The Menehune and the Birds: The Flow of Energy in Hawai'i's Rainforest

Lesson 1

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Developing Background
Focus, Make Connections, and Reflect

Driving Question: *Why should we be concerned about the threatened rainforest and organisms within the rainforest?*

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The Menehune and the Birds: The Flow of Energy in Hawai‘i’s Rainforest

Lesson 1

Mālama ika ‘āina *(Respect the Land)*

You came for feathers and destroyed the very ***source*** *of your treasure.*

Lesson Notes

I. Reflecting and Connecting

Concepts/Themes
In a food chain, every organism can be classified as a producer, a consumer, or a decomposer.

Simple food chains and food webs can be traced back to plants.

Food chains and food webs are affected by introduced species.

Objective
Students express their personal reflections on why a healthy forest habitat is important to them.

Length
30 minutes

Materials
1. E Ho`omau! journals

Developing Background

Focus, Make Connections, and Reflect

Driving Question: *Why should we be concerned about the threatened rainforest and organisms within the rainforest? Why is a healthy forest habitat important to you?*

I. Reflecting and Connecting

1. Complete Personal Reflections
   Students record at least two personal responses to the driving question in their *E Ho‘omau!* journal. In *The Menehune and the Birds,* the Menehune chief tells the men, “You came for feathers and destroyed the very **source** of your treasure.” *What did he mean?* Related questions might include: (a) *imagine the forest gone* and (b) *why should you care?*

2. Conduct a Class Discussion

   a. Hold a discussion on the driving question starting with students sharing one idea from their journal. Related questions might include: *What are examples of healthy habitats?*
   b. Encourage students to use examples from their interdependence lessons.
   c. Extend the idea beyond the rainforest, into family

communities, school communities, neighborhood communities, and global communities, and their connections with the rainforest and among themselves.

The responses reflect student's personal experiences and provide insights into the background information they bring to the lesson. Students may also include the ideas that were developed in lessons related to the animated stories, *The Menehune and the Birds*.

II. Simulating Interactions and Interdependence, Class Web

Objective
Students articulate how the Class Web activity relates to interactions and interdependence in the rainforest.

Length
30 minutes

Materials
1. *Appendix 1.1: Flow of Energy Class Web.*
2. *Colored yarn prepared in a ball (see directions).*
3. *The Menehune and the Birds Cycles of Matter and Flow of Energy science text-set.*

II. Simulating Interactions and Interdependence, Class Web

The Class Web is an activity that demonstrates interactions and interdependence among parts of the whole—whether it relates to the organisms in the rainforest, or the people in a family, school, or community. (See Appendix 1.1: *Flow of Energy* Class Web.)

1. Have students stand in a circle.

2. Provide the students with the activity rules:

    a. Each student represents a member of a community and is dependent on someone or something in their community.
    b. The yarn will be tossed to show the connections.
    c. Hold on to the yarn and toss the ball to someone in the circle.

3. The teacher starts the toss by looking at the student she will toss the yarn to. In one sentence say what connection she has with the student; (e.g., "I pick up Fran at her home each morning").

4. Fran catches the ball of yarn and looks around the circle and tosses the yarn, explaining in one sentence what her connection is with that student; (e.g., Manu helps me with my ukulele tuning before the morning music class).

5. Continue until everyone has tossed and received the ball of yarn. A web is created.

6. Discuss how the web illustrates the connections and interdependence among the group members.

7. Debrief in a discussion. Ideas may include:

    a. Illustrations of connections.
    b. Importance of all.

c. Strength of the whole connection.
d. Impact when one connection is loose, or is lost.
e. Impact when several connections are lost.
f. Jobs and roles in the communities that students are connected to.

8. Relate the activity to the rainforest and the organisms in the rainforest.

    a. *How is this class web similar to interdependence in the rainforest?*
    b. *What happened when one link was dropped?*
    c. *What happened when someone else picked up for another person? What happened to the person? What happened to the group?*

9. A variation of the game is to have students take the role of different organisms in the rainforest and act out their interdependence.

III. Balancing Rainforest Relationships With Four Squares

Concept/Theme
Language follows conventions or rules. These rules help ensure effective communication. Knowledge of conventions is needed to comprehend and construct text (print, media, and electronic).

Objective
Students accurately depict balance in the rainforest using the four square vocabulary strategy.

Length
30 minutes

Materials
Appendix1.2: The Flow of Energy Four Squares.

Hawaiian Words
Laulima
'Ohana (family)
Kokua (help)

III. Balancing Rainforest Relationships With Four Squares

In a healthy habitat, the organisms depend on one another for their food, shelter, and water. On a larger scale, the whole rainforest depends on the balance among the organisms, even beyond the rainforest.

1. As a class, read Pages 1 and 2 in *The Menehune and the Birds: The Flow of Energy in Hawai'i's Rainforest.*

    a. Focus on the Kumulipo poem that shows partnerships, or the balance between land and sea organisms.
    b. Invite a kūpuna to the class, or have students check with their kūpuna on other interdependent relationships.
    c. Invite students to check with their parents on other relationships beyond the land and the sea. For example, when the moon is full, the crabs are empty.

2. Introduce the concept of balance.

    a. What purpose did poems serve to the early Hawaiians?
    b. What can you infer from the Kumulipo poem about the practices they followed?
    c. Why would they express these ideas in poems?

3. Extend the idea of balance between the rainforest and humans.

    a. Read “Think About It,” on Page 3 in *The Flow of Energy in Hawai‘i’s Rainforest.*

4. Conduct a class discussion after reading the questions in “Making Connections,” on Page 4 in *The Flow of Energy in Hawai‘i’s Rainforest.*

5. Have students complete a four square activity with a partner.

6. Share the student four squares. Students return to these squares at the end of the lesson to compare their perspectives of *balance*.

Appendix 1.1: *The Flow of Energy* Class Web

Class Web

What is the Class Web?
The Class Web is an activity that demonstrates interactions and interdependence among parts of the whole—whether it relates to the organisms in the rainforest, or the people in a family, school, or community.

Purpose
To demonstrate the concepts of balance and interdependence among individuals, groups, and communities.

Materials
Colored yarn rolled in a ball (approximately 30 yards).

Procedure

Prepare the yarn by tying different colored yarn (approximately 2 yards per color) as you form a ball. For example, tie 2 yards of red yarn to yellow; tie another 2 yards of green to the yellow yarn. Continue tying different colors until you have a ball with approximately 30+ yards of yarn.

Do this activity in an open area where students can comfortably stand in a circle.

1. Have students stand in a circle.

2. Provide the students with the activity rules:

    a. Each student represents a member of a community and is dependent on someone or something in their community.
    b. The yarn will be tossed to show the connections.
    c. Hold on to the yarn and toss the ball to someone in the circle.

3. The teacher starts the toss by looking at the student she will toss the yarn to. In one sentence say what connection she has with the student; (e.g., “I pick up Fran at her home each morning”).

4. Fran catches the ball of yarn and looks around the circle and tosses the yarn, explaining in one sentence what her connection is with that student.

5. Continue until everyone has tossed and received the ball of yarn. A web is created.

6. Discuss how the web illustrates the connections and interdependence of the group.

7. Discuss:

a. Connections.
b. Importance of all.
c. Strength of the whole connection.
d. What happens when one connection is loose, or is lost?
e. What happens when several connections are lost?
f. Jobs and roles in the communities that students are connected to.

8. Relate the activity to the rainforest.

Variations of the activity:

1. Instead of school jobs and roles, use the interactions found in the previous lesson on Interdependence among organisms in the rainforest.

2. Use the game as a culminating activity showing food web connections, with each student represented as part of a food web.

Appendix 1.2: *The Flow of Energy* Four Squares

Four Squares

What is Four Squares?
Four Squares is a simple version of a word map. It is used for any word with which students are having difficulty. It was developed by Eeds and Cockrum (1985), and because of its simplicity, it is sometime referred to as a "hip pocket" approach.

It is recommended that this activity be completed with the whole class, or in cooperative groups, capitalizing on the interactive discussions with others.

Purpose
1. *To build a deeper understanding of word meanings or concepts.*
2. *To establish word relationships.*

Materials
Blank copy of Four Squares.

Procedure

1. Each student folds a sheet of paper to create four sections.
2. Students write the target word or concept in the upper left corner of the section.
3. The teacher describes the word and provides a student-friendly definition that serves as a conversation starter. (Students do not write the definition.)
4. Have students provide examples of the word or concept. Make a list of these examples. Have students select and write several examples in the top right corner of the section of their paper.
5. Next, repeat the same procedure with nonexamples. Have students write the nonexamples of the word or concept in the bottom right corner or section of the paper.
6. Ask students to compose a definition in their own words for the concept or word in the bottom left corner or section of the paper.

Reference

Eeds, M., & Cockrum, W. (1985). Teaching word meanings by expanding schemata vs. dictionary work vs. reading in context. *Journal of Reading*, *28*(6), 492–497.

