WHAT ARE FOOD CHAINS AND FOOD WEBS?

Overview

In this lesson students will learn about the basic elements found in food chains and food webs. They will learn that animals and plants get their energy by consuming food, depend upon each other to survive, and that the food they eat can be traced back to living plants and plankton that produce food from the sun's energy.

Note: There are 2 parts to this lesson. Each part will take approximately 1 class period. Part 1 can be done independently. Vocabulary and concepts learned in Part 1 and needed to complete Part 2.

Objectives

On successful completion of this lesson, students will be able to:

- identify the basic elements of a food chain and classify organisms into those elements;
- organize familiar plants and animals into a simple food chain; and
- construct and describe a food web.

Alaska Standards

Alaska Science Standards / Grade Level Expectations

[3] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

[3] SA1.2 The student demonstrates an understanding of the processes of science by observing and describing the student's own world to answer simple questions.

[3] SC3.2: The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by organizing a simple food chain of familiar plants and animals.

Alaska Cultural Standards

[D] Culturally- knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. Students who meet this cultural standard are able to:

[D4] Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.

[E] Culturally- knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:

[E1] Recognize and build upon the inter-relationships that exist among the spiritual, natural and human realms in the world around them, as reflected in their own cultural traditions and the beliefs as well as those of others.

[E8] Identify and appreciate who they are and their place in the world.

Bering Strait School District Scope & Sequence

2nd Grade Sequence #7: Environment for Living Things

A. Understand interaction between plants and animals

3rd Grade Sequence #8: Ecosystems

E. Understand how plants and animals interact

F. Organize a simple food chain of familiar plants and animals

G. Describe a food web

Materials

- Chart illustrating a simple food chain
- Index or note cards
- Picture cards of local plants and animals
- Picture card of the sun
- *Tundra Food Webs* by Paul Fleisher
- Ball of yarn
- Student supplies: chart paper, glue, yarn or string, markers

Additional Resources

What If There Were No Gray Wolves?: A Book About the Temperate Forest Ecosystem by Suzanne Slade

Who Eats What? Food Chains and Food Webs by Patricia Lauber

Top of Form: What Are Food Chains and Webs? (Science of Living Things) by Bobbie Kalman

Pass the Energy, Please! Paperback by Barbara Shaw McKinney

Tundra Food Webs in Action by Paul Fleisher

Arctic Appetizers: Studying Food Webs in the Arctic by Gwendolyn Hooks

WHAT ARE FOOD CHAINS AND FOOD WEBS?

Polar Sea Life by Jinny Johnson

What If There Were No Sea Otters?: A Book About the Ocean Ecosystem by Suzanne Slade

Activity Preparations

Part 1

1. Prepare the chart of the simple food chain, using pictures if desired (example: Sun -> grass -> snowshoe hare -> lynx -> worm).
2. Gather the picture cards of the local tundra plants and animals. There should be at least one card per student.

Part 2

1. Preview the food web on page 4 of the book *Tundra Food Webs*.
2. Gather the picture cards of the local tundra plants and animals. There should be at least one card per student, preferably a different plant or animal for each student if possible.
3. Gather the picture cards of the Arctic Ocean animals and plankton. Make sure there is a set of cards for each group of students.
4. Gather supplies for student charts: yarn, chart paper, markers, glue or tape.

Whole Picture

Alaska Native culture bearers have long believed that all things are intricately connected. "The science of ecology, the study of the interactions between living things and their environments, circles back to the ancient wisdom found in the rich oral traditions of American Indian stories. Time and again the stories have said that all of the living and non-living parts of the Earth are one and that people are a part of that wholeness. Today, Western ecological science agrees" (J. Bruchac, 1989, cited in Kawagley, 2006, p. 12). Both culture bearers and scientists believe that disturbances to one element in the web can have dire effects on other components.

