twig Science



Designed for the NGSS: Foundations Teacher Support Evidence Chart

Teacher materials…	Strong	Adequate	Weak
F1. Presence of Phenomena/Problems. Identify and provide background information about the phenomena/problems in the unit and how they match the targeted learning goals.	✓		
F2. Presence of Three Dimensions. Identify and provide background information about the each of the three dimensions in the unit. • the SEPs • the DCIs (including engineering) • the CCCs • *also note* (NoS/CNS) and Connections to Engineering, Technology and the Applications of Science (ETS/CETAS)	✓		
F3. Presence of Logical Sequence. Identify and provide background information on the sequence of learning in the unit.	✓		

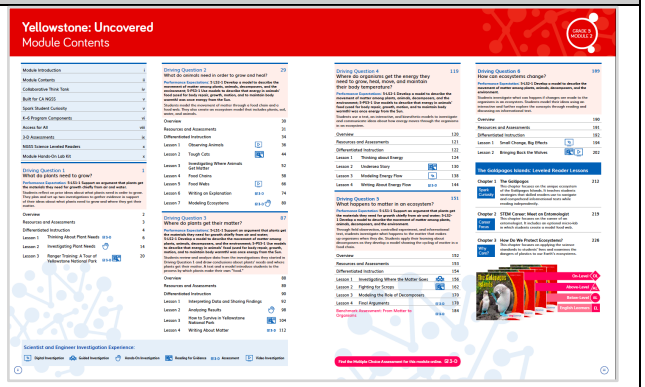
Strengths related to these Teacher Supports

F1. Presence of Phenomena/Problems.

The module is strong at identifying and providing background information about the phenomena/problems in the unit and how they match the targeted learning goals.

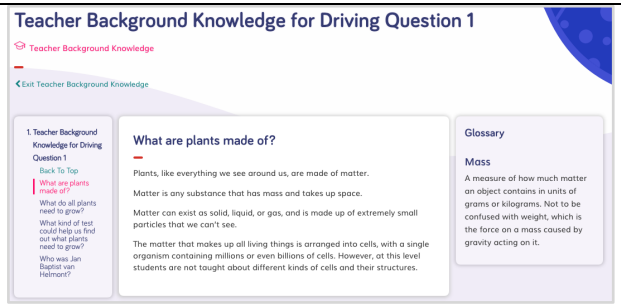
Evidence

- An Module Introduction online and in print (TE p. i–iii) sets out at high level how students will solve the Module Phenomenon.



Module Introduction TE p. i–iii

- Teacher Background Knowledge on the phenomena and DCIs addressed in every Driving Question is explained simply in a Q&A format with supporting diagrams and visuals. A glossary of scientific terms is also provided. For example, DQ1 provides background information on matter, what plants need to grow, fair tests, and Jan Baptist van Helmont, while DQ4 explains energy, where it comes from, and why we need it.



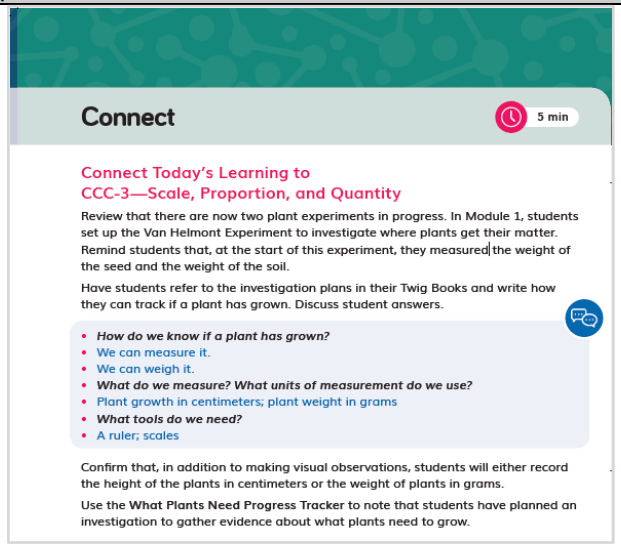
Teacher Background Knowledge

F2. Presence of Three Dimensions.

The module is strong at identifying and providing background information about each of the three dimensions in the unit. It also supports opportunities to connect to the nature of science (CNS) and engineering, technology, and applications of science (CETAS).

Evidence

- A digital guide to SEPs and CCCs provides a clear explanation for each practice and concept with guidance on what these skills should look like in a 5th grade classroom, with specific reference for how students ask questions and develop investigations in Grade 5 Module 2.
- Additional module-specific support is frequently given at point of use in the instructional materials for all dimensions, Connections to the Nature of Science (CNS) and Connecting to Engineering, Technology, and Applications of Science (CETAS), often in the Connect. For example, in DQ1L2 TE Connect p. 19, support is given on connecting the learning activity to CCC-3 Scale, Proportion, and Quantity.



Connect 5 min

Connect Today's Learning to CCC-3—Scale, Proportion, and Quantity

Review that there are now two plant experiments in progress. In Module 1, students set up the Van Helmont Experiment to investigate where plants get their matter. Remind students that, at the start of this experiment, they measured the weight of the seed and the weight of the soil.

Have students refer to the investigation plans in their Twig Books and write how they can track if a plant has grown. Discuss student answers.

- *How do we know if a plant has grown?*
- We can measure it.
- We can weigh it.
- *What do we measure? What units of measurement do we use?*
- Plant growth in centimeters; plant weight in grams
- *What tools do we need?*
- A ruler; scales

Confirm that, in addition to making visual observations, students will either record the height of the plants in centimeters or the weight of plants in grams.

Use the **What Plants Need Progress Tracker** to note that students have planned an investigation to gather evidence about what plants need to grow.

DQ1L2 TE Connect p. 19

F3. Presence of Logical Sequence.

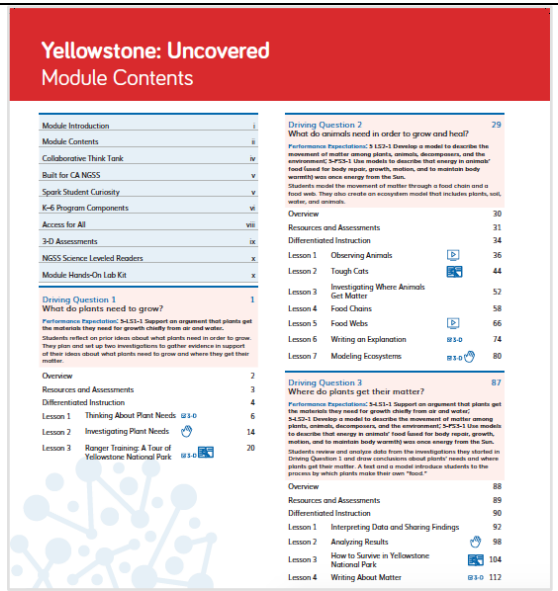
The module is strong at Identifying and providing background information on the sequence of learning in the unit.

Evidence

- A Module Introduction video provides the teacher with an engaging overview on the phenomena explored in Yellowstone: Uncovered, the sequence of learning, and an explanation of how the Performance Expectations are addressed and how they build on each other.

Module Introduction video

- The Module Contents identifies the sequence of three dimensions addressed in Grade 5 Module 2 and states how they build on each other. For example, in DQ2, students investigate and model food chains and food webs. In DQ3–6, they develop an increasingly sophisticated understanding of how matter and energy flow through ecosystems using an ecosystem model that they create.



Yellowstone: Uncovered
Module Contents

Module Introduction i
Module Contents ii
Collaborative Think Tank iv
Built for CA NGSS v
Spark Student Curiosity v
K–6 Program Components vi
Access for All viii
3-D Assessments ix
NGSS Science Leveled Readers x
Module Hands-On Lab Kit x

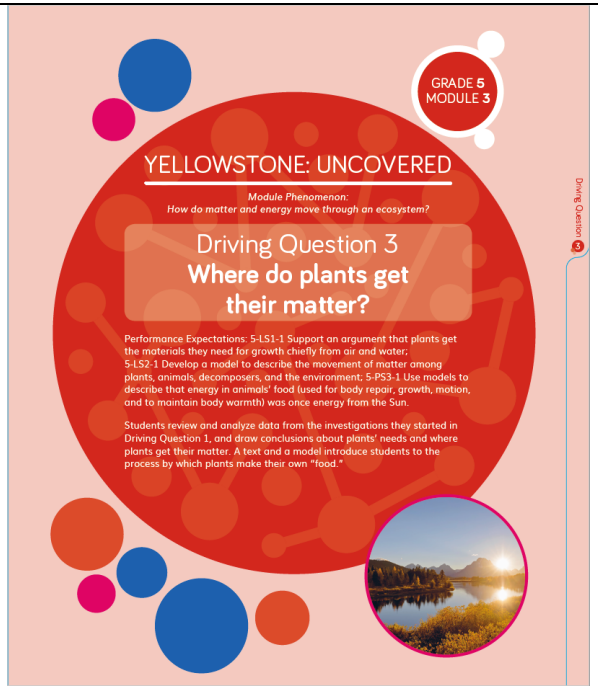
Driving Question 1 1
What do plants need to grow?
Performance Expectation: 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water.
Students reflect on prior ideas about what plants need in order to grow. They plan and set up two investigations to gather evidence in support of their ideas about what plants need to grow and where they get their matter.
Overview 2
Resources and Assessments 3
Differentiated Instruction 4
Lesson 1 Thinking About Plant Needs 3-D 6
Lesson 2 Investigating Plant Needs 14
Lesson 3 Ranger Training: A Tour of Yellowstone National Park 3-D 20

Driving Question 2 29
What do animals need in order to grow and heal?
Performance Expectations: 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment; 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.
Students model the movement of matter through a food chain and a food web. They also create an ecosystem model that includes plants, soil, water, and animals.
Overview 30
Resources and Assessments 31
Differentiated Instruction 34
Lesson 1 Observing Animals 36
Lesson 2 Tough Cats 44
Lesson 3 Investigating Where Animals Get Matter 52
Lesson 4 Food Chains 58
Lesson 5 Food Webs 66
Lesson 6 Writing an Explanation 3-D 74
Lesson 7 Modeling Ecosystems 3-D 80

Driving Question 3 87
Where do plants get their matter?
Performance Expectations: 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; 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.
Students review and analyze data from the investigations they started in Driving Question 1 and draw conclusions about plants' needs and where plants get their matter. A text and a model introduce students to the process by which plants make their own "food."
Overview 88
Resources and Assessments 89
Differentiated Instruction 90
Lesson 1 Interpreting Data and Sharing Findings 92
Lesson 2 Analyzing Results 98
Lesson 3 How to Survive in Yellowstone National Park 104
Lesson 4 Writing About Matter 3-D 112

Module Contents

- More detail is provided in the Driving Question Dividers and Driving Question Overviews, which tell the story of how students will sequentially use the three dimensions in each lesson in the DQ to answer the question posed. For example, in DQ3 students analyze and interpret data and consider cause and effect to develop a model that describes how matter moves among plants, animals, decomposers, and the environment. This knowledge helps them realize that the energy in animal's food was once energy from the Sun.



GRADE 5
MODULE 3

YELLOWSTONE: UNCOVERED

Module Phenomenon:
How do matter and energy move through an ecosystem?

Driving Question 3
Where do plants get their matter?

Performance Expectations: 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; 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.

Students review and analyze data from the investigations they started in Driving Question 1, and draw conclusions about plants' needs and where plants get their matter. A text and a model introduce students to the process by which plants make their own "food."

Driving Question 3

Driving Question Divider TE p. 87

Overview: **Full Course**

Driving Question 4 Where do organisms get the energy they need to grow, heal, move, and maintain their body temperature?

