

Food Webs

Lesson 1a: Food

Grade 5	Length of lesson: 46 minutes	Placement of lesson in unit: 1a 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: What is food?
Main learning goal: Food provides matter and energy for all living things.		
Science content storyline: All living things need both matter and energy to survive. Scientists define <i>food</i> as “matter (building materials) that contains energy living things can use to live and grow, to heal wounds, and to keep all their parts working.” Only food has both of those essential components. We can find out if materials are food by analyzing whether they have mass and Calories (a measure of food energy). For example, some chewing gum is food because it is matter (measured in grams) that contains energy (measured in Calories). Some chewing gum is not food because it doesn’t have any Calories (food energy).		
Ideal student response to the focus question and the synthesize/summarize task: Food is matter that contains energy living things need to live and grow, to heal wounds, and to keep all their parts working. We can tell whether materials are food by examining nutrition labels. If the material has mass, it’s matter. If the material has Calories, then it contains food energy. Some chewing gum has both mass and Calories, so it’s food by the scientific definition.		

Preparation

<p>Materials Needed</p> <ul style="list-style-type: none"> • Science notebooks • Packet of small seeds (1 per group) • Large green plant or large log • <i>Optional:</i> chart paper, markers <p>Student Handouts</p> <ul style="list-style-type: none"> • 1.1 What Is Food? (1 per student) 	<p>Ahead of Time</p> <ul style="list-style-type: none"> • Review the Food Webs Content Background Document: section 1.2, Is Food Considered Matter or Energy or Both? • Review the PowerPoint slides or Smart Board images and modify them as you wish. • Decide how you’ll begin the lesson (see NOTE TO TEACHER in introduction section). Will you use the photos of adult and baby organisms or use seeds and a large plant or log (or a combination)? You may want to show students just a few photos of adult and baby organisms and save some of these PowerPoint images for later lessons. • Collect the necessary food and beverage containers OR make copies of labels to use as handouts. You might request that students bring in empty food, beverage, vitamin, and plant-food containers from home and/or ask your teaching colleagues to do the same.
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Lesson 1a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	Introduction: The teacher introduces the 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> Then the teacher elicits student ideas about what plants and animals need to live and grow from a small seed or baby animal into a large plant or an adult animal.	<ul style="list-style-type: none"> All living things need food to live and grow.
5 min	Lesson focus question: The teacher introduces the focus question <i>What is food?</i>	<ul style="list-style-type: none"> Food provides what living things need to live and grow.
10 min	Setup for activity: Students write their own definitions of the word <i>food</i> . Then they write about and discuss the question, <i>Do you think chewing gum is food?</i>	
10 min	Activity: To answer the question about whether chewing gum is food, students read and discuss a scientific definition of <i>food</i> .	<ul style="list-style-type: none"> Scientists define <i>food</i> as “matter (building materials) that contains energy living things can use to live and grow.” Energy in food is measured in Calories. Because food is matter, it has mass that can be measured (e.g., in grams).
10 min	Follow-up to activity: Students use the definition of <i>food</i> from the reading and their analysis of gum nutrition labels to figure out whether chewing gum is food.	<ul style="list-style-type: none"> To be defined as food, substances must have <i>both</i> matter (mass) and energy (Calories). Nutrition labels show measures of matter (grams) and food energy (Calories).
5 min	Synthesize/summarize today’s lesson: Students revisit their original definitions of <i>food</i> and write about how they’re different from the scientific definition.	<ul style="list-style-type: none"> To be defined as food, substances must provide matter <i>and</i> energy that living things can use to live and grow.
1 min	Link to next lesson: The teacher links science ideas to the next lesson.	

