Are native plants worth protecting?

Supporting Questions

1. What is the difference between native and non-native plants?
2. How did early Hawaiians use native and non-native plants?
3. Are native plants thriving in the islands today?
## 4th Grade Human Environment Interactions Inquiry

### Are native plants worth protecting?

<table>
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<tr>
<th>C3 Framework Indicator(s)</th>
<th>D2.Geo.8.3-5. (Spatial Patterns and Movements) Explain how human settlements and movements relate to the locations and use of various natural resources.</th>
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<tbody>
<tr>
<td>Hawai‘i C3 Standard</td>
<td>SS.4.3.14.2 (Theme 3: Early Hawaiians and the Land) Differentiate between the native and non-native plants and animals used by early Hawaiians.</td>
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<tr>
<td>Staging the Compelling Question</td>
<td>Examine a number of images that depict native and non-native plants in Hawai‘i and have students classify them into groups based on observations. Respond to the following question: What are some ways to group/classify plants?</td>
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#### Supporting Questions

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<th>Supporting Question 1</th>
<th>What is the difference between native and non-native plants?</th>
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<tr>
<td>Formative Performance Task</td>
<td>Classify, and present a native and non-native plant.</td>
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<tr>
<th>Supporting Question 2</th>
<th>How did early Hawaiians use native and non-native plants?</th>
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<tbody>
<tr>
<td>Formative Performance Task</td>
<td>Describe how early Hawaiians used native and non-native plants within an ahupua’a.</td>
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<table>
<thead>
<tr>
<th>Supporting Question 3</th>
<th>Are native plants thriving in the islands today?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formative Performance Task</td>
<td>Identify plants located in the community using inaturalist to make inferences whether native and non-native plants are thriving.</td>
</tr>
</tbody>
</table>

#### Featured Sources

- **Source A:** Plant Cards
- **Source B:** Framework for Active Learning Experience
- **Source C:** Plant Vocabulary Reference Table

- **Source A:** Map of the Ahupua‘a (labels: mauka, kula, kai) and Map of the 8 Major Hawaiian Islands
- **Source B:** From the Mountain to the Sea excerpt
- **Source C:** Plant Vocabulary Reference Table

#### ARGUMENT

*Are native plants worth protecting? Construct an argument that answers the previous question using researched claims, with evidence from multiple sources, and also acknowledges opposing viewpoints (counterclaims).*

#### EXTENSION

*Write and deliver a speech that argues your position on your answer to the compelling question. Defend your position using evidence from the sources analyzed in this inquiry and by including relevant personal experience.*

#### UNDERSTAND

*The utility of native and non-native plants for early Hawaiians.*

#### ASSESS

*Evaluate the extent to which the native and non-native plants that were used by early Hawaiians are still useful today.*

#### ACT

*Partner with agency/group/program that focuses on advocating and supporting native and/or non-native plants significant to Hawaiian culture.*

1. Create a PSA for that/or in support of that specified organization and their goals
2. Participate with them in planting/replenishing native and non-native plants in a specific location.
# TEACHING THE C3 FRAMEWORK

<table>
<thead>
<tr>
<th>Content Integration</th>
<th>Science</th>
</tr>
</thead>
</table>
|                     | 4-Ess2-2 Analyze and interpret data from maps to describe patterns of Earth’s features.  
[Clarification Statement: Maps can include topographic maps of Earth’s land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.] |
|                     | 4-Ess3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.  
[Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.] |

<table>
<thead>
<tr>
<th>Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCSS.ELA-LITERACY.W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</td>
</tr>
</tbody>
</table>
| CCSS.ELA-LITERACY.W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.  
[Grade-specific expectations for writing types are defined in standards 1-3 above.] |
| CCSS.ELA-LITERACY.W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. |

## Overview

### Inquiry Description

This geography inquiry leads students through an investigation of native and non-native plants that are significant to Hawaiian culture. By investigating the compelling question “Are native plants worth protecting?” students learn, apply, and assess the complex skills and strategies related to plant identification, uses, and cultural significance. The formative performance tasks build on knowledge and skills through the course of the inquiry and help students learn engage in close and critical reading of texts, geographical vocabulary, and participate in a community of inquiry discussions related to indigenous intelligence. At the end of the inquiry students will create an evidence-based argument that applies geographical concepts and explains the complexity and impact of native and non-native plants significant to Hawaiian culture. In the end, students will partner with agency/group/program, create a PSA and then aid in planting/replenishing native or non-native plants in specific locations to understand and connect to the impact of native and non-native plants in their communities.

It is important to note that this inquiry requires prerequisite knowledge of how to sort/classify plants and the existence of native and non-native plants. Thus, students should have already been exposed to basic concepts in geographical literacy (e.g. basic knowledge of the ahupua’a system, eight Hawaiian islands, major landforms, cardinal directions, climate).

Note: This inquiry is expected to take approximately eight 45-minute class periods. The inquiry time frame could expand if teachers think their students need additional instructional experiences (i.e., background knowledge, supporting questions, formative performance tasks, and featured sources). Teachers are encouraged to adapt the inquiries in order to meet the needs and interests of their particular students.
Resources can also be modified as necessary to meet individualized education programs (IEPs) or Section 504 Plans for students with disabilities.

**Structure of the Inquiry**

In addressing the compelling question “Are native plants worth protecting?” students work through a series of supporting questions, formative performance tasks, and featured sources in order to construct an argument supported by evidence while acknowledging competing perspectives.

**Staging the Compelling Question**

In staging the compelling question, “Are native plants worth protecting?” teachers may prompt students with a number of resources: (a) view a series of images of native and non-native plants to be sorted in small groups (students determine how plants are classified) (b) Followed by a discussion based on a series of close readings/text/images on what native and non-native plants are significant to the Hawaiian culture. Students will reflect on this process/experience by having a collaborative discussion responding to the question: What native and non-native plants are significant to the Hawaiian culture?

