clean hands to break the leaves into smaller pieces.

With adult supervision, heat the oil in the pan and saute the crushed/chopped garlic for about 30 seconds, then add the 'uala leaves and stir frequently with the wooden spoon on high heat for about 10 minutes until cooked. Add a sprinkling of salt and turn off the induction heater. Using the tongs, place a small amount of the cooked 'uala leaves onto each leaf plate, making sure there is enough for everyone

to try. After all the jobs are finished and everyone has washed their hands, the snack may be served.

All students must wash their hands thoroughly with soap and water after working in the gardens and before eating their snack.



CLOSING AND SNACK

15 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

Discuss with students:

- Have one student from each group share about their tasks and experience.
- What does ALOHA mean and how did you practice this Hawaiian value today?
- Why is it important to work as a COMMUNITY?
- What are some of the benefits using locally grown foods instead of imported ones?

Have the students from Group 6 (Cooking) hand out the ti leaf plates with cooked 'uala leaf samples, making sure there is enough for everyone to try. Have students share what they are thankful for before eating. Enjoy!

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.

"Please continue to take good care of your kalo, 'uala, 'ulu, and kī plants and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). It is very important that the soil stays moist. Remember, you are the MAHI'AI (farmers) responsible for these plants that will provide us with food and much more!"



The line for seconds!

FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Thoroughly water the 'ulu and kī plants at least once a week until well established, and during dry periods. Install irrigation if necessary. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens and around the base of the 'ulu tree and kī plants.
- Students must wash their hands thoroughly with soap and water after working in the garden.

FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Have students complete the Edible Leaves Student Worksheet.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.



Student Worksheet
THE HAWAIIAN GARDEN
Lesson 5 * 'Uala Leaf Harvest

Edible Leaves

Directions: Fill in your answers to the questions below.

1. Describe your role in the 'ula leaf harvest community work day.
2. Did you like the taste of the cooked 'ula leaves?
3. Mark your regular garden sites or 'uluae marked. In the attached section, list 3 different types of edible plant leaves, write their names below, and the place where they were grown.

Type of Plant With Edible Leaves	Where Was It Grown?
1.	
2.	
3.	

4. Describe at least 2 benefits of using 'uluae-grown produce instead of imported produce.
5. What does 'ĀINA mean?
6. Describe at least one specific example of how you or someone else practiced 'ĀINA today.

Student Worksheet * Grade 4 * The Hawaiian Garden * Lesson 5
Page 2 of 2

Student Worksheet:
Edible Leaves

LESSON EXTENSIONS

Hungry For More!
(4.W.1, 4.W.3)

1. Turn a regular composition notebook into a classroom cookbook by having each student take the book home to add a healthy recipe that they cook with their families using a locally grown fruit or vegetable.
2. As a class, prepare one or more additional recipes using 'uala leaves harvested from the garden. Several are suggested on page 8.
3. Have students cook both of the recipes at home with their families, then draw pictures of themselves and their families cooking the recipes and write brief opinion pieces comparing the two and/or narratives describing the process (see page 2 of the Edible Leaves Student Worksheet).



LESSON EXTENSIONS

CONTINUED

'Uala Leaf Salad

1 medium bunch of fresh 'uala leaves, trimmed
5 cups water
2 medium tomatoes, sliced or quartered
1 medium onion, minced
1 thumb-sized ginger, minced
Juice of 1 lemon
1 Tbs. olive oil
3 Tbs. soy sauce

Instructions

In a small bowl, combine ginger, lemon juice, olive oil and soy sauce. Heat water in a pot, bring to a boil, add 'uala leaves and blanch for 30 seconds. Drain. Transfer to a serving dish. Pour the lemon juice mixture over the blanched 'uala leaves, add tomato slices and onions, and mix well. Serve.

Source: www.motherearthnews.com/real-food/sweet-potato-leaves-recipe-zb0z11zwar.aspx



'Uala Leaf Quinoa Soup

1/2 onion chopped
1 stick celery chopped
1/2 cup uncooked quinoa triple washed
5 cups veggie broth
2 cups 'uala leaves coarsely chopped
Avocado

Instructions

In a medium sized pot sauté the onion and celery until the onion starts to turn golden. Add the veggie broth and quinoa and bring to a boil, reduce heat and simmer for 10 minutes. Add the 'uala leaves and simmer for five more minutes. Garnish with sliced avocado and enjoy.

Source: www.blog.cobrahead.com/2011/11/20/sweet-potato-leaf-quinoa-soup/



'Uala

Use this information to help verify student knowledge and answer student questions during the 'Uala Discussion in the Lesson Introduction. See the 'Uala Mo'olelo Sign for a story about the cultural significance of 'uala.

Q: Is 'uala an important food plant in Hawai'i?

A: Yes, 'uala was a major dietary staple of the early Hawaiians, second in importance to kalo. 'Uala is the Hawaiian word for sweet potato and refers to Hawaiian varieties of the plant.

Q: What other cultural significance does this plant have in Hawai'i?

A: 'Uala is associated with the Hawaiian god Kamapua'a.

Q: How did the sweet potato arrive in Hawai'i?

A: It was brought here by early Polynesian voyagers about 1,500 years ago.

Q: Where did sweet potatoes originate?

A: The sweet potato is native to Central or South America. It is thought that Polynesian voyagers traveled to the Americas and brought the sweet potato back with them.

Q: Do other cultures use sweet potatoes for food?

A: Yes. Sweet potato is the seventh most important food crop in the world.

Q: How many varieties of sweet potato exist?

A: About 400 varieties have existed worldwide. The skin and flesh of different varieties may be white, cream, yellow, orange, pink, or deep purple, and the leaves have many different shapes. In Hawai'i, it is estimated that about 200 varieties of 'uala were developed and cultivated by Hawaiian farmers. Today, only about 24 Hawaiian varieties remain. The loss of diversity is related to the decline of Hawai'i's population and separation of people from the land after Western contact, along with efforts by the University of Hawai'i in the early 1900s to hybridize different varieties, and poor documentation.

Q: What parts of the sweet potato plant can be eaten? How are they eaten?

A: All parts of the sweet potato plant can be eaten. The "root tubers" ('uala) may be cured for four to seven days after being harvested and before being eaten or stored, in order to increase the total sugar content and improve flavor and shelf life. Steaming is the best cooking method for preserving nutrients, and the beta-carotene in orange or yellow colored sweet potatoes will be better absorbed when eaten with a bit of fat (e.g., olive oil, coconut milk, etc.). The 'uala may also be boiled, fried, processed into chips, or baked in an oven or imu (underground earth oven). The stems and tips may be steamed, boiled, sauteed, or fried for use in soups, salads, and as a vegetable dish. Both roots and foliage can be grown as animal feed.

Q: What are the nutritional benefits of eating sweet potatoes?

A: Sweet potatoes are an excellent source of vitamin A (in the form of beta-carotene). They are also a very good source of vitamin C and manganese. In addition, sweet potatoes are a good source of copper, dietary fiber, niacin, vitamin B5, and potassium. Purple sweet potatoes are especially prized for their high levels of antioxidants (which guard against cardiovascular disease and cancer). The antioxidant known as anthocyanin is the pigment responsible for the purple color, which is the same pigment and antioxidant contained in blueberries, red grapes, and red cabbage.



Q: Are sweet potatoes related to regular potatoes?

A: Yes, but not closely related. In fact, potatoes are more closely related to tomatoes, eggplants, and peppers. All three (sweet potatoes, potatoes, and yams) come from different plant families. The moist-fleshed, orange-colored root vegetable that is often thought of and sold as a “yam” in the United States is actually a sweet potato. Botanically, yams (which are monocots) form a stem tuber (a modified stem) that is eaten, while sweet potatoes and potatoes (which are dicots) form root tubers (a modified root).

Q: How are sweet potatoes grown?

A: The sweet potato is a hardy plant that can grow in a variety of climates, and generally needs less water than other crops. Good soil drainage is important for successful growth of the crop. Sweet potato slips called “lau” in Hawaiian (vegetative cuttings from the growing tip of vines, about 12” to 14” long) are typically planted in mounds or ridges by laying them horizontally (with irrigation) or vertically or at a 45 degree angle (without irrigation), about 4” to 9” below the surface. Root sprouts may also be planted. Root growth is encouraged by trimming or turning vines back into the patch (instead of allowing them to sprawl). Roots can be harvested for food in four to six months. Rotating the location of sweet potato plantings is important for discouraging pests; do not plant sweet potatoes in the same location for at least one year (preferably three to four years). The best planting period in Hawai'i is March to May. Lowest yields occur when sweet potatoes are planted from October to December, due to the shorter days and to the higher rainfall during that time of the year.

Q: Are there other uses for 'uala besides food?

A: Yes. Medicinally, 'uala helps to heal a sore throat (cooked and eaten or made into a gargle), or it can be mixed with kī (ti leaves) to induce vomiting. Cooked 'uala can be used as bait for fishing. In Hawai'i, old vines and leaves were placed beneath floor mats as padding, and plant leftovers were used as pig food.

Q: What is the scientific name for sweet potatoes?

A: Ipomea batatas. Sweet potatoes are members of the Convolvulaceae (morning glory) family.





KEY TERMS AND CONCEPTS

Directions: Use this space to record your notes, drawings, and observations.

Aloha - Love, compassion; to show kindness, mercy, and affection; a word of greeting or farewell in recognition of life in another; a way of life, connecting us to each other and all that exists

Aloha Spirit - Harmony of soul, heart, and mind within and among all people and things

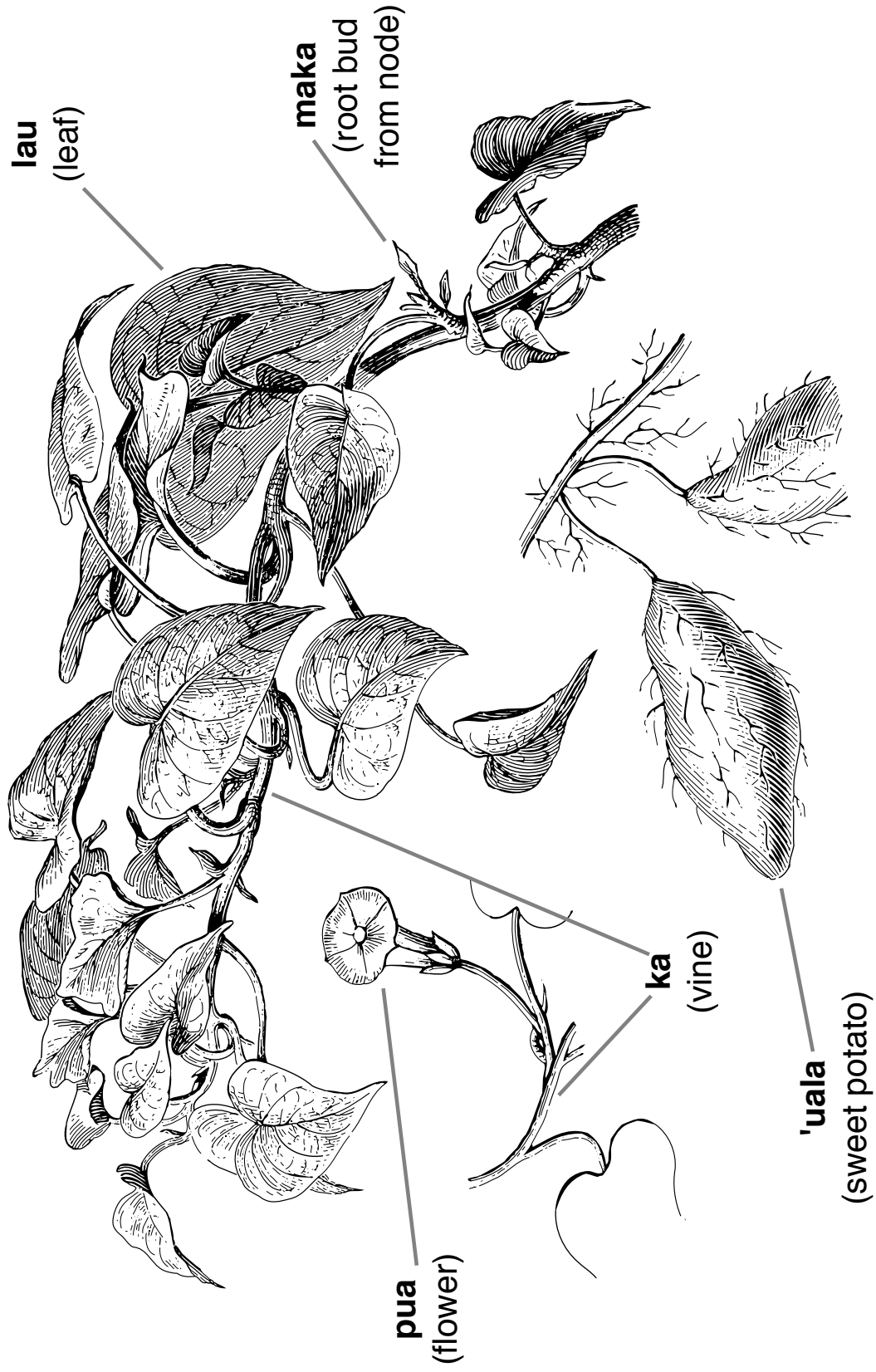
Community - A social group whose members reside in a specific locality, and share government or common characteristics, interests, culture, and/or historical heritage

Mahi'ai - Farmer

Nutrient - A substance that provides nourishment essential for growth and the maintenance of life, such as protein, vitamins, and minerals

'Uala - Hawaiian word for sweet potato; refers to Hawaiian varieties of sweet potato; parts of the plant include the ka ('uala vine), lau (leaf), maka (root bud from node), pua (flower), 'uala (sweet potato root)

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant





Edible Leaves

Directions: Fill in your answers to the questions below.

