Food Webs
Lesson 3b: Matter for Growth

Grade 5	**Length of lesson:** 50 minutes (plus a 5-minute optional synthesize/summarize extension)	**Placement of lesson in unit:** 3b 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 question:** How do animals grow bigger?
Main learning goal: Animals consume the matter originally made by plants (in the form of food molecules). This matter moves from one organism to another in food chains, and each organism uses it to build body structures and grow bigger.		
Science content storyline: Plants are producers that can take non-energy-supplying matter from the air (carbon-dioxide molecules) and soil (water molecules) and use energy from the Sun to change this matter into energy-supplying food matter (molecules). Consumers (herbivores, carnivores, and omnivores) get food molecules by eating plants or other consumers that have eaten plants. Like plants, they use these food molecules (matter) to build their body structures and grow bigger.		
Ideal student response to the focus question: Living things need food matter to get bigger. Plants can make their own food and use it to grow bigger. But animals have to get food molecules by eating plants or animals that have eaten plants. This is called a *food chain*. Each organism in the food chain uses the food molecules it eats to build body structures and grow bigger.		

Preparation

Materials Needed
• Science notebooks
• Time-lapse video showing animal growth:
  • German shepherd—https://www.youtube.com/watch?v=ISYBpayqL-0
• For each group of 4 students:
  • 10 linking-cube water molecules (1 H_2O = 2 blues, 1 white)
  • 20 linking-cube carbon-dioxide molecules (1 CO_2 = 2 whites, 1 red)
  • 4 linking-cube food/sugar molecules (sugar = 1 red, 1 white, 1 blue)
  • 3 gallon-sized plastic bag to store the linking cubes
• Strand of large-sized chain from hardware store (2.5–3 ft)
• *Optional:* chart paper, markers
 	
Student Handouts (1 for each group of 4 students)
• 3.1 Organism Tree Poster (place mat), laminated, 11" × 17" (from lesson 3a)
• 3.2 Organism Squirrel Poster (place mat), laminated, 11" × 17"
• 3.3 Organism Mountain Lion Poster (place mat), laminated, 11" × 17"
	Ahead of Time
	• Review the Food Webs Content Background Document: Introduction to Part 2 (pp. 5-6), Section 2.3, Section 2.4, and Section 2.6 (focus on 2nd bullet in the summary of key points).
	• Review the PowerPoint slides and modify them as you wish.
	• Try out slide 15 so you know when to make the squirrel, tree, and water and carbon-dioxide molecules appear.
	• Decide whether you want students to work on the synthesize/summarize task (slide 19) in pairs or individually.
	• Consider whether you want to allow extra time to include the optional extension of the synthesize task that engages students in evaluating their food-chain diagrams (slide 20).

Lesson 3b General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
3 min	**Link to previous lesson:** Students discuss what they learned in the previous lesson about how plants grow bigger.	• Plants take non-energy-supplying matter from the air (carbon-dioxide molecules) and soil (water molecules) and use energy from the Sun to change this matter into energy-supplying food matter (molecules) that are used to build the plants' structures and make the plants grow bigger.
5 min	**Lesson focus question:** Students discuss their ideas about the focus question—*How do animals grow bigger?*—and whether animals grow bigger in different ways than plants.	
5 min	**Setup for activity:** Students recap how they used linking-cube food molecules in the previous lesson to "grow" a tree. Then they arrange the linking-cube food molecules on the tree mat and set up the squirrel and mountain-lion mats (organism posters).	• Plants take carbon-dioxide molecules from the air and water molecules from the soil and use energy from the Sun to rearrange these molecules to create energy-supplying food molecules that are used to build the plants' structures and make the plants grow bigger.
8 min	**Activity:** The teacher guides small groups of students in using linking cubes (representing atoms and molecules) and organism posters (mats) to show how animals get the food matter they need to grow by eating plants or other animals that have eaten plants.	• Animals eat some of the food molecules plants make and use this matter (food molecules) to grow bigger.
12 min	**Follow-up to activity:** As a group, students construct a diagram showing how the squirrel and mountain lion grow bigger. Using the same food chain, the teacher introduces the terms *food chain*, *consumer*, *herbivore*, *carnivore*, and *omnivore*.	• The food molecules that producers make move in a pattern of food chains from the producers that make the food to consumers (herbivores, carnivores, omnivores) that get the food matter they need to grow by eating plants or other consumers that have eaten plants.
21 min	**Synthesize/summarize today's lesson:** Students create and label a simple food chain and write sentences about how plants and animals in this food chain get the matter they need to build their body structures and grow. Then the teacher summarizes key science ideas from the lesson. **Optional extension of synthesize task (5 min):** The teacher guides students in evaluating their food-chain diagrams and sentences.	• Plants are producers that take non-energy-supplying matter from the air (carbon-dioxide molecules) and soil (water molecules) and use energy from the Sun to rearrange this matter into food molecules that are used to build the plants' structures and make the plants grow bigger. This food matter moves in a pattern of food chains from producers, which use matter in the environment to make their own food, to consumers (herbivores, carnivores, omnivores) that get the food matter they need to grow by eating plants or other consumers. All living things use the matter in food to build their body structures and grow bigger.
1 min	**Link to next lesson:** The teacher links science ideas to the next lesson and introduces the focus question.	