The featured sources for the staging the compelling question are native and non-native plants cards. These sources are also used in supporting question one. Click here to be taken to source a (plant cards) below. Click here to be taken to source c (vocabulary reference table) below.

**Supporting Question 1**

The first supporting question—“What is the difference between native and non-native plants?”—provides students with an opportunity to acquire background information and an overview of native and non-native plants significant to the Hawaiian culture. The formative performance task asks students to classify native and non-native plants, and then present research gathered from each category.

The featured sources for this question are native and non-native plant cards, framework for active learning experience, and plant vocabulary reference table. Featured Source A are information plant cards that provides students with basic information including but not limited to: species, Hawaiian name, cultural uses, classification. Featured Source B is a framework template for an active learning experience that students and teachers can use to guide them in openly discussing whether or not the ahupua’a system could have thrived with the sole use of native endemic plants or polynesian introduced plants. Featured Source C is the key vocabulary/academic language breakdown necessary for teachers and students to use and understand throughout the inquiry.

**Supporting Question 2**

For the second supporting question—“How did early Hawaiians use native and non-native plants?”—students
describe the uses of native and non-native plants. The formative performance task asks students to describe and show how various native plants are used throughout the ahupua’a system.

The featured sources for this question are framework for the native and non-native plant jigsaw activity, From the Mountain to the Sea excerpt (Williams, 1997), and plant vocabulary reference table. Featured Source A is a basic map of the ahupua’a (with labels for mauka, kula and kai). The framework for the jigsaw activity will serve to set the context for the progression of this inquiry by allowing students to take a closer look at specific native and non-native plants, how they were used, and where they could be found in the ahupua’a. Featured Source B is an excerpt from the text From the Mountain to the Sea (Williams, 1997). This excerpt will focus on the various plants used in the smaller land divisions of the ahupua’a: uka, kula and kai. Featured Source C is the key vocabulary/academic language breakdown necessary for teachers and students to use and understand throughout the inquiry.

Supporting Question 3

The third supporting question—“Are native plants thriving in the islands today?”—asks students to identify in their community (either surrounding school or if available, a botanical garden or park near the school) various plants. The formative performance task asks students to further investigate whether there are native and non-native plants are currently thriving in their community.

The featured sources for this question are a guiding task sheet and plant vocabulary reference table. Featured Source A is a guiding task sheet which includes guidelines students will need to gather geographical information about plants that exist in their community. Featured Source B is the key vocabulary/academic language breakdown necessary for teachers and students to use and understand throughout the inquiry. There is no source C for this supporting question.

Summative Performance Task

At this point in the inquiry, students have examined the history of native and non-native plants, studied the various ways to classify and sort plants, researched and investigated uses of native and non-native plants in the ahupua’a system, and identified where the native and non-native plants are currently thriving in the eight major islands in the State of Hawai‘i.

In the summative performance task, based on the compelling question “Are native plants worth protecting?,” students are expected to demonstrate the breadth of their understandings and their abilities to use evidence from multiple sources to support their claims. It is important to note that students’ arguments could take a variety of forms, including a detailed outline, poster, or essay.

Students’ arguments will likely vary, but could include any of the following:

- **We need to preserve native plants because they are part of the early Hawaiian culture and practices. If we lose many native plants, we will be unable to carry out many traditional practices today.**

- **Destruction/loss of native plants prevents scientists from finding further advanced uses in modern**
TEACHING THE C3 FRAMEWORK

medicine.

- Many native plants are used in products we consume today (e.g. noni). If we were to see a depletion of native plant resources, we would lose many of the ingredients used in commercial products today.

- Culture changes over time, in some cases today, non-native plants may be more useful than native plants.

To extend their arguments, students will write and deliver a speech presenting their position using evidence from the sources analyzed in this inquiry and by including relevant personal experience. Their presentations will reflect and applied using the Structured Academic Controversy (SAC) process.

Students have the opportunity to Take Informed Action by drawing on their understandings of the complex skills and strategies related to the identification and application of native and non-native plants. To understand, students will generate a list of the effects of a diminished native and non-native plant populations significant to the Hawaiian culture (effects on native animals, altering sustainable ecosystems, and becoming endangered/extinct etc.). To assess the issue, students will evaluate the survival rate of one native plant as a precursor to determine which plant population to replenish in the “act” section. To act, students will partner with agency groups/plant programs to first, create a PSA for or in support of that agency. Then secondly, replenish native and/or non-native plants in specific locations. They analyze the purpose of these communities/organizations and the impact they have on native and non-native plant revitalization (e.g. Maui Cultural Lands, The Nature Conservancy Hawai‘i (Statewide), Hui Kū Maoli Ola (O‘ahu), National Tropical Botanical Gardens (Kaua‘i)).

Staging the Compelling Question: Suggested Instructional Exercises

Included are two sequential instructional exercises to help students build background in the staging the compelling question portion of the inquiry.

Instructional Exercise Part One: Classify plants based on prior knowledge and characteristics. To complete this task the students will be given information plant cards created from the following websites:

- Hui Kū Maoli Ola [http://www.hawaiinnativeplants.com/]
- Maui Cultural Lands [http://mauculturallands.org/]
- Native Plants Hawai‘i [http://nativeplants.hawaii.edu/index/]

Classify: In this activity students in small groups will be given random information plant cards to sort in any way they see fit (color, size, texture, fruit bearing etc.). In this inquiry, students will be determining why they chose that categorizing strategy and share their rationale with the whole group when classifying is complete. This will be accomplished using chart/poster paper and index cards to support a oral presentation of their classifying strategies. A variety of steps can be employed to achieve this:
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1. Have students get into small groups and sort based on their personal preferences and background knowledge.
2. Give students pre-determined categories for sorting (color, texture, fruit bearing, location etc.)

