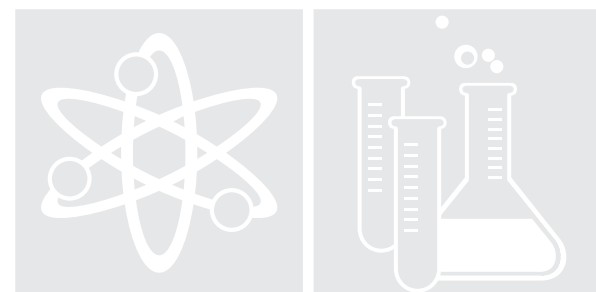
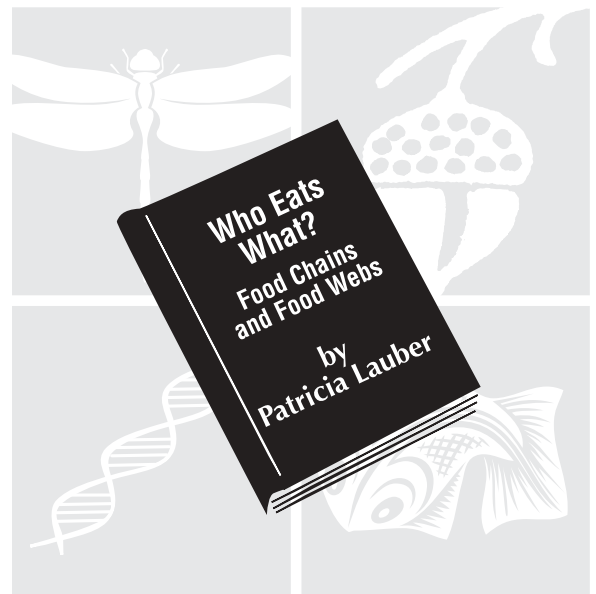


Grade

4

Strategic
Science
Teaching





Title of Lesson:

Who Eats What?

Essential Question:

How do interactions among organisms within food webs transfer energy through an ecosystem?



Conceptual Statement:

Energy is transferred through food webs. Organisms compete for resources in food webs to obtain the energy and nutrients they need to live and grow.



Conceptual Learning Sequence:

This lesson is part of a conceptual unit on ecosystems focusing on the interactions that occur within ecosystems. It is appropriate after students understand the living and non-living components of an ecosystem; the interdependence of these components; and that all energy comes from the sun.

Student Outcomes:

- Students understand that the sun's energy is transferred from one organism to another in a food web.
- Students gather evidence of who eats what in specific environments and create examples of food webs for those environments.
- Students use "Graphic Outlining" to show the flow of energy in a variety of environments.

Lesson Overview:

In this lesson, students use the learning strategy "Graphic Outlining" to draw a diagram of a typical food chain and a food web for various environments presented in the book, *Who Eats What?* Using paper chains, students construct a 3 dimensional representation of a food chain, and then create a food web by connecting related food chains.

English Language Learning:

English Language Development standards are referenced in the lesson where appropriate. The hand icon appears throughout the lesson when learning strategies and lesson components are identified as pathways for academic success and reflect critical developmental differences for students who are English Learners (EL).



Literature in the Science Learning Cycle:

The book *Who Eats What?* is used in the ENGAGE stage to provide specific examples of organisms and their relationships. It is also used in the EXPLAIN stage for students to compare information gained through the activity with the information in the text.



Learning Strategy:

Students use "Graphic Outlining" to illustrate the relationship of one organism to another by identifying the flow of energy from the sun through various organisms to the top organisms in a food web. Arrows on the graphic organizer show the direction of the flow of energy from one organism to another. (See Appendix pages 162-163.)

Literature Selection:

Title: *Who Eats What?*

Author: Lauber, Patricia



Publisher: Harper Collins Publishers Inc., New York, New York, 1995. ISBN: 0064451305

Annotation: This book introduces the concept of how the sun's energy is transferred from one organism to another, creating food chains and food webs in various environments.

Genre: Nonfiction

California Science Content Standards:*

Science: Grade 4, Life Science

- 2. All organisms need energy and matter to live and grow. As a basis for understanding this concept:
 - a. Students know plants are the primary source of matter and energy entering most food chains.
- 3. Living organisms depend on one another and their environment for survival. As a basis for understanding this concept:
 - c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.