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3 min	**Link to Previous Lesson** **Synopsis:** Students discuss what they learned in the previous lesson about how plants grow bigger. **Main science idea(s):** • Plants take non-energy-supplying matter from the air (carbon-dioxide molecules) and soil (water molecules) and use energy from the Sun to change this matter into energy-supplying food matter (molecules) that are used to build the plants' structures and make the plants grow bigger.	Link science ideas to other science ideas.	**Show slides 1 and 2.** What did we learn in our last science lesson about how plants grow bigger?	They make sugar molecules and use them to grow bigger. I want to add that plants take water molecules from the soil and carbon-dioxide molecules from the air and change them into food molecules. I agree, but I want to add that plants need sunlight, too!	Does anyone agree or disagree or have anything to add to this statement?
5 min	**Lesson Focus Question** **Synopsis:** Students discuss their ideas about the focus question—*How do animals grow bigger?*—and whether	Set the purpose with a focus question or goal statement.	**Show slide 3.** Last time we considered how plants grow. Today our focus question is *How do animals grow bigger?* Write this question in your science notebooks and draw a box around it. **ELL support:** Identify key vocabulary words and put them on a chart or display them in the		

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	animals grow bigger in different ways than plants.		classroom. Review the words from the previous lesson. Also prepare visual representations for the following key terms: *producer*, *consumer*, *herbivore*, *carnivore*, *omnivore.* We're going to look at a video and some pictures of living things. As you look at these images, think about whether animals grow bigger in the same way as plants or in a different way. **Show slides 4–10.** **NOTE TO TEACHER:** • *Show a time-lapse video of animal growth, such as the video of a German shepherd (slide 4). (Link to video at https://www.youtube.com /watch?v=ISYBpayqL-0.)* • *Show pictures of baby animals and adult animals.* **Turn and Talk:** Do you think animals grow bigger in the same way plants do, or in a different way? Talk about this question with an elbow partner, and be ready to give your reasons. **Whole-class share-out:** Let's hear some of your ideas.	*A sophisticated response:* We think animals grow bigger in the same way as plants because they eat plants, so they must use the same molecules to grow bigger.	

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				A less sophisticated response: Both plants and animals use food to grow bigger, but they use different kinds of food. Plants and animals have different body parts, so they have to grow differently.	
5 min	**Setup for Activity** **Synopsis:** Students recap how they used linking-cube molecules in the previous lesson to "grow" a tree. Then they arrange the linking-cube food molecules on the tree mat and set up the squirrel and mountain-lion mats (organism posters). **Main science idea(s):** • Plants take carbon-dioxide molecules from the air and water molecules from the soil and use	Make explicit links between science ideas and activities **before** the activity.	**Show slide 11.** What did we do yesterday with water and carbon-dioxide molecules? **ELL support:** Display diagrams of water, carbon-dioxide, and food molecules, including definitions and usage. Get out the large plastic bags of food molecules and arrange them on your tree mats like you did yesterday. **Student work time.**	We used water and carbon-dioxide molecules to make food molecules. We showed how a tree makes food molecules from water and carbon-dioxide molecules and uses the food molecules to grow bigger.	

