Food Webs
Lesson 6b: Energy in Food Chains

Grade 5	**Length of lesson:** 43 minutes	**Placement of lesson in unit:** 6b of 7 two-part lessons 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 questions:** What happens to energy in food chains? Is it recycled? (Part 2)
Main learning goal: While matter is continuously recycled in a food chain, energy *flows through* food chains, is released as heat into the environment, and does not recycle; therefore, food chains require a constant supply of new energy from the Sun to keep them going.		
Science content storyline: In food chains, energy moves from the Sun to producers and then to consumers. Producers (plants) transform light energy from the Sun into energy stored in food molecules. When herbivores eat plants, when carnivores eat other organisms, or when decomposers eat wastes and dead organisms, energy is passed from one organism to another. Each organism uses some of this food energy to live, move, and reproduce. As organisms use the energy stored in food, they also give off heat energy into the environment. Because living things can't use this heat energy again, a constant supply of new energy from the Sun is needed in food chains. Therefore, energy *flows through* food chains, is released as heat into the environment, and is not recycled.		
Ideal student response to the focus questions: Energy stored in food molecules is passed from one organism to another in a food chain. As an organism uses this stored energy, it also gives off heat energy into the environment. Organisms can't use this heat energy again, so it can't be recycled in food chains. Instead, a constant supply of new energy from the Sun is needed in food chains.		

Preparation

Materials Needed
• Science notebooks
For each small group:
  • Glue or tape
  • Markers
For each student:
  • Scissors
  • Sheet of plain, unlined paper or light-colored construction paper (ideally a bit larger than 8.5" x 11")
 	
Student Handouts
• 6.2 Energy in Food Chains (from lesson 6a)
• 6.3 Food-Chain Game Cards (1 set per student)
	Ahead of Time
	• 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.
	• Decide whether to present slide 3 or slide 4 first. Slide 3 introduces a use-and-apply task (a girl eating a banana) to assess how well students understood the science ideas discussed in lesson 6a. Slide 4 reviews key ideas about what happens to energy in food chains. If you think your students need some review before tackling the use-and-apply task, start with slide 4.

Lesson 6b General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
10 min	**Link to previous lesson and focus questions:** The teacher reviews the focus questions from the previous lesson: *What happens to energy in food chains? Is it recycled?* Students work in pairs on a use-and-apply task related to energy in food chains.	• Producers (banana plants) transform light energy from the Sun into energy stored in food molecules. • When organisms use the food molecules, energy is released that enables the organisms to move, live, and grow. Some of the food energy is changed to heat energy, which is released into the environment.
5 min	**Setup for activity:** Students prepare for the activity by reviewing key science ideas from the previous lesson.	• Producers (banana plants) transform light energy from the Sun into energy stored in food molecules. • When organisms use the food molecules, energy is released that enables the organisms to move, live, and grow. Some of the food energy is changed to heat energy, which is released into the environment. • Living things can't use this heat energy again, so a constant supply of new energy is needed in food chains.
15 min	**Activity**: Students create their own food-chain diagrams to show what happens to energy in food chains.	
10 min	**Follow-up to activity:** Students share their diagrams and give one another feedback.	
2 min	**Synthesize/summarize today's lesson:** The teacher gives a brief summary of the key science ideas that answer both of today's focus questions.	
1 min	**Link to next lesson:** The teacher previews science ideas that will be addressed in the next lesson.	

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10 min	**Link to Previous Lesson and Focus Questions** **Synopsis:** The teacher reviews the focus questions from the previous lesson: *What happens to energy in food chains? Is it recycled?* Students work in pairs on a use-and-apply task related to energy in food chains. **Main science idea(s):** • Producers (banana plants) transform light energy from the Sun into energy stored in food molecules. • When organisms use the food molecules, energy is released that enables the organisms to move, live, and grow. Some of the food energy is changed to heat	Set the purpose with a focus question or goal statement. Engage students in using and applying new science ideas in a variety of ways and contexts. Engage students in	**Show slides 1 and 2.** Today we're going to continue working on the same focus questions from last time: *What happens to energy in food chains? Is it recycled?* **NOTE TO TEACHER**: *Based on what you decided in advance, present either slide 3 (use-and-apply task) or slide 4 (review of key science ideas) first.* **Show slide 3.** Imagine you're on a long walk or a hike, and you're feeling really tired. You eat a banana for some energy to help you keep walking. **Turn and Talk:** Talk with a partner about the two questions on the slide. Use what you know about energy in food chains to answer these questions, and be ready to share your answers with the class: 1. How did energy get into the banana? 2. What happens to the energy in the banana after you eat it? **NOTE TO TEACHER:** Students may refer to handout 6.2 from the previous lesson (Energy		