		FULL COURSE		
		LESSON	PAGE	SUGGESTED PACING
ENGAGE / EXPLORE	1	**Thinking About Energy** Students reflect on their prior knowledge about what energy is, and engage in a brief Energy Hunt activity in preparation for investigating where organisms get their energy.	124	50 min + optional 50 min extension
EXPLAIN	2	**Undersea Story** Students read an informational text, then complete a graphic organizer explaining the relationships between Antarctic organisms. Students explain the cause and effect relationship between individual organisms and the food chain itself.	130	50 min + optional 50 min extension
ELABORATE	3	**Modeling Energy Flow** Students use a digital interactive to model their ideas about how energy and matter flow between organisms in a food chain. The Sun is added to the class matter flow model, and students begin to trace the flow of energy back to the Sun.	138	50 min

Driving Question Overview TE p. 120

- The Lesson Overview identifies the dimensions used in each lesson, while the graphic organizer details how the dimensions relate to the learning experience. For example, in DQ4L3, the 3-D Learning Objectives explain that in this lesson students will use an interactive to digitally model energy and matter flow. They connect this learning to a video about food chains, make kinesthetic models of energy moving through a food chain, and complete diagrams that show energy movement.

Investigating Plant Needs

OVERVIEW

Spark	10 min	Students review their role as ecologists and discuss how they might investigate plant needs.
Investigate	25 min	Students set up an investigation and complete their investigation plans.
Report	5 min	Students discuss control and variable elements in their investigation and learn about the data collection routine for the next few weeks.
Connect	5 min	Students take note of what measurements they will take as they investigate their plants' growth.
Reflect	5 min	Students predict the outcome of their investigation.

Lesson Overview TE p. 14

Designed for the NGSS: Foundations Teacher Support Evidence Chart

Teacher materials…	Strong	Adequate	Weak
SW1. Phenomena/Problems. Provide support and strategies for how to help students figure out/solve authentic and relevant phenomena/problems using the three dimensions.	✓		
SW2. Three-dimensional Conceptual Framework. Provide support and strategies for how teachers: • help students develop a conceptual framework of scientifically accurate understandings and abilities related to DCIs, SEPs, and CCCs, CNS and CETAS, ELA and math, • create a learning environment that values students' ideas, motivates learning, and helps students negotiate new meaning as they interact with others' ideas, new information, and new experiences.	✓		

SW3. Prior Knowledge. Provide support and strategies to leverage students' prior knowledge and experiences to motivate learning.	✓		
SW4. Metacognitive Abilities. Provide support and strategies for how to help students develop metacognitive abilities.	✓		
SW5. Equitable Learning Opportunities. Provide resources and strategies for how to ensure that ***all*** students, including those from non-dominant groups and with diverse learning needs, have access to the targeted learning goals and experiences.	✓		

Strengths related to these Teacher Supports

SW1. Phenomena/Problems.

The module is strong at providing support and strategies for how to help students figure out authentic and relevant phenomena using the three dimensions.

Evidence

- The instructional materials have been designed to support the teacher to guide students on a scaffolded learning journey to solve the Module Phenomenon: How do matter and energy move through an ecosystem? They tackle the problem one Driving Question at a time, applying the three dimensions with increasing sophistication, building the skills and knowledge they need through a series of investigations.
- The teacher is supported in the instructional material to connect their learning experiences back to the Module Phenomenon at strategic points with frequent class discussions where students share their ideas and evidence. For example, in DQ4L4 TE p. 149, the teacher leads a discussion of matter and energy flow, encouraging students to connect their learning to a reading investigation from DQ3.

Review Matter and Energy Flow

Review matter and energy flow by referring to the article, "How to Survive in Yellowstone National Park," that students read in Driving Question 3, Lesson 3. Remind students that Everts ate thistles to survive in the park after he was separated from his group.

- *What did Everts get from the thistles that helped him survive?*
- *What did Everts get that helped him maintain his body temperature, heal from injury, and move around the park?*
- He got matter and energy from the thistle.
- *Where did the thistle get the matter and energy it needs to survive?*
- The thistle made its own matter using energy from the Sun.

DQ4L4 TE p. 149

SW2. Three-dimensional Conceptual Framework.
The module is strong at providing support for helping students develop a conceptual framework across the dimensions and creating a learning environment that values all students.

Evidence

- The instructional materials are designed to elicit students' understanding of matter and energy at the start of the module and then develop their understanding over time, through hands-on, reading, digital, video and data investigations.
- Opportunities to articulate, question, and revise their conceptual framework are woven into the instructional resources with teachers supported with continuous assessment for learning strategies and with support for how to tailor instruction accordingly.
- Support is given for how to create a positive learning environment where all contributions are valued along with activities that support teamwork and collaboration. Many of the activities involve students working in pairs and teams and they understand what effective teamwork looks and feel like having completed the 3-D Team Challenge at the start of Grade 5 (in Grade 5 Module 1, Matter Mysteries Hotline). Throughout Yellowstone: Uncovered, students are given many opportunities to support each other. For example, in DQ2, students engage in a collaborative language routine, sharing their scientific explanations with a partner and using that feedback to strengthen and clarify their explanations (DQ2L6 TE p. 78). These activities are scaffolded with sidebars that provide additional support for students with special needs, English Learners, and Standard English Learner students.

Write Supporting Evidence

Ask students to independently write their scientific explanations on page 36 in their Twig Books. Encourage students to write in pencil so they can make revisions, as needed. Remind them to explain how the evidence supports their claim. They must provide their reasoning and include a conclusion that sums up their findings.

Stronger and Clearer Each Time (Language Routine)

Once their explanations have been drafted, have students work together to give and receive feedback. First, they will share with their current partners and then they will refine their work and share with two other partners in succession. Explain that during this process, they should be referring to the rubric on page 35 in their Twig Books.

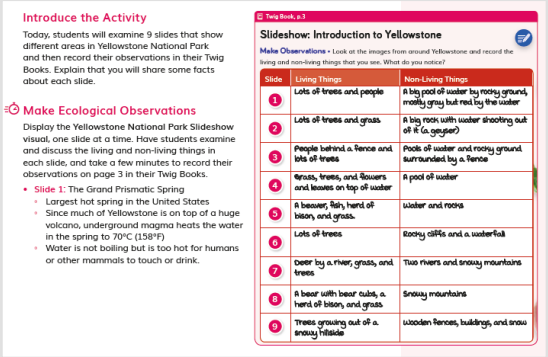
1. Partner 1 tells their ideas while Partner 2 listens. Partner 2 asks questions and tries to get more detail, clarifications, and input from Partner 1. Give pairs 30–45 seconds for this step. Give Partner 1 time to revise.
2. Partner 2 tells their ideas while Partner 1 listens. Partner 1 asks questions and should try to get more details, clarifications, and input from Partner 2. Give pairs 30–45 seconds for this step. Give Partner 2 time to revise.
3. Students switch to a new partner. They follow the same process as in steps 1 and 2, but use what they heard from their first partner to strengthen what they share with their new partner (e.g., add more detail and be clearer).

DQ2L6 TE p. 78

SW3. Prior Knowledge.
The module provides strong support and strategies to leverage students' prior knowledge and experiences to motivate learning.

Evidence

- Teachers are supported with strategies to leverage prior knowledge of energy and matter through resources such as visuals, e.g., the Yellowstone National Park Slideshow visual in DQ1L1 Investigate TE p. 9 and the Eating to Live Prior-Knowledge Read-Aloud in DQ1L1 TE Spark p. 8. Additional support is provided at point of use for strategies to leverage prior knowledge and answer the Module Phenomenon.



Introduce the Activity

Today, students will examine 9 slides that show different areas in Yellowstone National Park and then record their observations in their Twig Books. Explain that you will share some facts about each slide.

Make Ecological Observations

Display the Yellowstone National Park Slideshow visual, one slide at a time. Have students examine and discuss the living and non-living things in each slide, and take a few minutes to record their observations on page 3 in their Twig Books.

- Slide 1: The Grand Prismatic Spring
  - Largest hot spring in the United States
  - Since much of Yellowstone is on top of a huge volcano, underground magma heats the water in the spring to 70°C (158°F)
  - Water is not boiling but is too hot for humans or other mammals to touch or drink.

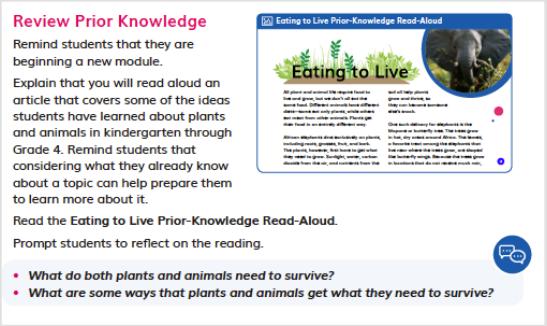
Twig Book, p.3

Slideshow: Introduction to Yellowstone

Make Observations • Look at the images from around Yellowstone and record the living and non-living things that you see. What do you notice?

Slide	Living Things	Non-Living Things
1	Lots of trees and people	A big pool of water by rocky ground, mostly gray but red by the water
2	Lots of trees and grass	A big rock with water shooting out of it (a geyser)
3	People behind a fence and lots of trees	Pools of water and rocky ground surrounded by a fence
4	Grass, trees, and flowers and leaves on top of water	A pool of water
5	A beaver, fish, herd of bison, and grass.	Water and rocks
6	Lots of trees	Rocky cliffs and a waterfall
7	Deer by a river, grass, and trees	Two rivers and snowy mountains
8	A bear with bear cubs, a herd of bison, and grass.	Snowy mountains
9	Trees growing out of a snowy hillside	Wooden fences, buildings, and snow

DQ1L1 Investigate TE p. 9



Review Prior Knowledge

Remind students that they are beginning a new module.

Explain that you will read aloud an article that covers some of the ideas students have learned about plants and animals in kindergarten through Grade 4. Remind students that considering what they already know about a topic can help prepare them to learn more about it.

Eating to Live Prior-Knowledge Read-Aloud

Eating to Live

Read the **Eating to Live Prior-Knowledge Read-Aloud**.

Prompt students to reflect on the reading.

- ***What do both plants and animals need to survive?***
- ***What are some ways that plants and animals get what they need to survive?***

DQ1L1 TE Spark p. 8

For example, in DQ5L3 TE Spark p. 172, the teacher prompts students to recall their background knowledge as they discuss decomposers.

Review Decomposers

Refer to the Energy and Matter Flowchart. Review the roles of the different kinds of consumers in an ecosystem.

- ***What is the role of the decomposer?***
- Decomposers break down food, waste, and dead matter.
- Decomposers help return dead matter/waste back to the earth.
- Decomposers break down dead matter/waste and return it to the soil.
- Some of the dead matter is turned into nutrients.

Display the image of the decomposers from the **Matter Flowchart handout**.

- ***Where should we put decomposers on our food web model?***

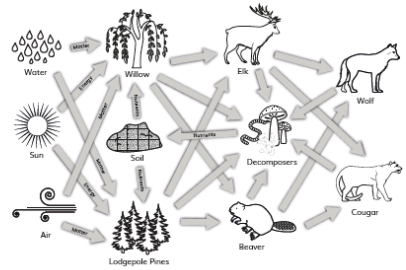
Have students share their ideas. Encourage students to provide their reasoning based on prior knowledge.

Tape the image of the decomposers to the flowchart and add arrows labeled "matter and nutrients" pointing from the beaver, lodgepole pine, elk, wolf, willow tree, and cougar to the decomposers. Reiterate that all the organisms on the Energy and Matter Flowchart will die and decompose.

- ***How can we show that decomposers reintroduce nutrients into the ecosystem on our Energy and Matter Flowchart?***
- ***Where should I put the "nutrients" arrows?***
- Pointing from the decomposers to the soil

Add an arrow labeled "nutrients" from the decomposers to the soil.

- ***What type of organism uses nutrients that the decomposers add to the soil as they make their own food?***
- Producers
- Plants



DQ5L3 TE Spark p. 172

SW4. Metacognitive Abilities.
The module provides strong support and strategies for how to help students develop metacognitive abilities.