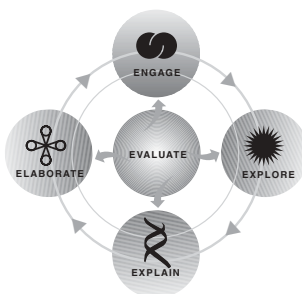
6. Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- c. Formulate and justify predictions based on cause-and-effect relationships.

*Selected standards addressed within this lesson.

Lesson at a Glance



Science Learning Cycle	Objective Science Thinking Process	Suggested Time
ENGAGE	Students engage in sharing ideas about what humans and tuna have in common, and establish the concept of a food chain. Students read <i>Who Eats What?</i> and discuss examples of food chains. Communicating	10 minutes
EXPLORE	Using picture cards, students explore possible arrangements of organisms in food chains. Student groups share and comment on each other's food chains. Observing, Communicating, Organizing, Inferring, Evaluating	20 minutes
EXPLAIN	Students use information from the text and their graphic organizer flow chart to explain a typical food chain and its related energy flow. Communicating, Organizing, Inferring, Applying	50 minutes
ELABORATE	Building on their understanding of interrelationships within an ecosystem, students make a 3-D representation of a food chain and connect the chains to form food webs. Students predict the impact of change on an ecosystem. The web is used as a class bulletin board. Communicating, Organizing, Inferring, Applying	50 minutes
EVALUATE	Students evaluate their understanding by considering other ecosystems and drawing/writing about the food web interrelationships of the organisms. Teacher evaluates student understanding of student outcomes in this activity as well throughout the lesson. Communicating, Organizing, Inferring, Applying, Evaluating	40 Minutes



Who Eats What?

Teacher Background:

All living organisms, including humans, are dependent on the living and non-living things in the environment. There are basic interrelationships among living organisms, which can be illustrated by diagrams, such as food chains and food webs. A typical food chain diagram begins with the sun's light energy being transferred and used by a plant to make its own food in a process called photosynthesis. The plant (producer) is then eaten by a plant eater (herbivore) which in turn, is eaten by various animals (carnivores), one after another, until a top predator completes the food chain. Decomposers will return nutrients, but not energy, to the producer level of the food chain.

Drawings show the interconnectedness of the diets of all organisms and how energy and nutrients are transferred from organism to organism. Arrows are often used to show the flow of energy from one organism to another. The arrow always points from an organism to the one that eats it and can be translated into the words, "is eaten by". For example: worm→bird means, "a worm is eaten by a bird."

A food web refers to a diagram that connects two or more food chains in a given environment. For example, two different food chains may have crickets in common. Therefore, they may be connected by arrows to show how both food chains are connected and dependent upon the crickets to sustain all the other organisms in both of their food chains. If anything happened to the cricket population in a given area, then all the organisms in both food chains would be at risk. The food webs illustrate the interconnections in nature.

Related California Content Standards

Language Arts: Grade 4

Reading Comprehension:

- 2.1 Identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

Writing Strategies

- 1.3 Use traditional structures for conveying information (e.g., chronological order, cause and effect, similarity and difference, and posing and answering a question).
2.1.a Relate ideas, observations, or recollections of an event or experience.

English Language Development Standards

Reading Comprehension: Grades 3-5

Early Advanced - Identify some significant structural (organizational) patterns in text, such as Sequence/chronological order, and cause/effect.

Advanced - Identify significant structural (organizational) patterns in text, such as compare/contrast, cause/effect, and sequence/chronological order.

English Language Development Standards

Writing Strategies & Applications

Early Intermediate: Use drawings, pictures, lists, charts, and tables to respond to familiar literature using simple sentences.

Grouping: Whole group, groups of 2-4

For hands-on activities, mix EL with fluent native speakers. For debriefing, partner at least two EL with fluent native speakers to form discussion groups.