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	energy, which is released into the environment.	communicating in scientific ways.	in Food Chains) to support this use-and-apply task. **Whole-class discussion:** What ideas did you come up with? As good scientific listeners, be ready to agree, disagree, add on, or ask each other clarification questions. So how did energy get into the banana? **NOTE TO TEACHER**: *Make sure students come to the conclusion that the energy in the banana originally came from light energy from the Sun, which a banana plant changed into stored food energy when it made food molecules.* Now let's talk about what happens to the	From a banana plant. A banana plant made it. A banana plant made food. I agree, but I want to add on that the banana plant changed light energy from the Sun into energy stored in food molecules. You use the energy from the banana to keep walking.	Can you say that in a complete sentence? What do you mean by "it"? Can you connect your answer to the question about how energy got into the plant? Anyone agree, disagree, or want to add on?

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		Highlight key science ideas and focus question throughout.	energy in the banana after you eat it. What are your ideas? So producers (in this case, a banana plant) transform light energy from the Sun into energy stored in food molecules. When organisms use food molecules, energy is released that enables the organisms to move, live, and grow. And some of the food energy is changed to heat energy, which is released into the environment.	And some of the energy is given off as heat energy.	
5 min	**Setup for Activity** **Synopsis:** Students prepare for the activity by reviewing key science ideas from the previous lesson. **Main science idea(s):** • Producers (banana plants) transform light energy from the Sun into energy stored in food	Make explicit links between science ideas and activities **before** the activity. Select content representations and models matched to the	Today you're going to use the ideas about energy in food chains that we've been talking about to create your own food-chain diagrams. First, let's review some key science ideas about energy. **Show slide 4.** **Pairs:** Now here's a challenge for you! See if you and a partner can figure out what the diagram on this slide is saying. Raise your hand as soon as you think you have it figured		*Challenge questions to ask during the pairs work:*

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	molecules. • When organisms use the food molecules, energy is released to enable the organisms to move, live, and grow. Some of the food energy is changed to heat energy, which is released into the environment. • Living things can't use this heat energy again, so a constant supply of new energy is needed in food chains.	learning goal and engage students in their use. Link science ideas to other science ideas. Engage students in communicating in scientific ways.	out. **NOTE TO TEACHER:** *Wander around the room during the pairs work and listen to students' ideas. Ask challenge questions and encourage them to speak in complete sentences*. *When the first couple pairs raise their hands, listen to their explanations and ask probe and challenge questions. Then ask one of these pairs to share their ideas with the class.* **Whole-class discussion:** I see most of you have figured out this challenge. That's great! I've asked a couple pairs to explain what this diagram means. Again, listeners be ready to agree, disagree, add on, or ask clarification questions. **NOTE TO TEACHER**: *During the presentations, encourage students to agree, disagree, add on, and ask clarification questions.* *Make sure students include the idea that energy can't be recycled.* ***This is important!*** *If it doesn't come up, refer to the focus questions and ask, "Have our explanations of the diagram answered* ***both*** *of our focus questions?"*		• How would you label this blue arrow here? • Can you say that in a complete sentence? • Why are there three arrows pointing away from the squirrel? *Sample challenge question to ask during the presentations:* How would you label the arrows to make it clear what's happening in the diagram?