For Alaska Natives, this connectivity is important not only to the natural world, but in the spiritual world, as well. The importance of maintaining balance among the natural, human, and spiritual worlds is frequently seen in creation stories. One such story concerns Raven — who is said to be the creator. "Some say that the creative force took the form of the Raven to make the world so that the Yupiaq will never think that they are above the creatures of the earth. How can they be when their creator is a creature of earth?" (Kawagley, 2006, p. 17-18). Raven, therefore, plays an important role in helping people maintain balance between the spiritual and natural worlds. Importantly, Western scientists, too, recognize the raven as a crucial element in the web; it is an important

detritivore — one who eats dead things and thereby helps them return to the earth, replenishing it with minerals to start anew.

Both Alaska Natives and Western scientists have noticed that climate change is already starting to impact the delicate balance. "The western Alaska coast supports an … impressive variety of animals and fish … Far from viewing their environment as the insentient provider of resources available for the taking, [Alaska Natives] continue to this day to view it as responsive to their own careful action and attention" (Fienup-Riordan, 1994, p. 14). Like many other indigenous peoples around the globe, Alaska Natives do not view humans as standing apart from the natural world. Instead, the "human being is a participant-observer in this universe" (Kawagley, 2006, p. 17). To this end, maintaining balance in the natural world promotes balance in the spiritual world and vice versa.

Note: You may wish to include "human" in your web activity to better illustrate this important detail.

Some elders believe that the reason so many changes are happening in the natural world is because the spiritual world is out of balance. "Elders attribute environmental change not only to human action — wasteful fishing, burning fossil fuels — but to human interaction. To solve the problems of global warming, elders maintain that we need not only to change our actions but to correct our fellow humans. They encourage youth today to attend to traditional qanruyutet, believing that if their values improve, correct actions will follow" (Fienup-Riordan and Rearden, 2012, p. 321). However, George Noongwook, a respected Siberian Yupik hunter from Savoonga, thinks differently: "We cannot change nature, our past, and other people for that matter, but we can control our own thoughts and actions and participate in global efforts to cope with these global climate changes. That I think is the most empowering thing we can do as individuals" (Krupnik & Jolly, 2002, p. 189).

Western Scientists are likewise interested in the delicate balance of species. One area of particular interest is the Bering Sea — "home to 266 species of phytoplankton, 300 species of zooplankton, 450 species of fish and invertebrates, 38 species of seabirds and 25 marine mammals" (Alaska Marine Conservation Council, slide 11). Scientists have already begun to document changes in the timing of seasonal phytoplankton blooms, changes that can dramatically affect the entire ecosystem. While phytoplankton may seem too small to be significant, the trickle-down is resulting in changes for fish, marine mammals, and sea birds. In other words, the impacts are being felt by predator populations further up the food chain, including humans.

Plankton, though tiny, are crucial to the entire food chain. Phytoplankton, key producers, use sunlight and nutrients in the water to create energy. They are then either eaten by zooplankton (or other marine species, like the bowhead whale), or they die and sink to the bottom, where they provide nutrients for animals like the crab and the other animals

who eat them, like pollock and gray whale. Small but important fish, like the herring, eat both zooplankton and the smaller fish that feed on them. In turn, larger fish and sea mammals, like seals, eat the herring. Finally, up on land, the polar bear and the human depend on well-fed seals for their own survival. As hard as it may be to believe, the polar bear might have a difficult time surviving if something happened to the phytoplankton. Without the phytoplankton, the entire system would be disturbed (Alaska Marine Conservation Council, slide 26).

Vocabulary

consumer	a living organism that eats plants or other animals
decomposer	an organism that breaks down dead plants and animals, returning nutrients to the soil
energy	allows an organism to move and do work from food that is eaten
food chain	the order of eating, or energy transfer, in an ecosystem
food web	the interaction of all related food chains
plankton	microscopic organisms floating in water
producer	a plant or plankton that changes the sun's energy into food

Activity Procedure

Part 1

1. Hand out a note card to each child. Ask students: Do you know what a food chain is? Tell them to draw or write their answer on the note card. Ask them to share their responses.
2. Display the chart of a simple food chain. Explain to the students this is a simple food chain. Explain that a food chain illustrates what is eating what and that there are many different food chains.
3. Explain that the sun is included in a food chain because it provides the energy that plants (land) and plankton (water) use to make food. Point to the plant on the chart. Explain that a food chain usually begins with a producer, which is a plant or plankton because that is the organism that changes sunlight to food. Ask the students if they can think of examples of producers.
4. Introduce the term consumer and explain that consumers eat plants and other animals in a food chain. Ask the students for examples of consumers.
5. Direct the students' attention to the food chain on the chart and have them identify the plants and animals in the food chain as producers or consumers.

