

Food Webs

Lesson 7a: Living Things Depend on One Another for Matter and Energy

Grade 5	Length of lesson: 50 minutes	Placement of lesson in unit: 7a of 7 two-part lessons in a unit on food webs
Unit central question: How do living things depend on one another to get the food (matter and energy) they need to live and grow?		Lesson focus question: How do living things depend on one another to get the food (matter and energy) they need to live and grow?
Main learning goal: Living things depend on one another for the food (matter and energy) they need to survive, and they all depend on a constant supply of new energy from the Sun, since energy isn't recycled in food chains or food webs.		
Science content storyline: Living things depend on one another to get the food (matter and energy) they need to live and grow. We've explored how organisms interact in food chains, but nature is more complicated than that! We describe these more complicated relationships as <i>food webs</i> . In food chains and food webs, organisms depend on producers to make their own food using light energy from the Sun, carbon dioxide, and water. Other organisms in food chains and food webs—consumers—can't make their own food. Therefore, consumers must get their food energy and matter by eating producers or other organisms that have eaten producers. Decomposers depend on all other organisms in a food chain or food web to leave behind solid wastes and die, because decomposers get their food from the waste and dead matter from producers and consumers. Producers depend on decomposers to recycle the matter (carbon dioxide and water) they need to make more food and minerals that help them stay healthy. All organisms ultimately depend on a constant supply of light energy from the Sun so that producers can make more food. Because energy isn't recycled in food chains or food webs, a constant supply of new light energy is needed.		
Ideal student response to the focus question: All organisms depend on producers to make energy-supplying food out of carbon dioxide, water, and energy from sunlight. Consumers get the food matter they need to grow and the energy they need to live and move by eating producers or other consumers that have eaten producers. Decomposers get their food matter and energy by eating the wastes and dead matter producers and consumers leave behind. Producers depend on decomposers to recycle matter (minerals, carbon dioxide, and water) needed to make more food. And all organisms depend on a constant supply of new light energy from the Sun, because energy isn't recycled in food chains or food webs.		

Preparation

Materials Needed <ul style="list-style-type: none">• Science notebooks• <i>For each student:</i> 1 red-colored pencil, 1 blue-colored pencil (or 1 yellow highlighter and 1 blue highlighter)• Chart paper and markers Student Handouts <ul style="list-style-type: none">• 7.1 Key Ideas about Food Chains (1 per student)• 7.2 A Meadow Food-Web Challenge (1 per student)• 7.3 Meadow Food Web (2 per student, or 1 per student with the food-web diagram on both sides; make sure to have extra copies of the handout in case students make mistakes and want to start over)	Ahead of Time <ul style="list-style-type: none">• Review the Food Webs Content Background Document: part 3, How Does Energy Flow in Food Webs?• Review the PowerPoint slides and modify them as you wish.• For the main activity (tracing matter and energy in a meadow food web):<ul style="list-style-type: none">• Decide whether you want students to draw both energy and matter lines on the <i>same</i> food-web diagram or on two different diagrams.• Decide whether to divide the activity into two parts—matter first and then energy. The lesson plan is designed for students to read the directions for matter and energy and work on both together.• Decide whether you want students to work on the activity individually, in pairs, or in small groups.
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Lesson 7a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
12 min	Link to previous lesson and lesson focus question: The teacher introduces the focus question, <i>How do living things depend on one another to get the food (matter and energy) they need to live and grow?</i> and reviews key ideas about matter and energy in food chains.	<ul style="list-style-type: none"> • Food provides both matter and energy that living things need to live and grow. • Organisms in a food chain can use food matter in four ways: (1) to grow new body parts, (2) to get the energy they need to live, (3) as wastes, (4) as energy-supplying matter for other organisms that eat them. • Producers are special: They are the only organisms that can make energy-supplying food out of non-energy-supplying matter (CO₂ and H₂O). • Decomposers are special: They break down food matter into tiny bits (carbon dioxide, water, and minerals) that plants can use again. So matter is recycled in food chains. • Matter is never lost or destroyed in food chains. It keeps changing and moving among organisms, but it never disappears. • Energy is <i>not</i> recycled in food chains, so a constant supply of light energy from the Sun is needed.
10 min	Setup for activity: Students are introduced to a meadow food-web diagram and the concept that a food web is made up of many food chains.	<ul style="list-style-type: none"> • Food webs show more complicated relationships among organisms than a simple food chain.
10 min	Activity: Students trace and label the pathways of matter and energy on a meadow food-web diagram.	<ul style="list-style-type: none"> • Matter keeps changing and moving among organisms in a food web, but it never disappears. Plants change matter from CO₂ and H₂O into energy-supplying food matter that all organisms can use to live and grow. • Decomposers break down food matter into tiny bits (carbon dioxide, water, and minerals) that plants can use to make more food and to be healthy. • Matter is recycled in food webs. • All organisms use the energy in food to move and live, and they give some off as heat energy. • Energy is <i>not</i> recycled in food chains or food webs, so a constant supply of new energy from the Sun is needed.
10 min	Follow-up to activity: The class looks at and discusses one or two student food-web diagrams.	
7 min	Synthesize/summarize today's lesson: The teacher guides students in summarizing the answer to the unit central question.	<ul style="list-style-type: none"> • Living things depend on one another to get the food (matter and energy) they need to live and grow. • All the organisms in a food web depend on producers to make food. Other organisms in a food web—consumers—can't make their own food. • Decomposers get their food from wastes and dead organisms (producers and consumers), so they depend on all other organisms in a food chain or food web to leave behind solid wastes and die. • Producers depend on decomposers to recycle matter (carbon dioxide, water, and minerals) that they can use to make more food for growth and to stay healthy. • All organisms also depend ultimately on the Sun to get their food. Because energy isn't recycled in food webs or food chains, a constant supply of new light energy from the Sun is needed.
1 min	Link to next lesson: The teacher previews science ideas that will be the focus of the next lesson.	