1. Describe your role in the 'uala leaf harvest community work day: _____

2. Did you like the taste of the cooked 'uala leaves? _____

3. Visit your regular grocery store or farmers' market. In the produce section, find 3 different types of edible plant leaves. Write their names below and the place where they were grown:

	Type of Plant With Edible Leaves	Where Was It Grown?
a)		
b)		
c)		

4. Describe at least 2 benefits of using Hawai'i-grown produce instead of imported produce:

5. What does ALOHA mean? _____

6. Describe at least one specific example of how you or someone else practiced ALOHA today:



Student Worksheet
THE HAWAIIAN GARDEN
Lesson 5 * 'Uala Leaf Harvest

Name

Class Date

EXTENSION: We sauteed our 'uala leaves with garlic, coconut oil, and a little salt. At home with your family, cook both of the recipes below, then in the space to the right of each recipe draw a picture of you and your family cooking the recipes and write a brief opinion piece comparing the two, and/or a narrative describing the process.

'Uala Leaf Salad

1 medium bunch of fresh 'uala leaves, trimmed
5 cups water
2 medium tomatoes, sliced or quartered
1 medium onion, minced
1 thumb-sized ginger, minced
Juice of 1 lemon
1 Tbs. olive oil
3 Tbs. soy sauce

Instructions

In a small bowl, combine ginger, lemon juice, olive oil and soy sauce. Heat water in a pot, bring to a boil, add 'uala leaves and blanch for 30 seconds. Drain. Transfer to a serving dish. Pour the lemon juice mixture over the blanched 'uala leaves, add tomato slices and onions, and mix well. Serve.

Source: www.motherearthnews.com/real-food/sweet-potato-leaves-recipe-zb0z11zwar.aspx

'Uala Leaf Quinoa Soup

1/2 onion chopped
1 stick celery chopped
1/2 cup uncooked quinoa triple washed
5 cups veggie broth
2 cups 'uala leaves coarsely chopped
Avocado

Instructions

In a medium sized pot sauté the onion and celery until the onion starts to turn golden. Add the veggie broth and quinoa and bring to a boil, reduce heat and simmer for 10 minutes. Add the 'uala leaves and simmer for five more minutes. Garnish with sliced avocado and enjoy.

Source: www.blog.cobrahead.com/2011/11/20/sweet-potato-leaf-quinoa-soup/

DESCRIPTION

Students will discuss Hawai'i's unique natural environment, learn about native Hawaiian and Polynesian-introduced plants, and discuss the Hawaiian value, mālama. They will plant one or more native plants on campus and care for their kalo, 'uala, 'ulu, and kī plants. They will sample a healing herbal tea made from the leaves of the endemic māmaki tree.

TIME: 60 minutes

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the distinction between native (endemic and indigenous) and introduced (Polynesian and alien/exotic) plants.
- Recognize the uniqueness, fragility, and intrinsic value of Hawai'i's native plants and discuss the terms endangered, extinct, and invasive.
- Treat their garden, plants, tools, self, and others with respect.
- Practice proper planting of their native Hawaiian plants.

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.W.1, 4.W.2, 4.W.3, 4.W.7, 4.W.8, 4.W.10, 4.SL.1, 4.SL.4

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.6.1, SS.4.6.3, SS.4.7.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document.

LESSON OUTLINE

- I. Introduction (20 minutes)
 1. Protocol
 2. Native Hawaiian Plants Discussion
 3. Group Activities Overview
- II. Group Activities (30 minutes)
 1. Planting (15 minutes)
 2. Garden and Tree Care (15 minutes)
- III. Closing and Snack (10 minutes)
 1. Māmaki Tea



KEY TERMS AND CONCEPTS

Endangered - Species at risk of extinction

Endemic - Species that evolved in Hawai'i and are native only to Hawai'i

Exotic - Species originating outside of Hawai'i and imported by humans (intentionally or accidentally) since 1778 (Western contact established via Captain James Cook)

Extinct - A species that has completely died out

Indigenous - Species that arrived here without human assistance; native to Hawai'i and other parts of the world

Introduced - Species originating outside of Hawai'i and imported by humans (intentionally or accidentally); also referred to as alien species

Invasive - Spreading prolifically and undesirably or harmfully

Mālama - To take care of, preserve, and protect

Native - Species that either originated (evolved) or arrived here without human assistance; endemic or indigenous to Hawai'i

Polynesian-Introduced; Canoe Plants - Non-native species that were brought to Hawai'i by Polynesian settlers (for food, clothing, medicines, dyes, etc.)

Species - A group of living organisms (plants, animals, etc.) consisting of similar individuals capable of interbreeding and producing fertile offspring.

LESSON MATERIALS

Community Supplies:

- Induction heater
- Extension cord
- Vermicast (about 1/4 cup per plant)

Lesson Supplies:

- Vocabulary Cards (set of 9)
- Native and Introduced Plants Sign
- Native Hawaiian Plant Profile Sheets
- Garden Agreements Sign
- Native Hawaiian plants (1 or more per class)
- Paper cups (small sample size, 1 per student)
- Māmaki tea
- Student Workbook

Teaching Team To Provide:

- Sign making materials (e.g., wooden sign and post, pens, paints, brushes; or cement, mold, decorative stones or tiles)
- Large pot or skillet (MUST HAVE MAGNETIC BOTTOM for use with induction heater; the pot has a magnetic bottom if a magnet sticks to the bottom on the outside of the pot)
- Optional: Natural sweetener for tea (local honey or stevia)

School To Provide:

- Garden Journals (if not using Student Workbook)
- Access to an electrical outlet (for induction heater)
- 2 shovels and/or hand trowels
- Mulch (about 1/2 to 1 bucket per plant)
- Buckets and cups for watering, mulch, and snack waste

MĀMAKI TEA RECIPE

1. Pour hot water over the leaves and steep for 10 to 15 minutes. Or make sun tea by filling a large clear glass container with water and the leaves and letting steep in the direct sun for several hours.
2. If desired, add a small amount of natural sweetener just before serving (honey or stevia).
3. Serve and enjoy!

ACCOMPANYING DOCUMENTS

- Teacher Handout: Native Hawaiian Plant Guide
- Background Information: Native Hawaiian Plants
- Guided Notes
- Student Worksheet: My Native Hawaiian Plant
- Student Worksheet: Native and Introduced Plants

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the Native Hawaiian Plants Background Information in preparation for the native Hawaiian plant discussion with students.
- Make copies of the Student Worksheet, one per student if not using the Student Workbook.
- Determine the number and types of native Hawaiian plants that will be planted by each class. Find out what plants are available to you and select plants that are best suited to your area (rainfall, elevation, etc.).
- Gather information to share with students about your selected plants via the Native Plants Profile Sheets, Native Hawaiian Plant Guide Teacher Handout, the “Native Plants Hawai'i Project” website (www.nativeplants.hawaii.edu), the Hui Kū Maoli Ola website (www.hawaiianativeplants.com), and other available resources.
- Work with participating classes and the school's Garden Team to select and receive approval for the planting sites, and to establish a plan for long term care of the plants (watering and mulching). Install irrigation if necessary.
- Coordinate pickup of your native Hawaiian plants.
- Prepare the māmaki tea according to the recipe at left. Make sure there is enough for all participating students and adults to sample.
- Draw out the Native and Introduced Plants Sign on a white board.
- Have students ready to take notes in their Student Workbook or Garden Journals.

INTRODUCTION

15 MINUTES

PROTOCOL

Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

NATIVE HAWAIIAN PLANTS DISCUSSION



Use the Vocabulary Cards and student volunteers to create a life-sized visual aid of the Native and Introduced Plants Sign during the discussion. Use the Native and Introduced Plants Sign to explain the key terms in detail. Have students take notes in their Student Workbook or Garden Journal.



Native and Introduced Plants Sign

Ask for three student volunteers, give the INTRODUCED Plants Card to a student and ask the student to read the definition on the back. “As MAHI’AI (farmers), what types of plants are our kuleana (responsibility to care for) at this school?” Desired answer: Kalo (taro), ‘uala (sweet potato), ‘ulu (breadfruit), and kī (ti plants).

Plant Name	Family	Type of Plant	Native Range
ENDEMIC			
INDIGENOUS			
INTRODUCED			

Teacher Handout: Native Hawaiian Plant Guide



Kalo (taro, *Colocasia esculenta*) is the most important POLYNESIAN-INTRODUCED plant in Hawai'i.

“Each of these plants is a type of POLYNESIAN INTRODUCED plant or CANOE PLANT. Give the POLYNESIAN-INTRODUCED/CANOE PLANT Card to a student and ask the student to read the definition. “In the INTRODUCED species there are EXOTIC plants.” Give the EXOTIC Card to the final student and ask the student to read the definition.

Now we are going to discuss NATIVE plants. “What is the definition of a NATIVE plant?” Desired answer: Plants that arrived here without human assistance (INDIGENOUS), or evolved here (ENDEMIC). Ask for three more student volunteers. Give the NATIVE Card to the student and ask the student to read the definition.



Ōhi'a lehua (*Metrosideros polymorpha*, ENDEMIC) is the most common and variable of all NATIVE Hawaiian trees.

“As MAHI’AI, our kuleana is to also care for NATIVE Hawaiian plants, which are extremely important to the health of our environment and culture. NATIVE plants play an essential role in providing water for these islands as NATIVE forests act like sponges to collect water from mist and rain and recharge our aquifers

INTRODUCTION

CONTINUED

(groundwater). In Hawai'i there is a saying that The rain follows the forest; Hahai no ka ua i ka ulu la'au." "Many or most of the plants we see around us every day are actually not NATIVE to Hawai'i.

These INTRODUCED plants have been brought here by humans either accidentally or on purpose." The two kinds of NATIVE plants we are going to discuss today, ENDEMIC and INDIGENOUS. Give the ENDEMIC Card to a student and have the student read the definition. Do the same with the INDIGENOUS Card.

There are three additional kinds of plants that are important to discuss. Ask for three more student volunteers and give the INVASIVE, ENDANGERED, and EXTINCT Cards to the students. Have each student read the definition on the back.

Ask students: "What do you know or want to know about NATIVE Hawaiian plants?" Use the Native Hawaiian Plants Background Information to help verify student knowledge and answer student questions. Spend about 5 to 7 minutes on this discussion.



