



Garden Energy

Connected Next Generation Science Standards

4-PS3-1 Make observations to provide evidence that energy can be transferred from place to place.

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.

Featured Science and Engineering Practices

Developing and Using Models

Featured Cross-Cutting Concepts

Energy and Matter

This lesson works better if students are familiar with the term **Matter** (the stuff that everything is made from) and that it is different from **Energy** (what living things get from food to help them grow and do).

Overview

In this lesson, students connect strenuous garden work with the flow of energy through the ecosystem and a garden snack. Students will create models to understand how energy is used and transferred. This model can be adapted to create more complicated food webs that demonstrate how energy moves through the ecosystem.

Students will

- Observe the different ways humans and animals use energy
- Diagram the flow of energy through the garden ecosystem
- Identify that eating provides energy for garden work

Teacher Preparation

- Walk through the garden to familiarize yourself with where garden animals might be found.
- Decide what garden work task needs to be done.
- Locate some areas to taste test in the garden, or prepare a snack from the garden.

Guiding Question - How does energy flow through the garden ecosystem?



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Materials

- Teacher - small whiteboard or chalkboard
- Small cups or bug containers
- Garden notebooks or worksheets and clipboards
- Pencil
- Optional - magnifying glasses, examples of previous students' diagrams, trowels

Settings

- School garden or green space
- Works best on a sunny day in the fall and spring when pollinators and other animals are most active.
- Bring garden animals inside or use a classroom worm composting bin or other classroom pets to do this activity inside

Explore

- Start class off with a strenuous garden task like watering with heavy buckets or using wheelbarrows. If there is not a garden task to do, run out to the garden or do jumping jacks for 30 seconds.
- When finished with the exercise, ask students, What helped them complete the garden task today? How did they have the energy to work in the garden/exercise?
- Connect student responses to the idea that food gives them energy.
- Draw a stick figure in the center of your whiteboard.
- What else do they get energy from? Popcorn student responses. Write a few of their energy input ideas on the left side of the stick figure with an arrow pointing from the food words to the stick figure.
- What other tasks do they use energy for beside garden work? Popcorn a few answers and add them to the right of the stick figure with an arrow pointing from the stick figure to the words. Make sure answers include energy uses like growing, repairing itself, and staying warm.
- Label the food words as "food" or "**energy inputs**" and the right side as "actions" or "**energy outputs**."
- Explain that they are going to find a garden animal and put it in a cup. After observing the animal for several minutes, they are going to make a drawing of their animal similar to the stick figure diagram based on the animal's behavior and body structures.



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Add a third category for **waste** to show how energy is lost moving through the food change. Waste includes things like sweat, carbon dioxide, heat, pee/poop, etc.

- Brainstorm with students the best places to look for garden animals - under logs, in the compost bin, and in the soil.
- Remind students of any boundaries or garden expectations (walk around the garden beds, only pick plants from a certain area) and kind garden animal behavior.
- Pass out notebooks, pencils, cups, and trowels if needed.

Digging Deeper

- Give students several minutes to find a garden animal and put it in their cup. If they want to observe a bird or flying insect, they may sit quietly for a few minutes to make observations.
- Students then make a drawing of their animal in the middle of the page. The drawing is to capture the animal's structures and does not need be artistic. Prompt students to add comments and labels about what the animal is doing.
- If students are struggling to make observations, have them work in small groups or pairs to add energy inputs and outputs on each side of their animal drawing.
- When finished, students should gently return their animals to where they found them.
- Bring the class back together and have students compare their animal drawing with another classmate. How did they decide what food or energy inputs their animal used? What behaviors did they observe? Do they agree with their partners observations?



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For more information about garden soil food webs and what garden animals eat, including poster, check out the USDA's website, www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/biology/?cid=nrcs142p2_053868

This lesson structure was influenced by the "Food, Build, Waste, Do" lesson by BEETLES™ at The Lawrence Hall of Science, <http://beetlesproject.org>.

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Making Connections

- Ask students, where did your animal get its energy from? Popcorn a few responses from the class, some of the food should be plants.
- If any of the animals ate other animals, where does the prey get its food?
- Where do the plants get their energy from? (the sun)
- In small groups or on their own, students should draw an arrow from the food or inputs of their garden animal to where that food got its energy. Students repeat the process until they write down the word sun.
- Alternatively, creating the food chain can be an entire class activity. Students can also repeat the energy inputs and outputs drawing with a garden plant to create a more complicated food chain.
- After students have completed some version of a food chain, wrap up class with a garden taste test or snack. What do you think your body is going to do with the energy from this food? Can you think of a time you might need a lot of energy?