To close the activity, the teacher will lead a discussion with the class that highlights the multitude of ways plants can be sorted/classified. Then lead the students to the focus of the inquiry, which is to understand and classify native and non-native plants.

**Instructional Exercise Part Two:** Identify vocabulary related to the inquiry. To complete this task the students will once again be given the information plant cards used to complete the sorting activity (see list of resources above).

**Word Wall:** A word wall is an organized display of vocabulary words and definitions drawn from the text. In this inquiry the students will read the information plant cards and identify vocabulary words essential to this inquiry. They will create definitions for each word based on their prior knowledge, and then craft working definitions based on information acquired from the activities. This will be accomplished using index cards, sentence strips or construction paper on a wall, window or door. Lettering should be large, neat and visible from every seat in the classroom. Before adding a word to the word wall, teachers should ensure that students understand its meaning in the context of the text. A variety of steps can be employed to achieve this:

1. Have students use context clues, affixes or roots, or word relationships. Use reference materials when meaning cannot be determined using these other means.
2. After working with information plant cards, provide definitions for all key terms to ensure one working definition through the inquiry to reference.

In addition to the word wall displays, reinforcement could be achieved through vocabulary flashcards, organizers and repetitious activities that explore native and non-native plants. In this particular inquiry, words on the word wall may include: native, non-native, endemic, indigenous, extinct, endangered, color, texture, shape, structure, climate, landforms, ahupua’a.

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**Staging the Compelling Question**

<table>
<thead>
<tr>
<th>Featured Sources</th>
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<tbody>
<tr>
<td><strong>Source A:</strong> Native and Non-Native Plant Cards</td>
</tr>
<tr>
<td><strong>Source C:</strong> Plant Species in Hawai’i Vocabulary Reference Table</td>
</tr>
</tbody>
</table>

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Screenshot clip of the linked resources (see links for full documents):
**TEACHING THE C3 FRAMEWORK**

Instructions: Cut only on solid lines to separate each plant card. Fold on perforated lines. Optional: Glue/tape each half together.

<table>
<thead>
<tr>
<th>Hawaiian Name</th>
<th>Classification</th>
<th>Habitat</th>
<th>Usage Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOA</td>
<td>NATIVE</td>
<td>UKA</td>
<td>Recreation and Tools</td>
</tr>
<tr>
<td>ILIAHI (ILIAHALO’E)</td>
<td>NATIVE</td>
<td>UKA</td>
<td>Recreation (scent kapa and used in leis)</td>
</tr>
</tbody>
</table>

Commonly Known As: SANDALWOOD
**TEACHING THE C3 FRAMEWORK**

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### Plant Vocabulary Reference Table

**Ahuapua’a:** a smaller section of the larger moku (island) running from the mountain to the sea. (Williams, 1997, p. 9, 12)

**Early Hawaiians:**

- **Endemic:** native, and not found anywhere else
  
  *Note: The vast majority of the 10,000+ native plants and animals of Hawai‘i are endemic (restricted entirely) to the islands, and represent an irreplaceable resource.
  
  **Note:** All native pre-contact plants would have been endemic
  
  ***Note:** native, Endemic (i.e., found naturally, and not found anywhere else but Hawai‘i) ca 1,000 spp. in this category.

- **Indigenous:** native, not necessarily restricted to the native location
  
  *Note:** native, Indigenous (i.e., found naturally, not introduced by people, and not necessarily restricted to the islands) ca 100 spp. in this category.

- **Kai:** smaller land division near the coastal lowland

- **Kula:** smaller land division located by the plains and fields

- **Native:** Native means it got here on its own, preceded human presence; that is, descendants of species that got to the islands without the help of human beings. The ‘ōhi’a tree in full red bloom, and the ‘opapane sipping nectar from its flowers, are two of these native species.

- **Naturalized:** A naturalized plant is one that was introduced, but has escaped cultivation and grows and reproduces on its own in the wild. Many plant pests are naturalized introductions that displace native ecosystems, for example, Strawberry guava (Psidium cattleianum).

- **Non-Native:** A plant that arrived through human intervention or introduction

**Polynesian Introduced:**

There is a third category of plants and animals among the Hawaiian biota: those plants and animals that arrived with the voyaging canoes and the Polynesian ancestors of the Hawaiian people. These “Polynesian introductions” form a special category of about 70 introduced plants and animals. They are also considered “Hawaiian” species, because they are associated with the uniquely Hawaiian culture that developed in these islands, but they are not considered endemic or indigenous, since all of these species can be found elsewhere in the world, and they required human beings to bring them to the islands, which is the key factor that qualifies a species as “introduced” vs. “native.”

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**Supporting Question 1: Suggested Instructional Exercises**
Included are two suggested instructional exercises to help students accomplish the task suggested by Supporting Question 1, What is the difference between native and non-native plants? When early Hawaiians arrived in the Hawaiian Islands, there were endemic plants (meaning native plants that were already thriving) and plants that were brought with them. The early Hawaiians were able to utilize these endemic native plants and the Polynesian introduced plants to create and sustain their culture. Through exploring the supporting question “How did early Hawaiian meet their needs?,” students will analyze close reading texts that showcase the importance of the plants that make up these two categories (endemic and Polynesian introduced) and how early Hawaiians were able to create a thriving culture through the use of the plants available to them before contact with the western world.