Evidence

- Support is given at point of use for how to develop students' metacognitive abilities. The Connect of the lesson often guides the teacher to draw students' attention to their growing use of the SEPs and CCCs, understanding of the DQ, or increasing ability to answer the Module Phenomenon (e.g., connecting to CCC-3 in DQ1L2 TE p. 19, and SEP-2 and SEP-3 in DQ6L1 TE p. 200).

Connect Today's Learning to CCC-3—Scale, Proportion, and Quantity

Review that there are now two plant experiments in progress. In Module 1, students set up the Van Helmont Experiment to investigate where plants get their matter. Remind students that, at the start of this experiment, they measured the weight of the seed and the weight of the soil.

Have students refer to the investigation plans in their Twig Books and write how they can track if a plant has grown. Discuss student answers.

- *How do we know if a plant has grown?*
- We can measure it.
- We can weigh it.
- *What do we measure? What units of measurement do we use?*
- Plant growth in centimeters; plant weight in grams
- *What tools do we need?*
- A ruler; scales

Confirm that, in addition to making visual observations, students will either record the height of the plants in centimeters or the weight of plants in grams.

Use the **What Plants Need Progress Tracker** to note that students have planned an investigation to gather evidence about what plants need to grow.

DQ1L2 TE p. 19

Connect Today's Learning to CCC-4 (Systems and Models) and CCC-5 (Energy and Matter)

Remind students that they have:

- Investigated how matter and energy flow between organisms in ecosystems
- Learned about how the parts of the ecosystem fit together in a food web
- Learned how the Sun provides the energy that we access through our food
- Investigated what can happen if a part of an ecosystem is changed or an organism is added or taken away.

- *How might you continue your work as an ecologist after this module ends?*

Direct students' attention to the Science Tools poster.

- *Are there science tools you can continue to use?*
- *Are there science ideas that you could use as you learn about the world?*

Have students share their ideas with a partner, and then call on a few pairs to share with the class.

DQ6L1 TE p. 200

- Discussions following diagnostic pre-assessments (Pre-Explorations) in DQ1–4 support teachers to track students' understanding of the three dimensions that make up the module's Performance Expectations, e.g. in DQ2L4 TE Report p. 62.

Discuss Food Chains

Lead a discussion about food chains.

- *What did passing the cup from organism to organism show?*
- That the grass was eaten by the pocket gopher and the pocket gopher was eaten by the grizzly bear
- Where different kinds of animals get their matter
- That the deer mouse gets matter from the willow and the hawk gets matter from the deer mouse
- *In this activity, where does the deer mouse get matter? The beaver? The gray wolf? The bighorn sheep?*
- These animals get their matter from the organisms that they eat.

DQ2L4 TE Report p. 62

SW5. Equitable Learning Opportunities.

This module provides strong resources and strategies to ensure that all students have access to the targeted learning goals and experiences.

Evidence

- Frequent support is given at point of use in all lessons on strategies to ensure that all students have access to the targeted learning goals. Numerous scaffolds are provided for Special Needs, English Learner, and Standard English Learner students, for example in DQ2L5 TE p. 69 and DQ4L1 p. 128.
- The reader that complements the module is provided at four levels—Above, On, Below, and EL, with on-level lesson instruction embedded in the TEs and above-, below-, and EL lesson instruction available online.
- Digital versions of the TB and readers have text-to-speech functionality.

Special Needs

Physical Disability

Arrange the two circles so that students with physical disabilities can participate in this kinesthetic experience.

DQ2L5 TE p. 69

English Learners

To maximize opportunities for constructive science conversations, provide a few minutes for students to discuss the summary questions and rehearse their responses before sharing in a large group.

Substantial Support (Emerging Proficiency)

Provide sentence frames using key vocabulary for students to use in their responses. Students can write the sentences and refer to them when sharing.

Moderate Support (Expanding Proficiency)

Have students share their ideas with a partner to clarify them. Listen in and offer vocabulary support, such as recasting sentences. Prompt students to use the more academic vocabulary.

Light Support (Bridging Proficiency)

Let students choose if they want to share with a partner before sharing with the whole class. Refer them to posted vocabulary words and encourage them to include some of these words in their responses.

DQ4L1 p. 128

• Short, high quality videos that engage and support learners with diverse learning needs are frequently provided to spark interest, summarize key concepts, and make ideas relevant to Grade 5 students. For example, the A Year in Yellowstone video (in DQ2L1) lets students explore the plants and animals in the national park from the classroom, while the Decomposers: Breaking It Down video (DQ5L2) helps students connect their learning about matter to the concept of decomposition.	 A Year in Yellowstone  Decomposers: Breaking It Down

Designed for the NGSS: Foundations Teacher Support Evidence Chart

Teacher materials…	Strong	Adequate	Weak
SP1. Three-dimensional Performances. Provide support with a range of sample student responses and/or rubrics for interpreting evidence of student learning across the three dimensions, specific to the element of each dimension, and related to the phenomenon/problem that provides context for the student performance.	✓		
SP2. Variety of Measure. Provide guidance and scoring tools for using a variety of measures matched to the targeted learning goals to help students monitor their progress toward learning goals and reflect on what they have learned, how they learn it, and how to use metacognition productively.	✓		
SP3. Student Progress Over Time. Provide guidance for using formative and summative assessments to monitor student progress over time. Examples include support for: capturing student growth; interpreting results; adjusting instruction and planning for future instruction; providing feedback to students; prompting students to consider what and how they've learned.	✓		
SP4. Equitable Access. Provide support and strategies for ensuring that assessments are accessible to students from diverse backgrounds and with diverse learning needs.	✓		

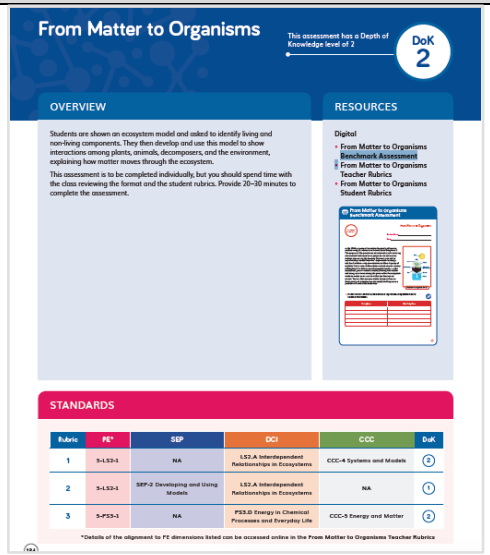
Strengths related to these Teacher Supports

SP1. Three-dimensional Performances.

The module provides strong support with a range of sample student responses and rubrics for interpreting evidence of student learning across the three dimensions. These are specific to the element of each dimension and related to the Module Phenomenon that provides the context for the student performance.

Evidence

- Rubrics are provided for the Performance Tasks and the Benchmark Assessment. The rubrics provide sample answers in the form of look fors that support teachers to interpret evidence of student attainment of the four different levels—emerging, developing, proficient, and advanced. The rubrics are specific to certain performance expectations with the assessed dimensions highlighted.
- The assessment tasks are well connected to the problems, phenomena, and dimensions being assessed. In the Benchmark Assessment From Matter to Organisms (TE p. 184), Rubrics 1 and 2 assess PE 5-LS2-1, while Rubric 3 assesses PE 5-PS3-1. Rubric 1 details that a student developing mastery of these dimensions would develop a model showing some accurate interactions of living and nonliving components. An example answer of incorrect labeling and misunderstanding decomposition is provided.



From Matter to Organisms

This assessment has a Depth of Knowledge level of 2

DoK 2

OVERVIEW

Students are shown an ecosystem model and asked to identify living and non-living components. They then develop and use this model to show interactions among plants, animals, decomposers, and the environment, explaining how matter moves through the ecosystem.

This assessment is to be completed individually, but you should spend time with the class reviewing the format and the student rubrics. Provide 20–30 minutes to complete the assessment.

RESOURCES

Digital

- From Matter to Organisms Benchmark Assessment
- From Matter to Organisms Teacher Rubrics
- From Matter to Organisms Student Rubrics

STANDARDS

Rubric	PE*	SEP	DCI	CCC	DoK
1	5-LS2-1	NA	LS2.A Interdependent Relationships in Ecosystems	CCC-4 Systems and Models	2
2	5-LS2-1	SEP-2 Developing and Using Models	LS2.A Interdependent Relationships in Ecosystems	NA	1
3	5-PS3-1	NA	PS3.D Energy in Chemical Processes and Everyday Life	CCC-5 Energy and Matter	2

*Details of the alignment to PE dimensions listed can be accessed online in the From Matter to Organisms Teacher Rubrics

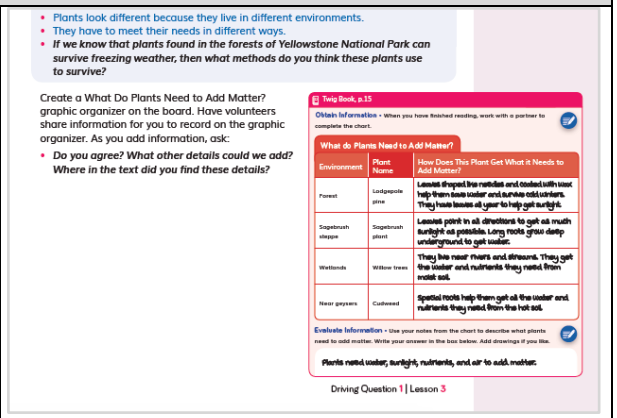
Benchmark Assessment TE p. 184

SP2. Variety of Measure.

The module provides strong guidance and scoring tools for using a variety of measures matched to the targeted learning goals to help students monitor their progress toward learning goals and reflect on what they have learned, how they learn it, and how to use metacognition productively.

Evidence

- Teacher support for guidance and scoring tools matched to the learning goals is integrated through the module. In addition to the rubrics mentioned above and answer guides for the module multiple choice assessment, the printed teacher edition contains TB pages with sample student answers, so at a glance teachers have guidance on what student understanding looks like (e.g., DQ1L3 TE Investigate p. 23, DQ6L2 TE Investigate p. 205). A digital version of this completed TB is available online.



- Plants look different because they live in different environments.
- They have to meet their needs in different ways.
- *If we know that plants found in the forests of Yellowstone National Park can survive freezing weather, then what methods do you think these plants use to survive?*

Create a What Do Plants Need to Add Matter? graphic organizer on the board. Have volunteers share information for you to record on the graphic organizer. As you add information, ask:

- *Do you agree? What other details could we add? Where in the text did you find these details?*

Twig Book, p.15

Obtain Information • When you have finished reading, work with a partner to complete the chart.

What do Plants Need to Add Matter?

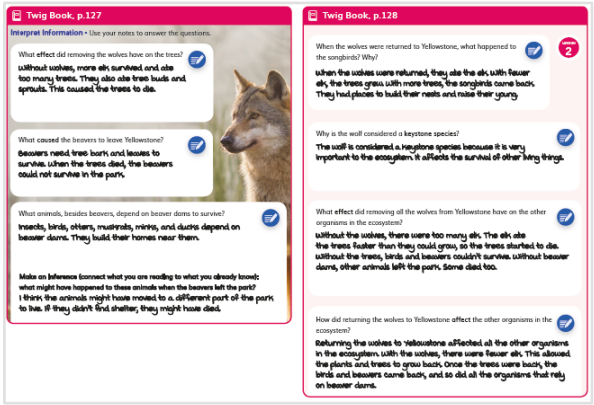
Environment	Plant Name	How Does This Plant Get What it Needs to Add Matter?
Forest	Lodgepole pine	Leaves shaped like needles and coated with wax help them save water and survive cold winters. They have leaves all year to help get sunlight.
Sagebrush steppe	Sagebrush plant	Leaves point in all directions to get as much sunlight as possible. Long roots grow deep underground to get water.
Wetlands	Willow trees	They live near rivers and streams. They get the water and nutrients they need from moist soil.
Near geysers	Cattiwood	Spatial roots help them get all the water and nutrients they need from the hot soil.