Background Information:
Native Hawaiian Plants



GROUP ACTIVITIES OVERVIEW

"Today we will plant NATIVE Hawaiian plants at our school! We will also care for our CANOE PLANTS that we have planted." Discuss with students the names characteristics, needs, and interesting facts about their native plant(s). Discuss proper planting methods and the plan for planting and care. Refer to the Native Hawaiian Plant Profile Sheets, Native

Hawaiian Plant Guide Teacher Handout, and other sources of information as listed in the Advance Preparation section. Divide the class into five equal groups. The first four groups will complete three activities:

1. **Planting and Discussion of Native Hawaiian Plants** (at least one native plant per group)
2. **Native Hawaiian Plants Sign Making**
3. **Canoe Plants Garden Care**

Group 1 - Planting, kalo care, sign making

Group 2 - Planting, 'uala care, sign making

Group 3 - Planting, 'ulu care, sign making

Group 4 - Planting, kī care, sign making

Group 5 - Māmaki tea snack prep. Select two or more volunteers to help with the serving of the māmaki tea during the Closing and Snack.

Hawaiian Values and Garden Agreements

"Our Hawaiian value for today is MĀLAMA, which means to care for, preserve, and protect." Have students repeat the Hawaiian value and share examples of how they will MĀLAMA their gardens, each other, and our planet today.

"Our Garden Agreements will also help to guide us in our practice of MĀLAMA." Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL

Have students bring their Student Workbooks or journals and pencils or pens to the garden.

If the class knows an oli (chant), please have them offer it before entering the garden to work. Have each group gather the garden tools needed for planting, vermicast, water, and the Native Plants Information Sign about their plant. During the Group Activities, help students to practice MĀLAMA.



GROUP ACTIVITIES

30 MINUTES

PLANTING AND SIGN MAKING (15 minutes)

Gather students around the area that they will be planting their native Hawaiian plant(s). Have students who are not actively performing a task sit in a circle around the planting area and read the Native Hawaiian Plant Profile Sheet.

Sign Making: Use the sign making materials (see Lesson Materials: Teaching Team to Provide) to create permanent signs for each of the plants (or one sign per plant type if they are planted together), including the Hawaiian and English name, Indigenous or Endemic, one fun fact, planting date, etc.



Hole Digging: Use shovels and/or hand trowels (depending on the softness of the soil and the size of the plant) to dig a hole for each plant. The hole should be only as deep as the soil inside the pot, and two to three times as wide as the pot that the plant is in. As soil is removed from the hole, keep it together in a pile so that it can easily be replaced.

Planting: Place the potted plant in the hole to measure and make sure the hole is the correct size. If the hole is too deep, add soil until the level of soil inside the pot matches the soil level outside the pot. Gently squeeze the pot to loosen it from the roots and soil. While holding the surface of the soil inside the pot with one hand, turn the plant sideways or upside down until it slowly comes out of the pot. Use two hands to gently place the plant into the hole, making sure that it is



standing upright. Note: It is very important to achieve the correct planting depth and avoid planting the plant too deep or too shallow.

Feeding and Watering: Mix a small handful (about 1/4 cup) of vermicast into the soil around the plant, or dissolve the vermicast in water and slowly water the soil around the plant, allowing the liquid to soak into the soil. Avoid making large puddles or causing runoff. Use any extra soil to make a berm around the plant (about a 1 foot radius around the stem or trunk) in order to prevent water runoff.



Mulching: Place a 4 to 6 inch deep layer of mulch (e.g., wood chips) around the plant (about a 2 foot radius of mulch around the plant), being sure that the mulch does not touch the plant (give the plant about a 2 inch radius of breathing room, so that the ring of mulch forms a “doughnut”).

Discussion: Students gather around the planting area and take turns reading the Native Hawaiian Plant Profile Sheet about their plant. Have students decide who will share the plant names, characteristics, needs, and interesting facts about their native Hawaiian plant during the closing presentations. Have students take notes on the My Native Plant Student Worksheet.

GARDEN AND TREE CARE (15 minutes)

After planting, direct the students to their assigned activities for garden care.

GROUP ACTIVITIES

CONTINUED

Group 1 - Kalo Care: Weed, water, and feed the kalo with vermicast (added directly to the soil or dissolved in water). Cover any bare soil with mulch or leaves to protect it from the sun. Have the students observe the health of their plants and garden soil.



Group 2 - 'Uala Care: Weed, water, and feed the 'uala with vermicast (added directly to the soil around the base of the tree(s) or dissolved in water). Cover any bare soil with mulch or leaves to protect it from the sun. If 'uala vines are "running" (vines extend outside of the garden bed), have students wrap or fold the vines back into the garden bed and cover them with soil if possible to encourage root growth.

Group 3 - 'Ulu Care: Weed, water, and feed the 'ulu tree(s) with vermicast (added directly to the soil around the base of the tree(s) or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips) around the tree(s)



(about a 2 foot radius around the trunk), being sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room).

Group 4 - Kī Care: Weed, water, and feed the kī plants with vermicast (added directly to the soil or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips, about a 2 foot radius around the plants), being sure that the mulch does not touch the plant stems (give them about a 2 inch radius of breathing room).

Group 5 - Māmaki Tea Snack Preparation

The māmaki tea should be warm; ensure that it is not too hot. Add a small amount of natural sweetener (honey or stevia) to the batch māmaki tea if desired. Have students help with portioning by setting out cups (1 cup per student and adult present) and filling them with a small amount of māmaki tea for tasting. Save some tea for seconds.



Māmaki (*Pipturus albidus*) is an ENDEMIC Hawaiian shrub or small tree, preferring partial shade and moist conditions. Māmaki is an important host plant for the Kamehameha butterfly (*Vanessa tameamea*), one of only two ENDEMIC Hawaiian butterflies. Traditionally, the inner bark of māmaki was an important source for kapa cloth.

Its fruits, seeds, and leaves have important medicinal properties. Tea made from fresh or dried māmaki leaves has a gentle soothing and invigorating effect.

All students must wash their hands thoroughly with soap and water after working in the gardens and before enjoying their snack.

CLOSING AND SNACK

10 MINUTES

Gather all the students in the garden. Have each group share the name(s), characteristics, needs, and interesting facts about their native plants. Students may refer to the Native Hawaiian Plant Profile Sheet during the presentation.

Discuss with students:

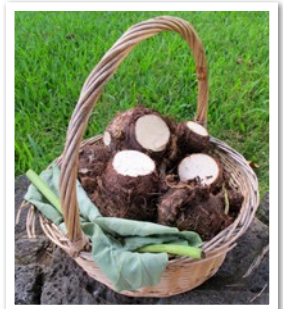
- What is the difference between NATIVE and INTRODUCED plants?
- What is the difference between ENDEMIC and INDIGENOUS plants?
- What does MĀLAMA mean and how did you practice this Hawaiian value today?

“Today we are going to taste tea made from the leaves of the māmaki tree, which is an ENDEMIC (NATIVE) Hawaiian plant. The fruits, seeds, and leaves of this plant are used in Hawaiian culture as medicine, with the leaves being made into an herbal tea that has been used for generations to strengthen overall health and well-being.”

Have the student volunteers hand out the cups of māmaki tea to each student and adult present. Have students share what they are thankful for before tasting the tea. Enjoy!

Have students place snack waste and compostable cups in a bucket and then add it to the school’s compost pile when finished.

“Please continue to take good care of your native Hawaiian plants, and your kalo, ‘uala, ‘ulu, and kī plants and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). It is very important that the soil stays moist. Remember, you are the MAHI’AI (farmers) responsible for these plants that will provide us with food and much more! In our next two lessons we will harvest, prepare, and eat our ‘uala and kalo!”



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors visit the gardens every day in order to water the soil, make observations, and record them in their journals, or a Class Journal. Thoroughly water the ‘ulu tree, kī, and native Hawaiian plants at least once a week until well established, and during dry periods. Install irrigation if necessary. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens and around the base of the ‘ulu tree, kī, and native Hawaiian plants.
- Students must wash their hands thoroughly with soap and water after working in the garden.

FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Have students complete the Native and Introduced Plants Student Worksheet.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.



Student Worksheet
THE HAWAIIAN GARDEN
Lesson 6 * Native Hawaiian Plants

Native and Introduced Plants

Directions: Part 1-5 in your answers to the questions below.

1. What is the difference between native and introduced plants?
2. Why is it important to protect and plant native Hawaiian plants?
3. What does MĀLAMA mean?
4. Describe at least one specific example of how you or someone else practiced MĀLAMA today.
5. What was your favorite part about the Native Hawaiian Plants lesson?

Garden-Based Learning * Grade 4 * The Hawaiian Garden * Lesson 6

Student Worksheet:
Native and Introduced Plants

LESSON EXTENSIONS

Field Trip

(4.W.3, 4.SL.1, SS.4.7.3)

1. The best way to learn about Hawai'i's natural environment is to experience it in person! Take students on a field trip to hike in the forest, visit a coastal ecosystem, native Hawaiian plant nursery, or arboretum.
2. Have students bring journals and spend time observing, writing, drawing, and reflecting.
3. Have students observe signs of human impact (positive and negative) on the natural environment and discuss the implications.
4. Create a scavenger hunt for students, including activities such as:
 - Finding and identifying plants they have studied in class or planted at school.
 - Locating 3 native and 3 introduced plants.



Protecting Hawai'i From Invasive Species

(4.SL.1, SS.4.7.3)

1. The documents referenced below are available from the 'Ōhi'a Project: www.mgf-hawaii.org/HTML/Resources/silent.htm.
2. Read the "No-no's" story with students, which describes how voyaging canoes returning to Hawai'i prevented the arrival of an unwanted alien species.
3. Play "The Invasion Game" with students, which raises awareness of certain unwanted alien species and encourages problem solving of ways to prevent their arrival.
4. More lesson plans are available from the 'Ōhi'a Project here: www.dlnr.hawaii.gov/education/forestry-wildlife/teachers-resources/.

The Human Impact On Hawai'i's Diverse Ecosystems

(4.SL.1, SS.4.7.3)

1. Discuss with students the amazing diversity of Hawai'i's ecosystems. Approximately 150 distinct types of ecosystems exist in Hawai'i! Today, many of these ecosystems are in trouble. Examples of Hawai'i's amazing ecosystems include:

- Lowland dry forests: Over 90% of them have already been lost, as these are the areas that humans mainly inhabit.
- Rainforests: These are our watersheds where native species are uniquely suited to recharge our island fresh water aquifers.
- Alpine deserts: On Mauna Kea's 14,000-foot summit, over 12 endemic arthropod species are found!
- Coral reefs: Hawai'i, including the Northwestern Hawaiian Islands, is home to over 7,000 reef species (algae, plants, sea turtles, marine mammals) found nowhere else on Earth.



2. Discuss with students the negative and positive impacts that humans have had and continue to have on Hawai'i's native ecosystems:
 - Negative impacts: Land development (including buildings, roads, farming, ranching), fire, introduction of non-native and invasive plants, animals, insects, and diseases.
 - Positive impacts: Protection of native ecosystems through legislation (e.g., National Parks and Natural Area Reserves), reforestation, endangered species protections, public awareness, youth programs, etc.

LESSON EXTENSIONS

CONTINUED

Campaign For Hawai'i's Environment!

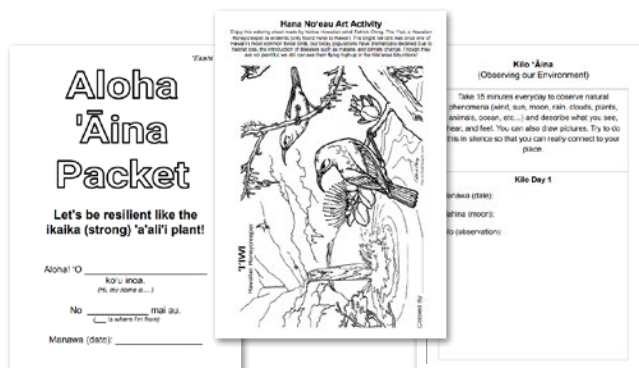
(4.W.1, 4.W.2, 4.W.3, 4.SL.4)

1. Based on the Lesson Extensions listed above, have students create posters about Hawai'i's environment and native species, including stories, poems, songs, drawings, collages, comic strips, plays, etc.
2. Post their creations around campus. Have students present their vision to the school community.
3. As a class, create a "road map" of steps that it would take to protect and restore Hawai'i's environment. Then, start taking them! Help your entire school to do the same. Create a pledge that families can make for this purpose.
4. Have students write to their elected representatives, natural resources department, local newspapers, and other media outlets about their visions and actions to mālama Hawai'i!