6. Ask students what happens to animals when they die. Explain that organisms that break down dead bodies and return the nutrients to the soil are called decomposers. Give them some examples of decomposers such as mushrooms, earthworms, beetles, and micro-organisms like bacteria. Ask them to look at the chart and identify the decomposer on the chart.
7. Divide students in groups. Explain to students they are about to play a game. Explain that each student will receive a card face down. When the teacher says go, each student will flip their card over. They will find three other students in the room they can make a food chain with. The group is to organize the plants and animals into a food chain by holding their cards in front of their bodies and standing in the correct sequence side by side. After forming the food chain, they are to decide among their group members which animals are producers, consumers, and decomposers. When all groups are finished, have each group share with the class their food chain and which organisms are producers, consumers, and decomposers..
8. Repeat the game, giving each student a different card, if time allows.
9. After the game, ask:
   - How many food chains did the class come up with?
   - What did you discover about food chains?
   - Which animals were in more than one food chain?
   - What are the basic elements of a food chain?
   - How are producers and consumers alike and different?
   - What do you think would happen if a link were taken out of a food chain?
   - What does it mean to have energy?
   - Where do the plants and animals on a food chain get their energy?
   - When you run out of energy, how do you get more energy?
   - Where do you get your energy from?
10. Assess the students' understanding by having them use the back of the note card handed out earlier or a separate piece of paper to do the following: Draw a food chain of local plants and animals. Include yourself as part of the food chain.

Part 2

1. Review what was learned in Part 1 by asking the following questions:
   - What is a food chain?
   - What is food?
   - Why are green plants and plankton called producers?
   - Why are animals considered consumers?

- Where do producers get their food?

2. Explain to the children that animals and plants are interdependent (they need each other) and that the feeding relationships and flow of energy between them are shown in a food chain. Explain that a food web can illustrate more clearly how plants and animals interact with one another.
3. Introduce the book *Tundra Food Webs* by Paul Fleisher. Show the students the food web on page 4. Ask the students how the food web is different from a food chain. Explain that food webs are more complex than food chains, but that are a more realistic representation of what happens in real life.
4. As you begin handing out one tundra picture card to each student, explain that the class is going to make a food web. Place the picture card of the sun on the floor. Have the students hold their picture cards in front of themselves and stand in a circle around the sun. To keep things simple, explain that they will pretend to be the picture on the card they are holding.
5. Explain that they will be using a ball of yarn to build the food web. Starting with a plant, that person holds onto the string and tosses the ball to a person that consumes them. That person then tosses the ball to a person who consumes them, and so on until you have an interconnected web including all members of the class.
6. Have the class look at the complexity of the web and ask:
   - What are some of the food chains in the food web?
   - What do all the food chains have in common?
   - What are the elements of the food web?
   - Which are the producers? Consumers? Decomposers?
   - What is the difference between a food chain and a food web?
   - What could we do to show that one plant was no longer available to eat?
7. Have a student drop their part of the string, then another, and another, asking the students to comment on what is happening to the web each time the string is dropped.
8. Ask:
   - What happened to our food web?
   - What would happen if all the grass died?
   - Why is the sun important?
   - Why should we be concerned about each plant or animal?
9. Divide the class into groups of four. Hand each group a set of Arctic Ocean picture cards. Instruct the class that each group will create a food web

using chart paper, markers, and yarn. Groups may share with the class when completed.

