CSEL Science

Supporting educators in enhancing science outcomes for secondary-level multilingual learners (MLLs) and their English proficient classmates

CSEL CENTER FOR THE SUCCESS of ENGLISH LEARNERS

Meet the Presenters

Dr. Diane August

Co-PI, CSEL Center
Center for Applied Linguistics

Dr. August brings 40 years of experience to the many aspects of educating language-minority children.

Dr. August spent ten years as an English as a Second Language teacher in California.

She has held a variety of other positions, including Study Director at the National Academy of Sciences and Managing Director at the American Institutes for Research.

Jessica Debski

Senior Research Associate,
Center for Applied Linguistics

Jessica Debski has a background in biology and chemistry, focused on genetics, evolutionary morphology, and climate science.

She holds a B.S. from Salem State University, a master's and JD from Vermont Law School.

She spent her career prior to CSEL as a congressional advisor for science, technology, and the environment as well as a conservation policy specialist for Audubon Vermont.

Megan Rogozenski

Department Head, Science
Worcester Public Schools

Megan Rogozenski is the Science Department Chair at Worcester East Middle School in Worcester, MA.

She holds a Master's in Curriculum and Instruction and currently teaches 7th and 8th grade Science. Megan brings 10+ years of teaching experience, 8 of which have been in Worcester.

She is passionate about fostering curiosity and critical thinking in students through hands-on experiments and real-world connections in science education

Presentation Road Map

1. Introduction
   Diane August
2. Survey Results
   Diane August
3. Design Principles
   Jessica Debski
4. Methods and Resources to Support Learning
   Jessica Debski
5. Conversation with a Teacher
   Megan Rogozenski

CSEL Science: Introduction

Center for the Success of English Learners

- The Center for the Success of English Learners (CSEL) is one of two national research and development centers focused on improving outcomes for secondary-level multilingual learners (MLLs).
    - Funded for 5 years by the U.S. Department of Education, Institute of Education Sciences
    - Focused on science, social studies, and policy work
- Our companion center, also funded for 5 years, is at West ED.
    - Their focus is English language arts math, and policy work

CSEL Partner Institutions

CAL CENTER FOR APPLIED LINGUISTICS

UNIVERSITY OF HOUSTON

David Francis is the overall project lead

TEXAS
The University of Texas at Austin

HARVARD UNIVERSITY

NYU

SERP
Strategic Education Research Partnership

Goal of the Science Work

- The goal of CSEL science is to learn about:
  - Teachers' perceptions of the usability, social validity, and promise of the methods used to teach science
  - Methods that best support multilingual learners (MLLs) and their English-proficient classmates in:
    - acquiring science knowledge and skills
    - developing academic language associated with the science content

Study Design

- We use a within teacher design.
    - Teacher's science sections that include MLLs are randomly assigned to either a treatment or control condition.
    - For example, if a teacher has 4 class sections where they teach the relevant content and have multilingual learners in their classroom:
        - 2 class sections are assigned to treatment; in these classes they teach CSEL science
        - 2 class sections are assigned to control; in these classes they teach science as usual