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	energy from the Sun to rearrange these molecules to create energy-supplying food molecules that are used to build the plants' structures and make the plants grow bigger.	Highlight key science ideas and focus question throughout.	**Show slide 12.** Now we'll explore the focus question, *How do animals grow bigger?* I'm going to give each group two new organism mats—a squirrel mat and a mountain-lion mat. Place them in a line the way they're shown on the slide. [*Distribute the squirrel and mountain-lion mats (handouts 3.2 and 3.3).*] **NOTE TO TEACHER:** *Remind students that models help us better visualize something very big (e.g., a globe as a model of Earth) or very small (linking cubes as models of molecules).*		
8 min	**Activity** **Synopsis:** The teacher guides small groups of students in using linking cubes (representing atoms and molecules) and organism posters (mats) to show how animals get the food matter they need to grow by eating plants or other animals that have eaten plants. **Main science idea(s):** • Animals eat some of the food molecules plants make and use this matter (food molecules) to grow bigger.	Select content representations and models matched to the learning goal and engage students in their use.	**ELL support:** During this activity, allow time for students themselves to talk about what is happening before moving on to the next organism. **NOTE TO TEACHER:** *Ask the following questions to model animal growth.* 1. Can the squirrel do what the plant does? Can it grow by making food molecules? 2. So how does the squirrel grow bigger? 3. To show how the squirrel gets bigger, let's imagine it eating some of the nuts on this tree.	No, only plants can use sunlight to make food. By eating the plant. By taking food molecules from the plant.	

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			When it does this, it takes food molecules the tree made and adds these molecules to its own body to grow bigger. **To model how the squirrel grows bigger by using this matter, move some food molecules from the tree to the squirrel. Don't move all of the food molecules, because the squirrel doesn't eat the whole tree!** 4. Now what about the mountain lion? How will it grow? 5. Yes, the mountain lion is going to get the matter (food molecules) it needs to grow bigger by eating most of the squirrel (it doesn't eat the bones). **So move most of the food molecules from the squirrel to the mountain lion to show how the mountain lion will grow bigger using the matter (food molecules) it got from eating the squirrel.** **NOTE TO TEACHER:** *Have each group put their linking-cube sugar molecules back into the large plastic bag. They'll need these again during the next lesson.*	It's going to eat the squirrel! The mountain lion will get food molecules from eating the squirrel and will use those molecules to get bigger.	*Challenge question:* Can you use the word *matter* or *food molecules* to describe how the mountain lion will get bigger?
12 min	**Follow-Up to Activity**		**Show slide 13.**		

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	Synopsis: As a group, students construct a diagram showing how the squirrel and the mountain lion grow bigger. Using the same food chain, the teacher introduces the terms *food chain, consumer, herbivore, carnivore,* and *omnivore*. **Main science idea(s):** • The food molecules that producers make move in a pattern of food chains from the producers that make the food to consumers (herbivores, carnivores, omnivores) that get the food matter they need to grow by eating plants or other consumers that have eaten plants.	Make explicit links between science ideas and activities **after** the activity. Select content representations and models matched to the learning goal and engage students in their use.	So how do animals grow bigger? What words, arrows, and drawings can we add to our diagram to show how these living things grow bigger? **Think-Pair-Share:** Think for a moment about what you would add to this diagram to show how the squirrel and the mountain lion can get bigger. Then pair up with a partner and share your ideas. **Whole-class discussion:** What should we add to this diagram to show how the squirrel and the mountain lion grow bigger? **NOTE TO TEACHER:** *As students offer suggestions that are acceptable to the class, you could have them come to the board (or Smart Board) and add to the diagram. Alternatively, you could make the additions yourself.* ***Emphasize** that the squirrel and the mountain lion are made up of many, many molecules piled on top of one another. You could compare this to a sand castle made of many, many grains of sand.*	We need to show food molecules going from the tree to the squirrel and from the squirrel to the mountain lion. They're like building blocks that help make the animal's body parts. Draw an arrow from the squirrel to the mountain lion showing that food molecules move to the mountain lion. Draw an arrow from	How do food molecules make the squirrel and mountain lion grow bigger?