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			Show slide 5. Next I want you to use these ideas to create your own food-chain diagrams. **NOTE TO TEACHER:** *Distribute handout 6.3 (Food-Chain Game Cards), as well as scissors, glue or tape, and plain (unlined) paper or light-colored construction paper.* **Directions for the activity:** Create a diagram with the game cards to show what happens to energy in a food chain. Follow these steps: 1. Have the students cut out their own Food-Chain Game Cards. 2. Arrange the Sun and organism cards on your sheet of paper in any way that makes sense to you. 3. You can refer to the Energy in Food Chains handout from last time if you need help. 4. Once you're satisfied with how you've arranged the cards, tape or glue them onto the paper. 5. Then use a marker to add words and arrows so that someone looking at your diagram can figure out what is happening to the energy. Make sure to		

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			label your arrows! 6. On the back of the diagram, write an explanation of what's happening to the energy in the food chain you've designed. While you're working, I'm going to walk around the room and listen to see if you're accurately using the ideas about energy in food chains that we've talked about.		
15 min	**Activity** **Synopsis:** Students create their own create food-chain diagrams to show what happens to energy in food chains. **Main science idea(s):** • Producers (banana plants) transform light energy from the Sun into energy stored in food molecules. • When organisms use the food molecules, energy is released to enable the organisms to move, live, and grow. Some of the	Engage students in making connections by synthesizing and summarizing key science ideas. Select content representations and models matched to the learning goal and engage	**Individual work time.**  ***Embedded Assessment Task*** **NOTE TO TEACHER**: *Allow students to talk to each other as they work on their diagrams. Listen carefully to gauge how accurately they're using the new science ideas. Ask challenge questions when you hear inaccuracies or incomplete explanations.* *Select two or three students to share their diagrams and sentences in the follow-up to the activity. Choose examples that are strong but not perfect. Make sure at least one of the diagrams and sentences addresses the issue of energy not being recycled.*		*Sample challenge questions to ask when you hear inaccuracies and/or incomplete explanations:* Does your diagram and your sentence on the back of the paper answer **both** of our focus questions? Does your diagram address whether energy is recycled?

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	food energy is changed to heat energy, which is released into the environment. • Living things can't use this heat energy again, so a constant supply of new energy is needed in food chains.	students in their use. Link science ideas to other science ideas.			
10 min	**Follow-Up to Activity** **Synopsis:** Students share their diagrams and give one another feedback. **Main science idea(s):** • Producers (banana plants) transform light energy from the Sun into energy stored in food molecules. • When organisms use the food molecules, energy is released to enable the organisms to move, live, and grow. Some of the food energy is	Make explicit links between science ideas and activities **after** the activity. Engage students in communicating in scientific ways.	**Show slide 6.** I've selected two or three students to share their diagrams and sentences using the document reader. Listen carefully to their explanations and be ready to agree, disagree, ask a clarification question, or add on. Remember to talk like a scientist, using the sentence starters on the slide. **NOTE TO TEACHER**: *During the presentations, encourage students to agree, disagree, add on, and ask each other clarification questions. Make sure that **both** of the focus questions are addressed in this discussion.*		*Sample challenge questions to ask during the presentations:* How would you label the arrows to make clear what's happening in the food chain? How does your diagram (or sentence) address the question about whether energy is recycled in food chains?

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	changed to heat energy, which is released into the environment. • Living things can't use this heat energy again, so a constant supply of new energy is needed in food chains.				
2 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** The teacher gives a brief summary of the key science ideas that answer both of today's focus questions. **Main science idea(s):** • Producers (banana plants) transform light energy from the Sun into energy stored in food molecules. • When organisms use the food molecules, energy is released to enable the organisms to move, live, and grow. Some of the	Highlight key science ideas and focus question throughout. Summarize key science ideas.	**Show slide 7.** So our focus questions are *What happens to energy in food chains? Is it recycled?* **Show slide 8.** We found out that the answers to both questions are complicated! **NOTE TO TEACHER***: The intent here is to quickly transition from this slide to slide 9. But if your students' food-chain diagrams reveal significant difficulties they're having with the science ideas, you may want to review this slide more slowly to resolve those difficulties.* **Show slide 9.** Even though the answers to our focus questions are complicated, we can simplify the		

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	food energy is changed to heat energy, which is released into the environment. • Living things can't use this heat energy again, so a constant supply of new energy is needed in food chains.		story this way. **NOTE TO TEACHER:** Read the slide to students line by line, ending with the Sun animation.		
1 min	**Link to Next Lesson** **Synopsis:** The teacher previews science ideas that will be addressed in the next lesson.		**Show slide 10.** In our lessons about food chains, we've learned a lot about what happens to matter and energy. Today and in the last lesson, we focused all of our attention on what happens to **energy** in food chains. But next time you'll use everything you've learned so far about matter **and** energy to explain what's happening in more complicated food chains.		