**Instructional Exercise Part One:** In this instructional exercise, students will revisit/re-look at the native and non-native plant cards used in the staging the compelling question activities. However, this time they will sort the same plant cards into two categories: endemic and polynesian introduced. Teachers will, therefore, scaffold these ideas by telling students that some plants were brought (Polynesian introduced) by Polynesian voyagers and other plants were found (native) by polynesians when they first arrived in the Hawaiian islands. The following are steps that can be used to achieve this understanding:

1. Explain to students that the plants used by early Hawaiians (pre-western contact) are sorted into two categories: Native and non-native. Meaning that the native plants already existed when the polynesians first arrived and the non-native plants were brought with them on their canoes. Students will be given the same plant cards this time and be asked to sort them into two categories: Native (what they found) and non-native (what they brought).
2. Divide students into small groups and provide a set of native plants and polynesian introduced plant cards to each group. *Note: you will need to make multiple sets of source A for this activity.
3. Each group will be tasked with determining whether or not the plants indicated on the plant cards represent plants that the early Hawaiians **brought** with them (polynesian introduced), or if they were plants that they **found** when they arrived (native). Use the terms “what they brought” and “what they found” when explaining to students.
4. Once the students have correctly classified the plant cards, have students reflect on the following questions as a group. Students should record their answers (teachers may provide chart paper, utilize the provided graphic organizer found in Framework for active learning source, or create their own recording sheet)
   a. What plants surprised you as being native?
   b. What plants surprised you as being non-native?
   c. Which plants are you most familiar with?
   d. Why do you think it is important to know the difference between native and non-native plants?
5. Bring all groups back to engage in a whole class discussion to review the reflection questions and answers.
6. Review the compelling question and how this activity will support them in eventually answering the compelling question.

**Instructional Exercise Part Two:** Once students have successfully organized plants into endemic and polynesian introduced, the teacher will lead them in an active experience regarding the role plants from both categories had in contributing to a thriving sustainable Hawaiian culture (pre-Western contact). Students and teachers together will determine if the early Hawaiians would have been able to create thriving communities that relied solely on just the use of native or the non-native plants. Throughout this process, rationales justifying these determinations must be provided.

1. Each individual student will be given one plant card. **Note:** Teachers, depending on the class size, equal amounts of the endemic and polynesian introduced cards are to be distributed.
2. Students will then split themselves into two groups based on whether they were given a plant that was found (native) or brought (non-native) to the Hawaiians islands (pre-western contact).
3. Once in these groups, the teacher will momentarily take back all plant cards. Note: Teachers, keep track of the plant cards, so they can be redistributed to each respective group.
4. Students will first create a web of all the items they would need to create a thriving community that could be acquired from plants. Students are given the concept map (source B) and tasked to write possible responses to each focused topic (health needs, recreational needs, tools and shelter needs). For example, the circle labeled “Health Needs” may inspire students to brainstorm ideas such as food, medicine, clothing etc. Students should use the topics to guide them in determining what a thriving community may need.
5. Once the web is filled with ideas, then students are given the plant cards back (either only native or only non-native). Students will use the information on the cards to decide if they can fulfill the needs on their generated list by relying only on those plants.
6. After working with the plant cards and filling in their concept map with the names of plants that help to meet the needs of a thriving community, the students will find a partner from the opposite group (e.g. a student from the native plant group will partner with a student from the non-native plant group).
7. Together the partners will compare their notes and find the “pukas” where their group could not fill the needs for a thriving community. Next, in partners, they will fill those “pukas” with plants from the opposite group (NOTE: Almost all of the food crops were Polynesian Introductions, in contrast. There are relatively few edible natives, maybe the exception being the fruit of lama (Diospyros sandwicensis), a few greens that could be steamed (such as ʻāweoweo (Chenopodium oahuense), a few other edible fruit such as ʻōhelo (Vaccinium spp.), ʻākala (Rubus sandwicensis), and māhoe (Alectryon macrococcus). Due to this fact, through the inquiry process students will come to find that both native and non-native plants were necessary to the thriving early Hawaiian culture.
8. Once the partners have completed sharing information and filling the “pukas” together, the teacher will have the whole class engage in a short debrief prior to the independent work time. Teachers can frame this debrief around what ideas, points of interest, etc. emerged during the partner discussion.
9. Students will then return to their desk to work individually/independently on the reflection questions (Framework for Active Learning Experience; Source B) Teacher have multiple sets of plant cards rotating throughout the class to support students in completing the reflection worksheet.
10. To close this instructional exercise, the teacher will engage the students in a whole class discussion focusing on “what is a thriving community?” and could the early Hawaiians have created a thriving community if they had relied solely on just one group of plants?”

Supporting Question 1 Source A

<table>
<thead>
<tr>
<th>Featured Source</th>
<th>Source A: Native and Non-Native Plant Cards</th>
</tr>
</thead>
</table>

Screenshot of plant cards (see link for full document):
**TEACHING THE C³ FRAMEWORK**

Instructions: Cut only on solid lines to separate each plant card. 
Fold on perforated lines. 
Optional: Glue/tape each half together.

<table>
<thead>
<tr>
<th>Hawaiian Name: KOA</th>
<th>Classification: NATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat: UKA</td>
<td>Usage Category: Recreation and Tools</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hawaiian Name: ILIAHI (ILIAHIALO’E)</th>
<th>Commonly Known As: SANDALWOOD</th>
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<tr>
<td>Usage Category: Recreation (scent kapa and used in leis)</td>
<td></td>
</tr>
</tbody>
</table>

**Supporting Question 1 Source B**

| Featured Source | **Source B**: Framework for Active Learning Experience |
# Teaching the C3 Framework

**Name:** ____________________________  **Date:** ____________________________

### Native and Non-Native Reflection Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What plants surprised you as being native?</td>
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</table>
TEACHING THE C3 FRAMEWORK

Name: ___________________________ Date: _________________________

- Health Needs
- Recreational Needs
- Thriving Communities
- Tool & Shelter Needs
TEACHING THE C3 FRAMEWORK

Name: __________________________ Date: ________________

How Did they Create a Thriving Community? Reflection Questions

1. Do you think it was necessary for early Hawaiians to use both native and non-native plants to create a thriving community? Why or why not?