Aloha 'Āina Packets

(4.W.2, 4.W.7, 4.SL.4)

1. Mālama Learning Center's Aloha 'Āina Packets contain fun Hawaiian-culture based activities for students and families to experience Hawai'i's natural environment.
2. To download the Aloha 'Āina Packets, visit: www.malamalearningcenter.org/aloha-699256ina-packets.html
3. Have students complete the packet activities and share their progress with info@malamalearningcenter.org



My Native Plant

(4.W.2, 4.W.7, 4.SL.4)









1. Have students choose one type of native Hawaiian plant about which to research and report. Suggested websites for research include: Hui Ku Maoli Ola (www.hawaiinativeplants.com), and the "Native Plants Hawai'i Project" (www.nativeplants.hawaii.edu). Reports may include:
 - Hawaiian Name
 - Common Name
 - Scientific Name (Genus and species names)
 - Indigenous or Endemic?
 - Endangered?
 - Additional Habitat Information
 - Water Requirements
 - Light Conditions
 - Early Hawaiian Use
 - Modern Use
 - Drawing of the plant using the pictures from the websites, or from life
2. Have students share their reports with the class.



'Ākala (*Rubus hawaiiensis*) is one of two species of native Hawaiian raspberries, which are among the largest fruiting species in the world, with berries up to 2 inches long.

Native Hawaiian Plant Guide

Below are listed a number of plants that are recommended for planting at schools, though many others may also be appropriate and available. All plants should be watered well for several weeks after planting in order to help them become established, after which time the water requirements noted below will apply. Further information, including early Hawaiian and modern day uses, as well as photos are available at www.nativeplants.hawaii.edu and www.hawaiinativeplants.com.

	Hawaiian /English Names	Scientific Name	Type of Plant	Light Conditions	Water Requirements & Other Notes	Image
ENDEMIC	Koki'o 'ula/ Red Hibiscus	<i>Hibiscus kokio</i>	Large shrub	Full or partial sun	Minimal watering once established; well drained soil; protected from wind	
	Koki'o ke'oke'o/ White Hibiscus	<i>Hibiscus arnottianus</i>	Medium to large shrub	Full or partial sun	Regular to minimal watering once established	
	Māmaki	<i>Pipturus albidus</i>	Shrub or small tree	Full or partial sun	Moist to wet conditions at the roots	
	Ma'o/ Hawaiian Cotton	<i>Gossypium tomentosum</i>	Medium shrub	Full sun	Minimal watering once established	
INDIGENOUS	'Ilie'e	<i>Plumbago zeylanica</i>	Ground-cover shrub	Full or partial sun	Minimal watering once established; well drained soil; water plants when soil is dry	
	Kupukupu/ Swordfern	<i>Nephrolepis cordifolia</i>	Fern	Full or partial sun or shade	Wet, moist, or dry; best appearance under moist conditions	
	Pōhinahina	<i>Vitex rotundifolia</i>	Medium shrub	Full sun	Minimal watering once established; well drained soil; salt, wind, drought tolerant	
	'Ūlei/ Hawaiian Rose	<i>Osteomeles anthyllidifolia</i>	Medium shrub	Full sun	Minimal watering once established	

Native Hawaiian Plants

Use this information to help verify student knowledge and answer student questions during the Native Hawaiian Plants Discussion in the Lesson Introduction.

KEY TERMS AND CONCEPTS

Endangered - Species at risk of extinction

Endemic - Species that evolved in Hawai'i and are native only to Hawai'i

Exotic - Species originating outside of Hawai'i and imported by humans (intentionally or accidentally) since 1778 (Western contact established via Captain James Cook)

Extinct - A species that has completely died out

Indigenous - Species that arrived here without human assistance; native to Hawai'i and other parts of the world

Introduced - Species originating outside of Hawai'i and imported by humans (intentionally or accidentally); also referred to as alien species

Invasive - Spreading prolifically and undesirably or harmfully

Mālama - To take care of, preserve, and protect

Native - Species that either originated (evolved) or arrived here without human assistance; endemic or indigenous to Hawai'i

Polynesian-Introduced; Canoe Plants - Non-native species that were brought to Hawai'i by Polynesian settlers (for food, clothing, medicines, dyes, etc.)

Species - A group of living organisms (plants, animals, etc.) consisting of similar individuals capable of interbreeding and producing fertile offspring.



Koa (*Acacia koa*) is a native Hawaiian plant species.

Q: What is the difference between NATIVE and INTRODUCED plants in Hawai'i?

A: All NATIVE plant species arrived here without human assistance via wind, wings (birds), or waves (the "three W's"). Or in Hawaiian, the "three M's: makani (wind), manu (wings), or moana (ocean/waves). INTRODUCED species were brought here purposefully or accidentally by humans from other parts of the world.

Q: There are two kinds of native plants in Hawai'i: ENDEMIC and INDIGENOUS. What is the difference between the two?

A: Both kinds are native to Hawai'i. ENDEMIC species evolved here and are native only to Hawai'i, such as the 'ōhi'a tree. INDIGENOUS species are native to Hawai'i and other parts of the world, such as the beach naupaka plant (naupaka kahakai) which is native to Hawai'i and throughout tropical and subtropical Pacific and Indian Ocean coasts. INDIGENOUS species originated elsewhere and arrived in Hawai'i without human assistance.



'Ōhi'a lehua (*Metrosideros polymorpha*, left) is native only to Hawai'i (ENDEMIC), having evolved here into a new species from an ancient ancestor that arrived in the islands without human assistance, while naupaka kahakai or beach naupaka (*Scaevola sericea*, right) is native to Hawai'i and other parts of the world (INDIGENOUS).

Q: Does Hawai'i have many ENDEMIC species?

A: Yes! About 90% of our native plant and animal species are ENDEMIC (they evolved here and are found nowhere else in the world)! This is the highest rate of ENDEMICISM in the world, making Hawai'i's native species the most unique assemblage of life on Earth.

Q: Why is Hawai'i so unique and diverse?

A: The Hawaiian islands are the most isolated land mass in the world and existed in isolation for almost 70 million years, during which time certain plant and animal species arrived by wind, wings (birds), or waves (ocean currents) and evolved over time into many new species that only exist here.



Hawai'i is the most isolated land mass on Earth.

Q: INTRODUCED plants, or those brought by humans to Hawai'i, are separated into two categories. What are these categories?

A: POLYNESIAN-INTRODUCED, also known as CANOE PLANTS, which were brought to Hawai'i by the Polynesians settlers for food, clothing, medicines, dyes, etc. The other category is EXOTIC plants, those which were brought by humans after 1778. Some EXOTIC plants (and other species) have or are becoming INVASIVE, causing minor, moderate, and major damage to local agriculture and native ecosystems.

Q: What is the significance of the year 1778 for Hawai'i?

A: That is the year that Western contact was established with Hawai'i when Captain James Cook sailed into Kealahou Bay on Hawai'i Island.

Q: What about other species besides plants?

A: Only 2 native mammals exist in Hawai'i, which are the Hawaiian hoary bat (*ōpe'ape'a*, *Lasiurus cinereus semotus*, endangered species, extinct on O'ahu) and the Hawaiian monk seal (*'ilio-holo-i-ka-uaua* or "dog that runs in rough water," *Monachus schauinslandi*; critically endangered species). There were no reptiles, amphibians, ants, mosquitoes, honeybees, earthworms, parrots, pine trees, or coconut trees in Hawai'i before humans brought them here.



The Hawaiian monk seal is one of only two mammals native to Hawai'i.

Q: What is the status of our native species?

A: Sadly, Hawai'i is considered "The Extinction Capital of The World" with over 75% of the United States extinctions having occurred here. EXTINCT species are those that have completely died out and no longer exist on Earth. ENDANGERED species are at risk of EXTINCTION under official designation by the United States federal government. Hawai'i is also known as "The Endangered Species Capital Of The World" with over 25% of the United States endangered species located in Hawai'i, which has only 0.2% of the land area in the country!



The Hawai'i mamo (*Drepanis pacifica*), an endemic bird, was extinct by 1898 due to habitat loss and overcollecting.

Q: Why are Hawai'i's native species so threatened?

A: Having evolved without predators, most plants and animals lost their defenses (such as thorns or strong scents in the case of plants, or the ability to fly in the case of many endemic Hawaiian birds) or became very specialized to particular habitats. Man's arrival brought hardier introduced species that displaced native ones, along with the destruction of habitat via land development (buildings, roads, farming, ranching). These threats continue to this day.

Q: Why is it important to plant and care for native Hawaiian plants?

A: Native Hawaiian plants played a vital role in all aspects of life related to ancestral/ancient Hawaiian culture. By learning about native Hawaiian plants, Hawai'i's native culture is preserved and strengthened. By growing native Hawaiian plants, we help to raise awareness and interest and prevent the extinction of native plants and the animals that depend on them for survival.



The endemic i'iwi bird (*Vestiaria coccinea*) with an endemic lobelia plant (*Lobelia sp.*).



KEY TERMS AND CONCEPTS

Endangered - Species at risk of extinction

Endemic - Species that evolved in Hawai'i and are native only to Hawai'i

Exotic - Species originating outside of Hawai'i and imported by humans since 1778

Extinct - A species that has completely died out

Indigenous - Species that arrived here without human assistance; native to Hawai'i and other parts of the world

Invasive - Spreading prolifically and undesirably

Mālama - To take care of, preserve, and protect

Native - Species that either originated (evolved) or arrived here without human assistance; endemic or indigenous to Hawai'i

Polynesian-Introduced; Canoe Plants - Non-native species that were brought to Hawai'i by Polynesian settlers (for food, clothing, medicine, dyes, etc.)

Species - A group of living organisms (plants, animals, etc.) consisting of similar individuals capable of interbreeding and producing fertile offspring.

Directions: Use this space to record your notes, drawings, and observations.



My Native Hawaiian Plant

Directions: Complete the questions below during your group discussion using the Native Hawaiian Plant Profile Sheet. Write your name next to the information you will present on.

1. **Hawaiian Name:**

2. **Scientific Name (Genus and species names):**

3. **Circle: Indigenous or Endemic**

4. **Is your plant endangered?:**

5. **Additional Habitat Information (summarize):**

6. **Water Requirements & Light Conditions:**

7. **Early Hawaiian Use(s) (summarize up to 3):**

8. **Modern Use(s) (summarize up to 3):**

9. **Draw a picture of the native Hawaiian Plant you planted!**

Name
Class Date

Part 1 Directions: Label the Native and Introduced Plants diagram using the words in the word list.

- Word List**
- Endangered
 - Endemic
 - Exotic
 - Extinct
 - Indigenous
 - Introduced
 - Invasive
 - Native
 - Polynesian

Arrived in Hawai'i without human assistance or originated (evolved) in Hawai'i



Evolved here and is native only to Hawai'i



'Ōhi'a lehua
Metrosideros polymorpha

Native to Hawai'i and other parts of the world



Naupaka kahakai, Beach naupaka
Scaevola sericea

Originated outside of Hawai'i and imported by humans (intentionally or accidentally); also referred to as alien species



Brought to Hawai'i by Polynesian settlers (also known as "Canoe Plants")



Kalo, Taro
Colocasia esculenta

Brought to Hawai'i since 1778 (Western contact established via Captain James Cook)



Red ginger
Alpinia purpurata

At risk of extinction



Ka'ala Loulu
Prichardia kaalae

Completely died out



Cross-bearing Pelelea
Melicope cruciata

Spreading prolifically and undesirably or harmfully



Miconia
Miconia calvescens



Native and Introduced Plants

Part 2 Directions: Fill in your answers to the questions below.

1. What is the difference between native and introduced plants? _____

2. What is the difference between endemic and indigenous native plants? _____

3. Why is it important to protect and plant native Hawaiian plants? _____

4. What does MĀLAMA mean? _____

5. Describe at least one specific example of how you or someone else practiced MĀLAMA today: _____

6. What was your favorite part about the Native Hawaiian Plants lesson? _____

DESCRIPTION

Students will review the importance of 'uala and discuss the Hawaiian value, ho'omaika'i. They will work as a community to care for their gardens and harvest, cook, and eat 'uala roots. This lesson should take place about 6 months after Lesson 2 ('uala planting).

