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| **Overarching Essential Question for the entire unit:**   * How do plants and animals use matter and energy to grow, live, and respond to their environment?   In Quarter 4, students are working toward these **NGSS Performance Expectations** from [*http://www.nextgenscience.org/search-standards*](http://www.nextgenscience.org/search-standards)**:**   * 5-PS3-1 Use models to describe that energy in animals’ food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. * 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. * 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. |

**Essential Question(s) for this lesson:**

* How can we use an owl pellet as a model? What is it a model of?

**Learning Target(s) for this lesson:**

* I can identify and label the bones of the organisms that an owl ate and figure out what an owl needs to survive.
* I can identify a food chain.

**NGSS Three Dimensions addressed in this lesson:**

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| **Science and Engineering Practices** | **Disciplinary Core Ideas** | **Crosscutting Concepts** |
| **Developing and Using Models**  Use models to describe phenomena.  **Analyzing and Interpreting Data**  **Engaging in Argument from Evidence**  Support an argument with evidence, data, or a model. | **LS2.A: Interdependent Relationships in Ecosystems**  The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.  **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems**  Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. | **Systems and System Models**  A system can be described in terms of its components and their interactions.  **Energy and Matter**   * Matter is transported into, out of, and within systems. * Energy can be transferred in various ways and between objects. |

**Teacher Background:**

This lesson is a continuation of the previous lesson regarding owl pellets. Students are examining owl pellets as an example of evidence of an interaction from an ecosystem. This example will lead into the idea of a food chain and/or food web, which is a series of interactions similar to the one which resulted in the owl pellet.

“The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants, while decomposers restore some materials back to the soil.

Assessment Boundary: Assessment does not include molecular explanations.”

National Research Council. (2012). A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

*FOR OUR PURPOSES:*

The focus of this lesson is for students to understand that organisms get the energy they need from food. Boundary: Assessment does not include molecular explanations.

*In this lesson, students are working toward the following****:***

**NGSS Performance Expectations:**

**5-PS3-1.** Use models to describe that energy in animals’ food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

* **Clarification Statement**: Examples of models could include diagrams and flowcharts.

**Excerpts from *A Framework for K-12 Science Education***

**LS1.C: ORGANIZATION FOR MATTER AND ENERGY FLOW IN ORGANISMS** See pages 147 - 148 in *A Framework for K-12 Science Education*.

**LS2.B: CYCLES OF MATTER AND ENERGY TRANSFER IN ECOSYSTEMS** See pages 152 - 154 in *A Framework for K-12 Science Education*.

**PRACTICE 7: Engaging in Argument from Evidence** See pages 71 - 74 in *A Framework for K-12 Science Education.*

**Crosscutting Concept: Energy and Matter: Flows, Cycles, and Conservation** See pages 94 - 96 in *A Framework for K-12 Science Education*

National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

**Teacher Preparation:**

* Science Word/Everyday Word suggestions:

*Science Word Everyday Word*

Model representation; smaller version of something

food chain a chain reaction of organisms eating other organisms

* During the exploration, students will need to work with the same partner from the previous lesson, and will need to use the bag of their discovered bones.
* For Lesson 6, *if you will be choosing* ***SEED C in the Engagement of Lesson 6*,** you will need to prepare for this 3 days prior.Three days before lesson 6, place a heavy, opaque object (a brick or something similar) outdoors in a grassy area and label it to be left alone (so no one moves it).
* Identify and collect materials needed for chosen **Engagement**, **Evaluation**, and/or **Extension** seeds within the lesson.
* Using the chart below, gather materials out of the kit and consumables, needed for the **Exploration**.

**SAFETY NOTE:** Students should wear gloves and goggles when handling the bones. Students should NOT take owl pellet pieces home - there are allergy and choking hazards involved (once students have items out of adult supervision).

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| **MATERIALS**  **Needed for the Exploration** | *Non-consumables*  Provided in the **KIT** | *Consumables*  To be ordered from  **Science Resource Center** | Locate in your  **SCHOOL** |
| ***Teacher*** | * owl pellet chart |  | * [Smartscope Digital Microscope](https://hcpss.instructure.com/courses/33235/pages/smartscope-directions?module_item_id=458330) |
| ***Group of 4***  Students |  |  |  |
| ***Pair*** of Students |  | * bag of dissected materials from previous lesson | * black construction paper * glue or tape |
| ***Individual***  Students | * 1 hand lens | * 1 mask * 1 pair of gloves * 1 toothpick | * 1 pair of goggles |

***Science Kit Conservation:*** *In an effort to reduce, reuse, and recycle we offer these suggestions:*

* *Save extra of the following items, reducing your order for next school year on the SRC G5.Q\_ CCOF:*
  + 6” x 6” plastic zipper bags
  + Masks
  + Gloves
  + Toothpicks

**Engagement** *(choose one or more)*

*(Engagement should last no more than 5-8 minutes)***:**

* **SEED A:** Facilitate a group discussion on models. Some questions may include:
  + What are models?
  + How do we use models in science?
  + How can models allow us to look more closely at something?
  + What can we learn from models?
* **SEED B**: Facilitate a Four Corners Activity. Work as a class to create a definition of a model. Statements may include:
  + Models are important to scientist.
  + Models help scientist to make predictions.
  + Scientist use models to represent their current understanding.
  + Scientist can learn from models.