Four Squares

Word	**Examples of the Word or Concept**
Abundant	Birds in the Menehune rainforests Plenty of rain Lush forest Source of energy
Student's Definition of the Word	**Nonexamples of the Word or Concept**
In great quantity; lots of	Scarce supply of feathers Sparse growth of trees Decreasing forest resources

The Menehune and the Birds Word List

Adaptation	Interdependence	Cycle of Matter/Flow of Energy	Hawaiian Words
adapt	absorb	eliminate	ali'i
defend	abundant	predator	kolohe
definite	adequate	prey	kuleana
habitat	consumer	provide	pololei
survive	decomposer	release	pono
transform	identifiable	scarce	
evidence	microscopic	transfer	
	producer		

Four Squares

Word	Examples of the Word or Concept
Interdependence	
Definition of the Word	Nonexamples of the Word or Concept

Name: _____ Date: _____

The Menehune and the Birds: The Flow of Energy in Hawai'i's Rainforest

Lesson 2

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Understanding the Flow of Energy
Acquire, Process, Understand, and Conceptualize Knowledge

Driving Question: *What is the flow of energy that keeps organisms in balance in the Hawaiian rainforest?*

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IV.	Developing word learning strategies using word parts (suffixes) (See Appendix 2.2: *The Flow of Energy* Word Part Strategies—Suffixes) (See Appendix 2.2a: *The Flow of Energy* Prefix and Suffix Squares)	15 21 25
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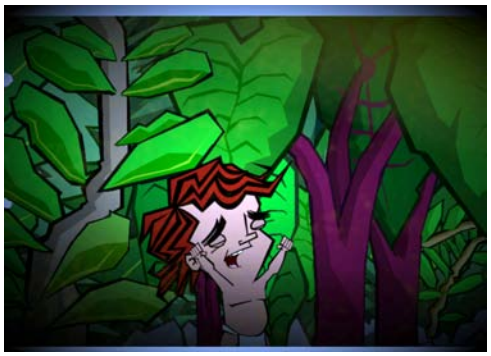
VI.	Seeing the flow of energy in a rainforest with a Concept of Definition Map (See Appendix 2.4: *The Flow of Energy* Concept of Definition)	16 35

The Menehune and the Birds: The Flow of Energy in Hawai‘i’s Rainforest

Lesson 2

Mālama ika ‘āina *(Respect the Land)*

By the time you have finished these tasks, you will understand that people, trees, and plants are all connected in the forest.



Lesson Notes

I. Understanding Food Chains in the Rainforest

Concepts/Themes
A range of environmental conditions must exist to meet the specific needs for survival of an organism.

In a food chain, every organism can be classified as a producer, a consumer, or a decomposer.

Food chains and food webs are affected by introduced species.

Objective
Students demonstrate the appropriate relationships of producers, consumers, and decomposers using the organism cards.

Length
45 minutes

Materials
1. *The Flow of Energy in Hawai‘i’s Rainforest science text-set.*
2. *The Menehune and the Birds graphic novel*

Developing an Understanding of Flow of Energy
Acquire, Process, Understand, and Conceptualize Knowledge

Driving Question: *What is the flow of energy that keeps organisms in balance in the Hawaiian rainforest?*

I. Understanding Food Chains in the Rainforest

Information from the animated story, the graphic novel, and the science text-sets provide the content for understanding the flow of energy in Hawai‘i’s rainforests. If the school is located close to a rainforest, use the rainforest as your laboratory. If the school is located in an urban area, apply the concepts to urban organisms.

1. Conduct a discussion on what students know about the words *producers*, *consumers*, and *decomposers*. Relate and make connections to their own experiences:

   Producers: organisms that make, invent, grow things.
   Consumers: organisms that use the goods, eat the goods, buy the goods.
   Decomposers: organisms that change matter into rich material (relate to compost, worm farms, etc.)

2. Introduce the concepts of producers, consumers, and decomposers in a rainforest.

   a. Read “The Sun’s Energy” on Page 5 in *The Flow of Energy in Hawai‘i’s Rainforest.* Emphasize where the energy comes from and what the

3. *Appendix 2.1: The Flow of Energy Rainforest Food Chain.*
4. *Appendix 2.1: The Flow of Energy Rainforest Food Chain.*

energy is used for in each part of a food chain.

b. Have the students recall the organisms they are familiar with from their rainforest visit/experience. Place the names of the organisms in the consumers, producers, or decomposers group.

3. Relate the word *chain* to the students' experiences (chain necklace, chain link fence, chain saw, food chain, etc.). *How are chains all similar? What holds all of the chains together?*

4. Read "Levels in a Food Chain: Rainforest Example" on Page 5 in *The Flow of Energy in Hawai'i's Rainforest.*

    a. Discuss where the energy comes from (the source of energy) and where the energy is transferred to (the consumer). Notice that the arrows point to where the energy is transferred.
    b. Discuss what it means to be the *top of the food chain.*

5. Students predict what the food chain would look like using the organisms in the "Producers and Consumers Chart" on Page 6 in *The Flow of Energy in Hawai'i's Rainforest*.

6. Complete food chain cards by following the directions provided in Appendix 2.1: *The Flow of Energy* Rainforest Food Chain.

    Note: Students completed cards of birds in Appendix 4.1: *Adaptations* Rainforest Features. Include those cards with the current set of cards.

Assessment: Do a quick check on student understanding of consumers, producers, and decomposers. Call out the word *consumer, producer, or decomposer*. Have the students hold up a card that represents the type of organism called. Discuss any misconceptions.

II. Understanding the Flow of Energy in a Food Chain

Objective
Students demonstrate understanding of a food chain by accurately placing the organisms in a food chain relationship.

II. Understanding the Flow of Energy in a Food Chain

1. As a class, model an example of a food chain in a rainforest.

    a. Nuku ʻiʻiwi → ʻiʻiwi → ʻio

2. The teacher provides each group a set of cards. (See "Other Examples of Food Chains in a Rainforest" on Page

Length
45 minutes

Materials
1. *The Flow of Energy in a Rainforest text-set.*
2. *Organism Cards created from directions included in Appendix 4.1: Adaptations Rainforest Features.*

6 in *The Flow of Energy in a Rainforest*.)

a. Students in the group arrange the cards to show the flow of energy in a food chain.
b. The group shares their arrangement with the rest of the class.

Assessment: Do a quick sight check on whether students are able to show accurate food chain arrangements.

III. Understanding the Flow of Energy in a Food Web

Concept/Theme
A food chain is part of a larger food web.

Objective
Students demonstrate the relationship of organisms in a rainforest by accurately determining the effect if one organism is removed from the food web.

Length
Two 45-minute sessions

Materials
1. *Food chain organisms.*
2. *Yarn.*
3. *Organism cards.*

III. Understanding the Flow of Energy in a Food Web

Most organisms are part of several food chains. They eat more than one kind of food to survive. And they, themselves, may be eaten by different kinds of consumers. A simple food chain is part of a larger food web.

1. Depending on the class, students could either create a food web bulletin board, or participate in the web activity introduced at the beginning of the lesson. Use the organism cards for this lesson.

2. Create a Food Web Bulletin Board

    a. Discuss with students the organization of the food web (arrows pointing in the direction of the energy). Study the flow of energy on Pages 7 and 8 in *The Flow of Energy in Hawai'i's Rainforest* text-set.
    b. Start with one organism and use the yarn to show the flow of energy.
    c. Continue until all of the organisms are placed on the bulletin board.

3. Participate in a Food Web Activity

    a. The Food Web activity is a natural way to assess the class' understanding of web relationships.
    b. Define the rules of the activity. With a web, each student takes the role of an organism (tape an organism card on each student, like a name tag).
    c. Start with the *sun*, who says, "I provide energy to the koa tree so the tree can produce its own food."
    d. The koa tree receives the ball of yarn and explains that he/she is an 'ōhi'a and says, "I produce my own food. I provide energy to the decomposers

when I get old and rot."

e. Continue the activity until all of the students have a turn.

4. Summarize by eliciting observations made by the students.

    a. *What happens if one organism is missing in the web*? (e.g., the nuku ʻiʻiwi, the ʻōhiʻa, or the ʻio.)
    b. Emphasize the roles of each type of organism—producers, consumers, and decomposers.

5. Find out which organisms are still common, which ones are threatened, which ones are endangered, and which ones are extinct. (See "Common, Threatened, Endangered, and Extinct Endemic Organisms" on Pages 11 and 12 in *The Flow of Energy in Hawaiʻi's Rainforest.*)

6. Students record reflections in their journals.

    a. What might be some of the effects you would notice if the organisms in the rainforest disappeared? Provide specific examples.
    b. What difference would it make to the plants in the rainforest?
    c. *What difference would it make to other birds and animals?*
    d. *What difference would it make to you?*

Assessment: Students complete a simple cause and effect graphic to show at least two effects if one of the organisms disappeared (e.g., the nuku ʻiʻiwi, the ʻiʻiwi, or the koa tree). The teacher may select other organisms.

IV. Developing a Word Learning Strategy to Understand Word Parts

IV. Developing a Word Learning Strategy to Understand Word Parts

Objective
Students independently figure out the meanings of unfamiliar words that begin with a prefix or end with a suffix

Length
45 minutes

Materials
1. *The Flow of Energy in Hawaiʻi's Rainforests text-set.*

When you think of conserving Hawaiʻi's rainforests, what comes to mind? The *protection* of Native Hawaiian birds and plants found nowhere else in the world? The *preservation* of rainforest habitats that provide food and shelter for endemic plants and animals? The careful management of Native Hawaiian plants and animals, and their habitats? You are on the right track to understanding rainforest *conservation*!