VOCABULARY

ecosystem – the organisms that live in a particular place, their relationship with each other, and their interactions with their environment

food chain – a diagram showing the links of who eats whom in a community of living things

food web – a spider web-like diagram showing many interconnecting food chains

predator – an animal that hunts and eats other animals

prey – an animal hunted and eaten by another animal

Materials:

Per Class:

Paper for Word Wall (See Teacher Tips)
 Pictures or illustrations of various ecosystems
 Terrarium with appropriate organisms (optional)

Per Group:

1 Whiteboard or large piece of butcher paper
 2 Dry erase markers
 Picture card sheet (Student Page 1.0)
 Scissors

Per Student:

Book: *Who Eats What?*
 6 Strips of construction paper, 2" x 12": 1 yellow; 1 green; 4 additional all the same color
 Glue stick
 Crayons
 2 Large paper clips
 Science journal/notebook
 1 copy of Student Page 1.1

Advanced Preparation:

1. Pre-cut enough strips for each student (see Per Student Materials)
2. Make a sample of the 3-D paper food chain following these directions:
 - Cut 6 strips of paper the same as in the per-student materials.
 - Label the yellow strip "Sun's Energy". Make a circle with this strip and glue it shut.
 - Write the name/drawing of a plant on the green strip. Link it to the sun and glue it shut.
 - Continue with the four other strips. Select names/drawings of animals that belong in the food chain and label each strip with one of these animals.
3. Link the strips in order of who eats whom, gluing each link shut.

Teacher Resources:

Terrarium: www.carolina.com
 FOSS: *Environments*, Delta Education

Teacher Tips:

- A Word Wall is used to record vocabulary words and definitions. The words are added to the wall as the lessons progresses.
- When making the food webs make sure students link food chains together where they share the same organism. For example, if both food chains have crickets in them, clip together the links that say "crickets." Students can use string or yarn instead of paper clips.
- Share the student booklets with the library so that other students can enjoy the learning from this lesson.
- Before teaching this lesson, review the "Graphic Outlining" in the Appendix for detailed instruction on how to use this strategy.

Common Misconceptions:

Students often omit the sun when constructing examples of webs. Food webs begin with the sun as the primary energy source for green plants.

Students often use the terms food chain and food web interchangeably. Food chains are linear, indicating "who eats what" in a specific series. Food webs more accurately represent the complexity of what happens in ecosystems.

Related Student Resources:

Spanish book: Ventura, Piero. *Los alimentos: La evolucion de la alimentacion a traves del tiempo* (*Food: The Evolution of Food through Time*); Everest Publishing, Spain, 1994.

The Science Learning Cycle:

Who Eats What?



ENGAGE:



1. Show students the back cover of *Who Eats What?* and read the question: what do you and a tuna have in common? Engage students in a discussion about their ideas.
2. Ask students to think about a specific habitat. What are all the living things you might find there? What does each organism eat? Partner students to discuss their ideas of a food chain. Ask partners to share with the class. Ask students to record ideas in their Science Journal/Notebook.
3. Make a "Word Wall" bulletin board. Write each new vocabulary word and its definition on a piece of paper and post to the word wall. Continue to add more words as the lesson continues.
4. Introduce book *Who Eats What?* and ask students to read pages to 4 - 12 by themselves or with a partner. EL students may be paired with fluent native speaking students if needed. Ask: What is the first link in all food chains? (Sun) What does the "top of the food chain" mean? (e.g., hawk in the prairie ecosystem). Discuss and give examples.



EXPLORE:

5. In groups of 2 or 4, distribute a sheet of picture cards (Student Page 1.0) to each group. Have students cut the cards apart and arrange them in some way to represent a typical food chain.
6. Share and discuss food chains created by student groups. Make sure all chains begin with the transfer of energy from the sun to a plant.



EXPLAIN:

7. Have students read pages 13-16 and 20-27 independently or in pairs.
8. Using pictures from the cards discuss briefly and demonstrate how to illustrate the food chain on the board. Be sure to use the same format as the graphic organizer you are about to distribute. This lesson component supports EL students.
9. Distribute the graphic organizer (Student Page 1.1) to each student. Have students select any environment pictured in the book and draw a picture of typical food chain for that environment. Have students include at least 4 organisms in their food chain, excluding the sun. Remind students that arrows indicate who eats what and the flow of energy.
10. Have students share within their groups and with the whole class. Check for understanding.
11. Have the students read pages 17-19 and pages 28-31 individually or in pairs. Discuss food webs and add "food webs" to the Word Wall. Refer to the food web on page 19 in the book. Have pairs or groups of students make up a food web on their whiteboards or on construction paper. Share with the class.



The Science Learning Cycle: Who Eats What?