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5 min	<p>Introduction</p> <p>Synopsis: The teacher introduces the 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> Then the teacher elicits student ideas about what plants and animals need to live and to grow from a small seed or baby animal into a large plant or an adult animal.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> All living things need food to live and grow. 		<p>Show slides 1 and 2.</p> <p>Today we'll begin a unit that will help us think about the question, <i>How do living things depend on one another to get the food (matter and energy) they need to live and grow?</i> We'll keep this unit central question in our minds as we complete the science lessons.</p> <p>Write this question in your science notebooks and draw a double-lined box around it.</p> <p>First, let's talk about what plants and animals need to live and grow.</p> <p>NOTE TO TEACHER: <i>You have three options for the next steps in the discussion about how plants and animals get bigger.</i></p> <ol style="list-style-type: none"> <i>Use the actual seeds and the plant/log to guide this conversation. You can either carry around the seeds and the plant/log to show the students OR provide each group with some seeds to compare to the large plant or log.</i> <i>Use PPT slides 3–10 to guide this conversation.</i> <i>Use both options 1 and 2.</i> <p>Show the seeds and the plant or log.</p> <p>Look at these small seeds. Seeds like these can grow into big plants like this one. [OR Seeds like these can grow into big trees. Here's just one piece of a big tree.]</p>		


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		Ask questions to elicit student ideas and predictions.	<p>And/or:</p> <p>Show slides 3–9 (some or all).</p> <p>Look at these photos of young and adult plants and animals.</p> <p>Discussion question: What does a plant or animal need to live and grow? How do plants and animals get bigger?</p> <p>NOTE TO TEACHER: <i>Don't let this conversation go on very long. The goal is to make sure students know that both plants and animals need food to grow.</i></p> <p><i>Acknowledge all ideas without indicating whether they are right or wrong. Probe only those ideas that are related to food, energy, and growth. (At this point, you don't need to probe students' ideas about water and vitamins.)</i></p>	<p>They need food.</p> <p>Food helps them grow.</p> <p>Plants and animals need healthy food.</p> <p>It helps you grow strong bones.</p> <p>Plants need sunlight.</p> <p>They need water.</p> <p>Plants grow toward the sunlight.</p> <p>Water is food for the plants.</p>	<p><i>Ask questions to probe student responses that are related to food or growth:</i></p> <p>Tell me more about needing food.</p> <p>What does food have to do with growing?</p> <p>How do you think sunlight/water helps a plant grow bigger?</p>

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5 min	<p>Lesson Focus Question</p> <p>Synopsis: The teacher introduces the focus question, <i>What is food?</i></p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Food provides what living things need to live and grow. 	<p>Set the purpose with a <u>focus question</u> or goal statement.</p> <p>Ask questions to elicit student ideas and predictions.</p>	<p>NOTE TO TEACHER: <i>Write the focus question on the board for the class to see, and refer to it throughout the lesson.</i></p> <p>Show slide 10.</p> <p>OK, we agree that plants and animals need food to grow. But <i>what is food?</i> That’s our focus question for today.</p> <p>Copy the focus question into your science notebooks and draw a box around it.</p> <p>What do you think? How would you define <i>food</i>? Let’s hear some of your ideas.</p>	<p>Food is what you eat.</p> <p>Food is what you chew.</p> <p>Drinks aren’t food.</p> <p>Food is anything you take in through your mouth.</p> <p>Water is food because you need it to live. Juice isn’t food because it’s a drink.</p>	<p><i>Probe student thinking:</i></p> <p>Tell me more about food.</p> <p>Who agrees that water is food?</p> <p>Say more about why you think that.</p>

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				<p>Vitamins are food because you need them to be strong.</p> <p>Food is anything you need to be healthy.</p>	<p>Is there a difference between juice and water?</p> <p>Say more about that.</p> <p>What do you mean when you say, “Vitamins are food”?</p> <p>What things are NOT food? Why aren’t they food?</p>
10 min	<p>Setup for Activity</p> <p>Synopsis: Students write their own definition of the word <i>food</i>. Then they write about and discuss the question, <i>Do you think chewing gum is food?</i></p>	<p>Ask questions to elicit student ideas and predictions.</p> <p>Make explicit links between science ideas</p>	<p>NOTE TO TEACHER: <i>Distribute handout 1.1, What Is Food?</i></p> <p>Show slide 11.</p> <p>Let’s read the first two paragraphs on the handout <i>What Is Food?</i></p> <p>ELL support: Review vocabulary words for this lesson: <i>energy, matter, and Calories.</i></p> <p>How would you answer the question, <i>What is food?</i> Write your ideas about this question in your science notebooks.</p> <p>Individual writing time. <i>[Students don’t share their ideas at this time.]</i></p> <p>ELL support: Provide an opportunity for students</p>		