2. Do you feel that one group may have held more important plants than another? For example, do you think the native plants held more valuable plants or the non-native plants were more valuable? Explain your thinking.
3. In the space below, draw an image that shows how the early Hawaiians met their needs by utilizing different native and non-native plants in the community. Images of the plants do not need to be identical to what the plant looks like, but please put labels next to each picture. Use plant cards to assist you.
TEACHING THE C3 FRAMEWORK

Plant Vocabulary Reference Table

Ahupua'a: a smaller section of the larger moku (island) running from the mountain to the sea. (Williams, 1997, p. 9, 12)

**Early Hawaiians:**

**Endemic:** native, and not found anywhere else
*Note: The vast majority of the 10,000+ native plants and animals of Hawai‘i are endemic (restricted entirely) to the islands, and represent an irreplaceable resource.
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## Supporting Question 2: Suggested Instructional Exercises

Included are two suggested instructional exercises to help students accomplish the task suggested by Supporting Question 2, How did early Hawaiians use native and non-native plants? Once the early Hawaiians were able to determine what the uses were for the different endemic native plants, the use of a combination of native and non-native plants supported a thriving Hawaiian culture within an ahupua’a. By exploring the question “How did early Hawaiians utilize their resources?,” students will begin to understand the various roles native and non-native plants played in the development and sustainability of the early Hawaiian culture.

### Instructional Exercise One:

1. Teacher briefly reviews the context set by supporting question #1, “How did early Hawaiians use native and non-native plants?” Remind students about the two major groupings of plants at the time (native and non-native) and how each group held plants for specific use within the thriving ahupua’a system.
2. Teacher then partners students to focus on and research one native and one non-native plant that exists in each smaller land division of the ahupua’a (uka, kula, kai). This is a jigsaw activity in which partners will research information about each kind of plant assigned to them by the teacher. An equal number of pairs should represent each smaller land division. Teachers may refer to source A titled Jigsaw Framework for Native and Non-Native plants. *NOTE: Teachers have students utilize this site first for basic information. [Bishop Museum Ethnobotany Database](http://www.bishopmuseum.org/ethnobotany/PlantList.html) (to search either native or non-native plants)
3. Once students complete their partner research, they will reconvene with other pairs assigned to the same smaller land division to share the information they gathered about their respective plants. For example, those who researched plants in the uka region of the ahupua’a will share and discuss what they learned about their respective plants. After the completion of the jigsaw, each group (uka, kula and kai) should have information on multiple native and non-native plants from only their respective smaller land division.

### Instructional Exercise Two:

1. After students in each smaller land division group uka, kula and kai, have had a chance to discuss and share their plants the teacher will reorganize the groups again. This time placing a pair from each smaller land division to form a larger group that will together create an ahupua’a. For example, the teacher will take one partner group from uka, kula and kai and combine them to make one large group to create an ahupua’a. Again, refer to source A titled Jigsaw Framework for Native and Non-Native plants, to view how to potentially create groups.
2. Using the pages from source B, From the Mountain to the Sea excerpt, have the ahupua’a work groups determine which plants in the text are native, and which are non-native using the various plant indexes provided. This close reading is meant to reinforce the idea that it was a combination of a native and non-native plants in the ahupua’a system that contributed to the success of each smaller land division, and thus the success of the ahupua’a system as a whole.
3. After reading and discussing the excerpt in From the Mountain to the Sea, students discuss any plants they researched that were not included in the excerpt and why they may have been overlooked in the text. Some guiding questions a teacher could offer:
   a. What native or non-native plants did you learn about were not included in this text? Why do you think that is? Explain your thinking.
   b. If you could offer a suggestion to the author or editor of this text in regards to which plants should
be included, what would it be?
c. Do you think it was a good idea that the text include only these native and non-native plants? Why or why not?

4. After completing their discussion regarding the close reading, each group will then create a *salt* dough ahupu’a. (create salt dough with salt, flour, water and food coloring (optional)). Within their ahupu’a, the groups will identify and label their smaller land divisions, with the native and non-native plants they learned about during their jigsaw and close reading text (if plants in text are different from plants they researched). These plants could be labeled on the ahupu’a using toothpicks, flags, or other indicators depending on materials available to the teacher.

5. Students will present their ahupu’a to the whole class and describe the native and non-native plants represented within their smaller land division. As a whole class, students will also discuss the impact of the various native and non-native plants on a thriving ahupu’a. Some focus question samples:
   a. Where are most of the native plants? Where are most of the non-native plants?
   b. Which plants do you think were the most valuable to a thriving ahupu’a system? Why?
   c. Was this an effective way for early Hawaiians to utilize their native and non-native plants resources? Explain.

6. Notes:
   a. *Note 1:* The teacher may choose to utilize a different form of ahupu’a construction instead of the salt dough. Teachers may want to construct dioramas, 2D recreations of the ahupu’a with labels or even a powerpoint accompanied by student voiceover. Salt dough is simply one of many options that could support this inquiry.
   b. *Note 2:* The teacher will need to provide ample work time for small group discussion and creation of the ahupu’a.

**Supporting Question 2**

<table>
<thead>
<tr>
<th><strong>Featured Source</strong></th>
<th><strong>Source A:</strong> Jigsaw Framework for Native and Non-Native Plants</th>
</tr>
</thead>
</table>

Screenshot of Jigsaw framework (see link for full document):
**Jigsaw Framework for Native and Non-Native Plants**

*This is a potential breakdown of native and non-native plants the teacher could have students research for the jigsaw.