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				the tree to the squirrel.	How should we label the arrow?
				Food molecules.	How does your picture show that the squirrel grows bigger?
				As the squirrel gets more and more food molecules, it gets bigger and bigger.	
			Show slide 14. **NOTE TO TEACHER:** *Display only the question and the mountain-lion image on the slide for the first part of this discussion.*		
		Engage students in analyzing and interpreting data and observations.	Now let's see if you can answer this question: Where did the matter in the mountain lion's food come from **at the very beginning**?	From the tree.	
				From the carbon dioxide and the water.	
					And how did the matter get from the tree to the mountain lion?
			Isn't this amazing to think about? The matter in the mountain lion's food started out in the beginning as carbon dioxide and water!		Can you go back even further than that—before the tree?
			NOTE TO TEACHER: *To emphasize this, reveal the slide images of the food-molecule pathway*		

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			organism by organism—first from the mountain lion to the squirrel, and then to the tree, and then to the water in the soil and the carbon dioxide in the air. **Show slide 15.** **NOTE TO TEACHER:** *First show only the tree image on the slide.* Scientists have names for these food-chain relationships among organisms. Does anyone remember the name for the plants that make food? **NOTE TO TEACHER:** *Next, reveal the squirrel and mountain lion on the slide.* Now let's see what they call the animals. Have you ever heard the word *consumer*? You've probably heard people described as consumers, right? Consumers can be people or any organism that uses things other people produce, or that plants produce in this case. What do the squirrel and the mountain lion "use" in a food chain? Can the squirrel ever be a producer?	Producers. Because they produce food. Food. No, only plants can make food out of water, carbon dioxide, and light.	Why do we call them *producers*? Yes, the tree makes its own food that it

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			Can the tree ever be a consumer? **NOTE TO TEACHER:** ***Emphasize*** *that the food the tree makes is what it uses to live and grow. Plants are not consumers.* *Kids may bring up Venus flytraps as an example of a plant that "consumes" flies. In fact, the Venus flytrap gets its energy-supplying food primarily from photosynthesis, but it uses flies as a good source of nitrogen to build protein molecules. This is needed when the soil in their environment doesn't provide enough nitrogen.* This sequence of the tree providing food for the squirrel and the squirrel providing food for the mountain lion is called a *food chain*. Why do you think scientists call it a chain? **NOTE TO TEACHER:** *Show students a length of chain to illustrate this concept*.	No, the tree makes food. But some plants are consumers: The Venus flytrap catches flies! Because the tree and the squirrel and the mountain lion are all linked together. Food! Yeah, a food molecule can start in the tree and go to the squirrel and then to the mountain lion. So	uses to live and grow. What links them together? Can you talk about that in terms of food molecules?

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		Select content representations and models matched to the learning goal and engage students in their use. Engage students in analyzing and interpreting data and observations.	**Show slide 16.** **Think-Pair-Share:** This slide gives more information about food chains. Think of the diagram as a puzzle to figure out. Study it and then turn and talk to a partner about how each link in the food chain works. Be ready to share your ideas with the whole class. **Whole-group share-out:** Now let's see if we can figure out each puzzle. **Puzzle 1:** What is the difference between how a tree gets food and how a squirrel gets the food it needs to grow? **Puzzle 2:** What is the difference between the squirrel and the mountain lion? **Puzzle 3:** What is the difference between the	they're all connected. The tree produces food, and the squirrel consumes the food that the tree makes. The squirrel is an herbivore, and the mountain lion is a carnivore. An herbivore eats plants, and a carnivore eats animals.	Looking at the diagram, can you figure out what the words *herbivore* and *carnivore* mean?