ELABORATE:



12. Show the 3-D paper chain model that you made to the class, and explain briefly how you made it.
13. Have groups select a specific ecosystem (either grassland, marine, or forest) for their 3-D paper food chain model. Make sure that each ecosystem has at least two groups of students working on it. Ask each student to make a quick drawing in their Science Journal/Notebook of a food chain within their ecosystem.
14. Distribute 6 strips of paper to each student. Ask students to label the yellow strip: Sun's Energy, bend it into a circle and glue the ends together to form a circle.
15. Have students label the green strip with the name/drawing of a plant. Ask them to thread the strip through the first circle so it forms a chain link and glue it closed. Continue labeling each strip with the name/drawing of the animal that comes next in their food chain. Have students continue to build the links as with the plant strip.
16. Have each student share their food chains with other students in their group.
17. Distribute two large paper clips to each student. Have each student examine the food chains of the students in their ecosystem group to see if they have a plant or animal in common. If they do, they can use the paper clips to link their food chains at their common link (e.g., grass to grass; cricket to cricket) to begin to form a food web. (See Teacher Tips).
18. Have each ecosystem group move to another identical ecosystem group and find other possible food web links in their ecosystem. For practical purposes, instruct students to make no more than 3 connections at a particular link.
19. Have the students display their complex food web by placing their food web on the floor or by pinning it to a large bulletin board.
20. Have ecosystems groups share their food webs, and discuss the similarities and differences among food webs.
21. Ask students to write a paragraph in their Science Journal/Notebook describing their ecosystem and the relationships among the organisms in their food webs.
22. Ask students to predict what will happen if a specific animal is removed from the food web. Ask them to also predict what will happen if a plant is removed from the web. Ask students to draw their food web on a whiteboard and indicate the impact of their predictions. Have groups share.

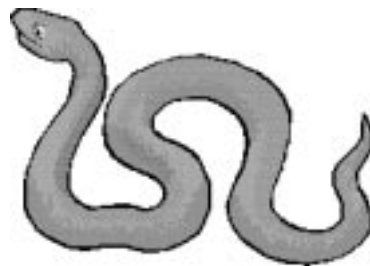
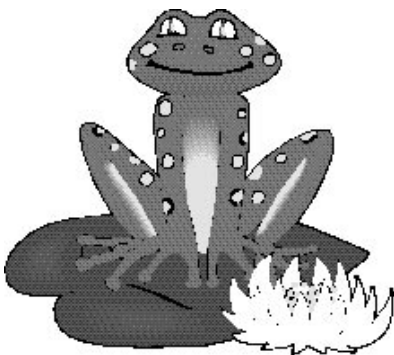
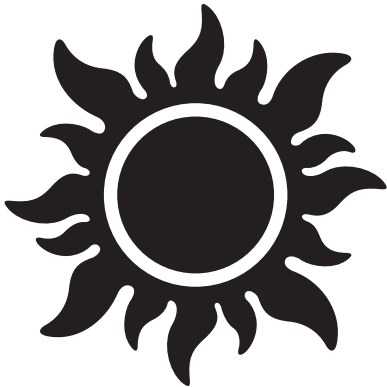
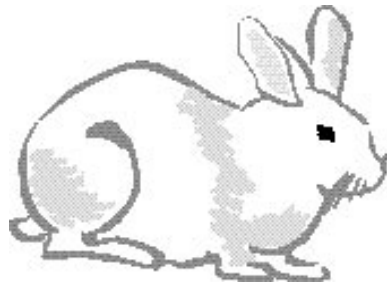


EVALUATE:

23. On the following day, take students outside and ask them to look for evidence (e.g., chewed leaves, droppings, nests, and holes in the ground) of plants and animals that could be a part of a food web.
24. Construct a classroom terrarium and conduct observations over the course of several months relating to the flow of food energy within the terrarium.
25. Have students write a summary, story, or mini-booklet about the food webs that they have observed over the course of study.

Teacher Reflection:

1. How does the student work provide evidence of student understanding of food webs and energy flow through an ecosystem?
2. What instructional strategies used in this lesson promote student understanding? How do you know?
3. How did the literature selection support student understanding of the science concepts?
4. How would you modify instruction to ensure understanding of student outcomes by all students?