After reading each statement, students will choose a corner of the room that matches their opinion about the statement - Agree, Strongly Agree, Strongly Disagree, Disagree. Once students have committed to a corner, discuss as a class what made them choose that particular corner. [(see directions for how to facilitate “Four Corners” at http://www.theteachertoolkit.com/index.php/tool/four-corners](http://www.theteachertoolkit.com/index.php/tool/four-corners))

**Exploration** *(your science kit and consumables are built to support this exploration)***:**

1. Distribute materials and the bags of bones back to each student pair.
2. Have students remove the saved bones from their plastic bag and follow the directions onG5.Q4.L03.DiagramingtheEvidence. Possible diagramming and display options:

* glue the bones to the paper and label
* draw and label diagram of bones
* take pictures and make an electronic diagram (wixie, PowerPoint presentation, etc.)

1. Have students compare the skeleton to the bones on the Owl Pellet Chart to verify whether they have created a vole or another animal.

**SAFETY NOTE:** Students should wear gloves and goggles when handling the bones. Students should NOT take owl pellet pieces home – they can be an allergy and choking hazard (*once students have items out of adult supervision).*

**Explanation:**

* **Seed A:** Read pages 10-11 in *The War in Your Backyard*. *Note: this text can be located in fourth grade.* Discuss the interactions between the owl and its prey. Lead students to think about what the owl’s prey may have eaten for energy. Ask students what this owl pellet is a model of? What does it show/represent on a small scale? (food chain). Have students add to their Science Word/Everyday Word: Food Chain. *Please refer to the* [*Vocabulary*](https://hcpss.instructure.com/courses/33235/pages/vocabulary-2?module_item_id=445259) *section of the* [*Science Journals*](https://hcpss.instructure.com/courses/33235/pages/science-journals-overview?module_item_id=445187) *module on Canvas for more information.* Add conclusions that can be made from today’s lesson to the THC chart or bulletin board.
* **Seed B:** Use the document camera, or in small groups, to read page 14 of *Exploring Ecosystems with Max Axiom*. After reading, discuss the owl’s food chain. Ask students what this owl pellet is a **model** of? What does it show/represent on a small scale? (food chain). Have students add to their Science Word/Everyday Word: Food Chain. *Please refer to the* [*Vocabulary*](https://hcpss.instructure.com/courses/33235/pages/vocabulary-2?module_item_id=445259) *section of the* [*Science Journals*](https://hcpss.instructure.com/courses/33235/pages/science-journals-overview?module_item_id=445187) *module on Canvas for more information*. Add conclusions that can be made from today’s lesson to the THC chart or bulletin board.

**Extension** *(choose one or more)***:**

* **Seed A:** Havestudents can draw in their journal a 3-part comic strip of possible interactions that could have occurred *before* and *after* the owl consumed the organism (discovered from the owl pellet investigation). Allow time for students to share their ideas with a partner or as a class. Feature any interactions that refer to the idea of a food chain (see G5.Q4.L03.OwlComicExample as a sample).
* **Seed B:** Have students explore <http://kidwings.com/virtual-pellet/>, which includes additional information about owls and owl pellets and allows for them to dissect pellets virtually.
* **Seed C:** Read the article, “[Scientists Uncover a New Species in Owl Pellets](http://mentalfloss.com/article/64613/scientists-uncover-new-species-owl-pellets)” and discuss why owl pellets are important and how scientists can use them. This is a real-life example of scientists using models.
* **SEED D:** Play The Food Chain Game: <https://www.brainpop.com/games/foodchaingame/>

**Evaluation** *(choose one or more)***:**

Formative Assessments: When considering collecting grades from student journals, please reference the “[Monitoring Student Progress](https://hcpss.instructure.com/courses/33235/pages/monitoring-student-progress?module_item_id=445265)” page in the Canvas [Science Journals module.](https://hcpss.instructure.com/courses/33235/pages/science-journals-overview?module_item_id=445187)

* Collect anecdotal notes of student participation and/or engagement.
* Review student diagram of owl pellet bones.
* Review comic strip from extension.