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Ecosystem Modeling

Connected Next Generation Science Standards

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposer, and the environment

Featured Science and Engineering Practices

Developing and Using Models

Featured Cross-Cutting Concepts

Energy and Matter

This lesson works best after the Ecosystem ABCs. Students should be familiar with the term ecosystem.

Overview

This lesson introduces the huge variety of garden ecosystem relationships, from pests eating plants to weeds competing for sunlight. Students will use the science practice of modeling which can provide the foundation for deeper classroom discussions about competition, predation, and food webs.

Students will

- Observe and identify different ecosystem relationships
- Create a model of ecosystem interactions
- Analyze the strength of their evidence of ecosystem interactions

Teacher Preparation

- Walk through the garden to familiarize yourself with the space. Notice unique ecosystem interactions, like pests, butterflies, or crowded plants.
- Optional: Save previous students' ecosystem models or create a sample model

Guiding Question - How do the parts of the ecosystem interact?

Ecosystem Modeling

Materials

- Teacher - small whiteboard or chalkboard
- Garden notebooks or worksheets and clipboards
- Pencils
- Optional - magnifying glasses

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.

Additional garden ecosystem interactions include a ladybug eating an aphid, a bird building a nest in a tree, a worm breaking down a buried plant, weeds and plants competing for water/space, etc.

Explore

- On your way out to the garden ask students: What are some garden plants or animals you have noticed are frequently near each other?
- In the garden, share the guiding question and tell the students that they are going to be scientists and discover the huge variety of connections in the garden ecosystem!
- If students did not do the Ecosystem ABCs lesson, allow several minutes of exploration time for students to first notice and create a list of as many living and nonliving parts of the garden as they can.
- If students already have a list, allow a few minutes of exploration time to add new abiotic or biotic parts of the garden to their list. What do they notice has changed in the garden since their last visit? Are there any new nonliving or living parts of the garden?

Digging Deeper

- Bring students back together and explain that gardens and all ecosystems are full of connections. Scientists use the word **interaction** to describe when one part of an ecosystem is connected to or affects another part of the ecosystem. For example, when a sunflower shades a tomato plant or a harlequin bug eats a kale plant these are interactions in the ecosystem. Point out or include a nearby ecosystem interaction. How does the harlequin bug impact the plant or sunflower affect the tomato plant?

Ecosystem Modeling

Students can either create a model in a garden journal or create a life size model by adding garden labels to places in the garden where they observe ecosystem interactions.

- Have students turn and talk to think about other examples of garden ecosystem interactions.
- Students are now going to create a model of the ecosystem using their list of abiotic, biotic, and cultural ecosystem factors. A **model** helps scientists visualize information about a complex topic like ecosystems!
- Students will draw lines between the abiotic and biotic columns on their worksheet that they notice are interacting. They will label the lines with interaction descriptions like, "eats" or "grow on." Younger students can draw lines between plants and animals that are interacting too.
- Help students as needed and remind them that their interaction lines have to be based either on an interaction they observe or evidence of that interaction (chew holes, poop, eggs, etc).

Making Connections

- Bring the students back together and share their ecosystem models with another group. Encourage students to ask each other questions about the strength of their evidence and notice similarities and differences between their models. Scientists frequently have to defend or argue about their ideas with others.
- Bring the class back together. How did they decide where there were interactions? What evidence did they find of interactions? Students will then thicken the interaction lines that they think have the strongest evidence. They can also change their models based on their pair-share discussions.

Ecosystem Modeling

- Choose a plant or animal that was drawn by many students. What would happen to the garden ecosystem if it was removed? How would its removal affect other parts of the ecosystem?
- Gardens are unique ecosystems because they are managed by people. How do humans interact with different plants, animals, and nonliving parts of the garden? How could we interact with the garden to promote a healthy ecosystem? Popcorn student answers.
- On the way back to the classroom, discuss how they could explain what an ecosystem interaction is to their friends or sibling.

This lesson structure was influenced by the "What Lives Here?" lesson by BEETLES™ at The Lawrence Hall of Science, http://beetlesproject.org.

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