1. Model with students the different strategies to unlock words with suffixes. (See Appendix 3.3: *The Flow of Energy* Prefix and Suffix Introduction.*)*

2. *Appendix 3.3: The Flow of Energy Suffix Introduction.*
3. *Appendix 3.3a: The Flow of Energy Suffix Squares.*

   a. Model with the sample *protection* in Appendix 3.3a: *The Flow of Energy* Prefix and Suffix Squares.

2. Have each student complete suffix squares for *protection*, *preservation*, *conservation*, *restoration*, and *extinction*.

   a. Understand how the suffix *–ion* changes the meaning and part-of-speech of the word.

Assessment: Review the suffix squares for accuracy.

V. Comparing the Conservation, Protection, Restoration, and Preservation of the Rainforests.

Objectives
Students apply the use of organizational patterns, such as compare and contrast, to demonstrate their understanding of conservation, protection, restoration, and preservation.

Length
45 minutes

Materials
1. *Appendix 3.4: The Flow of Energy Compare and Contrast.*
2. *The Flow of Energy in Hawai'i's Rainforests text-set*

V. Comparing Conservation, Protection, Restoration, and Preservation of the Rainforests

1. Skim Pages 15–18 in *The Flow of Energy in Hawai'i's Rainforest.* Look for practices that are in place to help save the Hawaiian rainforests and the organisms in the rainforests.

   a. Identify protection, conservation, preservation, and restoration efforts. *What are the purposes, and what are the impacts?*

2. Students create their own graphic organizer to show the similarities and differences of these practices.

3. Consider which practice the students think they could participate in, and which one would be most difficult to participate in, and why?

VI. Seeing the Flow of Energy in a Rainforest with Concept of Definition Maps

Objective
Students accurately complete Concept of Definition maps of targeted vocabulary words.

Length
30 minutes

Materials
Appendix 2.4: The Flow of Energy Concept of Definition Map.

VI. Seeing the Flow of Energy in a Rainforest with Concept of Definition Maps

1. Complete Semantic Concept Maps for any of the words that were not reviewed in the lesson.

   a. Provide students with the words.
   b. Have students work in pairs or independently.

Appendix 2.1: *The Flow of Energy* Food Chain

Rainforest Food Chain

All organisms need energy to survive and grow. Energy comes in the form of the sun and food. How does energy flow in an ecosystem like the Hawaiian rainforest? The energy that flows from the sun to the producer, such as the koa tree, and on to the consumer, shows the path, or *flow of energy*, from one organism to another. This transfer of energy is called a food chain.

Purposes

1. *To reinforce word or concept learning by applying the use of the words and concepts in an application context.*
2. *To describe the relationship among concepts.*
3. *To apply knowledge of the new words or concepts.*

Materials

1. *Trade books.*
2. *Textbooks.*
3. *Online Internet simulation sites.*
4. *Cards, illustration material.*

Procedure

1. Provide groups of students with names of organisms that live in a rainforest. For example, birds, insects, plants, animals, and microscopic bacteria. (See Page 6 in *The Menehune and the Birds Flow of Energy.*)

2. Students research specific rainforest organisms and provide the following information on cards:
   - Name
   - Picture
   - A one sentence description of the organism
   - Energy level of the organism
   - Its survival features (habits, physical features)
   - Food
   - Shelter

   On the back of the card include its food and the organisms that it is eaten by.

3. Share cards with other groups.

   a. Have the groups lay out the cards in a food chain board display.
   b. Each group explains their food chain. Other students are encouraged to ask questions.

4. Debrief as a class, reviewing the major concepts:

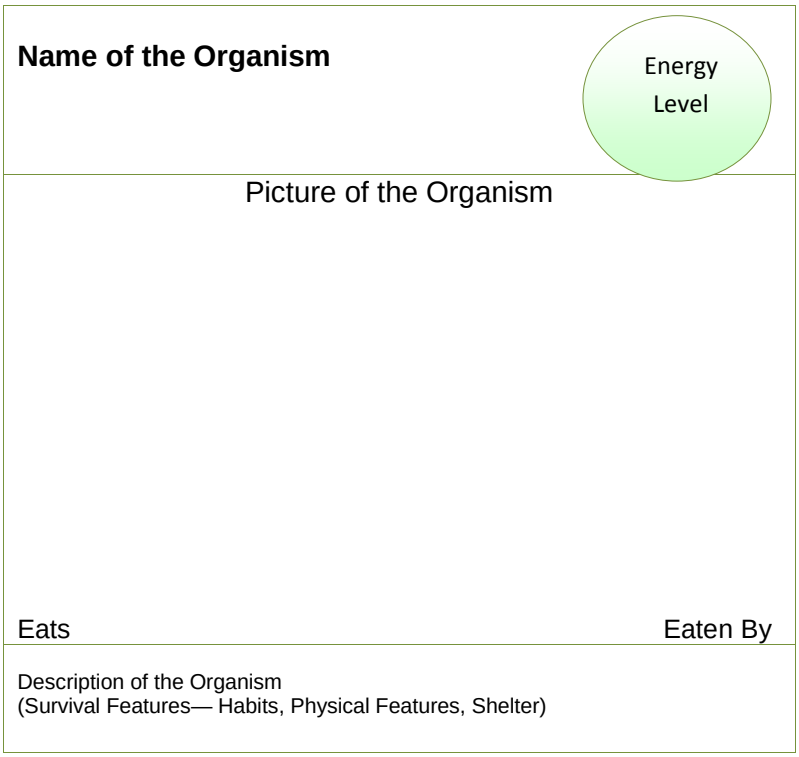
   c. Consumers, producers, and decomposers food chain

Extension

1 Students create their own card game using the Rainforest Map and Food Chain Animal Cards.
2 Students play or create their own food chain game, such as an application from simple to complex food chains.

Resources	**Biomes and Habitats** [*www.enchantedlearning.com/subjects/rainforest/animals/Rfbiomeanimals.shtml*] This website includes pictures and descriptions of animals that live in the tropical rainforest. **The Food Chain** [*www.sheppardsoftware.com/content/animals/kidscorner/foodchain/foodchain.htm*] This website provides interactive explanations, simulations, and games on food chains. **The Food Chain Game** [*www.sheppardsoftware.com/content/animals/kidscorner/games/foodchaingame.htm*] Users place the organisms in a food chain from simple to complex chains. **Living Things—Food Chains** [*www.bbc.co.uk/schools/ks2bitesize/science/activities/food_chains.shtml*] The British Broadcasting Corporation (BBC) provides an interactive video, worksheet, test, and fact sheet on food chains. **Parts of the Food Chain (Producers and Consumers, and Others)** [*www.sheppardsoftware.com/content/animals/kidscorner/foodchain/producersconsumers.htm*] Information about the food chain is provided. **Producers and Consumers** [*www.sheppardsoftware.com/content/animals/kidscorner/foodchain/producersconsumers.htm*] Basic information is provided about the producers and consumers in a food chain.

Rainforest Organism Sample

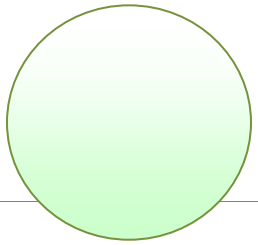


Directions
Create a card for each organism. The card includes:

- **Level**: For each organism, provide a level of energy (consumer, producer, or decomposer).
- **Name of the Organism**: Write the name of the organism you are describing.
- **Description of the Organism**: Include the survival features of the organism as they relate to its habits, physical features, the food it eats, and the shelter that protects it.
- **What it Eats and Whom it is Eaten By**

Words that may be used in the descriptions:
Producer, consumer, decomposer, microscopic, adequate, decay, source, absorb, habitat, organism, adaptation, survive, nutrient, defend, structure, predator, prey, provide, eliminate, release.

Name of the Organism



Picture of the Organism

Eats: **Eaten By:**

Description of the Organism

Appendix 2.2: *The Flow of Energy* Word Part Strategies—Suffixes (Introduction)

Word Part Strategies—Suffixes
Explicit Instruction

Overview
Instruction in word parts is a valuable word-learning strategy, particularly for English language learners and struggling readers. There are a relatively small number of affixes that are used in a large number of words. The following affixes are introduced in *E Ho'omau!*

- ***un-, dis-, re-, in-*** (*im- , ir-)* are the four most frequent prefixes that account for 58% of the prefixed words in printed school English
- ***-ly, -er*** *(-or)* ***-ion*** *(-ation, ition),* ***-able,-ible*** are four of the seven most frequently used suffixes that account for 82% of suffixed words in printed school English.

  (White, T., Sowell, J., & Yanagihara, A. (1989). Teaching elementary students to use word-part clues. *The Reading Teacher, 42,* 302–309.)

A suffix is a group of letters added at the end of a word. Learning these word endings can help students recognize whether a word is a noun, verb, adjective, or adverb.

Note: The lesson focuses on *derivational suffixes*, not *inflectional* suffixes. *Derivational suffixes* change the meaning of the base word and are usually a different part of speech. The meaning of the word is related to the original meaning—it is derived from the original meaning.

Since suffixes are often abstract and it is difficult to explain their meanings, instructional process focuses on suffix removal. By separating a suffix from the base word, students can recognize or decode the base word and then reapply the suffix.

Emphasize the use of word-part clues with context clues to verify the meanings of the affixed words since there are multiple meanings to many words.