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		<p>and activities before the activity.</p> <p>Ask questions to elicit student ideas and predictions.</p>	<p>to talk about possible approaches and/or answers to the question.</p> <p>ELL support: Draw pictures of food for humans, an animal, and a plant.</p> <p>NOTE TO TEACHER: <i>Remind students not to just list examples of food they eat. Encourage them to try to define the term food.</i></p> <p>ELL support: A model would help here. The only model students have right now is a list of food, exactly what is not wanted. Help students create definitions by providing an outline of specific components.</p> <p>Individuals: Let’s move on to question 2 on the handout. Using your definition of <i>food</i>, do you think chewing gum is food? Write your answers in your notebooks and give your reasoning (your thinking) about why you said yes or no.</p> <p>Individual writing time.</p> <p>Whole-class discussion: Let’s hear some of your initial ideas. Do you think chewing gum is food? What are your reasons?</p> <p>NOTE TO TEACHER: <i>Have several students share their reasoning. Notice whether students agree or disagree about whether gum is food. Don’t correct their ideas at this time but suggest that you’ll get answers today by exploring a scientific definition of food.</i></p>	<p>Yes, because you chew it.</p> <p>Yes, because you swallow the juices from the gum.</p> <p>No, because you don’t swallow it.</p>	

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				No, because it's not healthy.	
10 min	<p>Activity</p> <p>Synopsis: To answer the question about whether chewing gum is food, students read and discuss a scientific definition of <i>food</i>.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> • Scientists define <i>food</i> as “matter (building materials) that contains energy living things can use to live and grow.” • Energy in food is measured in Calories. • Because food is matter, it has mass that can be measured (e.g., in grams). 	<p>Make explicit links between science ideas and activities during the activity.</p> <p>Highlight key science ideas and focus question throughout.</p>	<p>To answer our question about chewing gum, let's find out how scientists define the word <i>food</i>.</p> <p>Scientists use very specific definitions to clarify what they mean by certain words like <i>food</i>. At the bottom of page 1 of the handout is a section titled How Do Scientists Define <i>Food</i>? Read the first paragraph of that section.</p> <p>Did any of you define <i>food</i> in these ways? [<i>Food is something we chew or take into our bodies.</i>]</p> <p>Now read the second paragraph at the bottom of page 1 and the scientific definition of <i>food</i> in the first box on that page.</p> <p>ELL support: Engage in an open-ended, student-centered discussion (a science workshop) about what the scientific definition of <i>food</i> might mean. Ask students, “What do we think this definition means?”</p> <p>MISCONCEPTION ALERT: Most molecules (including water molecules and carbon-dioxide molecules) contain some energy stored in their bonds. <i>But only some molecules contain energy that living things can use to live and grow.</i> In these lessons, we consistently refer to food as providing “energy that living things can use to live and grow.” We sometimes call this <i>food energy</i>.</p> <p>Show slide 12.</p>		

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			<p>What do you think are the two most important words in this scientific definition?</p> <p>Why are these words so important? Find a sentence on the handout that answers this question.</p> <p>ELL support: Provide an opportunity for ELL students to do something with these words. Have them draw examples of each, for example.</p> <p> STOP AND THINK</p> <p>Let's talk about the Stop and Think question on page 2 of the handout. How many of you have heard of matter? What about energy? What do you think these words mean?</p> <p>Now let's continue reading about matter and energy in food (the paragraphs after the Stop and Think box on page 2 of the handout).</p> <p>ELL support: Vocabulary words with definitions (<i>matter, energy, mass, Calories</i>) should be displayed/discussed prior to the lesson. Students could make key-terms dictionaries.</p> <p>NOTE TO TEACHER: <i>We want to have students talk about the mass of an object rather</i></p>	<p>Matter and energy.</p> <p>“All living things need both the matter and energy in food to grow, to heal wounds, and to keep all their parts working.”</p> <p>Matter means it's not important; it doesn't matter.</p> <p>Energy is what helps you run and stuff.</p>	