<table>
<thead>
<tr>
<th>Smaller Land Division</th>
<th>Native</th>
<th>Non-Native</th>
<th>Student partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. uka</td>
<td>Koa</td>
<td>‘Ohi’a ʻai (Mountain Apple)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>2. uka</td>
<td>Ilihi (ilihialoʻe) sandalwood</td>
<td>‘Akala (Hawaiian Raspberry)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>3. uka</td>
<td>Maile</td>
<td>Laua’e (Fern) (Note: can be found at sea level to higher elevations)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>4. uka</td>
<td>Moa</td>
<td>Kukui (condlenut)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>5. uka</td>
<td>‘Ohi’a Lehua (Note: can be found at sea level to higher elevations)</td>
<td>‘awapuhi (ginger)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>1. kula</td>
<td>A‘ali‘i</td>
<td>‘Ulu (breadfruit)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>2. kula</td>
<td>Pill (Toll Pili Grass)</td>
<td>Kalo (taro)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>3. kula</td>
<td>Palapalai (Lace Fern)</td>
<td>Ki (Tī)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>4. kula</td>
<td>Nanu (Hawaiian gardenia)</td>
<td>Ka (sugarcane)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>5. kula</td>
<td>Hale Pepe</td>
<td>Wauke (Paper mulberry)</td>
<td>1. 2.</td>
</tr>
<tr>
<td>1. kai</td>
<td>Naupaka Kahakai</td>
<td>Noni</td>
<td>1. 2.</td>
</tr>
<tr>
<td>2. kai</td>
<td>Kaunaoa</td>
<td>Milo</td>
<td>1. 2.</td>
</tr>
<tr>
<td>3. kai</td>
<td>Ma’o</td>
<td>Hau</td>
<td>1. 2.</td>
</tr>
</tbody>
</table>
## Supporting Question 2

| Featured Source | Source B: [From the Mountain to the Sea Excerpt (textbook pages 18 - 29.)](#) (This is a link to the entire textbook, not just the pages needed for the suggested instructional activity.) |
Uka: Mountains and Uplands

From the *uka* came many resources needed by early Hawaiians. *Koa* wood was used for canoes, houseposts and images of spirits. *Kauila* hardwood provided spears and tools. Pliable stalks of *ʻulei* were used as rims for fish nets and for the musical bow, *ʻukēkē*.

The *olonā* plant made the strongest cordage for fish lines, fish nets and network for feather cloaks. Plants and herbs such as *koʻokoʻolau* and *moa* had medicinal uses.

*Maile* vines made fragrant *lei* and decorations for the *hula* altar. The strong roots of the *ʻieʻie* vine were woven into carrying baskets and fish traps.
Details of ūka plants and trees
The word *ahupua‘a* is made up from “ahu,” which means altar, and “pua‘a,” which means pig. People built an altar of stones where the *ahupua‘a* boundary intersected, or crossed, the main trail circling the island. That altar was dedicated to Lono, the spirit of fertility, peace and rain.

An image of a pig’s head, carved out of *kukui* wood and stained with ‘*alae*a, red dirt, was placed upon the altar. Lono was believed to reside within this image.
Māmaki bark was used for *kapa*. ‘Iliahi, or sandalwood, when ground or shaved, supplied a sweet scent for bathing and scented containers used for storing clothing.

Colorful birds provided the feathers for the cloaks and helmets worn by *ali‘i* and for *kahili*, the feather standards used as symbols of chiefly rank.
Wao is the general term for the inland forest region. Wao kanaka is the most accessible of the forest areas and the one most valued by the early Hawaiians. Wao kele is the rain forest where tree ferns and other ferns and giant trees grow. Lands higher in the mountains were known as wao akua, forests of the spirits, where Hawaiians believed only these spirits resided.
Kula: Plains and Fields

Kula were the flat and sloping lands between the uka and the kai. Many useful products were made from plants growing in the kula area. Kukui trees provided nuts used for oil and lighting. Wauke trees offered bark for the finest kapa. Pili grass for thatching houses grew here.

Bamboo was used for fishing rods and as stamping tools for patterning kapa. Gourds became containers and musical instruments. Kī leaves were used for food wrappings, rain capes, sandals and thatching. Other plants offered many of the ingredients used in Hawaiian medicines or beautiful flowers for decorations.
Details of kula plants and trees
Food plants in great variety were raised in the *kula*. There were bananas, dry-land *kalo*, sugar cane, sweet potatoes and yams. *Lo‘i kalo*, or ponds for wet-land taro, were built near the *kahawai*, “the place having fresh water.”

*Poi*, the most important food of the early Hawaiians, was made from *kalo*. All the parts of the *kalo* plant were prepared as food in one fashion or another and eaten.

*‘Ulu* fruit was another primary starch food. In addition to getting food from the fruit, wood of the *‘ulu* plant was used for *hula* drums, *poi*-pounding boards and surfboards.
Kai: The Sea and the Lands Nearby

The third major division of an ahupua’a was the kai, the sea and the area nearby. From the kai came fish and life-sustaining salt and a wide variety of other seafoods. The kai provided a medicine used for such ailments as dizziness, fever, nausea and stomach ache. The sea water itself was the medicine.

Pure salt was extracted from the sea water through evaporation. This Hawaiian salt, pa‘akai, was used as medicine, for preserving food, in religious ceremonies and as a seasoning.

