



# **Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project**

## **Grade 5 Science**

### **Unit 2 Instructionally-embedded Assessment Task Specification Tool:**

#### **“Movement and Decomposition of Matter in an Ecosystem”**

#### **Matter and Energy in Organisms and Ecosystems**

**January 2023**

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<b>Grade 5</b>	<b>Unit 2</b>	<b>Instructional Segment 3</b>	<b>Task Title: Movement and Decomposition of Matter in an Ecosystem</b>
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## Unit 2: Matter and Energy in Organisms and Ecosystems

<b>Anchor Phenomenon</b>	<b>Problematization/Investigative Strategy for the Unit</b>
In this unit, the anchor phenomenon is based on the shared experience the class will have dissecting owl pellets. The teacher can problematize this for students by setting up the general questions, “What do owls eat? Is it possible to tell what an owl eats by dissecting owl pellets?”	If we want to understand whether the owl population has enough to eat we’ll need to investigate what they eat and why they need to eat. We’ll need to understand how the owls’ food supply is also dependent on the food supply and the interconnected plants and animals that live in the ecosystem. Was a new species introduced to the ecosystem that changed the balance and decreased the owls’ food supply?

## Segment 3 Overview

This unit consists of three segments, each engaging students in multiple science and engineering practices and crosscutting concepts as students make sense of the key disciplinary ideas of energy in chemical processes and everyday life, matter and energy flow in organisms, interdependent relationships in ecosystems, and cycles of matter and energy transfer in ecosystems.

Informal and formal assessments for this segment focus on students' ability to develop and use models, carry out investigations, analyze and interpret data, and support arguments about how matter cycles through the ecosystem. Students use these same practices to explore the role of decomposers and the interactions among elements in an ecosystem, including how the ecosystem might be altered by the introduction of a non-native species or by the removal or change to a living or nonliving element.

<b>Lesson Title(s)</b>	<b>Lesson Description</b>
Movement of Matter Through an Ecosystem: Can You Show It?	<p>In this lesson, students learn about the types of matter that move among producers, consumers, and decomposers. The goal is for students to describe the movement of matter among plants, animals, and decomposers. At the end of the lesson, students develop a model (e.g., diagram) to describe how matter cycles among the living and nonliving components within an ecosystem, showing how organisms have biological needs which must be met within their ecosystems.</p> <p>Students first develop an understanding of the biotic and abiotic factors within ecosystems, the characteristics and classification of living organisms, and how plants and animals obtain and use energy to fulfill their needs. Students delve deeper by examining the interdependent relationships within an ecosystem by studying the movement of matter between producers, consumers, and decomposers by creating models of food chains and food webs.</p>

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As a class, students learn that individual organisms live together in an ecosystem and depend on one another. They have many different types of interactions with each other, and many of these interactions are critical for their survival.

- An ecological community consists of all the populations of different species that live together in a particular area.
- Many species share a habitat, and their interactions play a major role in regulating population growth and abundance.
- The populations of all the different species that live together in an area make up what's called an ecological **community**.
- Some organisms can make their own food, and others must get their food by eating other organisms.

After students have learned about the different types of interactions in an ecosystem, they will develop a model that describes how matter cycles among the living and non-living components of an ecosystem. The teacher asks students to think about and discuss why decomposers are an important part of the ecosystem. The teacher uses guiding questions, such as, “What would the world be like without decomposers?” (The world would be covered in waste. Plants would not have the nutrients to grow.) “How do decomposers contribute to a healthy ecosystem?” (They return nutrients to the soil to support plant growth.)

#### What Students Figure Out

- a. Matter moves (cycles) between organisms and non-organisms (i.e., abiotic elements) creating interdependent relationships among organisms and components within an ecosystem. (5-LS2-1)
- b. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. (5-LS2-1)

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Matter Cycles through Decomposition: What’s the Breakdown?

In this lesson, students watch a video on decomposers and decomposition. As a whole class, students use what they saw in the video to predict what happens to a fruit that is left untouched for several weeks. The teacher lists what students share on a poster titled, “What happens to fruit over time”? Next, students watch a timelapse of fruit in various stages of decomposition. In small groups, students use what they see in the video and the timelapse to make a claim about what causes the fruit to decompose over time using a Claim, Evidence, Reasoning (C-E-R) graphic organizer that supports the development of an evidence-based argument. Students then incorporate information from the C-E-R and other learning into their explanatory models.

#### What Students Figure Out

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- c. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. (5-LS2-1)

Constructing an Ecosystem

In this lesson, students attach two large plastic bottles to create a decomposition eco-column. Students revisit their understanding of living and nonliving factors within ecosystems, the characteristics and classification of living organisms, and how plants and animals obtain and use energy to fulfill their needs.

Then, over the course of 1 to 2 weeks, students collect data on the observed changes to the ecosystem and delve deeper to examine the interdependent relationships within the eco-column and the movement and decomposition of matter.

Finally, students use evidence from their observations and completed data table to support the claim that there are interdependent relationships among organisms/elements within an ecosystem.