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			squirrel and the fox?	The squirrel only eats nuts from the tree, but the fox eats nuts from the tree and eats the squirrel, too.	
				Omnivores.	So what do we call organisms that eat both plants and animals?
			Puzzle 4: What is the difference between the mountain lion and the fox?	The fox eats both the nuts from the tree and the squirrel, but the mountain lion eats only the squirrel.	
				The mountain lion is a meat eater.	
				An omnivore.	So we call the mountain lion a *carnivore*. What do we call the fox?
		Highlight key science ideas.	Let's practice saying these words together. The mountain lion is a **consumer**. This squirrel is a **consumer**. The plant is a **producer**. Because the squirrel eats only plants, we call it an **herbivore**. Because the mountain lion eats only other consumers, we call it a **carnivore**. The fox is an **omnivore** because it eats both producers and consumers.		
			ELL support: Display the words *consumer*,		

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			producer, *herbivore*, *carnivore*, and *omnivore*, including visual examples of each. **Show slide 17.** There are ways to remember what these words mean: • **Vore** means "to devour" or "to eat" in Latin. • **Herb**ivores devour herbs, which are plants or vegetation. • **Carn**ivores devour meat. The word *carne* means "meat" in Spanish. • **Omni**vores devour both herbs and meat. They eat all kinds of living or once-living things. The word *omni* means "all" in Latin. **ELL support:** This might be a good time to talk about scientific names in Latin (or Greek) and the relationship of Spanish to Latin as a romance language, since the word *carne* and similar conjugations (e.g., *carni*) are also Latin. This is a way to reinforce Spanish as a helpful resource for learning Latin-derived scientific names. Think about what you eat. Do you eat both producers and consumers? Are you an herbivore, a carnivore, or an omnivore?		
21 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** Students create and label a simple food chain and write sentences about how plants and animals	Engage students in using and	**NOTE TO TEACHER**: *Decide whether you want students to work in pairs (as suggested here) or individually*. **Show slide 18.** Now let's see if you can use the ideas we've talked about to draw and label a food-chain diagram to		

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	in this food chain get the matter they need to build their body structures and grow. Then the teacher summarizes key science ideas from the lesson. **Main science idea(s):** • Plants are producers that take non-energy-supplying matter from the air (carbon-dioxide molecules) and soil (water molecules) and use energy from the Sun to rearrange this matter into food molecules that are used to build the plants' structures and make the plants grow bigger. This food matter moves in a pattern of food chains from producers, which use matter in the environment to make their own food, to consumers (herbivores, carnivores, omnivores) that get the food matter they	applying new science ideas in a variety of ways and contexts. Select content representations and models matched to the learning goal and engage students in their use.	show how matter helps living things grow bigger. a. First, select three or four organisms from the list on the slide: • Bush with berries • Small bird • Squirrel • Raccoon • Deer • Oak tree with acorns • Hawk • Grass • Grasshopper • Wolf b. You can work with a partner, but each of you should draw the diagram in your own notebook. You can refer to our tree-squirrel-mountain-lion model of a food chain for help. c. Draw a diagram with arrows and label your arrows "provides matter for." d. Be sure to label the organisms in your food chain as either **producers** or **consumers**. **CONTENT NOTE TO TEACHER:** ***Emphasize*** *that you're following the pathway of how matter moves: The food molecules move from the plant to the herbivore and then to the carnivore. A common mistake is to draw the arrows backward, showing the rabbit finding and eating the grass or the mountain lion catching and eating the rabbit.* **NOTE TO TEACHER:** *When most students are nearly finished drawing and labeling their diagrams, give directions for writing sentences.*		