Hawaiians gathered and ate many kinds of algae and seaweeds, or limu. Limu was a major source of vitamins and minerals in their diet.
Growing along the shore was the tree for which Hawaiians had found more uses than any other plant they knew—the coconut tree. Its trunk provided bowls, drums, small canoes and spears. Leaflets became brooms, fans, game balls and lei-making needles. Fibers from the husk surrounding the nut itself became cordage. Shells from the nuts were made into small bowls and knee drums. At different stages of development the nut provided various forms of food and drink.
Hau was another tree growing in the near-ocean lowlands. Its tough-but-light wood was used for adze handles, massage sticks, and outrigger canoe booms and floats. Milo trees grew only along the beach, not in the uphill forests. Its rich brown wood was prized for food bowls. Noni was a near-shore shrub whose fruit was used for medicine and whose inner bark was the basis for a yellow dye.

So it was that by dividing islands into districts running from the mountains to the sea, the ali‘i made certain their people would be well-supplied with the different products of the uka, kula and kai.
TEACHING THE C3 FRAMEWORK
The ahupua’a monument or altar marked the boundary of the land division.
## Supporting Question 2

<table>
<thead>
<tr>
<th>Featured Source</th>
<th>Source C: Plant Vocabulary Reference Table</th>
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</table>

TEACHING THE C3 FRAMEWORK

Screenshot of the reference table (see link for full document):

<table>
<thead>
<tr>
<th>Plant Vocabulary Reference Table</th>
</tr>
</thead>
</table>

**Ahupua'a:** a smaller section of the larger moku (island) running from the mountain to the sea. (Williams, 1997, p. 9, 12)

**Early Hawaiians:**

**Endemic:** native, and not found anywhere else

*Note: The vast majority of the 10,000+ native plants and animals of Hawai‘i are endemic (restricted entirely) to the islands, and represent an irreplaceable resource.

**Note: All native pre-contact plants would have been endemic

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**Indigenous:** native, not necessarily restricted to the native location

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**Kai:** smaller land division near the coastal lowland

**Kula:** smaller land division located by the plains and fields

**Native:** Native means it got here on its own, preceded human presence; that is, descendants of species that got to the islands without the help of human beings. The 'ōhi'a tree in full red bloom, and the 'apapane sipping nectar from its flowers, are two of these native species.

**Naturalized:** A naturalized plant is one that was introduced, but has escaped cultivation and grows and reproduces on its own in the wild. Many plant pests are naturalized introductions that displace native ecosystems, for example, Strawberry guava (Psidium cattleianum).

**Non-Native:** A plant that arrived through human intervention or introduction

**Polynesian Introduced:**

There is a third category of plants and animals among the Hawaiian biota: those plants and animals that arrived with the voyaging canoes and the Polynesian ancestors of the Hawaiian people. These "Polynesian introductions" form a special category of about 70 introduced plants and animals. They are also considered "Hawaiian" species, because they are associated with the uniquely Hawaiian culture that developed in these islands, but they are not considered endemic or indigenous, since all of these species can be found elsewhere in the world, and they required human beings to bring them to the islands, which is the key factor that qualifies a species as "introduced" vs."native."
Supporting Question 3: Suggested Instructional Exercises

Included is a suggested instructional exercise to be completed to help students accomplish the task suggested by Supporting Question 3, Are native plants thriving in the islands today? Once the students have had an opportunity to learn how the early Hawaiians used different endemic native plants and how the combination of native and non-native plants support a thriving Hawaiian culture within an ahupua’a system, they will be ready to explore the question “Are native plants thriving in the islands today?” In this active learning experience, students will use inaturalist to investigate plants that can be found in their existing community.

**Instructional Exercise Part One:**

1. Teacher briefly reviews the context set by supporting question #2, “How did early Hawaiians meet their needs?” Remind students about the two major groupings of plants at the time (native and non-native) and how each group held plants for specific use within the thriving ahupua’a system. Teacher may review some of the previous discussion questions to support student understanding:
   a. Where are most of the native plants? Where are most of the non-native plants?
   b. Which plants do you think were the most valuable to a thriving ahupua’a system? Why?
2. Students will review with the teacher what thriving means (to grow or develop vigorously, flourish, prosper)
3. Teacher and students will review basic geographical terms and descriptors. For example cardinal directions, smaller land division terms, and other ways to describe locations.
4. Then the teacher will introduce students to the inaturalist website (inaturalist.org). The students will create a class login.
5. If available, teacher shares various technology tools that will be used to capture images (e.g. ipads, smartphones and digital cameras).
6. Teacher will go over the guiding task sheet with students before taking them out into the community to capture images of plants. *NOTE: teacher may opt to do a walking field trip/learning journey in the area surrounding the school or stay on campus grounds.
7. Once the guiding task sheet is complete and images have been recorded, teacher and students will return to upload to inaturalist website.
8. As a whole class, discuss the results of their findings once returned from the site. Teacher may use the following guiding questions:
   a. What native or non-native (polynesian introduced) plants did you find in our community?
   b. What did you notice about the plant populations in our community?
   c. Are native or non-native plants thriving in our community? Why or why not?

**Optional Extension:**

1. Using the same guiding task sheet, the teacher may take students to parks or botanical gardens to further extend student exposure to the plants that may or may not be thriving or found within their community.
2. Huaka’i Possibilities:
   a. Manoa Heritage Center
   b. Lyon Arboretum
   c. He’eia Fishpond
   d. Hawai’i Loa Ridge (East)
   e. Honouliuli Wetlands
TEACHING THE C3 FRAMEWORK

f. Wahiawa Botanical Gardens
g. Koko Crater Botanical Garden
h. Liliuokalani Botanical Garden
i. Ho’omaluhia Botanical Garden
j. Foster Botanical Garden
k. Moanalua Botanical Gardens
l. National Tropical Botanical Gardens (Kaua’i)
m. Maui Botanical Gardens (Maui)
n. Maui Cultural Lands (Maui)
o. Maui Garden of Eden (Maui)
p. Botanical World Adventures (Hakalau, Hawai’i)

Supporting Question 3

<table>
<thead>
<tr>
<th>Featured Source</th>
<th>Source A: Guiding Task Sheet</th>
</tr>
</thead>
</table>

Screenshot of guiding task sheet (see link for full document):
Name: __________________________ Date: ___________________ 1

Guiding Task Sheet

Inaturalist website: https://www.inaturalist.org/

Directions: Take a walking tour around the campus and/or surrounding community. When you find a plant that intrigues you, stop and fill in this guiding task sheet. Use the prompts below to help you gather information. Don’t forget to take a picture for inaturalist!