TIME: 60 minutes

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the role and significance of 'uala in Hawaiian culture and around the world, and describe the nutritional benefits of eating 'uala.
- Work as a community and treat their gardens, plants, tools, self, and others with respect.
- Harvest and prepare 'uala roots for eating, and lau (slips) for planting.

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.W.1, 4.W.2, 4.W.3, 4.W.8, 4.W.10, 4.SL.1, 4.SL.4

HCPS III: HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.6.1, SS.4.6.3

NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document.

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Protocol
 2. 'Uala Review
 3. Group Activities Overview
- II. Group Activities (30 minutes)
 1. Kalo Care
 2. Kī Care
 3. 'Ulu Care
 4. 'Uala Harvest and Care
 5. Ti Leaf Plates and Kō'elepālau Preparation
- III. Closing and Snack (15 minutes)
 1. Kō'elepālau



KEY TERMS AND CONCEPTS

Ho'omaika'i - Grateful, to thank, to improve/ correct/perfect

Kō'elepālau - Sweet potato pudding; cooked, mashed sweet potato mixed with coconut milk

Lau - Leaf; vegetative cutting or slip of the 'uala plant, used to propagate 'uala

Mahi'ai - Farmer

Node - The part of a plant stem from which one or more leaves emerge, often forming a slight swelling or knob on the stem

'Uala - Hawaiian word for sweet potato; refers to Hawaiian varieties of sweet potato; parts of the plant include the ka ('uala vine), lau (leaf), maka (root bud from node), pua (flower), 'uala (sweet potato root)

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

LESSON MATERIALS

Community Supplies:

- 2 garden clippers (for harvesting and preparing 'uala slips)
- 2 clean scissors (for preparing plates)
- Large bowl
- Cooking spoon
- Sponge and soap (for washing hands and cooking utensils)
- 2 plastic dish tubs (for washing hands)
- Vermicast (about 1 cup per class)
- Optional: Clam shells (5 to 10 for harvesting 'uala)

Lesson Supplies:

- 'Uala Plant Parts Sign
- Garden Agreements Sign
- Wooden pestle
- Student Workbook

Teaching Team To Provide:

- Peeled and cooked 'uala (3 medium to large locally grown sweet potatoes per class)
- Coconut milk (about 1/2 can per class)
- 5 to 6 large ti leaves per class

School To Provide:

- Garden Journals if not using Student Workbooks
- 5-gallon bucket (for harvesting 'uala)
- Bucket and cups for watering and snack waste

KŌ'ELEPĀLAU RECIPE

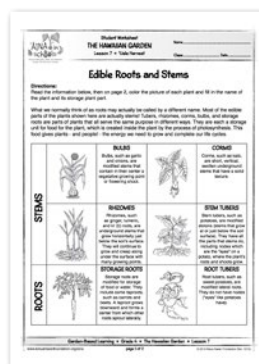
1. Wash the 'uala and remove 'uala skins with a vegetable peeler. Cut into large chunks and steam until soft (can be pierced easily with a knife).
2. Place the peeled and cooked 'uala roots in a bowl and mash them with a wooden pestle.
3. When mashed, add the coconut milk in small amounts, mixing it in with the pestle or cooking spoon, until the mixture achieves a smooth consistency.
4. Serve on ti leaf plates and enjoy!

ACCOMPANYING DOCUMENTS

- Background Information: 'Uala
- Guided Notes
- Student Worksheet: Edible Roots and Stems

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the Background Information in preparation for the 'Uala Review with students.
- Make copies of the Student Worksheet, one per student if not using Student Workbooks.
- Harvest or purchase and prepare the necessary snack ingredients (see Lesson Materials: Teaching Team To Provide) and review the Kō'elepālau Recipe.
- Set up the hand washing station: Two plastic dish tubs with water and soap, next to a hose for rinsing hands after scrubbing.
- Harvest and clean the ti leaves for the ti leaf plates.
- Have students practice E Hō Mai.
- Have students ready to take notes in their Student Workbooks or Garden Journals



Student Worksheet:
Edible Roots and Stems



Background Information: 'Uala

INTRODUCTION

CONTINUED

GROUP ACTIVITIES OVERVIEW

"It is especially important when we harvest and prepare food that we work together as a community. In a healthy community, each person does their job and the whole community benefits. In traditional times, Hawaiian people had to do this well in order to survive using the resources available to them. So do we."

"Each of you will be assigned a job. Let's each do our best while we work toward a common goal. If you finish, see where help is needed. When all groups have finished and cleaned up we will enjoy our snack together!"

Assign students in equal numbers to the following four groups (see descriptions under Group Activities): Students will first care for their plants (15 minutes), then groups 1 and 2 will combine to harvest 'uala and groups 3 and 4 will combine to prepare ti leaf plates and kō'elepālau for the snack.

1. Kalo Care/Harvest 'Uala
2. Kī Care/Harvest 'Uala
3. 'Ulu Care/Ti Leaf Plates and Kō'elepālau Prep
4. 'Uala Care/Ti Leaf Plates and Kō'elepālau Prep

Hawaiian Values and Garden Agreements

"Our Hawaiian value for today is HO'OMAIKA'I. HO'O means to make, and MAIKA'I means good; HO'OMAIKA'I means to improve, correct, or perfect. When we grow gardens we improve the world in so many ways!" Invite students to share examples of this. "HO'OMAIKA'I also means grateful. What are you grateful for today?" Have students repeat the Hawaiian value and share examples of how they will practice HO'OMAIKA'I in the gardens today.

"Our Garden Agreements will also help to guide our practice of HO'OMAIKA'I."

Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Have the student groups move to the garden to begin their work.

GROUP ACTIVITIES

30 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students to practice HO'OMAIKA'I.

Each group will spend the entire time on their assigned job. If students finish their jobs they should assist others and/or record observations in their journals. All jobs must be done and cleaned up and all students must wash their hands thoroughly with soap and water before enjoying the snack together.

KALO CARE

Group 1: Weed, water, and feed the kalo with vermicast (added directly to the soil or dissolved in water). Cover any bare soil with mulch or leaves to protect it from the sun. Have the students observe the health of their plants and garden soil.



GROUP ACTIVITIES

CONTINUED

KĪ CARE

Group 2: Weed, water, and feed the kī plants with vermicast (added directly to the soil or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips, about a 2 foot radius around the plants), being sure that the mulch does not touch the plant stems (give them about a 2 inch radius of breathing room).



'ULU CARE

Group 3: Weed, water, and feed the 'ulu tree(s) with vermicast (added directly to the soil around the base of the tree(s) or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips) around the tree(s) (about a 2 foot radius around the trunk), being sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room).

'UALA CARE

Group 4: Use the garden clippers and/or scissors to harvest lau (slips; 12 to 14 inch vegetative cuttings from the growing tips of the 'uala vines). Students may take these home for planting, or they may be planted in another location on campus.



'UALA HARVEST

Groups 1 and 2:

Harvest the 'uala roots by carefully following the vines to their places of origin in the soil, then digging down gently with clam shells and hands to find the roots underground. If several classes are sharing an 'uala bed, be sure to leave enough for subsequent classes to harvest. Do not wash the 'uala roots. Although they may be cooked and eaten right away, they may also be cured (left to sit in the dark at room

temperature) for 5 to 10 days to allow their sugars to develop before being cooked. 'Uala plants may be left to grow if they will continue to be tended and harvested. Otherwise, remove the plants from the soil and place the vines over the soil (along with any additional mulch materials) in order to protect the soil from the sun.

TI LEAF PLATES AND KŌ'ELEPĀLAU PREPARATION

Groups 3 and 4: Prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (each approximately a 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean.

Place the peeled and cooked 'uala roots in a bowl and have students take turns mashing them with the wooden pestle. When mashed, add the coconut milk in small amounts, mixing it in with the pestle or cooking spoon, until the mixture achieves a smooth consistency. Have students use the cooking spoon to place a small amount of the koele palau onto each leaf plate, making sure there is enough for everyone to try. After all the jobs are finished and everyone has washed their hands, the snack may be served.



All students must wash their hands thoroughly with soap and water after working in the gardens and before eating their snack.

CLOSING AND SNACK

15 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

Discuss with students:

- How did you work as a community today?
- Have one student from each group share about their tasks and experience.
- What does HO'OMAIKA'I mean and how did you practice this Hawaiian value today?

Have the students from Groups 3 and 4 (Kō'elepālau Preparation) hand out the ti leaf plates with kō'elepālau samples, making sure there is enough for everyone to try. Have students share what they are thankful for before eating. Enjoy!

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.

"Please continue to take good care of your kalo, 'uala, 'ulu, kī, and native Hawaiian plants and make sure to visit them every day to water the soil, make observations, and record them in your journals (or the Class Journal). It is very important that the soil stays moist. Remember, you are the MAHI'AI (farmers) responsible for these plants that will provide us with food and much more!"

Invite students to take home the lau ('uala slips, prepared by Group 4 during the 'Uala Harvest and Care activity), to be planted and well cared for. Slips may be planted immediately or placed with one end in water, allowing roots to sprout. Note: It is best to rotate the planting location of 'uala to keep plants healthy by preventing build up of pests and diseases.



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

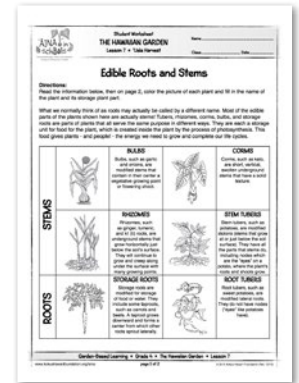
- Continue to have Garden Monitors visit the gardens every day to water the soil, make observations, and record them in their journals, or a Class Journal. Thoroughly water the ‘ulu, kī, and native Hawaiian plants at least once a week until well established, and during dry periods. Install irrigation if necessary. Have the Garden Monitors share their observations with the class. Rotate the Garden Monitors each day or week.
- Remove weeds from in and around the gardens and around the base of the ‘ulu, kī, and native Hawaiian plants.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Have students complete the Edible Roots and Stems Student Worksheet.
- Have students prepare and eat the ‘uala that the class harvested from their garden, after the unwashed ‘uala roots have cured (sat in the dark at room temperature) for 5 to 10 days after harvesting.
 1. Scrub and rinse the ‘uala roots with scrub brushes and water.
 2. Remove ‘uala skins with a vegetable peeler.
 3. Cut the ‘uala in large chunks and steam them until soft (can be pierced easily with a knife).
 4. Cut into smaller pieces, add salt (optional), and enjoy!
 5. Optional: Follow the directions in this lesson plan for making koele palau, or have the students find a different ‘uala recipe to try.



Student Worksheet:
Edible Roots and Stems

LESSON EXTENSIONS

A Plant Of Many Uses

(4.W.2)

1. Hawaiians discovered many different uses for the 'uala plant. Discuss these with students and have them create labeled drawings explaining one or more uses of this important plant.
2. Hawaiian uses for 'uala include:
 - Roots cooked and eaten.
 - Roots cooked and mashed with coconut milk to make poi (koele palau).
 - Young leaves cooked as greens.
 - Made into a gargle for a sore throat.
 - Cooked roots used as bait for fishing.
 - Old vines and leaves placed beneath floor mats as padding.
 - Plant leftovers used as pig food.

Oli Mahalo

Have students learn and share the Oli Mahalo, which is a well-known Hawaiian oli (chant), used for expressing thanks (e.g., sing before harvesting and/or eating).

'Uhola 'ia ka makaloa lā
Pū 'ai i ke aloha lā
Kū ka'i 'ia ka hā loa lā
Pāwehi mai nā lehua
Mai ka ho'oku'i a ka hālāwai lā
Mahalo e Nā Akua
Mahalo e nā kūpuna lā, 'eā
Mahalo me ke aloha lā
Mahalo me ke aloha lā

Translation:

The makaloa mat has been unfurled
In love, (food is/was shared) we share
The great breath has been exchanged
Honored and adorned is the Lehua
From zenith to horizon
Gratitude and thanks to our Akua
Gratitude and thanks to our beloved ancestors
Gratitude, admiration, thanks, and love
To all who are present, both seen and unseen

Sustaining Our Resources: 'Uala

(4.SL.1, 4.SL.4)

1. Discuss with students the important role of gardeners and farmers in perpetuating diverse varieties of edible, medicinal, and other useful plants.
2. Have students take home one or more lau ('uala slips) to plant and care for, and to serve as a source of planting material for next year's students. Note: Students should only take lau home if they are committed to caring for them.
3. Have students report back to the class on their home-grown 'uala experience.