Evaluate Information • Use your notes from the chart to describe what plants need to add matter. Write your answer in the box below. Add drawings if you like.

Plants need water, sunlight, nutrients, and air to add matter.

Driving Question 1 | Lesson 3

DQ1L3 TE Investigate p. 23



Twig Book, p.127

Interpret Information • Use your notes to answer the questions.

What effect did removing the wolves have on the trees?

Without wolves, more elk survived and ate too many trees. They also ate tree buds and sprouts. This caused the trees to die.

What caused the beavers to leave Yellowstone?

Beavers need tree bark and leaves to survive. When the trees died, the beavers could not survive in the park.

What animals, besides beavers, depend on beaver dams to survive?

Insects, birds, otters, muskrats, minks, and ducks depend on beaver dams. They build their homes near them.

Make an Inference (connect what you are reading to what you already know): what might have happened to these animals when the beavers left the park?

I think the animals might have moved to a different part of the park to live. If they didn't find shelter, they might have died.

Twig Book, p.128

When the wolves were returned to Yellowstone, what happened to the songbirds? Why?

When the wolves were returned, they ate the elk. With fewer elk, the trees grew. With more trees, the songbirds came back. They had places to build their nests and raise their young.

Why is the wolf considered a keystone species?

The wolf is considered a keystone species because it is very important to the ecosystem. It affects the survival of other living things.

What effect did removing all the wolves from Yellowstone have on the other organisms in the ecosystem?

Without the wolves, there were too many elk. The elk ate the trees faster than they could grow, so the trees started to die. Without the trees, birds and beavers couldn't survive. Without beaver dams, other animals left the park. Some died too.

How did returning the wolves to Yellowstone affect the other organisms in the ecosystem?

Returning the wolves to Yellowstone affected all the other organisms in the ecosystem. With the wolves, there were fewer elk. This allowed the plants and trees to grow back. Once the trees were back, the birds and beavers came back, and so did all the organisms that rely on beaver dams.

DQ6L2 TE Investigate p. 205

- Assessments are multimodal and support a variety of learning styles and abilities. They include:
  - Performance Tasks (written, DQ2L6 TB p. 35, DQ3L4 TB p. 62, DQ4L4 TB p. 84, DQ5L4 TB p. 107)

Scientific Explanation

Make a Claim • What do animals need in order to grow and heal?

In the box below, write a claim that answers the question.

Claim: Animals need to get matter from the food they eat in order to grow and heal. They can get matter by eating plants and animals.

Obtain Information • Record 3 pieces of evidence that you will use to support your explanation. Include facts and details. In the left column, record the source of the evidence (where you got it.) In the right column, record the evidence.

Source	Evidence
Carnivores video	We saw animals eating other animals to add matter to their bodies.
"Tough Cats" article	Mother cougars teach their young how to hunt. They hunt to catch and eat prey. This adds matter to their bodies.
National Park Service website	I researched bison. I found out that they eat grass and other plants to add matter to their bodies.

DQ2L6 TB p. 35

Decomposition Observations

Make Observations • Use the magnifying glass to observe what has happened to the contents of each bag after sitting in the dark for approximately **1 week**. Record your observations in the table.

Bag	Contents	Observations
1	Fruit, No Soil	The fruit looks slimy and a bit moldy.
2	Fruit, Soil	The fruit and soil look slimy and there is a lot of mold.
3	Cottage Cheese, No Soil	The cottage cheese looks slimy and a bit moldy.
4	Cottage Cheese, Soil	The cottage cheese and soil look slimy and there is a lot of mold.
5	Soil, Water	The soil looks the same.

DQ5L4 TB p. 107

- Formative Assessments (written, and drawn, DQ2L2 TE p. 50, DQ2L5 TE p. 73, DQ4L2 TE p. 135, DQ5L2 p. 167)

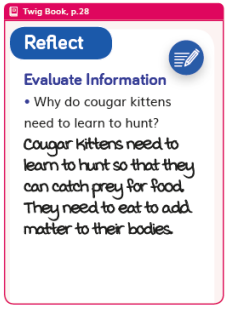
Formative Assessment

Discuss what students learned as they read the article. Then, ask students to turn to page 28 in their Twig Books and answer the question.

Use the Formative Assessment

For students who did not associate the need to hunt with the need to eat food and thus grow, follow up after the next lesson. After the class discussion in Lesson 3, ask whether students have new ideas about where the animals they read about get their matter. After each of the next four lessons, follow up with these students to ensure that, by Lesson 6, they identify food as the source of matter.

On subsequent days, revisit the article to focus on key text features and the structures students will encounter in other informational texts.


Twig Book, p.28

Reflect

Evaluate Information

• Why do cougar kittens need to learn to hunt?

Cougar kittens need to learn to hunt so that they can catch prey for food. They need to eat to add matter to their bodies.

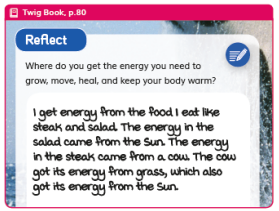
DQ2L2 TE p. 50

Formative Assessment

Have students answer the question on page 80 in their Twig Books.

Use the Formative Assessment

Collect students' Twig Books so you can review them before the next lesson. This will give you an opportunity to assess students' thinking about the Driving Question in the context of their own bodies.


Twig Book, p.80

Reflect

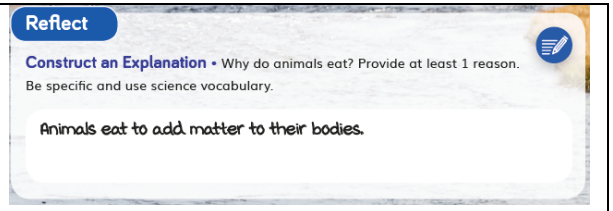
Where do you get the energy you need to grow, move, heal, and keep your body warm?

I get energy from the food I eat like steak and salad. The energy in the salad came from the Sun. The energy in the steak came from a cow. The cow got its energy from grass, which also got its energy from the Sun.

Look for students who do not identify that the energy in their bodies comes from the food they eat. Check in with these students in future lessons. Review the Matter Flowchart and ask them to identify where they might fall on the chart. Have these students visualize a favorite food and guide them to replicate a matter and energy flowchart with them as the top consumer. Have students add the Sun and verbally explain how the energy moves from the Sun to a producer to a consumer (the student).

DQ4L2 TE p. 135

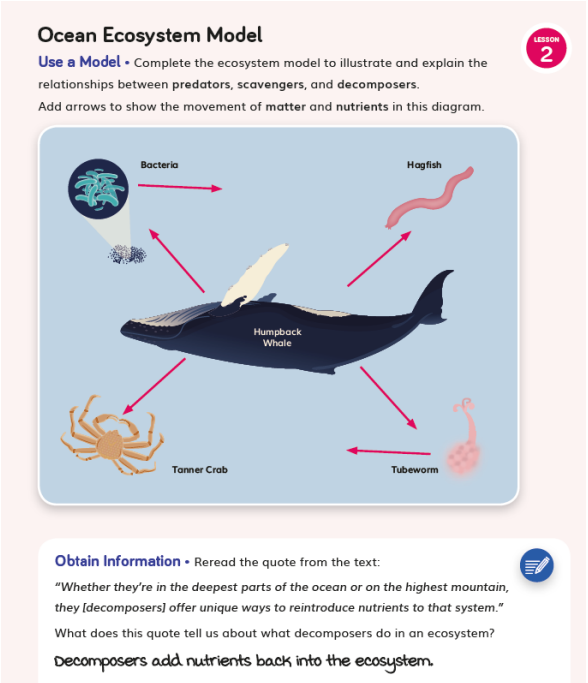
- Constructed response (written and drawn, DQ2L4 TB p. 32, DQ4L3 TB p. 83, DQ5L2 TB p. 102)


Reflect

Construct an Explanation • Why do animals eat? Provide at least 1 reason. Be specific and use science vocabulary.

Animals eat to add matter to their bodies.

DQ2L4 TB p. 32


Ocean Ecosystem Model

LESSON 2

Use a Model • Complete the ecosystem model to illustrate and explain the relationships between **predators**, **scavengers**, and **decomposers**.
Add arrows to show the movement of **matter** and **nutrients** in this diagram.

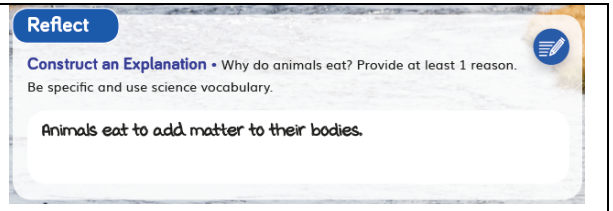
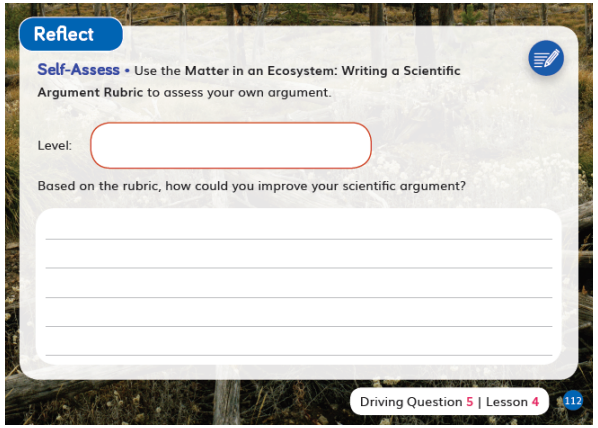
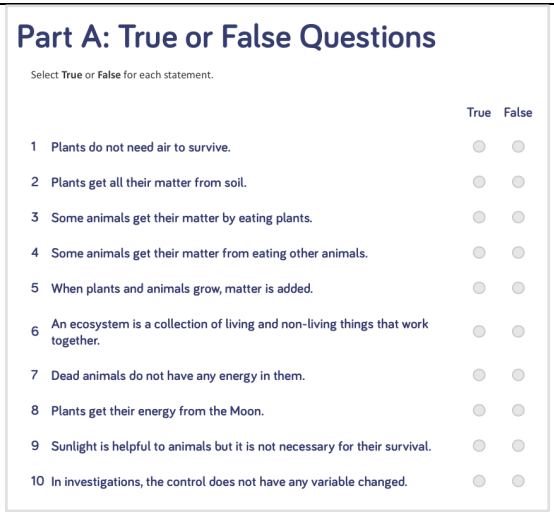
Obtain Information • Reread the quote from the text:

"Whether they're in the deepest parts of the ocean or on the highest mountain, they [decomposers] offer unique ways to reintroduce nutrients to that system."

What does this quote tell us about what decomposers do in an ecosystem?

Decomposers add nutrients back into the ecosystem.

DQ5L2 TB p. 102

○ Self- and peer assessment (DQ2L6 TE Reflect p. 79, DQ5L4 TB p. 112)	 Reflect Construct an Explanation • Why do animals eat? Provide at least 1 reason. Be specific and use science vocabulary. Animals eat to add matter to their bodies. DQ2L6 TE Reflect p. 79  Reflect Self-Assess • Use the Matter in an Ecosystem: Writing a Scientific Argument Rubric to assess your own argument. Level: Based on the rubric, how could you improve your scientific argument? Driving Question 5 | Lesson 4 112 DQ5L4 TB p. 112
○ Multiple choice (digital, DQ6).	 Part A: True or False Questions Select True or False for each statement. True False 1 Plants do not need air to survive. 2 Plants get all their matter from soil. 3 Some animals get their matter by eating plants. 4 Some animals get their matter from eating other animals. 5 When plants and animals grow, matter is added. 6 An ecosystem is a collection of living and non-living things that work together. 7 Dead animals do not have any energy in them. 8 Plants get their energy from the Moon. 9 Sunlight is helpful to animals but it is not necessary for their survival. 10 In investigations, the control does not have any variable changed. Multiple choice (digital, DQ6)

- Text-to-speech functionality is available for all assets.
- Class discussions are supported with suggested question scaffolds and sample answers (for example, DQ2L4 TE Report, p. 62).