1. Picture #1:
   a. Do you know what plant you are looking at? Can you guess what plant you are looking at? Remember to take a clear photo that can be uploaded to the inaturalist website.
   b. Where am I? First describe your location, then draw a basic image of where you are. You can include landmarks, street names physical features and labels in your illustration.

I think this plant is (native or non-native): __________________________
I think it might be a... __________________________
Because...

Location Description:

Image of Location (with labels):

---

Supporting Question 3
TEACHING THE C3 FRAMEWORK

| Featured Source | Source: Plant Vocabulary Reference Table |

Screenshot of reference table (see link for full document):
Plant Vocabulary Reference Table

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Summative Performance Task

In the summative performance task, the students are tasked to construct an argument that answers the question, “Are native plants worth protecting?” Students will use researched claims, with evidence from multiple sources, and acknowledges opposing viewpoints (counterclaims).

Summative Performance Task

<table>
<thead>
<tr>
<th>Featured Source</th>
<th>Source A: Website Resources</th>
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</thead>
</table>

Screenshot of website resources (see link for full document):

Website Resources

Research native and non-native plants to help you construct your argument.

a. Bishop Museum Ethnobotany Database (to search either native or non-native plants)
   NOTE: Teachers have students utilize this site first for basic information.

b. Native Plants Hawai‘i (to search for Native plants only)
c. Hui Ku Maoli Ola (to search for Native plants only)
d. Maui Cultural Lands (to search for Native plants only)
e. Hawai‘i Alive
f. Botany Database
   g. [https://www.bishopmuseum.org/botany-database/](https://www.bishopmuseum.org/botany-database/) – Change | Remove
   h. [https://youtu.be/AXT7y9kIHC](https://youtu.be/AXT7y9kIHC) (indigenous plants in Hawai‘i)
j. Hawaiistheses (Plant Industry Website)
k. Why native plants
l. Canoe Plants and Introduction

Summative Performance Task (Extension)

As an extended learning experience for students, teachers may opt to have students write and deliver a speech that argues their position regarding the question, “Are native plants worth protecting?” Students will defend their position using evidence from sources analyzed in this inquiry and by including relevant personal experience(s). Students will present their information by applying the Structured Academic Controversy (SAC) process/framework.
Summative Performance Task (Extension)

| Featured Source | Source A: SAC Framework |

Screenshot of SAC Framework (see link for full document):
STRUCTURED ACADEMIC CONTROVERSY (SAC):
5 PHASES/PROCESS

1. Learn your Position (Research & Prepare)
   a. Research several points with supporting evidence.
   b. Prepare your points in an outline so that you can present the
      information to the other team.

2. Present your Position (Present and Advocate)
   a. As a team, present your position clearly and persuasively.
   b. Listen carefully and learn the opposing position.
   c. Record the opposing team’s position points.

3. Discuss the Issue (Open Discussion)
   a. Re-state your position and support your points with any
      additional argument.
   b. Listen carefully and critically to the opposing position.

4. Reverse Perspectives
   a. Select two major points made by the opposing team and
      present these major points as if you were they. Be as
      convincing as you want.
   b. Elaborate on their position by relating it to other information
      that you have.

5. Reach a Decision (Synthesize)
   a. Summarize the best arguments made by each side.
   b. Reach a consensus on a position that is supported by the
      facts.
   c. Write a consensus that is accepted by both sides and
      includes a solution.

Note: These are the 5 phases/processes that comprise a SAC. The SAC
can also be completed in pairs/partners and small groups/team.

*Adapted from Patricia Halagoo’s Fil-am Education Institute worksheet, University of
Hawaii at Manoa, College of Education
Taking Informed Action

A significant feature of the C3 Inquiry Framework, is to provide students with opportunities to actively participate and contribute to the community in which they live. On a broader and global perspective, student participation can be enacted at the local, state, and/or national levels. There are no parameters to the degree that students can take informed action. However, the focus, rather, is that students are given the opportunities to actively experience making positive and informed changes to the community in which they belong. This will support students in making connections with the content that they learned throughout this inquiry and applying this knowledge to present-day situations.

For this inquiry, it is suggested that students understand, assess and take action to protect native and non-native plants that were significant to the early Hawaiians and how these plants continue to be significant to the Hawaiian culture today.

*Note: It is to be determined by the teacher, the most applicable and relevant instructional strategies to accomplish the three steps (understand, assess, act) of Taking Informed Action listed below:

**UNDERSTAND** How do we protect native and non-native plants that are significant to the Hawaiian culture? Generate a list of the effects of a diminished native or non-native plant population (effects on native animals, altering sustainable ecosystems, becoming endangered/extinct, etc.).

**ASSESS** Evaluate the survival rate of one native plant as a precursor to determine which plant population to replenish in the “act” step.

**ACT** Partner with agency/group/program that focuses on advocating and supporting native and non-native plants significant to Hawaiian culture.

1. Create a public service announcement (PSA) in support of that specified organization and their goals.
2. Participate in collaboration with this partnership in planting/replenishing native and non-native plants in a specific location.