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			<p><i>than its weight, since it is scientifically more accurate. It's OK to say we weigh something, but emphasize that by weighing something, we're finding its mass.</i></p> <p>NOTE TO TEACHER: <i>It's very difficult to understand what energy is, and that it is not matter. Energy is not a "thing." Scientists define it as "the ability to do work," but this definition won't have much meaning for students.</i></p> <p>Emphasize: Matter and energy aren't the same. Matter is something that has mass (weight) and takes up space. It can be very big or very tiny. It has a size and a mass. In contrast, you can't weigh energy; you can't put it in a bottle and look at it.</p> <p>Are bones matter or energy?</p> <p>What about muscles?</p> <p>What about running?</p> <p>Continue reading the paragraphs on page 2. How</p>	<p>Bones are matter.</p> <p>Bones weigh something, so they're matter.</p> <p>Muscles are matter too.</p> <p>You use energy to run.</p> <p>Running isn't something you can weigh.</p>	

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			<p>do living things get the matter and energy they need to live and grow?</p> <p>After reading: What have you learned so far about our focus question, <i>What is food?</i></p> <p>Clarify: Food doesn't just have some matter in it; it IS matter. Every part of it is matter. And that matter contains energy [<i>or more accurately, it has the potential to release energy</i>].</p> <p>MISCONCEPTION ALERT: <i>Technically, it's misleading to say that food "contains" energy, because energy isn't a thing that can be contained. it's more accurate to say that food has the potential to release or provide energy. For these lessons, it's OK for students to talk about energy being stored or contained in the matter. However, be on the lookout for students who talk about energy as if it IS matter (e.g., that energy is a "thing" or "food is energy and matter").</i></p> <p>ELL support: Have students discuss food in light of the new definition. Provide opportunities for students to use home language.</p> <p>What else have you learned so far about our focus question, <i>What is food?</i> (Look back at the two paragraphs near the bottom of page 2 of the handout.)</p> <p>Clarify: Calories are not energy. They are used to measure how much energy is in food.</p>	<p>Food has matter.</p> <p>It says food is matter.</p> <p>Food is also energy.</p> <p>It says food contains energy.</p> <p>The kind of energy that living things can use to live and grow.</p> <p>We learned about Calories.</p> <p>Calories are energy. [<i>Misconception</i>]</p>	<p>Look back at the scientific definition of <i>food</i>. What does it say about food and matter? Does it say, "Food has matter"?</p> <p>Does the scientific definition say that food is energy?</p> <p>What kind of energy?</p> <p>What do Calories have to do with food?</p>

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			How do we measure how much matter is in food?	It says food energy is measured in Calories. We weigh it!	Find the sentence in the handout that says, “Calories are energy.” Yes, we find its mass.
10 min	<p>Follow-Up to Activity</p> <p>Synopsis: Students use the definition of <i>food</i> from the reading and their analysis of gum nutrition labels to figure out whether chewing gum is food.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> To be defined as food, substances must have <i>both</i> matter (mass) and energy (Calories). Nutrition labels show measures of matter (grams) and food energy (Calories). 	Make explicit links between science ideas and activities after the activity.	<p>Show slide 13.</p> <p>Does the handout tell us whether chewing gum is food?</p> <p>What do we need to know about chewing gum to decide whether it’s food by the scientific definition?</p> <p>We need to know whether gum is matter that contains energy living things can use to live and grow.</p> <p>Turn and Talk: How do we know whether chewing gum is <i>matter</i> that contains food <i>energy</i>? If you need help, look back at the two paragraphs near the bottom of page 2 right under the question, <i>How do living things get the matter and energy they need to live and grow?</i></p> <p>Whole-class discussion: What did you find out?</p>	<p>No!</p> <p>If it has matter and energy. <i>[Note the misconception. Food is matter; it doesn’t just have matter.]</i></p> <p>If it weighs something, it’s matter.</p>	