Discuss Food Chains

Lead a discussion about food chains.

- ***What did passing the cup from organism to organism show?***
- That the grass was eaten by the pocket gopher and the pocket gopher was eaten by the grizzly bear
- Where different kinds of animals get their matter
- That the deer mouse gets matter from the willow and the hawk gets matter from the deer mouse
- ***In this activity, where does the deer mouse get matter? The beaver? The gray wolf? The bighorn sheep?***
- These animals get their matter from the organisms that they eat.

DQ2L4 TE Report, p. 62

- The Reflect of most lessons integrates formative assessment opportunities for the students to reflect on what they have learned and how they used the three dimensions to grow their understanding of the module phenomena and problems (for example, DQ2L2 TE Reflect p. 50, DQ4L2 TE Reflect p. 135).

Formative Assessment

Discuss what students learned as they read the article. Then, ask students to turn to page 28 in their Twig Books and answer the question.

Use the Formative Assessment

For students who did not associate the need to hunt with the need to eat food and thus grow, follow up after the next lesson. After the class discussion in Lesson 3, ask whether students have new ideas about where the animals they read about get their matter. After each of the next four lessons, follow up with these students to ensure that, by Lesson 6, they identify food as the source of matter.

On subsequent days, revisit the article to focus on key text features and the structures students will encounter in other informational texts.

Twig Book, p.28

Reflect

Evaluate Information

- Why do cougar kittens need to learn to hunt?

Cougar kittens need to learn to hunt so that they can catch prey for food. They need to eat to add matter to their bodies.

DQ2L2 TE Reflect p. 50

Formative Assessment

Have students answer the question on page 80 in their Twig Books.

Use the Formative Assessment

Collect students' Twig Books so you can review them before the next lesson. This will give you an opportunity to assess students' thinking about the Driving Question in the context of their own bodies.

Twig Book, p.80

Reflect

Where do you get the energy you need to grow, move, heal, and keep your body warm?

I get energy from the food I eat like steak and salad. The energy in the salad came from the Sun. The energy in the steak came from a cow. The cow got its energy from grass, which also got its energy from the Sun.

Look for students who do not identify that the energy in their bodies comes from the food they eat. Check in with these students in future lessons. Review the Matter Flowchart and ask them to identify where they might fall on the chart. Have these students visualize a favorite food and guide them to replicate a matter and energy flowchart with them as the top consumer. Have students add the Sun and verbally explain how the energy moves from the Sun to a producer to a consumer (the student).

DQ4L2 TE Reflect p. 135

SP3. Student Progress Over Time.

The module provides strong guidance for using Formative and Summative Assessments to monitor student progress over time. Examples include support for capturing student growth, interpreting results, adjusting instruction and planning for future instruction, providing feedback to students, and prompting students to consider what and how they've learned.

Evidence

- Teachers can elect to administer the Pre-Explorations, Benchmark Assessment, and Multiple Choice assessments digitally or in print. Answers are tagged to specific dimensions and, if administered digitally, teachers will be able to track student growth in level of attainment of the dimensions over time and tailor instruction accordingly. Teachers can also provide students with feedback digitally. Teachers can opt to add the scores manually for all non-digital assessment tasks.
- Downloadable Progress Trackers support teachers to track students' mastery of their misconceptions as assessed in the Pre-Explorations as well as the results of formative assessments of the three dimensions across the DQs (for example, the Energy in Ecosystems Progress Tracker used in DQ4). Guidance for teachers on how to adjust instruction for students needing more support to clear up their misconceptions is provided at point of use in the instructions (for example, DQ2L4 TE Report p. 62, DQ3L1 TE Report p. 97, and DQ4L3 TE Investigate p. 142).

Discuss Food Chains

Lead a discussion about food chains.

- ***What did passing the cup from organism to organism show?***
- That the grass was eaten by the pocket gopher and the pocket gopher was eaten by the grizzly bear
- Where different kinds of animals get their matter
- That the deer mouse gets matter from the willow and the hawk gets matter from the deer mouse
- ***In this activity, where does the deer mouse get matter? The beaver? The gray wolf? The bighorn sheep?***
- These animals get their matter from the organisms that they eat.

DQ2L4 TE Report p. 62

Misconceptions from the Pre-Exploration

Use the **Energy in Ecosystems Progress Tracker** to note if students have cleared up the following misconception.

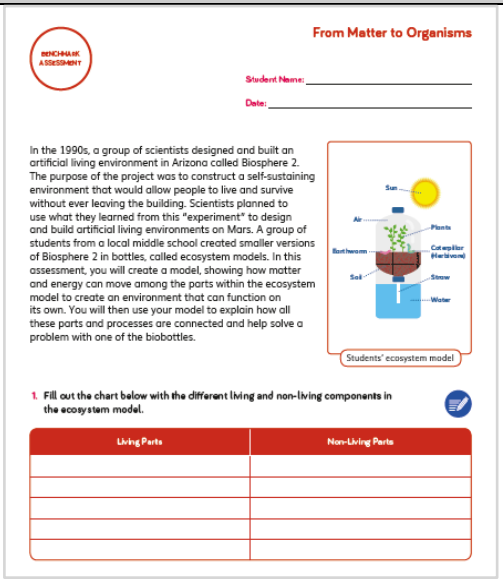
Misconception	What to Do
Humans and other animals get the energy they need from somewhere other than food.	As students model their ideas with the interactive, have them explain where the energy for each organism comes from. Then, ask them to visualize where humans might fit into the model and to reflect on where the energy for humans' food comes from.

DQ4L3 TE Investigate p. 142

SP4. Equitable Access.
The module provides strong support and strategies for ensuring that assessments are accessible to students from diverse backgrounds and with diverse learning needs.

Evidence

- Assessments of the three dimensions are multimodal and include multiple choice, writing, drawing, physical models, and oral discussions, allowing all students to access a range of assessment types to suit their learning style and/or reading level.
- The digital TB and digital assessment items (Benchmark, Multiple Choice, Rubrics) have a text to speech function allowing students of all reading levels to access the assessments.
- The rubrics for the performance tasks (DQ2L6, DQ3L4, DQ4L4, DQ5L4) and Benchmark Assessment (DQ5 TE p. 184) have four levels (emerging, developing, proficient, advanced) allowing all students to demonstrate their current level of attainment.



BENCHMARK ASSESSMENT

From Matter to Organisms

Student Name: _____

Date: _____

In the 1990s, a group of scientists designed and built an artificial living environment in Arizona called Biosphere 2. The purpose of the project was to construct a self-sustaining environment that would allow people to live and survive without ever leaving the building. Scientists planned to use what they learned from this "experiment" to design and build artificial living environments on Mars. A group of students from a local middle school created smaller versions of Biosphere 2 in bottles, called ecosystem models. In this assessment, you will create a model, showing how matter and energy can move among the parts within the ecosystem model to create an environment that can function on its own. You will then use your model to explain how all these parts and processes are connected and help solve a problem with one of the biobottles.

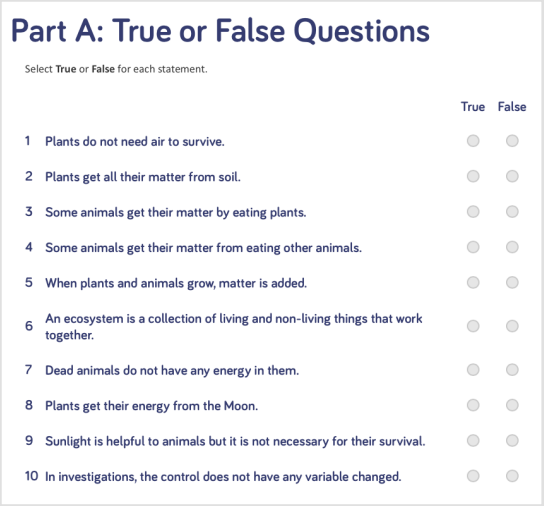
Students' ecosystem model

1. Fill out the chart below with the different living and non-living components in the ecosystem model.

Living Parts	Non-Living Parts

DQ5 TE p. 184

- The multiple choice assessment (DQ6) contains questions targeting different DoK levels, with an extended section available to further challenge GATE students.



Part A: True or False Questions

Select **True** or **False** for each statement.

		True	False
1	Plants do not need air to survive.		
2	Plants get all their matter from soil.		
3	Some animals get their matter by eating plants.		
4	Some animals get their matter from eating other animals.		
5	When plants and animals grow, matter is added.		
6	An ecosystem is a collection of living and non-living things that work together.		
7	Dead animals do not have any energy in them.		
8	Plants get their energy from the Moon.		
9	Sunlight is helpful to animals but it is not necessary for their survival.		
10	In investigations, the control does not have any variable changed.		

Multiple choice (digital, DQ6)

- Writing, Reading, Listening and Speaking domain tasks dedicated to monitor English language development are integrated into the core instructional resources (DQ3L3 TE p. 111, DQ4L2 TE p. 137) and the on-level reader lessons (TE Chapter 3 Second Read, p. 231).

Focus on Comprehension—Inferring Meaning

Remind students that even the best readers encounter unfamiliar words. Sometimes you can't determine a word's meaning. When this happens, you can identify how the word is being used in context to infer its meaning.

Refer students to paragraph 1 of the article, "How to Survive in Yellowstone National Park." Read the following sentence: "After wandering away from his group, he quickly lost them, and spent a whopping 37 days alone in the wilderness." Explain to students that if you did not know what the word *whopping* meant, you would reread the sentence to see how the author used the word. Even though the word ends in *-ing*, it is not being used as a verb or a word to show action. In fact, it is being used to describe "37 days alone in the wilderness".

- ***How would you describe 37 days alone in the wilderness?***
- I would describe it as scary.

Prompt students to think about the context. They should recognize that, e.g., Everts was not scared. Point out that the author describes Evert's recovery as *lucky*. Guide students to infer that *whopping* describes something extremely large or extraordinary—i.e., an extremely long amount of time.

Repeat the process with the word *tactics* in paragraph 2. Remind students to check their inferred meaning to see if it makes sense in context.

In pairs, have students infer the meaning of five more unfamiliar words. Have them annotate the text to explain their thinking. Prompt them to share and discuss their inferences or consult a dictionary to check accuracy.

Focus on Comprehension—Chunking Text

Explain to students that summarizing is a strategy that strong readers use to make sense of a text as they read. Summarizing chunks of text instead of waiting until the end of a reading is a great way to check understanding.

Informational texts are often written with headings or subtopics which make it easier to know what text to chunk for summarizing. However, the article "How to Survive in Yellowstone National Park," does not have headings.

- ***How would you chunk this article?***
- By paragraph

In pairs, have students reread the article and write a brief summary for each paragraph. After they've finished, encourage them to reread their summaries and string them together in order to create a single summary statement for the entire article.

When pairs finish, ask them to join another pair and read aloud their summaries. They should then explain the differences between their responses and refine their summary statements as needed.

English Learners

Monitoring English Language Proficiency

Engage students in the following tasks to monitor their growing English Language development. These tasks are best administered individually.

Writing Domain

Have students look at the illustration on page 60 and write a brief description of what is happening.

Reading Domain

Use the illustration on page 57. Write these words: *producer*, *consumer*, *food chain*. Have students read each word, then use it to talk about the illustration. Ask: Which word could be used as a label for the illustration? Point to and name the consumers in the illustration. Why are they called consumers? Point to the producer? Why is it called a producer?

Speaking Domain

As students share their answers to the Listening Domain questions, record their use of academic vocabulary and connecting words.

Listening Domain

Read aloud the pages 53–57. Ask: What happened to Truman Everts? What did we learn from him? How do plants make their own food?

DQ3L3 TE p. 111

Focus on Text Structure—Cause/Effect

Have students revisit the article, "Undersea Story," on pages 75–80 in their Twig Books. Explain that before they read the text again, they will first identify the text structure. This will help students see how the author organized the text, which will help them organize their thinking and understand the text.