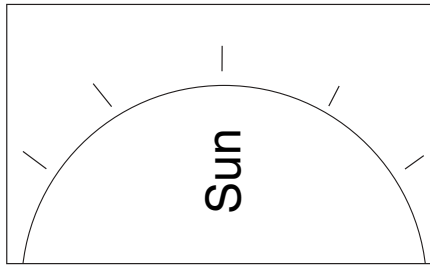
Who Eats What?

Name: _____

Draw and label a food chain in an environment that was shown in the book, *Who Eats What?* (Or select an environment of your own to draw.)

1. Write the names of the plants and animals that are in your food chain on the lines below.
2. Draw an arrow from the plant or animal to the animal who eats it.

Type of Environment: _____



Plant

Plant Eater

Animal

Animal

Animal

Graphic Outlining

Graphic outlining is a method of representing information from a text so that the organizational pattern of the text is highlighted. It helps students understand what they read by leading them to predict and organize information they encounter.

Goals

1. Guide the student's comprehension process by creating graphic representations of the text (e.g., clusters or concept maps, such as a flow chart).
2. Help students recognize and use the organizational patterns inherent in informational texts (e.g., description, sequence, comparison, cause and effect, problem-solution).

Teacher Preparation

1. Introduce to the students the five organizational patterns of informational text.
2. Identify a section of text that clearly follows one of the five organizational patterns.

Instructional Procedures

1. Have students survey the text passage by examining the title and headings, looking for clues to the organizational pattern used by the author.
2. Ask questions that focus on the differences between the different patterns. For instance, does the author describe a cause-and-effect relationship? Are two or more concepts being compared?
3. Guide students to make predictions about the text's basic structure. When they think they have begun to develop a relatively clear sense of the pattern being used, ask them to make a graphic representation of the pattern.
4. Direct students to check their graphic

outline as they continue reading to see whether it picks up the important ideas in the text selection and shows the relationship among those ideas. Students should also be looking for ideas that are not yet represented in their outline. Add subtopics to the outline as needed.

5. Model the process for completing the graphic outlines, and provide students with samples of the various patterns.
6. Guide students through the process of using their outlines to write a summary of the selection.

Variations

Bubble map. The map may be useful for stimulating students' ideas about a given topic. When asked to describe a topic or idea studied, students jot down associated words and draw a bubble around words, clustering them in some kind of order. Students may use the map for a prewrite, generate ideas before writing in journals, or review for a test.

Double bubble map. The map may be used for drawing comparisons. Students note the qualities that are unique in the outer parts of two overlapping circles. Attributes common to both things are listed in the middle. This technique helps students to distinguish common qualities from unique qualities before writing about or discussing a topic.

Flow chart. The chart is useful for helping students organize a series of items or thoughts in a logical order. Students write major stages of the sequence in large rectangles and substages in smaller rectangles under the larger rectangles.

Cause-and-effect chart. The chart is an aid for students to learn cause-effect reasoning. In the center of a sheet of paper, write the topic (the focus of the lesson). On the left-hand side, write the apparent causes of the topic. On the right-hand side, write the apparent effects of the topic.

STRATEGY INDEX	
Student Audience	
Beginning readers	
Below grade level	
At or above grade level	
Text Type	
Literary	
Informational	
Special Features	
Automaticity with print	
Prior knowledge and interest	
Discussion about texts	
Collaborative learning	
Writing emphasis	
Graphic representation	
Student control of reading process	
Student ownership of strategy	

Supporting idea chart. The chart helps students become aware of the relationship between a whole thing (structure) and its parts. Write the idea on a single line to the left. On the next set of lines to the right, write the major parts of the idea. Finally, fill in the subparts on lines that branch off the major parts of the idea.

Relevant English–Language Arts Content Standards

Grade Four: Reading Comprehension

- 2.1 [Students] identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

Grades Five Through Eight: Reading Comprehension

- 2.0 Students read and understand grade-level-appropriate material. They describe and connect the essential ideas, arguments, and perspectives of text by using their knowledge of text structure, organization, and purpose.

Grade Six: Reading Comprehension

- 2.4 [Students] clarify an understanding of texts by creating outlines, logical notes, summaries, or reports.

Further Resources

Cook, Doris. *Strategic Learning in the Content Areas*. Madison: Wisconsin Department of Public Instruction, 1989.