What Students Figure Out

- d. Matter moves (cycles) between organisms and non-organisms (i.e., abiotic elements) creating interdependent relationships among organisms and components within an ecosystem. (5-LS2-1)
- e. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plant parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. (5-LS2-1)

**Formal Assessment Title**

**Assessment Description**

Movement and Decomposition of Matter in an Ecosystem

Matter cycles through ecosystems in different ways and is recycled. Decomposers break down dead organisms, and therefore, nutrients and gases are released and used by other organisms. When living things die, the cycle repeats. In this assessment, students analyze and interpret data to obtain evidence about the role of decomposers and the interactions among elements in an ecosystem. This assessment is intended to be administered following the lesson, “Constructing an Ecosystem.”

**NGSS PE(s) Code(s) & Description(s)**

**5-LS2-1** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

**AG(s) Code(s) & Description(s)**

**A12.** Develop a model to describe that matter cycles among living and non-living components in an ecosystem.

**A20.** Analyze and interpret data to make sense of the process of decomposition of matter, using logical reasoning.

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**A21.** Use data to evaluate claims about the role of decomposers in breaking down matter.

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**Evidence Statement(s)**

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- Develop a model that describes how matter cycles among biotic and abiotic components within an ecosystem.
  - Make observations and/or measurements to produce data about the role of decomposers within an ecosystem.
  - Use observations and/or data to generate a conclusion about how interactions in a system of plants, animals, decomposers, and the environment allow multiple species to meet their needs.
  - Use evidence, data, or a model to support the claim that there are interdependent relationships among organisms/elements within an ecosystem.
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**Phenomenon or Phenomenon-rooted Design Problem**

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- Decomposers digest or break apart the remains of dead plants and animals, recycling nutrients back into the soil to support plant growth. This process supports the overall health and balance of the ecosystem by contributing to the cycling of matter among living and nonliving elements of the ecosystem.
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**General Scenario Description**

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An eco-column is a small-scale model of an ecosystem that includes both living and nonliving things. An eco-column is a helpful tool to study how plants, animals, and other organisms interact with each other and the environment. Eco-columns can be used to explore a variety of ecosystems.

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**Chain of Sensemaking**

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- Students observe and record their observations of their decomposition eco-column from the lesson, “Constructing an Ecosystem.”
  - Students identify true and false statements about the role of decomposers in an ecosystem.
  - Students use evidence from their completed Ecosystem Changes Data Sheet to explain how their observations provide evidence of the role of decomposers in an ecosystem.
  - Students construct a model showing the flow of matter among the living and nonliving parts of a land ecosystem.
  - Students describe the flow of matter between living and nonliving parts of a land ecosystem as shown in their completed model.
  - Students make a claim about the effects of removing decomposers from an ecosystem.
  - Students support their claim with evidence from their Ecosystem Changes Data Sheet and their Model 1: Flow of Matter through a Land Ecosystem.
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**Work Products**

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- Data table
  - True/false statements
  - Concept map
  - Sentences starters / constructed response
  - T-chart / graphic organizer
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**Application of Universal Design for Learning-based Guidelines to Promote Accessibility (<https://udlguidelines.cast.org/> )**

Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action & Expression
<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Context or content</li> <li><input checked="" type="checkbox"/> Age appropriate</li> <li><input checked="" type="checkbox"/> Appropriate for different groups</li> <li><input checked="" type="checkbox"/> Makes sense of complex ideas in creative ways</li> <li><input checked="" type="checkbox"/> Vary the degree of challenge or complexity within prompts</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Provide visual diagrams and charts</li> <li><input checked="" type="checkbox"/> Make explicit links between information provided in texts and any accompanying representation of that information in illustrations, equations, charts, or diagrams</li> <li><input checked="" type="checkbox"/> Activate relevant prior knowledge</li> <li><input type="checkbox"/> Bridge concepts with relevant and simple analogies and limited use of metaphors</li> <li><input type="checkbox"/> Highlight or emphasize key elements in text, graphics, diagrams, formulas</li> <li><input checked="" type="checkbox"/> Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships</li> <li><input checked="" type="checkbox"/> Give explicit prompts for each step in a sequential process</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Solve problems using a variety of strategies</li> <li><input checked="" type="checkbox"/> Sentence starters</li> <li><input checked="" type="checkbox"/> Embed prompts to “show and explain your work”</li> </ul>

**Targeted PE(s) Code(s) and Alternate Conception(s)**

- **NGSS PE: 5-LS2-1** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]
  - **Common Alternate Conceptions**
    - Soil is the primary source of energy for plants.
    - Dead things do not have energy/nutrients and do not have value to an ecosystem.
    - Small changes to an ecosystem only have small impacts.

**Unit 2 Vocabulary**

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| <ul style="list-style-type: none"> <li>● Ecosystem</li> <li>● Environment</li> </ul> | <ul style="list-style-type: none"> <li>● Cycles</li> <li>● Matter</li> <li>● Organisms</li> </ul> | <ul style="list-style-type: none"> <li>● Microbes</li> <li>● Producers</li> <li>● Consumers</li> </ul> | <ul style="list-style-type: none"> <li>● Decomposers</li> <li>● Decomposition</li> <li>● System</li> </ul> |
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