For example, if the text is a biography, you'll look for a series of events in the subject's life presented in the order they occurred (chronologically). If a text is a comparing and contrasting topics, you'll look for how they're alike and different.

"Undersea Story" has a complex text structure. It contains main ideas represented by headings and details represented by body text. It also presents information in a cause-and-effect structure.

Refer students to paragraph 8 of the article.

- ***What is causing the penguins to lose their waterproofing?***
- The penguins are molting/losing their feathers.

Explain that authors use signal words and phrases to help the reader understand the structure of the writing. In a cause-and-effect text structure, these include: *so, because, since, therefore, if... then, leads to, as a result, due to, effect of, consequently,* and *thus*.

Explain that causes can have multiple effects. For example, the Greenhouse Effect can cause:

- More ice to melt
- Increased flooding
- The reduction of some animal and plant populations.

The Greenhouse Effect is just one cause, but it has many effects.

Have students read the text on their own or in pairs. Ask them to annotate the causes and effects they find in the text along with the words that signal these relationships.

Discuss students' annotations. There are multiple cause-and-effect relationships in the text. Have students choose the one they think is the most important and explain their choice.

Note: The shrinking ice and subsequent decrease in phytoplankton which, in turn, affects the amount of krill is undoubtedly the most significant cause-and-effect relationship represented in the text.

Encourage students to think about text structure when they read informational texts and look for words that signal cause-and-effect relationships between ideas, objects, and/or people.

English Learners

Monitoring English Language Proficiency

Engage students in the following tasks to monitor their growing English Language development. These tasks are best administered individually.

Writing Domain

Have students look at the illustration on page 80 and write a brief description of what is happening.

Reading Domain

Have students read aloud page 77 and the top of page 78.

- ***Why is there less sea ice in Antarctica? Find the sentence that answers the question.***
- ***What do the krill eat? Point to the word in the text.***
- ***Why is there less of this food available? Find the sentences that answer the question.***

Speaking Domain

As students share their answers to the Listening Domain questions, record their use of academic vocabulary and connecting words.

Listening Domain

Read aloud pages 78–79.

- ***Why does the author say krill is vital, or very important, to emperor penguins?***
- ***What other animals are suffering in Antarctica?***
- ***Why?***
- ***What are scientists doing to help?***

DQ4L2 TE p. 137

Monitoring English Language Proficiency

During your leveled reader instruction, engage students in the following tasks to monitor their growing English language development. These tasks are best administered individually.

Writing Domain

Have students look at the photo and illustration on pages 24–25 and write a brief description of what is happening.

Reading Domain

Use the photos and illustration on pages 10–11.

Write:

- A food web shows what animals eat each other.
- Some animals and plants on islands grow larger than normal.
- The Galápagos has special sea animals.

Have students read each sentence, then match it to the correct visual.

Listening Domain

Describe the food web illustration on page 21. Add key details included in the photo, but not in the caption (e.g., names of animals, terms like predator and prey).

- ***What is this picture?***
- ***What does it show?***
- ***Why are the eagle and snake connected?***
- ***What is the relationship between the frog and the grasshopper? Why?***

Speaking Domain

As students answer the four questions in the Listening Domain task, record their use of academic vocabulary and ability to summarize key details.

TE Chapter 3 Second Read, p. 231

Designed for the NGSS: Foundations	High Quality 5	Medium Quality 3	Low Quality 1
TS1. Phenomenon/Problem Driven Three-Dimensional Learning. Teacher materials provide: • background information about the phenomena or problems included in the learning sequence and across sequences; • an explanation of the role of phenomena or problems in driving student learning; • rationale for why the unit phenomena or problems were selected for the targeted DCIs, SEPs, and CCCs. Refer to F1, F2, SW1, SW2, SP1.	Materials provide clear guidance to teachers on how students develop, use, and integrate the three dimensions to make sense of phenomena or design solutions to problems.	Materials provide some guidance to teachers about how students develop, use, and integrate the three dimensions.	Materials provide little guidance on developing, using, or integrating them to make sense of phenomena or design solutions to problems.
TS2. Coherence. Teacher materials describe and provide a rationale for: • the conceptual framework and sequence of ideas, practices, and learning experiences in the learning sequences and across sequences; • strategies for linking student experiences across lessons to ensure student sense- making and/or problem-solving focused on phenomena or problems is linked to learning across all three dimensions; • Connections to other Science Domains, Nature of Science, Engineering, Technology, and Applications of Science, math, and ELA. Refer to F2, F3, SW2, SP2.	Materials provide strong support for understanding unit coherence and helping students link experiences to learning across all three dimensions and to phenomena or problems.	Materials provide some support for understanding unit coherence and helping students link experiences to learning across all three dimensions and to phenomena or problems.	Materials provide little support for understanding unit coherence and helping students link experiences to learning across all three dimensions and to phenomena or problems.
TS3. Effective Teaching. Teacher materials support the use of and provide a rationale and evidence of effectiveness for strategies that: • support students in learning through authentic and meaningful phenomena or design problems; • support student learning across the three dimensions; • make student thinking visible; promote reasoning, sense-making, and problem- solving; challenge student thinking; and develop metacognitive abilities.	Materials provide rationale and robust support for implementing strategies that enhance student performances, thinking, and	Materials provide some rationale and support for implementing strategies that enhance student performances, thinking, and	Materials provide little rationale and support for teachers to implement strategies that enhance student performances, thinking, and

Refer to SW1, SW2, SW3, SW4, SP3.	metacognition.	metacognition.	metacognition.
TS4. Support for Students with Diverse Learning Needs. Teacher materials provide an array of strategies: ● to support student access to the targeted learning goals, experiences, and performances; ● that help teachers differentiate instruction. Refer to SW5, SP4.	Materials include robust and comprehensive strategies for supporting learners with diverse needs.	Materials include some robust strategies for supporting learners with diverse needs.	Materials include few robust strategies for supporting learners with diverse needs.
TS5. Support to Monitor Student Progress. Materials provide support for teachers to: ● monitor student learning and progress over time; ● make decisions about instruction and provide feedback to students. Refer to SW3, SW4, SP1, SP2, SP3.	Materials provide robust support for interpreting and using data generated from assessments.	Materials provide some support for interpreting and using data generated from assessments.	Materials provide little support for interpreting and using data generated from assessments.

Designed for NGSS: Teacher Support

Analyze Evidence

Directions:

1. Review the Designed for NGSS: Foundations Rubric.
2. Reflect on the evidence (or lack of evidence) that you and your team gathered and represented.
3. Record strengths and limitations for each criterion based on your evidence. Cite specific examples.

Strengths
TS1. Phenomenon/Problem Driven Three-Dimensional Learning.
The Module materials are High Quality 5 in regards to TS1. They provide clear guidance to teachers on how students develop, use, and integrate the three dimensions to make sense of phenomena or design solutions to problems.
Evidence • In DQ1, students start by exploring what plants need to grow. They set up an investigation into plant needs, applying the concepts of scale, proportion, and quantity (CCC-3), and observe the Van Helmont experiment set up in Module 1. Through observations and reading an informational text, they explore the phenomena of matter and energy flow in organisms (LS1.C). • In DQ2, students explore the phenomenon of matter and energy flow in ecosystems, engaging in video and reading investigations. They apply the concepts of energy and matter (CCC-5) and systems and system models (CCC-4) to model food chains and food webs. This culminates in students writing scientific explanations to answer the Driving Question. • In DQ3, students review and analyze the data from their two hands-on plant investigations and evaluate their findings. They consolidate their learning of matter and energy flow in organisms (LS1.C) by writing arguments from evidence that explain where plants get matter to grow. • In DQ4, students activate prior knowledge of energy, exploring the phenomenon of energy in chemical processes and everyday life (PS3.D). They close read an informational text and use an interactive to model food chains, and apply the concept of cause and effect (CCC-2) to construct explanations about how energy moves through the food chain. • In DQ5, students turn to decomposition. They apply the concept of energy and matter (CCC-5) as they observe a guided experiment and then embark on a hands-on investigation to observe decomposition in the field. Their explorations and data collection culminate in written arguments they share with the class, demonstrating their grasp of cycles of matter and energy transfers in an ecosystem (LS2.B). • In DQ6, students close the module with a focus on interdependent relationships in ecosystems (LS2.A). They apply the concepts of cause and effect (CCC-2) and stability and change (CCC-7) to examine what happens when a non-native species is introduced to an ecosystem. They explore this idea using an interactive and a final digital and video investigation.

TS2. Coherence.

The Module materials are High Quality 5 in regards to TS2.

They provide teachers with a clear conceptual framework in a logical sequence, strategies for linking student experiences across lessons, and connections to other science domains, CNS (NoS), CETAS (ETS), math, and ELA.

Evidence

- The instructional materials have been designed to support the teacher to guide students on a scaffolded learning journey to solve the Module Phenomenon: How do matter and energy move through an ecosystem? They tackle the problem one Driving Question at a time, applying the three dimensions with increasing sophistication, building the skills and knowledge they need through a series of investigations.
- A digital guide to SEPs and CCCs provides a clear explanation for each practice and concept with guidance on what these skills should look like in a 5th grade classroom, with specific reference for how students ask questions and develop investigations in Grade 5 Module 2.
- Additional module-specific support is frequently given at point of use in the instructional materials for all dimensions, Connections to the Nature of Science (CNS) and Connecting to Engineering, Technology, and Applications of Science (CETAS), often in the Connect. For example, in DQ1L2 TE Connect p. 19, support is given on connecting the learning activity to CCC-3 Scale, Proportion, and Quantity.
- Opportunities to articulate, question, and revise students' conceptual framework are woven into the instructional resources with teachers supported with continuous assessment for learning strategies and with support for how to tailor instruction accordingly.

Connect Today's Learning to CCC-3—Scale, Proportion, and Quantity

Review that there are now two plant experiments in progress. In Module 1, students set up the Van Helmont Experiment to investigate where plants get their matter. Remind students that, at the start of this experiment, they measured the weight of the seed and the weight of the soil.

Have students refer to the investigation plans in their Twig Books and write how they can track if a plant has grown. Discuss student answers.

- *How do we know if a plant has grown?*
- We can measure it.
- We can weigh it.
- *What do we measure? What units of measurement do we use?*
- Plant growth in centimeters; plant weight in grams
- *What tools do we need?*
- A ruler; scales

Confirm that, in addition to making visual observations, students will either record the height of the plants in centimeters or the weight of plants in grams.

Use the **What Plants Need Progress Tracker** to note that students have planned an investigation to gather evidence about what plants need to grow.

DQ1L2 TE Connect p. 19

TS3. Effective Teaching.

The Module materials are High Quality 5 in regards to TS3.

They provide strong guidance to support students in learning through authentic and meaningful phenomena/problems, support student learning across the three dimensions, and develop students' metacognitive abilities.

Evidence

- The teacher is supported in the instructional material to connect their learning experiences back to the Module Phenomenon at strategic points with frequent class discussions where students share their ideas and evidence. For example, in DQ4L4 TE p. 149, the teacher leads a discussion of matter and energy flow, encouraging students to connect their learning to a reading investigation from DQ3.

Review Matter and Energy Flow

Review matter and energy flow by referring to the article, "How to Survive in Yellowstone National Park," that students read in Driving Question 3, Lesson 3. Remind students that Everts ate thistles to survive in the park after he was separated from his group.

- *What did Everts get from the thistles that helped him survive?*
- *What did Everts get that helped him maintain his body temperature, heal from injury, and move around the park?*
- He got matter and energy from the thistle.
- *Where did the thistle get the matter and energy it needs to survive?*
- The thistle made its own matter using energy from the Sun.