Extension Activities

- Label each picture in their Polar Ocean Food Web as producer, consumer, or decomposer.
- Invite a culture bearer to share creation stories or stories that illustrate how all things are connected. Afterwards, discuss how the interconnections in the stories are relevant to food chains and food webs.
- Have students identify food chains and food webs from other ecosystems in Alaska (forest, wetland, marine, pond or lake, etc.) and make pictures of the plants and animals from that ecosystem, using arrows to indicate the flow of energy.

Answers

Part 1

1. Answers will vary.
2. Answers will vary.
3. Answers will vary.
4. grass (producer) -> snowshoe hare (consumer) -> lynx (consumer) -> worm (decomposer)
5. They rot, decompose, answers may vary. -> worm (decomposer)
6. Answers will vary but may include some or a variation of the following food chains:
   - Moss – lemming – arctic fox – arctic wolf
   - Grass – lemming – ermine – snowy owl
   - Lichen – lemming - snowy owl – arctic fox
   - Cotton grass – caribou – polar bears - worms
   - Moss – caribou – wolf - lichen
   - Arctic willow – arctic ground squirrel – snowy owl – arctic wolf
   - Arctic willow – ptarmigan – arctic fox – polar bears
   - Arctic willow – arctic hare – snowy owl – arctic fox
   - Arctic willow – black flies – salmon – brown bear
   - Arctic willow – Arctic bumble bee – common eider – snowy owl
   - Lichen – musk ox – polar bears - mushrooms

- Lichen – musk ox – brown bear - moss
- Lichen – musk ox – arctic wolf - bacteria
- Cotton grass – caribou – brown bear
- Cotton grass – arctic hare – arctic fox – arctic wolf
- Sedges – caribou – wolf - mushrooms
- Sedges – musk ox – polar bear - worms
- Sedges – arctic hare – snowy owl – arctic fox

7. After the game, ask:
   - Several, many, lots
   - Begin with the sun and a plant, some animals eat plants, some animals eat other animals, some eat dead things
   - Answers will vary.
   - Producers, consumers, decomposers, sun
   - They use energy for food and pass that energy along as food
   - The animals or plants after that link would die.
   - To be able to move and do things.
   - From the food they eat which is plants or other animals except for producers which get their food from the sun
   - By eating food.
   - From the food I eat
8. Answers will vary

Part 2

1. Review what was learned in Part 1 by asking the following questions:
   - The feeding relationships and flow of energy between plants an animals
   - Energy that is passed through plants and animals
   - They make food from the sun's energy
   - They eat plants or other animals
   - From the sun.
2. Answers will vary, but may include that food webs are more complex than food chains, but they are a more realistic representation of what happens in real life.
3. Have the class look at the complexity of the web and ask:
   - Answers will vary.
   - Have producers and consumers, begin with the sun and a plant.

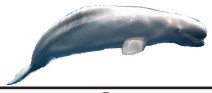
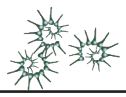
- Producers, consumers, decomposers, sun
- Answers will vary.
- A food chain shows the feeding relationship between producers and consumers, while a food web shows the interrelationships between producers, consumers, and decomposers. Food webs are much more complex that food chains and can be composed of many food chains.
- Drop that piece of yarn.

4. Answers will vary but should indicate that connections are lost between animals.
5. Ask:
   - Our food web lost connections between strands and animals were affected because their food sources were no longer available.
   - Many animals would die, not just those that eat grass, but also those that eat animals that eat grass.
   - It allows the plants to convert sunlight to food.
   - If an animal dies or disappears, then other animals may have no food and they may also die and disappear.
6. Answers will vary. A sample of a Polar Ocean Food Web is attached.

Student Worksheet: Polar Ocean Food Web Chart

Names _____

Use the chart below to help you organize your food web.

Eats	Animals	Eaten by
	krill 	
	herring 	
	Bowhead whale 	
	crabs 	
	Harp seal 	
	Ringed seal 	
	walrus 	
	beluga 	
	Polar bear 	
	orca 	
	bacteria 	
	worms 	
	plankton 	

Polar Ocean Food Web Sample