1. Essential Element

Activity/Lesson Title: Movement of Matter Through Food Chains

EE: EE.5.LS2-1: Create a model that shows the movement of matter (e.g., plant growth, eating, composting) through living things

Teacher: Patrick

Grade Level: Elementary (Grades 3-5)

Student: Jacoby

Level: Target

2. Science and Engineering Practice

SEP 2: Developing and Using Models

SEP description: Students are supported in using models to represent amounts, relationships, relative scales (bigger, smaller), and/ or patterns in the natural world. They distinguish between models and the actual objects, process, or events that the model represents as they use models to describe phenomena.

3. Disciplinary Core Idea

Cycles of Matter and Energy Transfer in Ecosystems

Core Idea description: 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.

4. Crosscutting Concept

Systems and System Models

Concept Description: Students learn that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They describe systems in terms of their components and their interactions.

5. Linkage Level Descriptors

Initial: Identify common human foods

Precursor: Identify a model that shows the movement of matter from plants to animals (e.g., food chain or food web)

Target: Create a model that shows the movement of matter (e.g., plant growth, eating, composting) through living things

6. Student's Typical Accessibility Supports

- Enlarged picture cards
- Graphic organizers
- Textured diagrams
- Models/manipulatives

7. Student Prior Experiences, Prior Knowledge

- The student enjoys going to the park.
- The student has an aquarium at home.
- The student loves animals, particularly those that live in the ocean.
- The student has prior knowledge of the movement of matter and simple models.

8. Phenomenon to Explore

Question: How does matter move through an Arctic food web?

9. Possible Alternative Conceptions

Some students may think (incorrectly) that:

- Matter passes through ecosystems in a straight line instead of cyclically
- The direction of arrows in visual models of food webs indicate "what eats what" instead of indicating the flow of matter/energy
- Insects break up materials after the material rots on its own first
- Dead plants and animals just "disappear" instead of cycling nutrients through a food web

10. UDL Options and Solutions to Potential Barriers

- Use synonyms to support complex vocabulary
- Use a variety of formats and materials (e.g., enlarged picture cards, textured diagrams, models, manipulatives)
- Use appropriately leveled texts
- Use a graphic organizer (e.g., T-chart) to collect information

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R324A180202 to University of Kansas. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

11. Engage

Think

- *How can I make sure to access student prior learning?*
- *How can I use the CCC to connect everyday language with scientific language of the phenomenon?*
- *How can I support student participation by scaffolding the SEP?*

Teacher Will

- Create picture response cards containing organisms in an Arctic food web (animals and ocean plants); draw arrows on separate cards so that they can be placed between organism cards (use the organisms depicted in the Tarheel Reader text called "An Arctic Food Chain")
- Ask students to think about where animals in the ocean get their food
- Ask students to consider how they can use picture cards to represent how animals get the nutrients they need from their food

Students Will

- Identify their favorite food(s) to organize in a food chain
- Use picture cards (organisms and arrows) to predict the order of the ocean food chain

12. Explore

Think

- *What is difficult or inaccessible about the phenomenon, and how can I make it more accessible in the Explore phase?*
- *How can students collect data in a way that helps answer a scientific question?*
- *How can I encourage students' careful observation and asking good questions vs. looking for only the "right answer"?*

Teacher Will

- Engage in shared reading session using the Tarheel Reader text called "An Arctic Food Chain"
- Provide picture response cards that reflect the organisms in the story
- Assist the student with placement of picture cards and arrows » Teacher will assure that arrows depict the direction that nutrients from food are moving (e.g., from prey to predator) vs showing "what eats what"
- Probe with questions like "Where does the whale get its food?" and "Where does the krill get its food?" "What do the arrows in your diagram represent?"
- Encourage students to ask questions and find answers together (e.g., using books and results from solid sources found in online searches)

Students Will

- While listening to the story, students will organize the picture cards as organisms are introduced
- Place the arrow cards to represent how nutrients move through the food chain
- Search for evidence to inform the placement of the cards

13. Explain

Think

- *How can I help students connect science topics, phenomena, data, and everyday experiences? How can I help my students differentiate everyday language from scientific language? What reasoning helps students see or explain the invisible?*

Teacher Will

Ask students to describe what is occurring in the food chain as matter (or nutrients) is passed between organisms

Assist students in describing the sequence of matter as it moves through the Artic food chain

Students Will

- Complete a CER statement

Claim: Arctic animals get their food from plants and animals in an Arctic food chain.

Evidence:

» I know that I get nutrients from the food I eat.

» I also found from books and a good internet source that Arctic animals have to eat plants and other animals to get their nutrients or food.

Reasoning: The photos represent organisms in a food web I read about; the arrows show how food/nutrients move through the food web. This process is like how I eat food that comes from plants and animals to stay healthy.

14. Elaborate

Think

- *How can I enrich or extend student ideas? Are there related science concepts or processes that would support student learning?*

Teacher Will

- Extend the lesson to explore the movement of matter in a forest ecosystem
- Engage in shared reading of a new text with the student
- Provide picture cards for the student

Students Will

- Arrange the picture cards to create a food chain for the forest organisms
- Complete a CER statement

15. Evaluate

Think

- *What do I need to see or hear from my students that assures that they have learned the science content? What information will inform my teaching throughout the lesson?*

Teacher Will

- Add new artic plants and animals to the food chain web or create a new artic food chain; ask students questions to assess how they think about food chains using added plants and animals

Students Will

- Respond to questions posed by teacher about the new food chain, make measurements and observations, organize data they gather, complete a CER statement using data as evidence.