Farm Field Trip

(4.W.1, 4.W.3, 4.W.8, 4.SL.1)

1. Take students on a field trip to a farm that grows sweet potatoes and other canoe plants.
2. Have students talk with the farmer(s) about their work.
3. Have students write a reflective journal entry about their experience, including narratives and opinions.



'Uala

Use this information to help verify student knowledge and answer student questions during the 'Uala Discussion in the Lesson Introduction. See the 'Uala Mo'olelo Sign for a story about the cultural significance of 'uala.

Q: Is 'uala an important food plant in Hawai'i?

A: Yes, 'uala was a major dietary staple of the early Hawaiians, second in importance to kalo. 'Uala is the Hawaiian word for sweet potato and refers to Hawaiian varieties of the plant.

Q: What other cultural significance does this plant have in Hawai'i?

A: 'Uala is associated with the Hawaiian god Kamapua'a.

Q: How did the sweet potato arrive in Hawai'i?

A: It was brought here by early Polynesian voyagers about 1,500 years ago.

Q: Where did sweet potatoes originate?

A: The sweet potato is native to Central or South America. It is thought that Polynesian voyagers traveled to the Americas and brought the sweet potato back with them.

Q: Do other cultures use sweet potatoes for food?

A: Yes. Sweet potato is the seventh most important food crop in the world.

Q: How many varieties of sweet potato exist?

A: About 400 varieties have existed worldwide. The skin and flesh of different varieties may be white, cream, yellow, orange, pink, or deep purple, and the leaves have many different shapes. In Hawai'i, it is estimated that about 200 varieties of 'uala were developed and cultivated by Hawaiian farmers. Today, only about 24 Hawaiian varieties remain. The loss of diversity is related to the decline of Hawai'i's population and separation of people from the land after Western contact, along with efforts by the University of Hawai'i in the early 1900s to hybridize different varieties, and poor documentation.

Q: What parts of the sweet potato plant can be eaten? How are they eaten?

A: All parts of the sweet potato plant can be eaten. The "root tubers" ('uala) may be cured for four to seven days after being harvested and before being eaten or stored, in order to increase the total sugar content and improve flavor and shelf life. Steaming is the best cooking method for preserving nutrients, and the beta-carotene in orange or yellow colored sweet potatoes will be better absorbed when eaten with a bit of fat (e.g., olive oil, coconut milk, etc.). The 'uala may also be boiled, fried, processed into chips, or baked in an oven or imu (underground earth oven). The stems and tips may be steamed, boiled, sauteed, or fried for use in soups, salads, and as a vegetable dish. Both roots and foliage can be grown as animal feed.

Q: What are the nutritional benefits of eating sweet potatoes?

A: Sweet potatoes are an excellent source of vitamin A (in the form of beta-carotene). They are also a very good source of vitamin C and manganese. In addition, sweet potatoes are a good source of copper, dietary fiber, niacin, vitamin B5, and potassium. Purple sweet potatoes are especially prized for their high levels of antioxidants (which guard against cardiovascular disease and cancer). The antioxidant known as anthocyanin is the pigment responsible for the purple color, which is the same pigment and antioxidant contained in blueberries, red grapes, and red cabbage.



Q: Are sweet potatoes related to regular potatoes?

A: Yes, but not closely related. In fact, potatoes are more closely related to tomatoes, eggplants, and peppers. All three (sweet potatoes, potatoes, and yams) come from different plant families. The moist-fleshed, orange-colored root vegetable that is often thought of and sold as a “yam” in the United States is actually a sweet potato. Botanically, yams (which are monocots) form a stem tuber (a modified stem) that is eaten, while sweet potatoes and potatoes (which are dicots) form root tubers (a modified root).

Q: How are sweet potatoes grown?

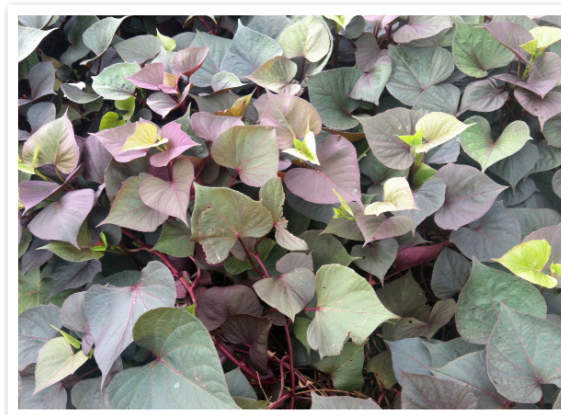
A: The sweet potato is a hardy plant that can grow in a variety of climates, and generally needs less water than other crops. Good soil drainage is important for successful growth of the crop. Sweet potato slips called “lau” in Hawaiian (vegetative cuttings from the growing tip of vines, about 12” to 14” long) are typically planted in mounds or ridges by laying them horizontally (with irrigation) or vertically or at a 45 degree angle (without irrigation), about 4” to 9” below the surface. Root sprouts may also be planted. Root growth is encouraged by trimming or turning vines back into the patch (instead of allowing them to sprawl). Roots can be harvested for food in four to six months. Rotating the location of sweet potato plantings is important for discouraging pests; do not plant sweet potatoes in the same location for at least one year (preferably three to four years). The best planting period in Hawai'i is March to May. Lowest yields occur when sweet potatoes are planted from October to December, due to the shorter days and to the higher rainfall during that time of the year.

Q: Are there other uses for 'uala besides food?

A: Yes. Medicinally, 'uala helps to heal a sore throat (cooked and eaten or made into a gargle), or it can be mixed with kī (ti leaves) to induce vomiting. Cooked 'uala can be used as bait for fishing. In Hawai'i, old vines and leaves were placed beneath floor mats as padding, and plant leftovers were used as pig food.

Q: What is the scientific name for sweet potatoes?

A: Ipomea batatas. Sweet potatoes are members of the Convolvulaceae (morning glory) family.



**KEY TERMS AND CONCEPTS**

Ho'omaika'i - Grateful, to thank, to improve/correct/perfect

Kō'elepālau - Sweet potato pudding; cooked, mashed sweet potato mixed with coconut milk

Lau - Leaf; vegetative cutting or slip of the 'uala plant; used to propagate 'uala

Mahi'ai - Farmer

Node - The part of a plant stem from which one or more leaves emerge

'Uala - Hawaiian word for sweet potato; refers to Hawaiian varieties of sweet potato

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

Directions: Use this space to record your notes, drawings, and observations.

KŌ'ELEPĀLAU RECIPE

1. Wash the 'uala and remove 'uala skins with a vegetable peeler. Cut into large chunks and steam until soft.
2. Place the cooked 'uala in the bowl and mash with a wooden pestle.
3. When mashed, add coconut milk in small amounts, mixing it in until smooth.
4. Serve on ti leaf plates and enjoy! Mmmm 'ono!



Notes, Drawings, and Observations
THE HAWAIIAN GARDEN

Name

Class Date





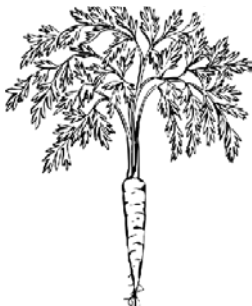

Directions: Use this space to record your notes, drawings, and observations.

Edible Roots and Stems

Directions:

Read the information below, then on page 2, color the picture of each plant and fill in the name of the plant and its storage plant part.





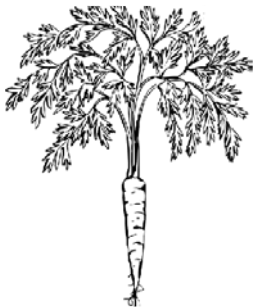

What we normally think of as roots may actually be called by a different name. Most of the edible parts of the plants shown here are actually stems! Tubers, rhizomes, corms, bulbs, and storage roots are parts of plants that all serve the same purpose in different ways. They are each a storage unit for food for the plant, which is created inside the plant by the process of photosynthesis. This food gives plants - and people! - the energy we need to grow and complete our life cycles.

STEMS		BULBS Bulbs, such as garlic and onions, are modified stems that contain in their center a vegetative growing point or flowering shoot.		CORMS Corms, such as kalo, are short, vertical, swollen underground stems that have a solid texture.
		RHIZOMES Rhizomes, such as ginger, tumeric, and kī (ti) roots, are underground stems that grow horizontally just below the soil's surface. They will continue to grow and creep along under the surface with many growing points.		STEM TUBERS Stem tubers, such as potatoes, are modified stolons (stems that grow at or just below the soil surface). They have all the parts that stems do, including nodes which are the "eyes" on a potato, where the plant's roots and shoots grow.
ROOTS		STORAGE ROOTS Storage roots are modified for storage of food or water. They include some taproots, such as carrots and beets. A taproot grows downward and forms a center from which other roots sprout laterally.		ROOT TUBERS Root tubers, such as sweet potatoes, are modified lateral roots. They do not have nodes ("eyes" like potatoes have).

Word List

Plant Names: carrot, garlic, ginger, kalo, potato, 'uala

Storage Plant Parts: bulb, corm, rhizome, root tuber, stem tuber, storage root

STEMS		Plant Name: Storage Plant Part:		Plant Name: Storage Plant Part:
		Plant Name: Storage Plant Part:		Plant Name: Storage Plant Part:
ROOTS		Plant Name: Storage Plant Part:		Plant Name: Storage Plant Part:

What does HO'OMAIKA'I mean? Describe at least one specific example of how you or someone else practiced HO'OMAIKA'I today: _____

DESCRIPTION

Students will review the importance of kalo and discuss the Hawaiian value, ho'omau. They will work as a community to care for their gardens and harvest their kalo plants. Kalo corms (kalo or makua) and leaves (lau) will be cooked and all participating classes will enjoy their snack together. This lesson should take place about 9 months after Lesson 1 (kalo planting).

TIME:

- 45 minute Lesson (adults and students; one class at a time)
- 45-75 minute Cooking (adults only; students return to class and complete Student Worksheet)
- 30 minute Harvest Party and Closing (adults and students from all participating classes)

SUBJECTS: Health, Language Arts, Social Studies

LEARNING OBJECTIVES

After this lesson students will be able to:

- Discuss the role and significance of kalo in Hawaiian culture and around the world, and describe the nutritional benefits of eating kalo.
- Describe the definition and significance of the ahupua'a.
- Work as a community and treat their gardens, plants, tools, self, and others with respect.
- Harvest and prepare kalo and lau for eating, and huli for planting.

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Protocol
 2. Kalo Review
 3. Group Activities Overview
- II. Group Activities (30 minutes)
 1. Native Hawaiian Plants Care
 2. Kī Care
 3. 'Ulu Care
 4. Lau Harvest
 5. Kalo Harvest
 6. Ti Leaf Plates
- III. Cooking (45-75 minutes, adults only)
 1. Cooked Kalo Corms and Leaves
- IV. Harvest Party and Closing (30 minutes)



KEY TERMS AND CONCEPTS

Ahupua'a - A common subdivision of land, usually extending from the top of the mountains (mauka) to the sea (makai) and containing the resources required for survival; a watershed

Ho'omau - To continue, to perpetuate, to persevere

Huli - Portion of the kalo that is planted (includes the hā and top 1/4 to 1/2 inch of the makua)

Kalo - Taro; a staple Hawaiian food and symbolic of the elder sibling of the Hawaiian people

Mahi'ai - Farmer

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

ACADEMIC STANDARDS*

CCSS, Language Arts: 4.W.1, 4.W.2, 4.W.3, 4.W.8, 4.W.10, 4.SL.1; **HCPS III:** HE.3-5.1.1, HE.3-5.1.2, HE.3-5.1.3, HE.3-5.5.1, HE.3-5.5.2, SS.4.1.1, SS.4.3.1, SS.4.3.2, SS.4.6.1, SS.4.6.3
NGSS: Patterns, Systems and System Models

*A detailed list of the Academic Standards can be found in the Unit Overview document.