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			<p>Yes, anything that has mass or weight is matter.</p> <p>What things do you see in this room that are matter and have weight?</p> <p>How about some really small examples of matter in our classroom?</p> <p>What about energy? How can you tell whether some kinds of matter can provide (or contains) food energy?</p> <p>Show slide 14.</p> <p>Next, I'm going to show you how to find out whether materials are matter and can provide</p>	<p>You can measure matter in grams.</p> <p>It has mass.</p> <p>“It” means anything—like chewing gum.</p> <p>Books.</p> <p>Desks.</p> <p>Me!</p> <p>Drops of water.</p> <p>Staples.</p> <p>Dust.</p> <p>Calories!</p> <p>Calories measure food energy.</p>	<p>What do you mean by “it”?</p> <p>Tell me more about Calories.</p>

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			<p>energy that living things can use to live and grow.</p> <p>Show packages of chewing gum.</p> <p>Boxes of things we buy at the grocery store, like chewing gum, have information on nutrition labels. We can look at nutrition labels to find out whether something is matter that contains food energy.</p> <p>Look at the chart at the top of page 3 on your handouts. We're going to look at nutrition labels for two different kinds of gum to see if the gum has any mass (weight). How will that help us decide whether the gum is food?</p> <p>Show slides 15 and 16.</p> <p>Now let's look at the nutrition labels on the slides and fill in this chart together.</p> <p>NOTE TO TEACHER: Use PowerPoint slides 15 and 16 to show the nutrition labels for two different types of gum. Guide students to fill in the chart and draw conclusions. (Is the gum food by the scientific definition? Yes or no?)</p>	<p>If it's matter.</p> <p>If it's matter, then it's food.</p> <p>I disagree. If it's matter, it <i>might</i> be food. It also has to have energy.</p>	<p>Say more.</p> <p>Does anyone agree or disagree?</p>

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		Engage students in analyzing and interpreting data and observations	<p>Show slide 17.</p> <p>Individuals: In your science notebooks, write your answers for the analysis question that appears on page 3 of the handout: <i>Is chewing gum food by the scientific definition? Explain your thinking.</i> Write two sentences using the sentence starters.</p> <p>Individual writing time.</p> <p>Think-Pair-Share (optional if time allows): After you've answered the analysis question, share your ideas with a partner. Do you and your partner agree? Where do you disagree?</p>		
5 min	<p>Synthesize/Summarize Today's Lesson</p> <p>Synopsis: Students revisit their original definitions of <i>food</i> and write about how they're different from the scientific definition.</p> <p>Main science idea(s):</p> <ul style="list-style-type: none"> To be defined as food, materials must provide matter <i>and</i> energy that living things can use to live and grow. 	<p>Highlight key science ideas and focus question throughout.</p> <p>Engage students in making connections by synthesizing and summarizing key science ideas.</p>	<p>Show slide 18.</p> <p>Today we addressed our focus question, <i>What is food?</i> We also learned about a scientific definition of <i>food</i>.</p> <p>Now I want you to reflect on what you learned. Look at the definition of <i>food</i> you wrote in your notebooks at the beginning of the lesson. Compare that definition to the scientific definition in the box at the bottom of page 1 in the handout.</p> <p>Show slide 19.</p> <p>Individuals: What new ideas do you have about the focus question, <i>What is food?</i> Be ready to share your ideas with the class using one of these sentence starters:</p> <ul style="list-style-type: none"> I learned ... 		

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			<ul style="list-style-type: none"> • My new ideas are ... <p>Individual think time.</p> <p>Whole-class share-out: <i>[Use equity sticks or go round-robin, if time allows.]</i> Tell me what you've learned today about the definition of <i>food</i>. Be sure to use one of the sentence starters on the slide and the handout.</p>		
1 min	<p>Link to Next Lesson</p> <p>Synopsis: The teacher links science ideas to the next lesson.</p>	Link science ideas to other science ideas.	<p>Show slide 20.</p> <p>Tomorrow we'll use the scientific definition of <i>food</i> to identify materials that are and are not food for living things. We'll also explore the question, <i>Do living things take in ("eat") materials that are not food?</i></p>		