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12 min	<p>Link to Previous Lesson and Lesson Focus Question</p> <p>Synopsis: The teacher introduces the focus question, <i>How do living things depend on one another to get the food (matter and energy) they need to live and grow?</i> and reviews key ideas about matter and energy in food chains.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Food provides both matter and energy that living things need to live and grow. • Organisms in a food chain can use food matter in four ways: (1) to grow new body parts, (2) to get the energy they need to live, (3) as wastes, (4) as energy-supplying matter for other organisms that eat them. • Producers are special: They are the only organisms that can make energy-supplying food out of non- 	<p>Set the purpose with a <u>focus question</u> or goal statement.</p> <p>Link science ideas to other science ideas.</p> <p>Highlight key science ideas and focus question throughout.</p>	<p>Show slide 1.</p> <p>We've learned a lot about how organisms use matter and energy in food chains. So today we're going to think about all we've learned and use it to answer our unit central question, which also happens to be our focus question for this lesson: <i>How do living things depend on one another to get the food (matter and energy) they need to live and grow?</i></p> <p>Show slide 2.</p> <p>Copy the focus question into your science notebooks and draw a box around it.</p> <p>Before we begin a new challenge that uses key science ideas about food chains, let's review some of them.</p> <p>Show slide 3.</p> <p>NOTE TO TEACHER: <i>Distribute handout 7.1, Key Ideas about Food Chains.</i></p> <p>Pairs: Read the key science ideas on this handout and work with a partner to fill in the blanks.</p> <p>Whole-class discussion: Now let's check your responses to each of these statements.</p> <p>NOTE TO TEACHER: <i>Review the correct answers after the discussion and have students make any necessary changes to their handouts.</i></p> <p>Keep this handout in front of you as a helpful</p>	<p><i>Correct answers:</i></p> <ol style="list-style-type: none"> 1. Matter; energy 2. Grow (or build new body parts); the energy they need to live; food 	