DQ4L4 TE p. 149

- The instructional materials are designed to elicit students' understanding of matter and energy at the start of the module and then develop their understanding over time, through hands-on, reading, digital, video and data investigations.
- Support is given at point of use for how to develop students' metacognitive abilities. The Connect of the lesson often guides the teacher to draw students' attention to their growing use of the SEPs and CCCs, understanding of the DQ, or increasing ability to answer the Module Phenomenon (e.g., connecting to CCC-3 in DQ1L2 TE p. 19, and SEP-2 and SEP-3 in DQ6L1 TE p. 200).
- Teachers can elect to administer the Pre-Explorations, Benchmark Assessment, and Multiple Choice assessments digitally or in print. Answers are tagged to specific dimensions and, if administered digitally, teachers will be able to track student growth in level of attainment of the dimensions over time and tailor instruction accordingly. Teachers can also provide students with feedback digitally. Teachers can opt to add the scores manually for all non-digital assessment tasks.

Connect Today's Learning to CCC-3—Scale, Proportion, and Quantity

Review that there are now two plant experiments in progress. In Module 1, students set up the Van Helmont Experiment to investigate where plants get their matter. Remind students that, at the start of this experiment, they measured the weight of the seed and the weight of the soil.

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DQ1L2 TE p. 19

Connect Today's Learning to SEP-2 (Developing and Using Models) and SEP-3 (Planning and Carrying Out Investigations)

Explain that it is difficult to observe how changes in ecosystems affect organisms because these changes occur over time and ecosystems are large.

Point to the Science Tools poster.

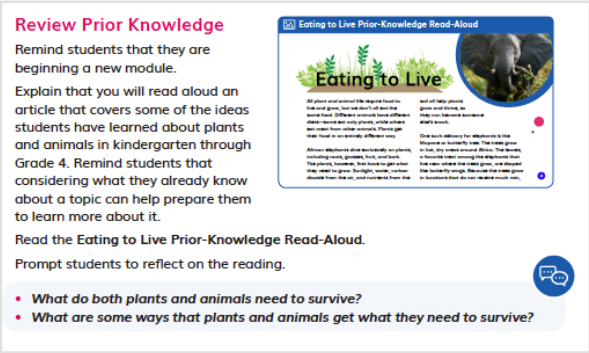
- ***What scientific tools did we use when using the interactive?***
- Develop and use models (the interactive simulation is a model)
- Plan and carry out investigations (we investigated what happened to an ecosystem when the number of organisms changes).

DQ6L1 TE p. 200

TS4. Support for Students with Diverse Learning Needs.
The Module materials are High Quality 5 in regards to TS4. They provide a strong array of strategies to support student access to the targeted learning goals and help teachers differentiate instruction.

Evidence

- Integrated EL sidebars offer teachers guidance to support students' engagement with the material (DQ1L1 TE p. 8, DQ2L3 TE p. 54, DQ3L4 TE p. 115, D4L4 TE p. 147).



Review Prior Knowledge

Remind students that they are beginning a new module.

Explain that you will read aloud an article that covers some of the ideas students have learned about plants and animals in kindergarten through Grade 4. Remind students that considering what they already know about a topic can help prepare them to learn more about it.

Eating to Live Prior-Knowledge Read-Aloud

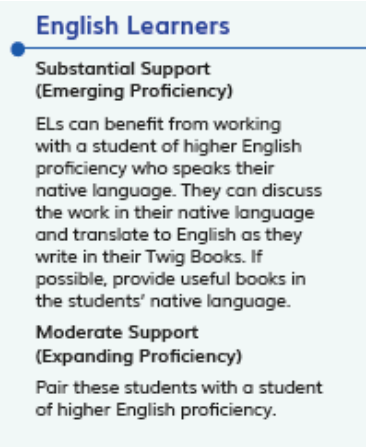
Eating to Live

Read the **Eating to Live Prior-Knowledge Read-Aloud**.

Prompt students to reflect on the reading.

- ***What do both plants and animals need to survive?***
- ***What are some ways that plants and animals get what they need to survive?***

DQ1L1 TE p. 8



English Learners

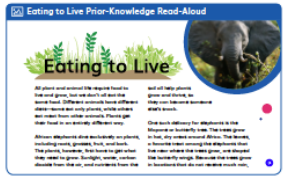
Substantial Support (Emerging Proficiency)

ELs can benefit from working with a student of higher English proficiency who speaks their native language. They can discuss the work in their native language and translate to English as they write in their Twig Books. If possible, provide useful books in the students' native language.

Moderate Support (Expanding Proficiency)

Pair these students with a student of higher English proficiency.

DQ2L3 TE p. 54

	English Learners Acknowledge that the rubric for writing a scientific argument is very similar to the rubric for writing a scientific explanation. Let students know that many of the same skills are needed for both types of writing. Read through each section of the rubric and ask students which seem familiar. Have them explain each domain in their own words. DQ3L4 TE p. 115
• Integrated Cultural Connection sidebars offer teachers guidance to engage students of all backgrounds (DQ1L1 TE p. 8, DQ2L3 TE p. 55, DQ3L3 TE p. 106, DQ5L3 TE p. 172).	**Review Prior Knowledge** Remind students that they are beginning a new module. Explain that you will read aloud an article that covers some of the ideas students have learned about plants and animals in kindergarten through Grade 4. Remind students that considering what they already know about a topic can help prepare them to learn more about it.  Read the **Eating to Live Prior-Knowledge Read-Aloud**. Prompt students to reflect on the reading. • ***What do both plants and animals need to survive?*** • ***What are some ways that plants and animals get what they need to survive?*** DQ1L1 TE p. 8

Review Decomposers

Refer to the Energy and Matter Flowchart. Review the roles of the different kinds of consumers in an ecosystem.

- ***What is the role of the decomposer?***
- Decomposers break down food, waste, and dead matter.
- Decomposers help return dead matter/waste back to the earth.
- Decomposers break down dead matter/waste and return it to the soil.
- Some of the dead matter is turned into nutrients.

Display the image of the decomposers from the **Matter Flowchart handout**.

- ***Where should we put decomposers on our food web model?***

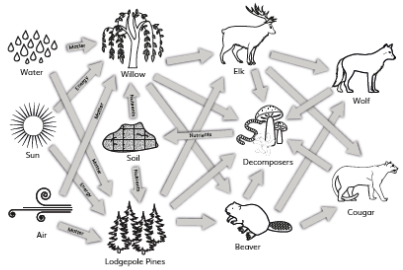
Have students share their ideas. Encourage students to provide their reasoning based on prior knowledge.

Tape the image of the decomposers to the flowchart and add arrows labeled "matter and nutrients" pointing from the beaver, lodgepole pine, elk, wolf, willow tree, and cougar to the decomposers. Reiterate that all the organisms on the Energy and Matter Flowchart will die and decompose.

- ***How can we show that decomposers reintroduce nutrients into the ecosystem on our Energy and Matter Flowchart?***
- ***Where should I put the "nutrients" arrows?***
- Pointing from the decomposers to the soil

Add an arrow labeled "nutrients" from the decomposers to the soil.

- ***What type of organism uses nutrients that the decomposers add to the soil as they make their own food?***
- Producers
- Plants



DQ5L3 TE Spark p. 172

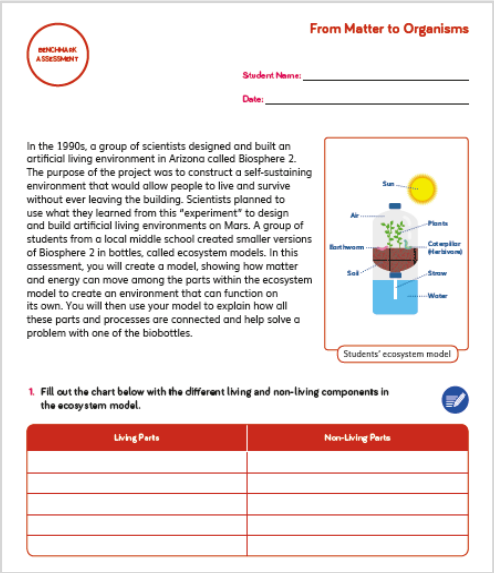
• Integrated Special Needs sidebars offer teachers guidance to support students of all abilities as they participation in class activities and grasp key concepts (DQ1L2 TE p. 18, DQ2L3 TE p. 56, D4L4 TE p. 148).	**English Learners** Provide support as needed for ELs as they share. **Substantial Support (Emerging Proficiency)** Provide students with sentence frames such as: • I <pushed/pulled> the _____ and it _____ (rolled, moved, fell down, etc.). **Moderate Support (Expanding Proficiency)** Prompt students to describe both what they did to the object and how the object moved. Help students with sentence frames if needed, such as: • I _____ the _____, and it _____. **Light Support (Bridging Proficiency)** Use questioning to help students describe how the item moved and the action taken, such as: • ***What happened when you pushed the button?*** DQ1L2 TE p. 18
• Integrated Challenges interspersed throughout the TB support GATE students who have met the learning goals (DQ1L1 TB p. 4, DQ2L2 TB p. 28, DQ3L2 TB p. 51, DQ5L2 TB p. 103).	**Challenge** LESSON 1 Describe how you would investigate what plants need in order to grow. I would give different plants different things. I would give Plant 1 water and soil. I would give Plant 2 soil and sunlight. I would give Plant 3 water, soil, and sunlight. Then I would test the plants to see what plants grew and what plants did not. Word Wall DQ1L1 TB p. 4

- Videos like Time-Lapse of a Plant (DQ1L1), Butterfly's Breakfast (DQ2L5), Decomposers: Breaking It Down (DQ5L2), and Wolves in Yellowstone (DQ6L2) bring phenomena and concepts to life for all students.
- Assessments of the three dimensions are multimodal and include multiple choice, writing, drawing, physical models, and oral discussions, allowing all students to access a range of assessment types to suit their learning style and/or reading level.
- The digital TB and digital assessment items (Benchmark, Multiple Choice, Rubrics) have a text to speech function allowing students of all reading levels to access the assessments.

Time-Lapse of a Plant

Decomposers: Breaking It Down

- The rubrics for the performance tasks (DQ2L6, DQ3L4, DQ4L4, DQ5L4) and Benchmark Assessment (DQ5 TE p. 184) have four levels (emerging, developing, proficient, advanced) allowing all students to demonstrate their current level of attainment.



BENCHMARK ASSESSMENT

From Matter to Organisms

Student Name: _____

Date: _____

In the 1990s, a group of scientists designed and built an artificial living environment in Arizona called Biosphere 2. The purpose of the project was to construct a self-sustaining environment that would allow people to live and survive without ever leaving the building. Scientists planned to use what they learned from this "experiment" to design and build artificial living environments on Mars. A group of students from a local middle school created smaller versions of Biosphere 2 in bottles, called ecosystem models. In this assessment, you will create a model, showing how matter and energy can move among the parts within the ecosystem model to create an environment that can function on its own. You will then use your model to explain how all these parts and processes are connected and help solve a problem with one of the biobottles.

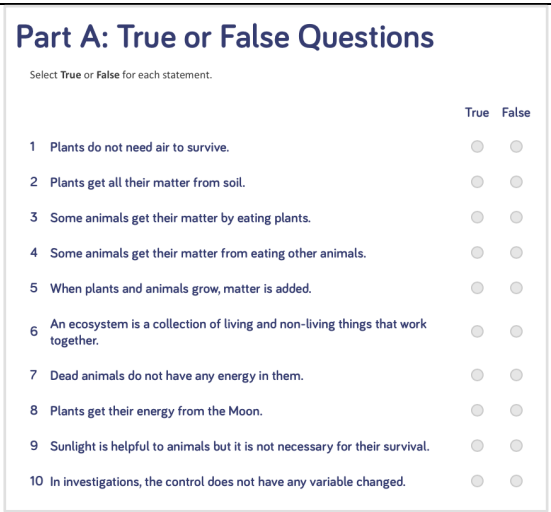
Students' ecosystem model

1. Fill out the chart below with the different living and non-living components in the ecosystem model.

Living Parts	Non-Living Parts

DQ5 TE p. 184

- The multiple choice assessment (DQ6) contains questions targeting different DoK levels, with an extended section available to further challenge GATE students.