An effective process is the application of the *think-aloud strategy*. Using think-aloud will provide learners with a tool they can use to unlock unknown words independently. In this process, the learners:

1. Identify and remove the suffix in a word.
2. Understand when a suffix is removed, there may be something left that *looks* like a word.
3. Determine and identify the base word.
4. Determine whether it is a suffix that can help unlock the word's meaning. (*Does the base word look like a word you might know?*)
5. Use context clues to verify the word's meaning

Think-Aloud Strategy

1. When I come to an unknown word that may contain a suffix, remove the suffix.

   An early Hawaiian **explorer** used his canoe with the help of the wind, currents, stars, and sun to guide him.

   explorer (n.) Take away the suffix *-er*

2. Look at what is left.
   explore

3. Ask yourself, do I know what the word means?
   explore means to travel from place to place; to discover

4. Can the suffix unlock the meaning of the word?
   -er added to something that is done, such as *explore*, usually refers to a person.

5. Use the context of the sentence to unlock the meaning of the word.
   A Hawaiian **explorer** is a person who travels from place to place to discover something.

6. Summarize the process. By taking away the suffix, you may recognize the meaning of the word base. Knowing how the suffix changes either the meaning, or part-of-speech of the word, will help you unlock the meaning of the word. You can verify the meaning by using other clues in the sentence.

7. Use other examples with the think-aloud process.

Word	Take away the suffix	Word you know or like a word you might know	Meaning of the base word	New meaning
teacher (n.)	er	teach (v.)	to instruct	one who instructs
brotherly (adv.)	ly	brother (n.)	a male sibling	like a brother
agreeable (adj.)	able	agree (v.)	to have the same opinion	able to have the same opinion
exploration (n.)	ation	explore (v.)	to travel to places; to discover	the process of traveling from place to place; to discover

Suffixes change the meaning and may change the part of speech of a word. See how common suffixes used in the *E Ho'omau!* material can help you unlock the meaning of unknown words.

Suffix	Change to the part-of-speech	Original word	Suffixed word	Changed Meaning
-ation	verb → noun	explore (v.) hesitate (v.)	explor**ation** hesit**ation**	act of, state of, result of
-sion		persuade (v.) divide (v.)	persua**sion** divi**sion**	act of, state of, result of
-er		teach (v.)	teach**er**	one who, that which
-able	verb → adj.	tax (n., v.)	tax**able**	can, can do, able to
-ly		brother (n.)	brother**ly**	characterized by
-ly	verb → adv.	hope (v., n.)	hope**fully**	like

Practice Words with Targeted Suffixes in The Menehune and the Birds

Booklet 1	Booklet 2	Booklet 3
adequately approximately conductor consumer definitely provider survivor	absorption consumer decomposer habitable identifiable producer responsible transferable	absorption adaptation conservation elimination extinction preservation protection

Provide multiple opportunities to practice and apply the suffix removal strategy.

Practice Sentences

1. The **survivors** of the rainforest were able to adapt to the conditions of their environment.
2. 'I'iwi vines provided food for the **consumers,** such as the 'i'iwi, whose beak over years

developed into a shape of the ‘i‘iwi flower.

3. The Hawaiian Islands are located **approximately** 2,500 miles away from the nearest continent.
4. Everyone is **responsible** for keeping invasive species from ruining our rainforests.
5. The kapu system of the early Hawaiian communities was a natural way to practice **conservation** of the ‘aina.

Appendix 2.2a: The Flow of Energy Suffix Squares

Prefix or Suffix Squares

What Are Prefix and Suffix Squares?
Prefix and suffix squares is a strategy that students can use to make personal associations with unfamiliar words by using graphics as they learn the meanings of prefixes and suffixes. As students learn the strategy, encourage them to apply it in a variety of contexts to develop their problem-solving skills in using word parts to understand the meaning of unknown words.

Purposes
1. *To build word consciousness.*
2. *To create personal associations in picture form for unfamiliar words.*
3. *To develop the strategy to independently figure out the meanings of unfamiliar words that begin with a prefix or end with a suffix.*

Materials
1. *Blank prefix-suffix squares template.*
2. *Drawing tools.*
3. *Dictionary.*

Procedure

1. Introduce the idea to the class by modeling the process with a few examples. Using the *think-aloud strategy* will help students in developing the skills of independently applying the strategy when they encounter an unfamiliar word with a prefix or suffix.
2. Divide a drawn square into four parts and label them according to the prefix/suffix sample.
3. In the top-right corner, write a word that has the prefix or suffix that the class is focusing on.
4. *Prefixes (un-, dis-, in-, im-, ir-)*
   Suffixes (-er, -ly, -able, -ible,- ion, -sion, -tion, -ation)
5. Remove the prefix or suffix and place it in the top-left corner of the square.
6. It is also important to have students be aware of prefix tips.
7. Check to see if the part of the word left is a real word.
   a. Not all *un-* are prefixes. For example, in the word *uncle*, removing the *un-* leaves (cle) which is not a base word. So *un-* in uncle is NOT a prefix.
   b. Prefixes have more than one meaning. For example, *un-* may mean *not* (unhappy) or *do the opposite of* (uncover).
8. Use the context of the word to figure out the meaning of the word. In other words do not only rely on the prefix and suffix.
9. In the bottom-left corner, write the meaning of the prefix or suffix.

10. In the bottom-right corner, draw a picture of the word and add a caption to it.

11. Have students collect words that share the same prefixes and suffixes that are the focus of study. In *E Hoʻōmau!,* the students encounter the following prefixes:

    Prefixes *un-, dis-, in-, im-, ir-, re-*
    Suffixes *-ly, -ion, -tion, -ation, -ition, -er, -or, -able, -ible*

12. Students share their squares by placing squares with similar prefixes together on a display board.

13. Have a discussion with the students focusing on arriving at the meaning of the word by removing the prefix or suffix, seeing it in context (caption), and associating the word with the picture.

Reference

Bromley, Karen (2002). *Stretching students' vocabulary: Vocabulary squares*, pp. 85–86. NY: Scholastic Professional Books.

Prefix Square

Prefix	A Word With the Prefix and its Meaning
un-	<u>unsafe</u> not safe or dangerous
Meaning of the Prefix	Graphic of the word
not	 It is **unsafe** to be in the water or near a site where the lava enters the ocean.

Prefix Square

Prefix	A Word With the Prefix and its Meaning
Meaning of the Prefix	Drawing of the Word Caption Sentence

Name: _____ Date: _____

Suffix Square

Suffix	A Word With the Suffix and its Meaning
-ion	<u>Protection</u> The act of protecting or shielding someone from harm
Meaning of the Suffix	Graphic of the Word
The act of The result of	 The <u>protection</u> of the forest is the kuleana of the Menehune.

Suffix Square

Suffix	A Word With the Suffix and its Meaning
Meaning of the Suffix	Graphic of the Word Caption Sentence

Name: _____ Date: _____

Appendix 2.3: *The Flow of Energy* Compare and Contrast Introduction

Compare/Contrast
Explicit Instruction

What is a Text Structure?
Text structures are the way authors organize the information in text. The most common informational text structures include the following: compare/contrast, problem/solution, cause/effect, sequence, and descriptive. Most informational texts contain a variety of integrated types of text structure.

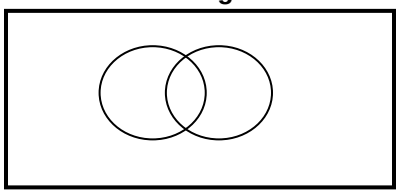
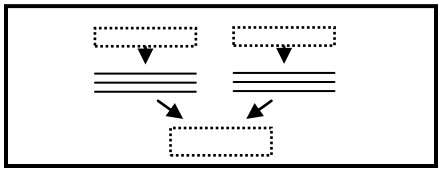
Compare/Contrast
One of the text structures that authors use to organize text is called compare/contrast. "Research has suggested that, of the most common expository text structures, the compare/contrast structure may be one of the more difficult for students to navigate" (e.g., Englert, & Hiebert, 1984; Raphael, Elglert, Kirschner, 1986). (Dreher, p. 134) It has also been stated that becoming familiar with the text structure of compare/contrast is particularly helpful to English Language Learners because it helps them to compare their own background knowledge with the new information. See Table 1 found below for additional information about the text structure of compare/contrast.

Signal Words
The way a reader can understand the text structure or the organization pattern of a text is through the use of signal words. Signal words are specific words that are clues or sign posts to the structure of the text. Each type of informational text has signal words that are unique to that structure. Signal words are clues to the reader that the author has organized the text in a specific way. In higher level texts, the signal words are often inferred rather than explicitly stated. See Table 1 for signal words that are commonly used with the text structure of compare/contrast and cause/effect.

Graphic Organizer
A graphic organizer is "A visual representation of information that shows the relationship between ideas or their organization" (Fountas & Pinnell, 2006, p. 490). Graphic organizers can be used to outline the text structure or pattern. They keep students actively engaged in reading and they help students see the structure and remember the important points. Graphic organizers keep students actively involved and help them to organize information, see how the major ideas are related, and remember key ideas that they read. See Table 2 for examples of graphic organizers for the compare/contrast and the cause/effect text structure.