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	<p>energy-supplying matter (CO₂ and H₂O).</p> <ul style="list-style-type: none"> Decomposers are special: They break down food matter into tiny bits (carbon dioxide, water, and minerals) that plants can use again. So matter is recycled in food chains. Matter is never lost or destroyed in food chains. It keeps changing and moving among organisms, but it never disappears. Energy is <i>not</i> recycled in food chains, so a constant supply of light energy from the Sun is needed. 		<p>resource while you work on our next challenge. You can also use the information you've written in your science notebooks.</p>	<p>(or matter)</p> <ol style="list-style-type: none"> Light energy (or energy); carbon dioxide; water Dead organisms; wastes; producers (or plants) Matter The Sun 	
10 min	<p>Set up for Activity</p> <p>Synopsis: Students are introduced to a meadow food-web diagram and the concept that a food web is made up of many food chains.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> Food webs show more complicated relationships among organisms than a simple food chain. 	<p>Link science ideas to other science ideas.</p> <p>Engage students in using and applying new science ideas in a variety of ways and contexts.</p>	<p>In previous lessons, we explored what happens to matter and energy as they move from organism to organism in a food chain.</p> <p>Today I want to challenge your thinking about food chains. Food chains are a very simple way of looking at what's happening in nature. But nature is much more complicated than that. These more complicated relationships among organisms are called <i>food webs</i>.</p> <p>Show slide 4.</p> <p>The food-web diagram on this slide shows some</p>		

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			<p>organisms that typically live in a meadow. See if you can identify any simple food chains. Think about this silently for a moment.</p> <p>Individual think time.</p> <p>Turn and Talk: Now talk with a partner about the food chains you identified in this diagram.</p> <p>NOTE TO TEACHER: <i>During the following discussion, encourage students to use the words matter and energy. Push them to go beyond saying what each organism eats.</i></p> <p>Whole-class discussion: What food chains did you find in the diagram? Give me some examples.</p> <p>Good job! Now let's look at the grasshopper. Using this diagram, tell me where the grasshopper gets its food matter and energy from.</p> <p>What organisms might get their matter and energy by consuming the grasshopper?</p>	<p>Berry bush, small bird, hawk, decomposer.</p> <p>From the grass.</p> <p>And from the berry bush.</p> <p>The small bird, the fox, and decomposers might get matter and</p>	<p>Can you put that in a complete sentence?</p> <p>In a sentence, please.</p>

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			<p>How is this food-web diagram different from the diagrams we've been making of food chains?</p>	<p>energy from the grasshopper.</p> <p>It shows a lot more organisms.</p> <p>It shows that some organisms eat more than one thing.</p> <p>Like the fox can get food matter and energy from the rabbit, grasshoppers, and the mouse.</p> <p>It shows that some organisms get eaten by more than one thing, like the mouse gets eaten by the snake or by the owl.</p> <p>Both the snake and the owl get energy from eating the mouse.</p>	<p>What else does this diagram show that food chains don't show?</p> <p>Can you use the word <i>matter</i> or <i>energy</i> in your sentence? And give an example?</p> <p>Can you reword your idea using the word <i>energy</i>?</p> <p>Now try starting your sentence with the word <i>energy</i>.</p>

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			<p>Today's lesson is all about applying what you've learned about food chains to food webs. So let's review what you've learned so far about how matter and energy move in food chains. Then your challenge will be to figure out how matter and energy move in a <i>food web</i>.</p> <p>Show slide 5.</p> <p>What's similar about how matter and energy move from organism to organism in a food chain?</p> <p>What's different about how matter and energy move in a food chain?</p>	<p>Energy is passed from the mouse to the owl and the snake.</p> <p>Every organism in the food chain uses both matter and energy.</p> <p>Both get passed from one organism to another.</p> <p>Energy starts with the Sun.</p> <p>Matter starts with water and carbon dioxide.</p> <p>Matter starts with the bush.</p> <p>The bush makes food.</p>	<p>Where does matter start?</p> <p>Tell me more about that.</p> <p>Who can add on to that?</p>