Part A: True or False Questions

Select **True** or **False** for each statement.

		True	False
1	Plants do not need air to survive.		
2	Plants get all their matter from soil.		
3	Some animals get their matter by eating plants.		
4	Some animals get their matter from eating other animals.		
5	When plants and animals grow, matter is added.		
6	An ecosystem is a collection of living and non-living things that work together.		
7	Dead animals do not have any energy in them.		
8	Plants get their energy from the Moon.		
9	Sunlight is helpful to animals but it is not necessary for their survival.		
10	In investigations, the control does not have any variable changed.		

Multiple choice (digital, DQ6)

- Writing, Reading, Listening and Speaking domain tasks dedicated to monitor English language development are integrated into the core instructional resources (DQ3L3 TE p. 111, DQ4L2 TE p. 137) and the on-level reader lessons (TE Chapter 3 Second Read, p. 231).

Focus on Comprehension—Inferring Meaning

Remind students that even the best readers encounter unfamiliar words. Sometimes you can't determine a word's meaning. When this happens, you can identify how the word is being used in context to infer its meaning.

Refer students to paragraph 1 of the article, "How to Survive in Yellowstone National Park." Read the following sentence: "After wandering away from his group, he quickly lost them, and spent a whopping 37 days alone in the wilderness." Explain to students that if you did not know what the word *whopping* meant, you would reread the sentence to see how the author used the word. Even though the word ends in -ing, it is not being used as a verb or a word to show action. In fact, it is being used to describe "37 days alone in the wilderness".

- ***How would you describe 37 days alone in the wilderness?***
- I would describe it as scary.

Prompt students to think about the context. They should recognize that, e.g., Everts was not scared. Point out that the author describes Evert's recovery as *lucky*. Guide students to infer that *whopping* describes something extremely large or extraordinary—i.e., an extremely long amount of time.

Repeat the process with the word *tactics* in paragraph 2. Remind students to check their inferred meaning to see if it makes sense in context.

In pairs, have students infer the meaning of five more unfamiliar words. Have them annotate the text to explain their thinking. Prompt them to share and discuss their inferences or consult a dictionary to check accuracy.

Focus on Comprehension—Chunking Text

Explain to students that summarizing is a strategy that strong readers use to make sense of a text as they read. Summarizing chunks of text instead of waiting until the end of a reading is a great way to check understanding.

Informational texts are often written with headings or subtopics which make it easier to know what text to chunk for summarizing. However, the article "How to Survive in Yellowstone National Park," does not have headings.

- ***How would you chunk this article?***
- By paragraph

In pairs, have students reread the article and write a brief summary for each paragraph. After they've finished, encourage them to reread their summaries and string them together in order to create a single summary statement for the entire article.

When pairs finish, ask them to join another pair and read aloud their summaries. They should then explain the differences between their responses and refine their summary statements as needed.

English Learners

Monitoring English Language Proficiency

Engage students in the following tasks to monitor their growing English Language development. These tasks are best administered individually.

Writing Domain

Have students look at the illustration on page 60 and write a brief description of what is happening.

Reading Domain

Use the illustration on page 57. Write these words: *producer, consumer, food chain*. Have students read each word, then use it to talk about the illustration. Ask: Which word could be used as a label for the illustration? Point to and name the consumers in the illustration. Why are they called consumers? Point to the producer? Why is it called a producer?

Speaking Domain

As students share their answers to the Listening Domain questions, record their use of academic vocabulary and connecting words.

Listening Domain

Read aloud the pages 53–57. Ask: What happened to Truman Everts? What did we learn from him? How do plants make their own food?

DQ3L3 TE p. 111

Focus on Text Structure—Cause/Effect

Have students revisit the article, "Undersea Story," on pages 75–80 in their Twig Books. Explain that before they read the text again, they will first identify the text structure. This will help students see how the author organized the text, which will help them organize their thinking and understand the text.

For example, if the text is a biography, you'll look for a series of events in the subject's life presented in the order they occurred (chronologically). If a text is a comparing and contrasting topics, you'll look for how they're alike and different.

"Undersea Story" has a complex text structure. It contains main ideas represented by headings and details represented by body text. It also presents information in a cause-and-effect structure.

Refer students to paragraph 8 of the article.

- ***What is causing the penguins to lose their waterproofing?***
- The penguins are molting/losing their feathers.

Explain that authors use signal words and phrases to help the reader understand the structure of the writing. In a cause-and-effect text structure, these include: *so, because, since, therefore, if... then, leads to, as a result, due to, effect of, consequently,* and *thus*.

Explain that causes can have multiple effects. For example, the Greenhouse Effect can cause:

- More ice to melt
- Increased flooding
- The reduction of some animal and plant populations.

The Greenhouse Effect is just one cause, but it has many effects.

Have students read the text on their own or in pairs. Ask them to annotate the causes and effects they find in the text along with the words that signal these relationships.

Discuss students' annotations. There are multiple cause-and-effect relationships in the text. Have students choose the one they think is the most important and explain their choice.

Note: The shrinking ice and subsequent decrease in phytoplankton which, in turn, affects the amount of krill is undoubtedly the most significant cause-and-effect relationship represented in the text.

Encourage students to think about text structure when they read informational texts and look for words that signal cause-and-effect relationships between ideas, objects, and/or people.

English Learners

Monitoring English Language Proficiency

Engage students in the following tasks to monitor their growing English Language development. These tasks are best administered individually.

Writing Domain

Have students look at the illustration on page 80 and write a brief description of what is happening.

Reading Domain

Have students read aloud page 77 and the top of page 78.

- ***Why is there less sea ice in Antarctica? Find the sentence that answers the question.***
- ***What do the krill eat? Point to the word in the text.***
- ***Why is there less of this food available? Find the sentences that answer the question.***

Speaking Domain

As students share their answers to the Listening Domain questions, record their use of academic vocabulary and connecting words.

Listening Domain

Read aloud pages 78–79.

- ***Why does the author say krill is vital, or very important, to emperor penguins?***
- ***What other animals are suffering in Antarctica?***
- ***Why?***
- ***What are scientists doing to help?***

DQ4L2 TE p. 137

Monitoring English Language Proficiency

During your leveled reader instruction, engage students in the following tasks to monitor their growing English language development. These tasks are best administered individually.

Writing Domain

Have students look at the photo and illustration on pages 24–25 and write a brief description of what is happening.

Reading Domain

Use the photos and illustration on pages 10–11.

Write:

- A food web shows what animals eat each other.
- Some animals and plants on islands grow larger than normal.
- The Galápagos has special sea animals.

Have students read each sentence, then match it to the correct visual.

Listening Domain

Describe the food web illustration on page 21. Add key details included in the photo, but not in the caption (e.g., names of animals, terms like predator and prey).

- ***What is this picture?***
- ***What does it show?***
- ***Why are the eagle and snake connected?***
- ***What is the relationship between the frog and the grasshopper? Why?***

Speaking Domain

As students answer the four questions in the Listening Domain task, record their use of academic vocabulary and ability to summarize key details.

TE Chapter 3 Second Read, p. 231

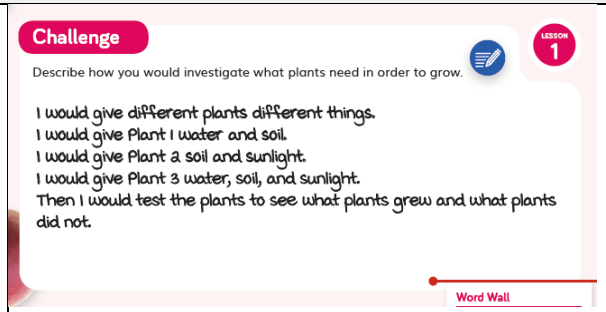
TS5. Support to Monitor Student Progress.

The Module materials are High Quality 5 in regards to TS5.

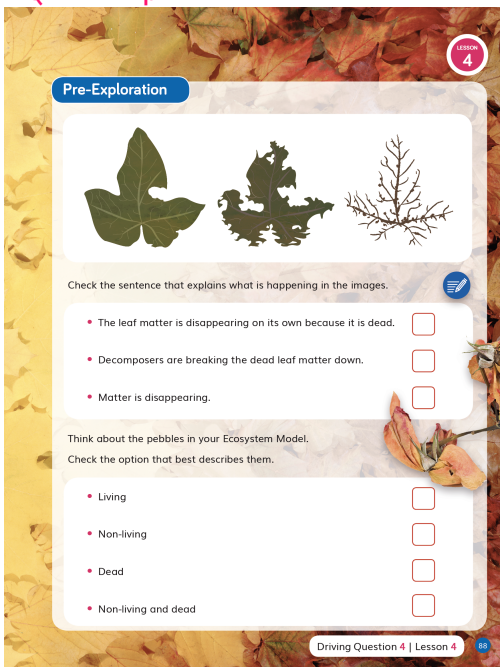
They provide strong support for teachers to monitor student learning and progress over time, and make decisions about instruction and provide feedback.

Evidence

- There are four diagnostic pre-assessments called Pre-Explorations at strategic points in the module that assess prior knowledge and misconceptions (e.g., DQ1L1 TB p. 4 and DQ4L4 TB p. 88). Notes in the TE and Progress Trackers support teachers to monitor students as they clear up their misconceptions and master the three dimensions, giving suggestions for how to tailor instruction accordingly.



DQ1L1 TB p. 4



DQ4L4 TB p. 88

See, for example, DQ2L4 TE Report p. 62, DQ3L1 TE Report p. 97, and DQ4L3 TE Investigate p. 142.

Discuss Food Chains

Lead a discussion about food chains.

- ***What did passing the cup from organism to organism show?***
- That the grass was eaten by the pocket gopher and the pocket gopher was eaten by the grizzly bear
- Where different kinds of animals get their matter
- That the deer mouse gets matter from the willow and the hawk gets matter from the deer mouse
- ***In this activity, where does the deer mouse get matter? The beaver? The gray wolf? The bighorn sheep?***
- These animals get their matter from the organisms that they eat.

DQ2L4 TE Report p. 62

Misconceptions from the Pre-Exploration

Use the **Energy in Ecosystems Progress Tracker** to note if students have cleared up the following misconception.

Misconception	What to Do
Humans and other animals get the energy they need from somewhere other than food.	As students model their ideas with the interactive, have them explain where the energy for each organism comes from. Then, ask them to visualize where humans might fit into the model and to reflect on where the energy for humans' food comes from.

DQ4L3 TE Investigate p. 142

- Downloadable Progress Trackers support teachers to track students' mastery of their misconceptions as assessed in the Pre-Explorations as well as the results of formative assessments of the three dimensions across the DQs (for example, the Energy in Ecosystems Progress Tracker used in DQ4). Guidance for teachers on how to adjust instruction for students needing more support to clear up their misconceptions is provided at point of use in the instructions (for example, DQ2L4 TE Report p. 62, DQ3L1 TE Report p. 97, and DQ4L3 TE Investigate p. 142).

Discuss Food Chains

Lead a discussion about food chains.

- ***What did passing the cup from organism to organism show?***
- That the grass was eaten by the pocket gopher and the pocket gopher was eaten by the grizzly bear
- Where different kinds of animals get their matter
- That the deer mouse gets matter from the willow and the hawk gets matter from the deer mouse
- ***In this activity, where does the deer mouse get matter? The beaver? The gray wolf? The bighorn sheep?***
- These animals get their matter from the organisms that they eat.

DQ2L4 TE Report p. 62

Misconceptions from the Pre-Exploration

Use the **Energy in Ecosystems Progress Tracker** to note if students have cleared up the following misconception.

Misconception	What to Do
Humans and other animals get the energy they need from somewhere other than food.	As students model their ideas with the interactive, have them explain where the energy for each organism comes from. Then, ask them to visualize where humans might fit into the model and to reflect on where the energy for humans' food comes from.

DQ4L3 TE Investigate p. 142