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	need to grow by eating plants or other consumers. All living things use the matter in food to build their body structures and grow bigger.		*Encourage students to use as many words from the word bank as they can.* **Show slide 19.** Next, write two sentences underneath your diagram, using the sentence starters on the slide. For the first sentence, explain how **producers** in this food chain grow. For the second sentence, explain how **consumers** in this food chain grow. Draw from the word bank on the slide to help you write complete explanations. [Word bank: *energy*, *matter*, *molecules*, *carbon dioxide*, *water*, *Sun*, and *food*] **NOTE TO TEACHER:** *Students may not be familiar with what different animals eat. You can provide this information or encourage students to search various references themselves. The following information may be helpful:* • *The producers in this list are the berry bush, the oak tree, and the grass.* • *The herbivores are the squirrel, the deer, and the grasshopper.* • *The wolf and the hawk are carnivores.* • *Raccoons are omnivores—they'll eat any living thing, plant or animal!* • *Some birds are herbivores and eat mostly seeds or nectar (like hummingbirds);* • *Some birds are omnivores and eat worms and insects as well as seeds (like robins).* **ELL support:** You could have a whole-class discussion about what each of the organisms might eat.		

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		Summarize key science ideas.	**NOTE TO TEACHER:** *While students work, look at their drawings and listen to their conversations to identify possible confusion. Use this time to think about what you want to highlight in your summary of key science ideas in the lesson.* **Show slide 20.** **ELL support:** Instead of giving the summary of key science ideas in today's lesson, ask students to provide the summary. So today we talked about how animals get the matter (or food molecules) they need to build their bodies and grow by eating plants or other consumers that have eaten plants. Animals are called *consumers* because they can't make their own food; instead, they "consume" or eat the matter or molecules plants produce. We also learned some scientific terms to describe these food relationships: **Food chains** have both **producers** (plants) and **consumers** (animals). Some animals eat only plants (**herbivores**), and some eat only other animals (**carnivores**). Some animals eat both plants and other animals (**omnivores**).		
5 min	**Optional Extension of Synthesize Task** **Synopsis:** The teacher guides students in evaluating their food-chain diagrams and sentences.		**Optional:** This activity could be included in another lesson.  ***Embedded Assessment Task***		

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	Main science idea(s): • Plants are producers that take non-energy-supplying matter from the air (carbon-dioxide molecules) and soil (water molecules) and use energy from the Sun to rearrange this matter into food molecules that are used to build the plants' structures and make the plants grow bigger. This food matter moves in a pattern of food chains from producers, which use matter in the environment to make their own food, to consumers (herbivores, carnivores, omnivores) that get the food matter they need to grow by eating plants or other consumers. All living things use the matter in food to build their body structures and grow bigger.		Now I want you to work with a partner to check your food-chain diagrams for scientific accuracy. Let's read the questions on the slide to guide you in assessing your food chains. If you discover any mistakes or gaps in your drawings as you go, fix them. **Show slide 21.** **Assessing Your Food-Chain Diagram** 1. Does your food chain start with a plant? 2. Did you label the plant a **producer**? 3. Did you draw an arrow from the plant to an animal? Did you label this animal a **consumer** and either an **herbivore** or an **omnivore**? 4. Did you draw an arrow from this animal to another animal that eats it? Did you label this new animal a **consumer** and a **carnivore**? **ELL support:** This new animal can also be an omnivore. Make this explicit to support ELL comprehension. 5. Are your arrows labeled "provides matter for"? 6. **Bonus:** Does your food chain include more than three organisms? **Show slide 22.** **Assessing Your Food-Chain Sentences** 1. Does your sentence about **producers** say they use sunlight, carbon dioxide, and water to make their own food?		

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			2. Does your sentence about **consumers** say that they get food molecules by eating plants or other animals that eat plants? 3. Do **both** of your sentences say that plants and animals use food molecules to grow bigger? 4. **Bonus:** Do **both** of your sentences mention that only producers (plants) can make their own food?		
1 min	**Link to Next Lesson** **Synopsis:** The teacher links science ideas to the next lesson and introduces the focus question.	Link science ideas to other science ideas.	**Show slide 23.** Tomorrow we'll look at and talk about the food-chain diagrams you've created. Your diagrams should show a variety of food chains, since there are many different kinds in nature. They should also show matter being passed along from organism to organism, as well as plants and animals using food matter to build their body parts and grow bigger. After looking at your diagrams, we'll think about an important question: *What happens to matter as it moves from organism to organism in a food chain?*		