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			<p>So matter gets recycled when it passes from decomposers to producers, but energy doesn't. Each organism uses energy to live and grow and give off heat energy. The energy organisms use and give off can't be captured and reused.</p> <p>Show slide 6.</p> <p>NOTE TO TEACHER: <i>Distribute handout 7.2, A Meadow Food-Web Challenge, and handout 7.3, Meadow Food Web.</i></p> <p>Let's read the directions on the first handout together. The second handout is the one you'll be marking up.</p> <p>NOTE TO TEACHER: <i>You might want to read the instructions for the matter task first and then let students work on this diagram before reviewing instructions for the energy task.</i></p> <p><i>Depending on what you decided in advance, direct students to draw energy and matter lines on either the same food-web diagram or two different ones. Let students know whether they should work on this task individually, in pairs, or in small groups.</i></p>	<p>The plant uses matter (water and carbon dioxide) to make food.</p> <p>Matter is recycled, and energy isn't.</p>	

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10 min	<p>Activity</p> <p>Synopsis: Students trace and label the pathways of matter and energy on a meadow food-web diagram.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Matter keeps changing and moving among organisms in a food web, but it never disappears. Plants change matter from CO₂ and H₂O into energy-supplying food matter that all organisms can use to live and grow. • Decomposers break down food matter into tiny bits (carbon dioxide, water, and minerals) that plants can use to make more food and to be healthy. • Matter is recycled in food webs. • All organisms use the energy in food to move and live, and they give some off as heat energy. • Energy is <i>not</i> recycled in food chains or food webs, so a constant 	Engage students in using and applying new science ideas in a variety of ways and contexts.	<p>Students work on diagrams (individually, in pairs, or in small groups).</p> <p>NOTE TO TEACHER: <i>Monitor students as they work on their diagrams. If they're having difficulty understanding the task, redirect them. If necessary, students can turn their handouts over and start again on the other side.</i></p> <p><i>After the activity, you may want to collect students' work, check it, and provide feedback.</i></p> <div data-bbox="846 630 951 711" style="text-align: center;">  </div> <p style="text-align: center;">Optional Embedded Assessment Task</p> <p>NOTE TO TEACHER: <i>This is an excellent embedded assessment activity. Watch and listen to students as you wander around the room. Ask probe and challenge questions to help them clarify and improve their work. If you detect common confusion among students, feel free to stop the work and address the issue.</i></p> <p><i>Be on the lookout for one or two interesting diagrams to share with the whole class. Select examples that are strong but not perfect.</i></p>	<p>Sample of an accurate diagram:</p> <p><i>Students should start the red matter line with CO₂ and H₂O and start the blue energy line with the Sun.</i></p> <p><i>To show matter cycling, students will need to add arrows from a decomposer back to a producer.</i></p> <p><i>To show energy flow, they will need to add arrows that point from individual organisms into the air and label the arrows "heat energy."</i></p>	

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	supply of new energy from the Sun is needed.				
10 min	<p>Follow-Up to Activity</p> <p>Synopsis: The class looks at and discusses one or two student food-web diagrams.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Matter keeps changing and moving among organisms in a food web, but it never disappears. Plants change matter from CO₂ and H₂O into energy-supplying food matter that all organisms can use to live and grow. • Decomposers break down the food matter into tiny bits (carbon dioxide, water, and minerals) that plants can use to make more food and to be healthy. • Matter is recycled in food webs. • All organisms use the energy in food to move and live, and they give some off as heat energy. • Energy is <i>not</i> recycled 	<p>Make explicit links between science ideas and activities after the activity.</p> <p>Engage students in communicating in scientific ways.</p>	<p>Let's look at a couple examples of your work using the document reader.</p> <p>As your classmates tell us about their food-web diagrams, listen carefully and be ready to agree, disagree, add on, or ask clarification questions.</p> <p>NOTE TO TEACHER: <i>Student descriptions should be consistent with the following ideas.</i></p> <p>Matter in food webs:</p> <ul style="list-style-type: none"> • <i>A producer (plant) uses matter from CO₂ and H₂O to make food it can use to live and grow.</i> • <i>Some of this food matter gets passed on to at least one consumer.</i> • <i>All wastes and dead organisms in the food web go to a decomposer.</i> • <i>The decomposer gives off CO₂ and H₂O into the air and the soil, and the plant uses them again to make food.</i> <p>Energy in food webs:</p> <ul style="list-style-type: none"> • <i>A producer takes light energy from the Sun and makes energy-supplying food molecules.</i> • <i>The producer uses some energy from food matter to live and grow and gives off some as heat energy.</i> • <i>Food molecules get passed on to at least one consumer that uses the energy from the food matter to live and move.</i> • <i>Each consumer gives off heat energy.</i> • <i>Decomposers break down dead organisms and wastes that producers and consumers leave behind.</i> 		