Table 1: Text Structure of Compare/Contrast

Text Structures and Signal Words

Text Structure	Description of structure	Signal words: Words	Sample Graphic Organizers
Compare/ Contrast	Texts that follow this structure describe similarities and differences between two or more things, places, or events. Example: Haleakala is a dormant volcano found in Hawai'i while Mount Rainier is a dormant volcano found in the state of Washington. Haleakala is 10,023 feet tall whereas Mount Rainier is 14,410 feet tall.	different from, same as, alike, like, unlike, similar to , as well as, yet, not only, but also, either…or, most however, on the other hand, opposite, opposed to, while, both, by contrast, compared with, different from, however, in common, instead of, on the other hand, otherwise, still, unlike, whereas, yet	**Venn Diagram**  **Compare/Contrast Matrix** Attribute | Item | Item | Item Attribute 1 Attribute 2 Attribute 3 **Compare/Contrast** 

Written by Susan Hanson, Reading Specialist at PREL (Pacific Resources for Education and Learning)

References

Dreher, M.J., Gray, J.L. (October 2009). Compare, contrast, comprehend: Using compare-contrast text structures with ELLs in K–3 classrooms. *The Reading Teacher*, *63*(2), pp. 132–141.

Fisher, D., Frey, N., & Lapp, D. (2009). *In a reading state of mind: Brain research, teacher modeling, and comprehension instruction*. Newark, DE: International Reading Association.

Fountas, I. C. & Pinnell, G. S. (2006). *Teaching for comprehension and fluency: Thinking, talking, and writing about reading, K–8*. Portsmouth, NH: Heinemann.

Williams, J. P., Nubla-Kung, A. M., Pollini, S., & Stafford, K. B. (March/April 2007). Teaching cause-effect text structure through social studies content to at-risk second graders. *Journal of Learning Disabilities*, *40*(2), pp. 111–120.

Appendix 2.3: Signal Words

Compare and Contrast Signal Words

Compare (Similarities)	Contrast (Differences)
alike	although
as well as	by contrast
both	different from
but also	however
compared to	in contrast to
in common	instead of
just like	most however
like	on the other hand
not only	opposite
same	opposed to
similar to	unlike
	while
	yet

Protection, Preservation, Conservation, Restoration

Skim pages 15–18 in *The Flow of Energy in Hawai'i's Rainforest* text-set. Create your own compare and contrast graphic organizer to show the similarities and differences among the practices to save the rainforest.

Name: _____ Date: _____

Appendix 2.4: The Flow of Energy Concept of Definition Map

Concept of Definition Map

A *concept of definition map* is a graphic organizer that helps students develop a richer concept of a word that goes beyond the way it is often defined in a dictionary (Schwartz and Raphael, 1985). A new word's attributes (category, properties) are explored to broaden and deepen students' understanding of the word.

Purpose

1. *To build a deeper understanding of word meanings or concepts.*
2. *To establish word relationships among words.*

Materials

1. *Blank copy of Concept of Definition Map.*
2. *The Menehune and the Birds Flow of Energy in the Rainforest.*
3. *Dictionary.*
4. *Science books.*

Procedure

1. Begin by modeling the process with the entire class. Discussions are a key component of the process since many science words are entirely new concepts. Discussions allow students to actively process word meanings and to develop a deeper understanding of complex concepts.

2. Inform students that everyone will work together to come up with a richer definition for a target concept they are learning about in class (e.g., *organism*). Write the word in the center circle.

3. Guide students to have them determine the broad category that the target word belongs to (e.g., *living things*).

4. Complete the map by asking students what are some words that describe the word (e.g., *animals, plants, grows, survives*) based on the context of what they are reading or have read. Have other resources available such as science text-sets, glossaries, or dictionaries.

5. Invite students to provide examples and nonexamples of the word.

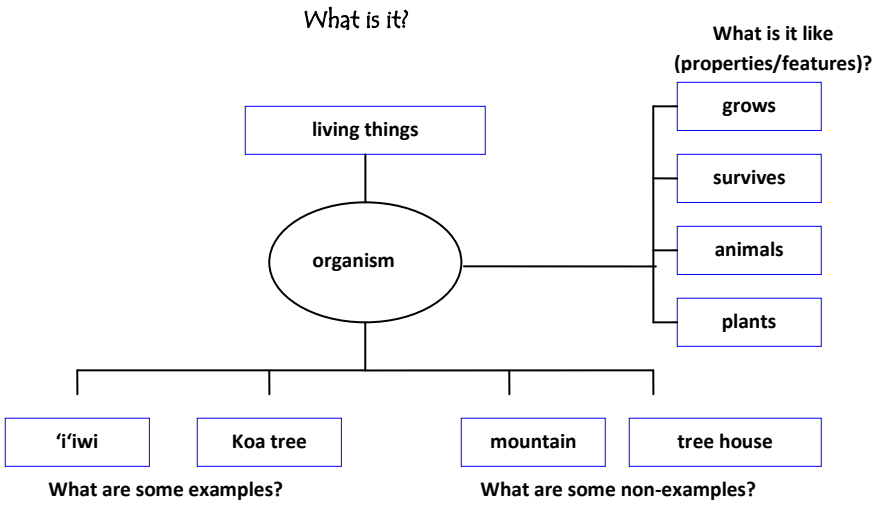
6. Demonstrate how to write a definition for the word using information on the word map.

7. Form small cooperative groups to provide guided practice with another word.

8. Provide independent work with other words.
   Note: This word map works best with nouns.

Schwartz, R., & Raphael, T. (1985). Concept of definition: A key to improving students' vocabulary. *The Reading Teacher*, *39*, 198–205.

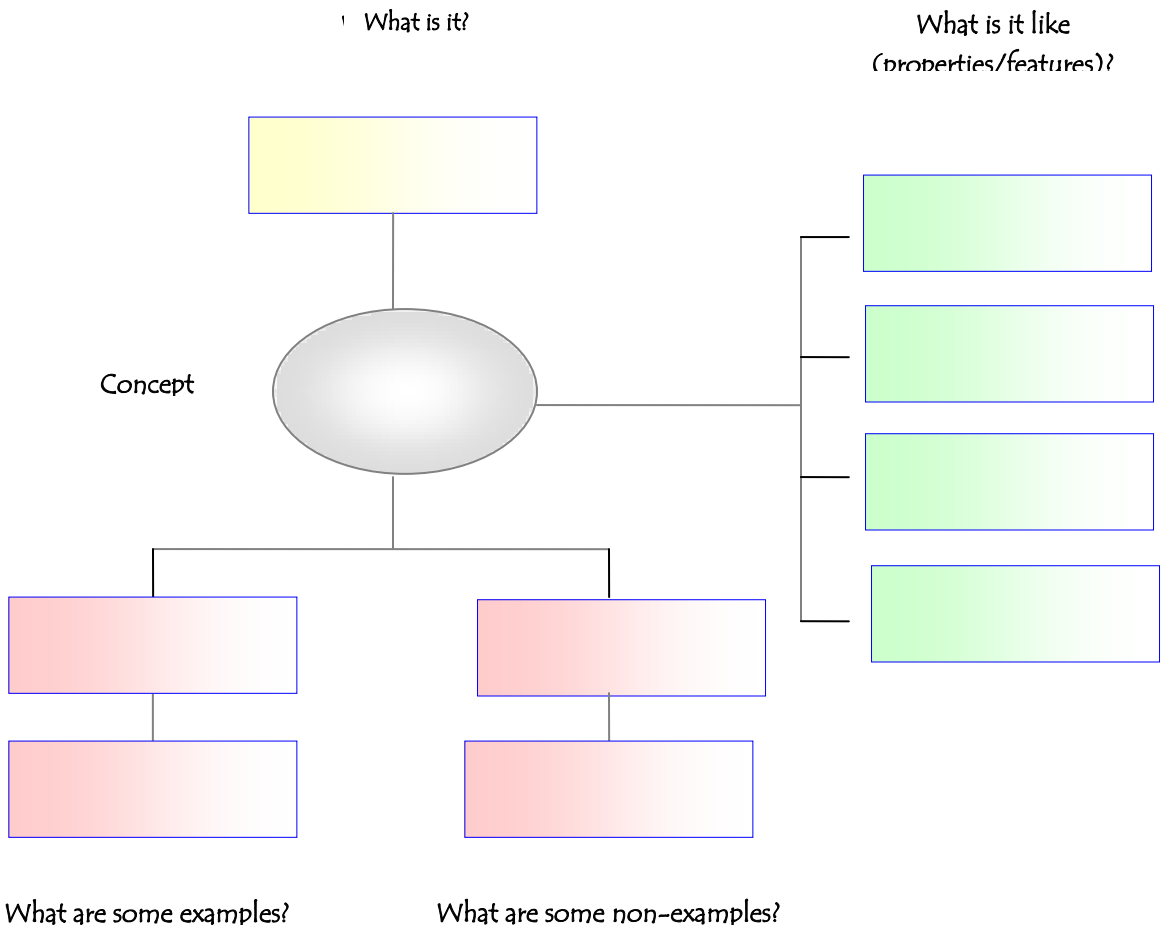
Concept of Definition Map for *Organism*



Sample Words from The Menehune and the Birds

Book 1—*Adaptation*	Book 2—*Interdependence*	Book 3—*Cycle of Matter, Flow of Energy*
adaptation	consumer	cycle
defend	decay	food chain
evidence	decomposer	predator
habitat	microscopic	prey
nutrient	producer	sequence
organism	rainforest	
survive	source	
structure		

Concept of Definition Map



Name: _____ Date: _____

The Menehune and the Birds: The Flow of Energy in Hawai'i's Rainforest

Lesson 3

Table of Contents

Extending Understanding of Cycle of Energy
Practice, Clarify, Internalize, and Demonstrate

Driving Question: *How does the cycle of matter and the flow of energy in the rainforest affect everyone, including people who are far from the rainforest?*

	Learning Engagements	Pages
I.	Extending the understanding of the flow of energy in the rainforest	39
II.	Extending the understanding of the cycle of matter in the rainforest	40
III.	Understanding the impact of invasive species	41
IV.	Reflecting on the question, *"Does it matter to me?"* (See Appendix 3.1: *The Flow of Energy* Food Chain and Food Web Resources)	42 43

The Menehune and the Birds: The Flow of Energy in Hawai‘i’s Rainforest

Lesson 3

Mālama ika ‘āina *(Respect the Land)*

When you turn on the water at home, where does that water come from?