LESSON MATERIALS

Community Supplies:

- 2 garden clippers (for harvesting lau)
- 2 clean scissors (for preparing plates)
- Colander
- Large bowl
- 2 cutting boards (for cutting cooked kalo and lau)
- Salt
- Induction heater
- Extension cord
- Sponge and soap
- 2 plastic dish tubs (for washing kalo and lau)
- 2 scrub brushes (for washing kalo)
- Vermicast (about 1 cup per class)

Lesson Supplies:

- Kalo Plant Parts Sign
- Garden Agreements Sign
- Ahupua'a Poster (Kamehameha Schools Press)
- Student Workbook

Teaching Team To Provide:

- Pressure cooker (MUST HAVE MAGNETIC BOTTOM for use with induction heater; the pressure cooker has a magnetic bottom if a magnet sticks to the bottom on the outside of the pot); or use an electric pressure cooker
- 2 pairs of tongs (for handling cooked lau and kalo)
- Knife (sharp; for adult use only; for separating huli from the makua and chopping cooked kalo and lau)
- 5 to 6 large ti leaves per class
- Optional: Additional induction heater and pressure cooker with magnetic bottom (to allow simultaneous cooking of kalo and lau)
- Optional: Kalo and/or lau (if not available in garden)

School To Provide:

- Garden Journals (if not using Student Workbook)
- Table (4 to 6 feet long; for cooking and serving)
- Access to an electrical outlet
- 5-gallon bucket (for harvesting kalo)
- Bucket and cups for watering and snack waste

ACCOMPANYING DOCUMENTS

- Background Information: Kalo
- Guided Notes
- Student Worksheet: Reflection
- Harvest Party Invitations
- ĀINA Post-Unit Survey

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- If parents and administration are being invited to attend this lesson (especially to assist with cooking and to enjoy the Harvest Party and Closing), print, cut, and send Harvest Party Invitations home with students one week before the lesson.
- Research kalo varieties prior to the lesson to share unique characteristics. Websites: www.ctahr.hawaii.edu/Site/Taro.aspx, www.digital.library.manoa.hawaii.edu/collections/show/44, www.canoaplants.com/kalo.html
- Review the Background Information in preparation for the Kalo Review with students.
- Make copies of the Student Worksheet, one per student if not using the Student Workbook.
- Set up kalo washing station: Two scrub brushes and 2 plastic dish tubs filled with clean fresh water (one bin for washing kalo (corms) and one tub for washing lau (leaves)).
- Set up cooking station: Table with induction heater plugged in (can use extension cord), plus other cooking utensils and ingredients (see Lesson Materials).
- If your teaching team decides to cook kalo ahead of time for the snack, harvest 3-4 corms per class and follow the cooking directions on page 6.
- Harvest and clean the ti leaves for the ti leaf plates.
- Have students practice E Hō Mai.
- Have students ready to take notes in Student Workbooks or Garden Journals.

INTRODUCTION

15 MINUTES

PROTOCOL

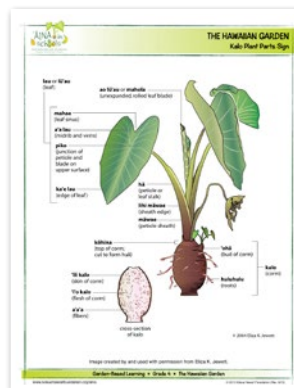
Have students stand tall and straight with their hands at their sides, focus their thoughts on the present moment, take a deep breath, and offer their oli (chant), E Hō Mai, three times. Have students be seated.

KALO REVIEW

“Today is our final ĀINA In Schools lesson of the school year. We will work together to care for our kī (ti) and native Hawaiian plants and our ‘ulu tree, and harvest our kalo!” Ask students to share some of the observations they have made in the gardens since the last lesson, including those recorded in the Student Workbooks or Garden Journals (or the Class Journal).

“What interesting facts do you know about KALO?”

Have students review the importance of kalo in Hawaiian culture, the fact that kalo is a Polynesian-introduced plant species, and that there are many nutritional benefits of eating kalo, including both the leaves (lau) and the corm (kalo or makua). Refer to Background Information. Show the Kalo Plant Parts Sign to remind students about the names of the plant parts. Spend about 5 minutes on this discussion.



Kalo Plant Parts Sign

“Do you remember how we planted our kalo garden?”
Desired answer: Using HULI (the portion of the kalo that is planted and includes the hā (stem) and top 1/4 to 1/2 inch of the makua (corm)). “Today we will also harvest our kalo plants, cook the lau (leaves) and the KALO/makua, and create HULI, which you may take home to plant and care for (or replant at the school).”

Review the names of the different kalo VARIETIES planted and have students share any special characteristics.

GROUP ACTIVITIES OVERVIEW

“It is especially important when we harvest and prepare food that we work together as a community. In a healthy community, each person does their job and the whole community benefits. In traditional times, Hawaiian people had to do this well in order to survive using the resources available to them. So do we.”

“In the beginning of the school year we imagined together what Hawai'i was like hundreds of years ago in Hawaiian ancestral times before contact with Western society. Without stores how did the people get their food and other things they needed to survive?” Desired answers: By farming, fishing, hunting, and making things by hand.

Show the Ahupua'a Poster and ask students to describe the definition and significance of the AHUPUA'A, a subdivision of land extending from the top of the mountains (mauka) to the sea (makai) and containing the resources required for survival; also a watershed.



Ahupua'a Poster

NUTRITIONAL BENEFITS OF KALO

Kalo is one of the most nutritious, easily digested foods. The corm is an excellent source of potassium, carbohydrate for energy, fiber, manganese, and vitamins E and B6, and is low in fat and protein. When eaten regularly it provides a good source of calcium and iron. The leaves are an excellent source of vitamins A and C, calcium, fiber, and riboflavin.

INTRODUCTION

CONTINUED

“Today each of you will be assigned a job. Let’s each do our best while we work toward a common goal. If you finish, see where help is needed. When all groups have finished and cleaned up we will enjoy our snack together!”

Divide the class into two groups. Group 1 will harvest kalo, group 2 will care for their plants, then switch (see descriptions under Group Activities):

1. Plants Care & Ti Leaf Plates Preparation
 - Native Hawaiian Plants Care
 - Kī Care
 - ‘Ulu Care
2. Kalo & Lau Harvest

Hawaiian Values and Garden Agreements

“Our Hawaiian value for today is HO’OMAU. Do you remember what HO’O means? Desired answer: To make. “MAU means always or perpetual. Therefore HO’OMAU means to continue, to perpetuate, to persevere. Have students repeat the Hawaiian value and share examples of how HO’OMAU is practiced by gardening at school (e.g., passing on knowledge and practice of planting, harvesting, and preparing

our own food and caring for the Earth, perpetuating Hawaiian culture, Hawaiian varieties of plants, and native Hawaiian plant species).

“We also have a responsibility to HO’OMAU, or perpetuate, our knowledge and practice of all of the Hawaiian values we have discussed this school year.” Have students share one or more Hawaiian values that are particularly meaningful to them.

“Our Garden Agreements will also help to guide our practice of HO’OMAU.” Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Have the student groups move to the garden to begin their work.

GROUP ACTIVITIES

30 MINUTES

If the class knows an oli (chant), please have them offer it before entering the garden to work. During the Group Activities, help students to practice HO’OMAU.

All jobs must be done and cleaned up and all students must wash their hands thoroughly with soap and water before enjoying the snack together.

PLANTS CARE AND TI LEAF PLATES PREPARATION

Group 1: Have students work in pairs or groups of 3 for the following plant care groups. After students finish their plant care they must wash their hands thoroughly before snack preparation.

Native Hawaiian Plants Care

Weed, water, and feed the native Hawaiian plants with vermicast (added directly to the soil or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips, about a 2 foot radius around the plants), being sure that the mulch does not touch the plant stems (give them about a 2 inch radius of breathing room).

Kī Care

Weed, water, and feed the kī plants with vermicast (added directly to the soil or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips, about a 2 foot radius around the plants), being sure that the mulch does not touch the plant stems (give them about a 2 inch radius of breathing room).

GROUP ACTIVITIES

CONTINUED

'Ulu Care

Weed, water, and feed the 'ulu tree(s) with vermicast (added directly to the soil around the base of the tree(s) or dissolved in water). Replenish/add a 4 to 6 inch deep layer of mulch (wood chips) around the tree(s) (about a 2 foot radius around the trunk), being sure that the mulch does not touch the trunk (give the trunk about a 2 inch radius of breathing room).

Ti Leaf Plates

Prepare the ti leaf plates for the snack by using clean scissors to cut each large ti leaf into about 4 plates (each approximately a 4"x4" section or larger). Make sure there is one plate for each student and adult present and that the plates are kept clean.

KALO HARVEST AND LAU HARVEST

Group 2: Have students work in two groups. One group will harvest kalo and the other group will harvest lau.

Kalo Harvest

Have students use their hands to harvest the kalo plants from their class' kalo garden by digging around the makua (corms) and gently removing them from the soil. **Place kalo of different VARIETIES into separate, labeled piles.** Remove any huluhulu (roots) and excess soil from the makua (corm). Have an adult use the knife to very carefully cut the HULI (planting material) away from each makua (corm). Be sure that at least 1/2 inch of the makua (corm) remains attached to the hā (stem) so that the HULI will grow again. Trim the stems to about 12 to 18 inches long in order to create the HULI (planting material). Have students scrub and rinse the makua in one of the plastic dish tubs containing clean fresh water.

Lau Harvest

Have students use the garden clippers and/or scissors to



If several known kalo varieties have been planted, be sure to keep them separate and labeled as they are harvested and made ready for replanting.

harvest healthy green lau (kalo leaves) from their class' kalo garden. The cut should be made at the very top of the hā (stem), where the hā meets the lau on the plant. Do not harvest leaves that are old, heavily damaged, or diseased. Wash the lau by rinsing them in one of the plastic dish tubs containing clean fresh water.

All students must wash their hands thoroughly with soap and water after working in the garden.

Have students return to their classrooms to complete the Reflection Student Worksheet after the Group Activities are finished. Classes will reconvene all together for the Harvest Party.



When creating the HULI (planting material) by removing the makua (corm) from the hā (stem), make sure to cut very carefully with a sharp knife and leave 1/2 inch of the top of the makua attached to the hā/HULI, as shown in the photo above. Cutting should only be done by an adult.



COOKING (ADULTS ONLY)

45-75 MINUTES

Adult volunteers will cook the lau and kalo according to the following instructions, in preparation for the entire grade level to enjoy the snack together during the Harvest Party and Closing. The cooking time will vary depending on whether there are one or two sets of induction heaters and pressure cookers.

Cooking The Lau (Leaves): Place the lau inside the pressure cooker and fill with water until the lau are mostly submerged. Cook under high pressure for 45 minutes to 1 hour. Release the pressure and remove the cooked lau with tongs. Discard the cooking water. Chop the cooked lau on a cutting board, then place them in a serving bowl, add salt, and mix.

Cooking The Kalo (Corms): Place the washed, unpeeled, whole kalo corms inside the pressure cooker and fill with water until the kalo are mostly submerged. Cook under high pressure for 45 minutes to 1 hour. Release the pressure and remove the cooked kalo with tongs. Discard the cooking water. Under cool running water, use hands and/or knives to remove the skin from each corm. Cut the cooked, peeled kalo into cubes on a cutting board, then place them in a serving bowl, add salt, and mix.

Preparation For Serving: Set up the serving table with the stack of leaf plates and the bowls of cooked lau and kalo. OR, place small samples of cooked lau and kalo onto the leaf plates in advance, making sure there is enough for everyone to try.

HARVEST PARTY AND CLOSING

30 MINUTES

Bring all classes together in the garden. Make sure that all students have washed their hands well with soap and water. If necessary, use the plastic dish tubs with clean water and soap to create a hand washing station. Have the students be seated in a circle

Discuss with students:

- Have students share their most memorable experience with The Hawaiian Gardens this school year.
- What does HO'OMAU mean and how did you practice this Hawaiian value today?