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	in food chains or food webs, so a constant supply of new energy from the Sun is needed.		<ul style="list-style-type: none"> • <i>Decomposers use some of this matter as food, leave bits of it in the soil for plants to use again, and give off some as heat energy.</i> 		
7 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: The teacher guides students in summarizing the answer to the unit central question.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Living things depend on one another to get the food (matter and energy) they need to live and grow. • All the organisms in a food web depend on producers to make food. Other organisms in a food web—consumers—can't make their own food. • Decomposers get their food from wastes and dead organisms (producers and consumers), so they depend on all other organisms in a food chain or food web to leave behind solid wastes and die. because decomposers . 	<p>Link science ideas to other science ideas.</p> <p>Engage students in making connections by synthesizing and summarizing key science ideas.</p>	<p>Show slide 7.</p> <p>Let's revisit our unit central question, <i>How do living things depend on one another to get the food (matter and energy) they need to live and grow?</i></p> <p>How are plants and animals connected to one another in a food web?</p> <p>In what ways do organisms depend on one another in food webs?</p>	<p>Plants and animals are food for one another.</p> <p>Plants and animals are connected by energy and matter.</p> <p>All organisms need to get matter and energy from food.</p> <p>Herbivores depend on plants, and carnivores depend on herbivores.</p> <p>I think carnivores also depend on producers, because without producers,</p>	<p>Try to talk about that in terms of matter and/or energy.</p> <p>Who can add on?</p> <p>What do herbivores depend on from plants?</p>

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	<ul style="list-style-type: none"> Producers depend on decomposers to recycle matter (carbon dioxide, water, and minerals) they can use to make more food for growth and to stay healthy. All organisms also depend ultimately on the Sun to get their food. Because energy isn't recycled in food webs or food chains, a constant supply of new light energy from the Sun is needed. 		<p>Do plants depend on other organisms to get their food?</p> <p>What about decomposers? Do they depend on other organisms?</p> <p>All organisms in a food web depend on one important thing to get the food they need. What is it?</p>	<p>there wouldn't be herbivores for the carnivores to eat.</p> <p>No, 'cause they make their own food.</p> <p>I disagree because plants depend on decomposers to recycle the stuff they need to make more food.</p> <p>They depend on other organisms to produce waste and die!</p> <p>They all need the Sun. Plants need the Sun to make food, and if they can't make food, then other organisms run out.</p> <p>All organisms need water and carbon dioxide for the same reason, so that plants</p>	<p>Anyone want to add on, agree, or disagree?</p> <p>Who can add on to that?</p>

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		Summarize key science ideas.	<p>In this Food Webs unit, we've learned how matter changes as it moves from organism to organism in a food chain or food web. Producers (plants) make food, and organisms use this food matter to grow, to get energy, and to produce wastes. Matter is never lost or destroyed in a food web. It moves in a cycle from producers to consumers to decomposers and back to producers.</p> <p>We also learned that energy stored in food molecules moves from organism to organism in a food web. When each organism uses this stored energy to move and live, some of it is also given off as heat energy. This energy can't be recaptured or recycled, so food webs depend on a constant supply of new light energy from the Sun.</p>	<p>can make food that gets passed to all organisms in the food web.</p> <p>The Sun provides the energy, and water and carbon dioxide are matter. Plants need both matter and energy to make food that is energy-supplying matter.</p>	Can someone add language about matter and energy?
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher previews science ideas</p>		<p>Show slide 8.</p> <p>Today we used everything we've learned about food chains and food webs to answer our unit</p>		

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	that will be the focus of the next lesson.		<p>central question, <i>How do living things depend on one another to get the food (matter and energy) they need to live and grow?</i></p> <p>Tomorrow we'll explore how organisms in a mini-environment get the matter and energy they need to live and grow.</p>		