Lesson Notes

I. Extending the Understanding of the Flow of Energy
II. Extending the Understanding of the Cycle of Matter

Concepts/Themes
Food chains and food webs are affected by introduced species.

Technology (eradication methods, propagation, conservation practices) enables the preservation of Hawai‘i’s native plants and animals.

Length
45 minutes

Objective
Students graphically demonstrate their understanding of the concepts of the Cycle of Matter and Flow of Energy in a rainforest.

Extending Understanding of Cycle of Matter and Flow of Energy in the Rainforest

Practice, Clarify, Internalize, and Demonstrate

Driving Question: *How does the cycle of matter and the flow of energy in the rainforest affect everyone, including people who are far from the rainforest.*

I. Extending the Understanding of the Flow of Energy

If necessary, review the concepts of the flow of energy in the rainforest. Students use the food chain animals developed in *The Menehune and the Birds: The Flow of Energy in the Rainforest* Lesson 2.

1. As a class, review the energy flow through a food chain. Extend the discussion with examples such as the following:
    a. Energy from food sources such as living organisms.
    b. Energy from nonliving food sources, such as the sun, water, soil.
    c. Review all of the organisms students created cards for.
    d. If students can think of more, write the names of the organisms on additional rainforest cards.
2. Review the levels and the role of the organisms in the

Materials

1. *The Flow of Energy in Hawai'i's Rainforest science text-set.*
2. *Computers with Internet connection.*
3. *Organism cards constructed in previous lessons.*

food chain: producers, consumers, and decomposers.

3. As a check, divide students into groups of three to four. Provide each group with a set of cards.

    a. Categorize cards into producers, consumers, and decomposers. (Introduce first and second consumers, if applicable.)

4. As a class, review what occurs when links in the chain are missing.

    a. Students in a group show one food chain using three to four organisms.
    b. Remove one of the organisms.
    c. Explain the effect when one level of the chain is missing.

5. Summarize the role of each level to keep the flow of energy in the ecosystem.

6. Students independently follow up with one of the extension activities.

    a. In their journals, show a food chain. Explain the role each organism plays in keeping the flow of energy in the ecosystem.
    b. See Appendix 3.1 *The Flow of Energy* Food Chain and Food Web Resources for interactive activities.

II. Extending the Understanding of the Cycle of Matter

Students work in small groups of three to research one of the topics:

- *How does the cycle of matter in the watersheds affect where you live?*
- *How does the impact of invasive species in the rainforest affect where you live?*

1. Cycle of matter in the Hawaiian Rainforest

    a. As a class, review the "Cycle of Matter" on Pages 3–4 in *The Flow of Energy in Hawai'i's Rainforest*.
    b. Like the flow of energy among organisms, each phase of the cycle of matter plays an important role in keeping a healthy forest.

2. Other Web-based resources include:

- **The Nature Conservancy: Forested Watersheds**

[*www.nature.org/ourinitiatives/regions/northamerica/unitedstates/hawaii/howwework/forested-watershed.xml*]

- **Last Stand, The Vanishing Hawaiian Forest**
  [*www.nature.org/ourinitiatives/regions/northamerica/unitedstates/hawaii/howwework/last_stand_web_lo.pdf*]

- **Forested Watersheds and Cultural Resources**
  [*http://hawp.org/forested-watersheds-and-cultur.asp*]
  [*http://hawp.org/resourcesandsupport.asp*]

    a. Call and interview scientists at conservation agencies on the status of the watersheds where you live. As a class, review interview protocols and develop a set of questions that can be used for the interview. Students may want to video tape the interviews.

3. In groups of 3-4, have students create a graphic representation of the **flow of energy** or the **cycle of matter** in the rainforest.

    a. Students divide the task, including each team member to create one part of the graphic representing the components of the cycle or flow.

    b. Assemble the components for a class sharing.

Assessment: Review the accuracy of the flow of energy and cycle of matter representations.

III. Understanding the impact of invasive species on the flow of energy in the Hawaiian rainforest

III. Understanding the Impact of Invasive Organisms

Objective
Students conduct research on threats to the rainforest and select one threat to act on.

Length
Two 45-minute sessions

Materials
1. *The Flow of Energy text-set.*
2. *Computers with Internet access.*
3. *Appendix 3.1: The Flow of Energy Resources.*

1. As a class review the invasive organisms from the text-set, *Interdependence in Hawai'i's Rainforest,* Pages 11-14.

2. Expand the understanding of the types of threats to the cycle of matter and flow of energy in the Hawaiian rainforest.
    i. Invasive plants and animals
    ii. Global warming
    iii. Fires

    Web-based resources include:

    Hawai'i's Ecosystems at Risk (HEAR)
    [*www.hear.org/*]

    Department of Land and Natural Resources

[*www.state.hi.us/dlnr/isw/iswhome.htm*]
[*www.state.hi.us/dlnr/dofaw/hortweeds/*]
[*http://hawaii.gov/dlnr/dofaw/invasive-species/*]

Watershed Partnerships, Nature Conservancy
[*www.nature.org/ourinitiatives/regions/northamerica/unitedstates/hawaii/howwework/watershed-partnerships.xml*]

3. From information on "The Cycle of Matter," "The Flow of Energy," and "Threats to the Cycle of Matter and Flow of Energy," each student selects a threat that they have a special connection with or interest in doing further research on how it is impacting the cycle of matter or flow of energy.

III. Reflecting on "Does it Matter to Me?"

Objective
1. *Students express in writing and a graphic representation the impact of the selected threat on the rainforest.*
2. *The class determine an authentic community project that they can participate in.*

Length
30 minutes

Materials
Journal

III. Reflecting on the question, *"Does it matter to me?"*

1. Students reflect and respond to the following:

    a. *Why was the particular threat selected?*
    b. Demonstrate in a graphic representation, the impact of the threat on the cycle of matter or flow of energy.
    c. Write a paragraph on why it matters to you.
    d. List at least five questions you could ask if you were to survey the community about this threat.
        i. What it is?
        ii. What is being done to eliminate or slow this threat?
        iii. Actions the community can take?
        iv. Other questions of interest to the class.

2. As a class, or in groups, plan on an authentic community-based action they can participate in. This can be related to their culminating project, pursued individually, or in small groups. (See Lesson 4 for project possibilities.)

Assessment: Students and teacher plan to participate in an authentic community project.

Appendix 3.1: *The Flow of Energy* Food Chain and Food Web Resources

Biomes and Habitats
[*www.enchantedlearning.com/subjects/rainforest/animals/Rfbiomeanimals.shtml*]
This website includes pictures and descriptions of animals that live in the tropical rainforest.

The Food Chain
[*www.sheppardsoftware.com/content/animals/kidscorner/foodchain/foodchain.htm*]
This website provides interactive explanations, simulations, and games on food chains.

The Food Chain Game
[*www.sheppardsoftware.com/content/animals/kidscorner/games/foodchaingame.htm*]
Users place the organisms in a food chain from simple to complex chains.

Living Things—Food Chains
[*www.bbc.co.uk/schools/ks2bitesize/science/activities/food_chains.shtml*]
The British Broadcasting Corporation (BBC) provides an interactive video, worksheet, test, and fact sheet on food chains.

Parts of the Food Chain (Producers and Consumers, and Others)
[*www.sheppardsoftware.com/content/animals/kidscorner/foodchain/producersconsumers.htm*]
Information about the food chain is provided.

Producers and Consumers
[*www.sheppardsoftware.com/content/animals/kidscorner/foodchain/producersconsumers.htm*]
Basic information is provided about the producers and consumers in a food chain.

Appendix 3.2: *The Flow of Energy* Semantic Gradient

Semantic Gradient
Developing Word Consciousness

Semantic Gradient
Semantic gradients are sequential arrangements of words placed along a continuum. Semantic gradients help students make connections between known words and new vocabulary. Arranging the words in a gradient allows students to visualize the relationships among the words.

Purpose
1. *To help students make connections between known and new words.*
2. *To enhance students' word knowledge by having them determine the shades of meaning of words.*

Materials
1. *Thesaurus.*
2. *Textbooks.*
3. *Dictionary.*
4. *Semantic Gradient Examples handout.*
5. *Semantic Gradients handout.*

Procedure

1. Review synonyms such as *big* and *humongous* with the class, emphasizing the idea of degrees and shades of meaning (e.g., *humongous* is a larger, stronger, more intense word than *big*; *tiny* refers to something that is smaller than *little*).

    a. Continue with other pairs (e.g., *difficult* and *stubborn*; *easy* and *simple*; *light* and *airy*; *large* and *massive*).