Lead students in singing the Oli Mahalo to show thanks for the bountiful harvest.

Have students form a line at the serving table and take one leaf plate each, then have adults



use the tongs to serve small samples of lau and kalo to each student. Or select several student volunteers to hand out the leaf plates with the cooked kalo and lau samples. If there is more than one variety of kalo, have students sample one small piece of each for a taste test. Enjoy!

Have students place snack waste and ti leaves in a bucket and then add it to the school's compost pile when finished.



Invite students to take home the huli (kalo planting material, prepared by Group 5 during the Kalo Harvest activity), to be planted and well cared for. Huli should be kept cool and rinsed daily (do not place in water) and planted within 1 to 7 days.

FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors visit the 'ulu, kī, and native Hawaiian plants for weekly watering.
- Cover any bare soil with a 4 to 6 inch deep layer of compost materials and mulch to nourish the soil and protect it from the sun.
- Create a plan for watering and care of the Hawaiian Garden plants during the summer.
- Students must wash their hands thoroughly with soap and water after working in the garden.

FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Review this year's garden experience, including the key concepts for the unit.
- Have students complete the Reflection Student Worksheet.
- Have students complete the Post-Unit Survey.
- Save and submit examples of student work to Kōkua Hawai'i Foundation.



Student Worksheet:
Reflection

LESSON EXTENSIONS

Sustaining Our Resources: Kalo
(4.W.1, 4.W.2, 4.W.3, 4.SL.1)

1. Discuss with students the important role of gardeners and farmers in perpetuating diverse varieties of edible, medicinal, and other useful plants.
2. Have students take home one or more huli (kalo planting material) to plant and care for, and to serve as a source of planting material for next year's students. Note: Students should only take huli home if they are committed to caring for them.
3. Have each student write a letter explaining their experience and some of the things they have learned about The Hawaiian Garden this school year.
4. Save the letters to be given to next year's 4th grade students during Lesson 1!



Lo'i Field Trip
(4.W.1, 4.W.3, 4.W.8, 4.SL.1)

1. Take students on a field trip to a farm that grows kalo and other canoe plants.
2. Be sure to get the full kalo experience by getting in the lo'i (students and adults)!
3. Have students talk with the farmer(s) about their work.
4. Have students write a reflective journal entry about their experience, including narratives and opinions.



Kalo



Use this information to help verify student knowledge and answer student questions during the Kalo Discussion in the Lesson Introduction. See the Kalo Mo'olelo Sign for a story about the cultural significance of kalo.

Q: Is kalo an important food plant in Hawai'i?

A: Yes, it is considered to be the most important and revered food plant of the Hawaiian culture. It is believed to have the greatest life force of all foods.

Q: What other cultural significance does this plant have in Hawai'i?

A: The kalo plant is considered to be the older sibling (known by the name of Hāloa) of the Hawaiian people. Hāloa means everlasting breath. Kalo is a living symbol of the importance of family. It is a reminder of our responsibilities to each other: Older siblings are responsible for feeding the younger siblings, and younger siblings are responsible for taking care of the older siblings. These relationships perpetuate life and prosperity for all.

Q: How did kalo arrive in Hawai'i?

A: It was brought here by early Polynesian voyagers about 1,500 years ago.

Q: Where did kalo originate?

A: The taro plant is native to Southeast Asia or India and has been cultivated for at least 7,000 years. It is one of the oldest cultivated crops in the world.

Q: Do other cultures use taro for food?

A: Yes, taro is grown in tropical Africa, the West Indies, the Pacific nations and in countries bordering the Indian Ocean in South Asia. It is a major dietary staple in many cultures and is the world's fourteenth most consumed vegetable.

Q: How is kalo grown?

A: Kalo is grown in either a māla (dryland/upland garden) or a lo'i (terraced wetland), up to about 4,000 feet elevation in Hawai'i. Different planting methods are used according to the local climate. For example, in drier areas, kalo is planted in a trench in order to collect and conserve moisture. In wet areas, kalo is planted in a mound so that excess moisture can drain away from the roots.

Q: How many varieties of kalo exist?

A: In Hawai'i, where cultivation has been the most intense, in the early days there may have been as many as 400 distinct varieties of taro, developed over time by Hawaiian farmers to suit diverse climates, soil conditions, and uses, including for poi, table taro, kūlolo (a dessert made of mashed kalo with coconut meat/milk), lū'au (cooked kalo leaves), or a combination of uses. Approximately 87 of these Hawaiian varieties are still recognized today, with slight differences in height, stalk color, leaf and flower color, size, and root type. The "Kalo o Hawai'i" poster by Halau Ku Mana is a helpful visual aid for illustrating the concept of variety types.

Q: What parts of the kalo plant can be eaten? How are they eaten?

A: All parts of the kalo plant can be eaten, including the leaves (lau or lū'au), stem (hā), and corm (kalo or makua). All parts of the plant must be thoroughly cooked before being eaten due to the presence of calcium oxalate crystals, which cause itching if not cooked long enough. Kalo may be boiled, steamed, pressure cooked, or baked in an imu (underground earth oven). Cooked and mashed corms make pa'i'ai, and when water is added, poi is made.

Q: What are the nutritional benefits of eating kalo?

A: Kalo starch is one of the most nutritious, easily digested foods. The corm is an excellent source of potassium, carbohydrate for energy, fiber, manganese, and vitamins E and B6, and is low in fat and protein. When eaten regularly it provides a good source of calcium and iron. The leaves are an excellent source of vitamins A and C, calcium, fiber, and riboflavin.

Q: Are there medicinal use of kalo?

A: Kalo is traditionally used to soothe burns, heal cuts and wounds, and alleviate swelling and insect bites.

Q: What is the scientific name for Hawaiian kalo?

A: *Colocasia esculenta*. Taro is a member of the Araceae (aroid) family.



KEY TERMS AND CONCEPTS

Ahupua'a - A common sub-division of land, usually extending from the top of the mountains (mauka) to the sea (makai) and containing the resources required for survival; a watershed

Ho'omau - To continue, to perpetuate, to persevere

Huli - Portion of the kalo that is planted (includes the hā and top 1/4 to 1/2 inch of the makua)

Kalo - Taro; a staple Hawaiian food and symbolic of the elder sibling of the Hawaiian people

Mahi'ai - Farmer

Variety - A type of plant showing similar characteristics to, and only slightly different characteristics from the species plant

Directions: Use this space to record your notes, drawings, and observations.



Notes, Drawings, and Observations
THE HAWAIIAN GARDEN

Name

Class Date

Directions: Use this space to record your notes, drawings, and observations.



REFLECTION

Directions: Fill in your answers to the questions below.

1. What do you remember most about your garden experience this school year? _____

2. What foods did you prepare and which was your favorite? _____

3. What do you like about gardening? _____

4. Why is gardening important? _____

5. Why is it important to help native Hawaiian plants? _____



Student Worksheet
THE HAWAIIAN GARDEN
Lesson 8 * Kalo Harvest

Name

Class Date

6. What are the benefits of working together as a community? _____

7. Describe the feelings you experienced while working as a community with your class. _____

8. What is the most meaningful lesson you learned from the Hawaiian Garden? _____

9. Choose one or more Hawaiian values that are especially meaningful to you and explain why:

Hawaiian Values
Aloha - Love, compassion; a way of life, connecting us to each other and all that exists
Ho'omaika'i - Grateful, to thank, to improve
Ho'omau - To continue, to perpetuate, to persevere
Kuleana - Privilege, responsibility
Laulima - Cooperation, to work together
Lokomaika'i - Kind, generous
Mālama - To take care of, preserve, protect
Pono - Excellence, wellbeing, to behave respectfully



You're invited to our

GARDEN HARVEST PARTY!

Date:

Time:

Place:

Please join us as we celebrate and enjoy
our bountiful garden harvest!

www.kokuahawaiiifoundation.org/aina



You're invited to our

GARDEN HARVEST PARTY!

Date:

Time:

Place:

Please join us as we celebrate and enjoy
our bountiful garden harvest!

www.kokuahawaiiifoundation.org/aina



You're invited to our

GARDEN HARVEST PARTY!

Date:

Time:

Place:

Please join us as we celebrate and enjoy
our bountiful garden harvest!

www.kokuahawaiiifoundation.org/aina



You're invited to our

GARDEN HARVEST PARTY!

Date:

Time:

Place:

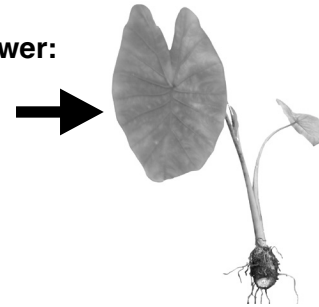
Please join us as we celebrate and enjoy
our bountiful garden harvest!

www.kokuahawaiiifoundation.org/aina

I have been at this school since grade: K 1 2 3 4 (circle one)

1. What part of the kalo is the arrow pointing to? Circle ONE answer:

- a. Kohina
- b. Lau
- c. Huli
- d. 'Oha



2. Circle the plants that were brought to Hawai'i in canoes by Polynesian voyagers:



Banana/Mai'a



Blueberries



Breadfruit/'Ulu



Carrots



Cucumber



Taro/Kalo



Coconut/Niu



Corn



Lettuce



Ti/Kī



Squash



Sweet Potato/'Uala



Tangerine

3. Draw a line to match each word to its correct definition:

- | | |
|--|---|
| a. Polynesian-Introduced
Canoe Plants | 1. Plants that evolved in Hawai'i and can only be found in Hawai'i |
| b. Ahupua'a | 2. Plants at risk of extinction |
| c. Endangered | 3. Non-native species that were brought to Hawai'i by Polynesian voyagers |
| d. Mālama | 4. To take care of, preserve, and protect |
| f. Endemic | 5. A common subdivision of land, usually extending from the top of the mountains to the sea |

4. How would you practice the Hawaiian value of ho'omau in the garden? Circle ONE answer:

- a. Continue growing native Hawaiian plants at school and home
- b. Work together with others to harvest, prepare, and cook food from the garden
- c. Give vegetables you grew as a gift to your teacher
- d. Water all the plants as fast as you can

5. What are two uses for the Kī (Ti) plant? Circle TWO answers:

- | | |
|-------------------|--|
| a. Garden signs | c. To wrap food and gifts in a pū'olo (bundle) |
| b. Ti leaf plates | d. Butterfly host plant |

6. Do you like gardening? Circle ONE answer:
 a. I do not like b. unsure c. I like a little d. I like a lot
7. Do you like eating fruits and vegetables? Circle ONE answer:
 a. I do not like b. unsure c. I like a little d. I like a lot
8. Do you like cooking? Circle ONE answer:
 a. I do not like b. unsure c. I like a little d. I like a lot
9. Do you like making compost? Circle ONE answer:
 a. I do not like b. unsure c. I like a little d. I like a lot
10. Do you like 'ĀINA Lessons? Circle ONE answer:
 a. I do not like b. unsure c. I like a little d. I like a lot

11. Do you and your family grow any food at home? Circle: Yes or No
 If yes, please list the foods you grow at home: _____

12. Do you compost at home? (compost pile, worm bins, or bokashi bucket) Circle: Yes or No

13. How often do you eat fruits and vegetables? Circle ONE answer:
 a. I don't eat fruits and vegetables b. 1-2 times a week c. 3-5 times a week d. Every day

14. Circle the fruits and vegetables that you like to eat:

Apple Cantaloupe Banana/Mai'a Blueberries Avocado Coconut/Niu Guava Dragonfruit
 Mango Passionfruit/Liliko'i Honeydew Rambutan Tangerine Strawberry Blackberries
 Lemon Starfruit Breadfruit/'Ulu Lychee Orange Papaya Pineapple Watermelon
 Radish Spinach Basil Beans Broccoli Squash Zucchini Sweet Potato/'Uala Corn Tomato
 Lettuce Watercress Taro/Kalo Cucumber Green Beans Asparagus Carrots Celery Kale

Other: _____

15. Describe what 'āina means to you: _____

16. List two ways that you take care of the 'āina:
 1. _____
 2. _____

17. Complete the following sentence:
 My favorite thing about 'ĀINA In Schools Lessons is _____