2. Thinking aloud, work with the class to place the words listed in the Word Bank, along the gradient for the two anchor words, *meticulous* and *careless*.

    b. Discuss the shades of meaning for the words.
    c. Students may add more words to the gradient, such as *thoughtless, reckless, particular,* and *cautious.*

Meticulous Careless

|----------|----------|----------|----------|

Word Bank: haphazard, careful, tidy, casual

3. Distribute the Semantics Gradient handout to groups of 3 to 4 students.

    a. Follow up with sharing and justifying the placement of the words.

b. Use the words along the continuum in sentences, discussing the shades of meaning with words along the gradient.
c. Discuss how words used in one context may not work in others, such as “the *scorching* heat,” but not “a *scorching* oven.”

Extension

1. Have students (in pairs or teams of three to four) create semantic gradients for the characters ‘Elepaio, the Menehune Chief, and Kehau.

    a. Students can create their own descriptions of characters using the Word Bank words, or their own interpretations.
    b. Example: ‘Elepaio (horrified, frightened, brave, courageous, fearless).
    c. Students share their character gradients and add to one student’s gradients.

References

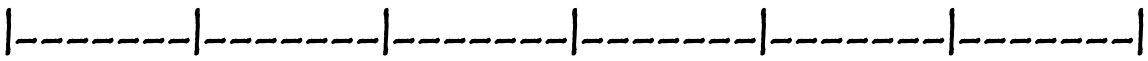
Blachowicz, C., & Fisher, P. J. (2002). *Teaching vocabulary in all classrooms*. Columbus, OH: Merrill Prentice Hall.

Greenwood, S. C., & Flanigan, K. (2007). Overlapping vocabulary and comprehension: Context clues complement semantic gradients. *The Reading Teacher, 61,* 249–254.

NCTE. read•write•think: Solving Word Meanings: Engaging Strategies for Vocabulary Development. Session 3: Introducing Semantic Gradients. Retrieved May 6, 2008, from www.readwritethink.org/lessons/lesson_view.asp?id=1089

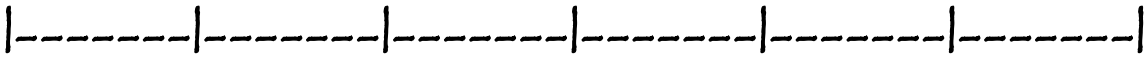
Semantic Gradient Examples

Meticulous Tidy Careful Casual Haphazard **Careless**



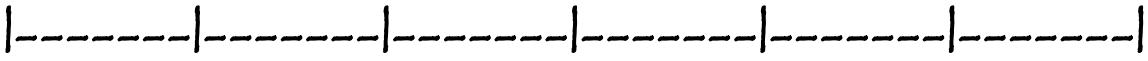
Word Bank: Haphazard, careful, tidy, casual

Depressed **Elated**



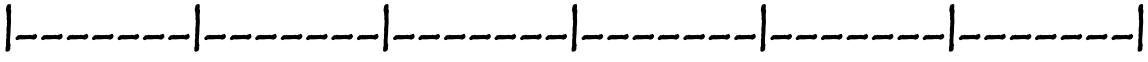
Word Bank: Upset, indifferent, glad, happy

Frigid **Scorching**



Word Bank: Warm, hot, cool, cold

Arrogant **Humble**



Word Bank: Proud, simple, snob, modest

Name_____ Date_____

Semantic Gradient

Create Semantic Gradients using the following words: ***microscopic, abundant, adequate, scarce,*** **and** ***definite***

Microscopic Macroscopic

|_____|_____|_____|_____|_____|_____|

Word Bank: Huge, large, small, minute

|_____|_____|_____|_____|_____|_____|

Word Bank:

|_____|_____|_____|_____|_____|_____|

Word Bank:

|_____|_____|_____|_____|_____|_____|

Word Bank:

Name_____ Date_____

The Menehune and the Birds: The Flow of Energy in Hawai'i's Rainforest

Lesson 4

Table of Contents

Adapting and Integrating the Understanding of the Cycle of Matter and the Flow of Energy in Hawai'i's Rainforest
Adapt, Exhibit, and Pose New Questions

Driving Question: *Now that you understand the cycle of matter and the flow of energy in the rainforest, what can you do with this understanding?*

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The Menehune and the Birds: The Flow of Energy in Hawai‘i’s Rainforest

Lesson 4

Mālama ika ‘āina *(Respect the Land)*

Your Turn!

Keeping a rainforest healthy is more than keeping the balance of the rainforest. Keeping a rainforest healthy means keeping the environment and life in balance.

Lesson Notes

I. Selecting and Completing a Culminating Activity

Objective
Students demonstrate their understanding of the Cycle of Matter and the Flow of Energy in Hawai‘i’s Rainforest by participating in a community-based project.

Length
Dependent on the selected project.

Materials
1. *Appendix 4.1: The Flow of Energy Culminating Project.*
2. *Appendix 4.2: The Flow of Energy Project Criteria.*
3. *Dependent on the selected project.*

Adapting and Integrating the Understanding of the Flow of Energy in Hawai‘i’s Rainforest

Adapt, Exhibit, and Pose New Questions

Driving Question: *Now that you understand the cycle of matter, and the flow of energy in the rainforest, what can you do with this understanding?*

I. Selecting and Planning a Culminating Activity

The completion of the activity would demonstrate the students’ understanding of *adaptation, interdependence, cycle of matter,* and *Flow of Energy* in Hawai‘i’s rainforest.

Select one of the following to complete as a class, in small groups, or individually. These projects should be authentic, school, or community-based.

1. See the list of possible culminating project ideas in Appendix 4.1: *The Flow of Energy* Culminating Project.

2. Determine the scope of the project and group configuration for accomplishing the project.

3. With the students, outline the procedure for completing the activity.

a. Determine what they already know.
b. Determine what questions they need to research and resources they need to answer their questions.
c. Outline an action plan.
d. Complete the project and present it to the school/community-based organization.

II. Completing the Culminating Project

1. The teacher reviews the project criteria with the students before, during, and after the project. (See Appendix 4.2 *The Flow of Energy* Project Criteria)

Complete the culminating project as a class, group, or individually.

Assessment: The culminating project reflects the application of the criteria in Appendix 4.2: *Flow of Energy* Project Criteria.

Appendix 4.1: The Flow of Energy Culminating Project Ideas

The Great Backyard Bird Count

Take part in an annual 4-day Great Backyard Bird Count with other students throughout the United States. Your data will be added to the material and will be available for viewing online. Which birds do you think were most commonly reported? See Hawai'i's count for 2010 at [*www.birdsource.org/gbbc/*].

Backyard Bird Count

<table>
<tr><td colspan="2">Name of the Bird
(species, if known)
Fairy Tern
  </td><td colspan="2">Description of the Bird

• Approximately 9–10 inches from head to tail
• All white with long black bill
• Black ring around eyes

Research: The Fairy Tern is also called the White Tern (manu-o-Kū). It was named the official bird of Honolulu, Hawai'i, on April 2, 2007.

It is a native bird of Hawai'i.</td></tr>
<tr><td>Date and Time</td><td>Numbers Observed</td><td>Location of Sighting (e.g., apartment, yard, school yard, park, nature reserve, roadside)</td><td>Bird's Habitat (woods, urban or city, rural or country, forest, grassland, water)</td></tr>
<tr><td>12/12/10</td><td>2</td><td>• State Capitol lawn area.
• Seen on a tree branch.</td><td>• Urban area.

Research: Nests on trees, rocky ledges, or on buildings.</td></tr>
</table>

How Do You Conduct a Bird Count?

Record the information you observe as accurately as possible. Use a new chart for each observation period.

1. Record the *highest* number of birds of each species that you saw together at any one time.
2. Write the species name, such as *Zebra Dove*, not just Dove. You may need to consult a book on birds.

The Threatened, Endangered, and Extinct

Have you watched a cartoon about an extinct dinosaur? Even if we do not have dinosaurs today, we learn a lot about them through cartoons. Besides cartoons, there are other creative ways for remembering the threatened, endangered, and extinct, such as stamps, coloring books, playing cards, and stories like *The Menehune and the Birds*. Can you think of others?

Check out the chart on organisms that are listed in the threatened, endangered, and extinct categories. Select one organism. Think of a "creative recovery or comeback," an idea for others to learn more about the organism. Share your idea with others in class in a presentation.

Does It Matter?

Create a public service announcement (PSA) on an issue relating to the cycle of matter or flow of energy as it relates to you and your community. Go out into the community and hear what people think.

1. Define the issue.
2. Find out the facts about the issue. *What is it? What background information is needed to understand the issue?*
    a. Visit or invite an expert on the issue.
    b. Interview the expert.
3. Develop a series of questions to canvas your community on the issue.
    a. Interview community members.
4. Organize the information.
5. Present it in a PSA.

Other Possible Community-Based Projects

1. Contact a community agency, such as the Lyon Arboretum, The Nature Conservancy, and the Department of Land and Natural Resources.

    a. Inquire about current community projects in which students can readily participate.

2. Develop a story that can be passed down from one generation to the next, like *The Menehune and the Birds*. The story should include:

    a. Several lessons to be learned: a lesson on an important belief of the people; a lesson explaining how something came to be in the rainforest; a lesson about the people who depended on the rainforest.
    b. History: a description of the time when the story took place.
    c. Possible ideas:
    How the 'I'iwi Got its Beak
    Tale of the Hoary Bat
    The Menehune and the Watershed

Appendix 4.2: The Flow of Energy Project Criteria Checklist

Project Criteria Checklist		
Criteria	**Yes**	**No**
1. Does the project show the effect of healthy/threatened cycle of matter in Hawai‘i’s rainforest?		
2. Does the project show the effect of healthy / threatened flow of energy in Hawai‘i’s Rainforest?		
3. Do participants apply collaborative practices in completing the project?		
4. Is the project authentic and relevant to all 4th grade students?		
5. Does the project summary use evidence to explain the relationships in Hawai‘i’s rainforest?		
6. Others as determined by the teacher and students.		

Vocabulary Practice

The Menehune and the Birds:

The Flow of Energy in Hawai'i's Rainforest

The Menehune and the Birds: The Flow of Energy in Hawai‘i’s Rainforest

Cloze Sentences

Select the appropriate word to complete each sentence.

1. Since a shark feeds on fish and large invertebrates, it is considered to be a _____ of the ocean.
    a. period
    b. presenter
    c. pyramid
    d. predator

2. Animals at the top of the _____ don't have to worry as much about being eaten.
    a. food chain
    b. food lane
    c. food set
    d. food series

3. Caterpillars _____ on smaller organisms that get too close to them.
    a. prey
    b. pray
    c. pressure
    d. prizes

4. _____ in the rainforest are interrupted by the introduction of invasive plants and animals.
    a. cyclones
    b. cycles
    c. cables
    d. canes

5. The hoary bat will _____ directions for the menehune to find the men.
    a. provide
    b. protect
    c. publish
    d. perish

6. The biologist will _____ the bird to a safer environment so it can survive.
    a. concur
    b. prefer
    c. defer
    d. transfer

7. We will _____ the invasive species from the rainforests.
    a. illuminate
    b. eliminate
    c. elevate
    d. migrate

8. Arrange the bird photos in _____ showing their life cycle.
    a. a reference
    b. a sequence
    c. a difference
    d. an incidence

9. The ranger will _____ the bear back to its natural environment.
    a. decrease
    b. release
    c. increase
    d. reverse

10. _____ birds are well protected by the laws.
    a. sore
    b. star
    c. scarce
    d. scared

The Menehune and the Birds: The Flow of Energy in Hawai‘i’s Rainforest

Matching Words with Definitions

Select the word for the definition that is provided.

1. an animal that hunts another animal for food
    a. senator
    b. competitor
    c. predator
    d. editor

2. a series of organisms in a community of living things that depend on one another for food
    a. food chain
    b. food link
    c. food group
    d. food line

3. an animal that is hunted for food by another animal
    a. prefer
    b. prey
    c. provider
    d. producer

4. regular pattern of events that is repeated
    a. cyber
    b. cycle
    c. cyan
    d. canyon

5. to give what is needed
    a. preside
    b. pried
    c. pride
    d. provide

6. to move from one place to another
    a. transfer
    b. transpire
    c. confer
    d. prefer

7. to destroy or get rid of
    a. eligible
    b. eliminate
    c. elite
    d. elude

8. a process in which one thing follows another
    a. patience
    b. quench
    c. sequence
    d. balance

9. to let someone or something go; to set free
    a. decrease
    b. increase
    c. disease
    d. release

10. not common; difficult to find
    a. scarce
    b. starve
    c. score
    d. scale

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Word Antonyms

Select the appropriate antonym. Write the word in the blank.

1. war is to peace as **provide** is to_____
    a. furnish
    b. supply
    c. contribute
    d. withhold

2. soft is to tough as **transfer** is to _____
    a. keep or hold
    b. move
    c. relocate
    d. change

3. plain is to fancy as **eliminate** is to _____
    a. eradicate
    b. annihilate
    c. save
    d. destroy

4. moderate is to severe as **release** is to _____
    a. let go of
    b. let loose
    c. hold
    d. free

5. Fat is to lean as **scarce** is to _____
    a. plentiful
    b. deficient
    c. rare
    d. scanty

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Semantic Association of Words

Select 2 words that are associated with the first word.

1. **predator**
   a. hunter
   b. killer
   c. alien
   d. torment

2. **food chain**
   a. organisms
   b. cycle
   c. shop
   d. market

3. **prey**
   a. injury
   b. effect
   c. victim
   d. sufferer

4. **cycle**
   a. sphere
   b. sequence
   c. rhythm
   d. vortex

5. **provide**
   a. enlist
   b. furnish
   c. accommodate
   d. require

6. **transfer**
   a. collect
   b. ship
   c. move
   d. research

7. **eliminate**
   a. contain
   b. discard
   c. expel
   d. assemble

8. **sequence**
   a. progression
   b. flow
   c. external
   d. general

9. **release**
   a. keep
   b. free
   c. hold
   d. dismiss

10. **scarce**
    a. fancy
    b. few
    c. unusual
    d. tidy

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Vocabulary Challenge 1

1. An animal **preserve** is an area that protects animals from _____.
    a. predators
    b. organisms
    c. adaptation
    d. starvation

2. Which of the following would be the highest organism on a **food chain**?
    a. frog
    b. fly
    c. owl
    d. papaya

3. An example of a bird of **prey** is _____.
    a. a chicken
    b. a turkey
    c. an eagle
    d. a mynah bird

4. A **cycle** is _____ pattern of events.
    a. a regular
    b. an irregular
    c. a stopped
    d. the start of a

5. When you **provide** food to people, you _____.
    a. give it to them
    b. take it away from them
    c. don't share with them
    d. do nothing

6. When you **transfer** something, you _____ .
    a. make it disappear
    b. paint it
    c. move it from one place to another
    d. watch it grow

7. To **eliminate** something, it must be totally _____.
    a. remade
    b. changed in color
    c. increased in number
    d. destroyed

8. The **sequence** of an animal's life is _____.
    a. a. measured in centuries
    b. birth, infancy, adulthood, and death
    c. reversible
    d. different in mammals

9. An example of **release** is to _____.
    a. hold on to a balloon
    b. practice for a school play
    c. let go of a balloon
    d. help people in need

10. If the birds become **scarce**, they are
    a. captured
    b. rare
    c. trapped
    d. abundant

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Vocabulary Challenge 2

1. _____ are natural **predators** of rats.
    a. mongoose
    b. roosters
    c. mice
    d. lions

2. A **food chain** _____.
    a. is a food chopper or grinder
    b. is a display at a grocery store
    c. shows how bread is made from wheat
    d. shows how organisms depend on each other for energy and food

3. The lion **preys** on _____.
    a. an elephant
    b. humans
    c. plant material
    d. an antelope

4. The life **cycle** of most plants starts with a _____.
    a. seed
    b. fruit
    c. stem
    d. leaf

5. One way to **provide** advice to a friend is to _____.
    a. keep it a secret
    b. hide the information from them
    c. do nothing
    d. tell them what you think.

6. What is the best way to **transfer** food from the kitchen to the dining room?
    a. eat the food
    b. use the disposal
    c. leave it on the kitchen counter
    d. carry the plate or bowl to the dining room

7. If you **eliminate** all your opponents, you
    a. take on more people
    b. talk to them
    c. remove them
    d. stare at them

8. Which of the following is an example of an increasing **sequence** of numbers?
    a. 5, 6, 7, 8
    b. 4, 9, 0, 15
    c. 100, 12, 82, 7
    d. 1,1,1,1

9. What is something you might NOT want to **release**?
    a. a dog trapped in a hole
    b. a whale lost in a river
    c. a turtle tangles in a fishing net
    d. a poisonous snake in a cage

10. A supply of food is **scarce** when _____.
    a. there is very little
    b. it is put away
    c. it is not cooked
    d. there is more than enough

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Vocabulary Answer Sheet

Cloze Sentences	Word Definitions	Word Antonyms	Semantic Associations	Challenge 1	Challenge 2
1. predator	1. predator	1. with hold	1. a. hunter b. killer	1. a. predators	1. a. mongoose
2. food chain	2. food chain	2. keep or hold	2. a. organisms b. cycle	2. c. owl	2. d. shows how organisms depend on each other for energy and food
3. prey	3. prey	3. save	3. c. victim d. sufferer	3. c. an eagle	3. d. an antelope
4. cycles	4. cycle	4. hold	4. b. sequence c. rhythm	4. a. a regular	4. a. seed
5.provide	5. provide	5. plentiful	5. b. furnish c. accommodate	5. a. give it to them	5. d. tell them what you think
6. transfer	6. transfer		6. b. ship c. move	6. c. move it from one place to another	6. carry the plate or bowl to the dining room
7. eliminate	7. eliminate		7. b. discard c. expel	7. d. destroyed	7. c. remove them
8. a sequence	8.sequence		8. a. progression b. flow	8. b. birth, infancy, adulthood, and death	8. a. 5,6,7,8
9. release	9.release		9. b. free d. dismiss	9. c. let go of a balloon	9. d. a poisonous snake in a cage
10. scarce	10. scarce		10. b. few c. unusual	10. b. rare	10. a. there is very little