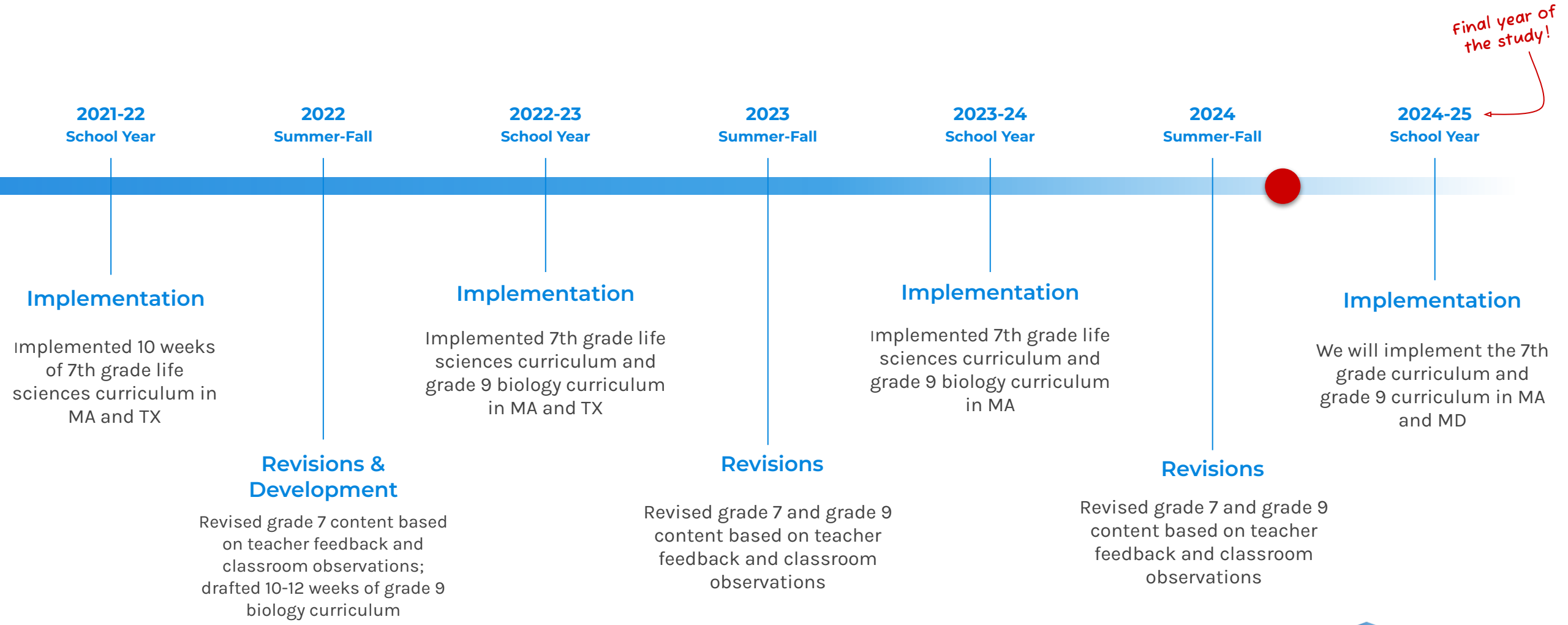
Study Design

- In participating treatment classrooms:
  - CSEL science curriculum and resources are used.
  - Students **cannot** opt out of CSEL instruction because it is their regular science class.
  - Parents and students **can** opt out of student data being used by project staff for analysis, evaluation, and reporting of the intervention.

Study Design

- All data is anonymized.
    - Study subjects (teacher and students) are assigned a randomly generated study ID number.
    - Once we assign Study IDs, we remove names from all datasets.
- Data analysis occurs using de-identified data sets.
    - Publications generated from this project report on data in the aggregate.
    - No individual student, teacher, or district is identified by name.

Timeline


Final year of the study!
2021-22
School Year
Implementation
Implemented 10 weeks of 7th grade life sciences curriculum in MA and TX
2022
Summer-Fall
Revisions & Development
Revised grade 7 content based on teacher feedback and classroom observations; drafted 10-12 weeks of grade 9 biology curriculum
2022-23
School Year
Implementation
Implemented 7th grade life sciences curriculum and grade 9 biology curriculum in MA and TX
2023
Summer-Fall
Revisions
Revised grade 7 and grade 9 content based on teacher feedback and classroom observations
2023-24
School Year
Implementation
Implemented 7th grade life sciences curriculum and grade 9 biology curriculum in MA
2024
Summer-Fall
Revisions
Revised grade 7 and grade 9 content based on teacher feedback and classroom observations
2024-25
School Year
Implementation
We will implement the 7th grade curriculum and grade 9 curriculum in MA and MD

Indicate if you think participation in the CSEL curriculum will result in benefits for only some students or if you think it will result in benefits for students at all levels of English proficiency.

	The benefit does not apply equally to students of all levels of ELP.	*The benefit applies equally to students of all levels of ELP.*
Increased knowledge of science content	**25.9%**	**74.1%**
Increased general academic language	**14.8%**	**85.2%**
Increased discipline-specific academic vocabulary	**7.4%**	**92.6%**
Increased discipline-specific reading comprehension, writing, and communication skills	**33.3%**	**66.7%**

Data from University of Houston teacher survey from 2023-23 and 2023-24 implementations.
Data includes survey results from 7th grade and 9th grade participants.

Indicate whether you think each of the following resources and methods did not work equally well for students at all levels of ELP, or if they did work equally well for students at all levels of ELP.

	Did not work equally well for students of all levels of ELP.	*Worked equally well for students of all levels of ELP*
Teacher materials	3.7%	96.3%
Student materials	22.2%	77.8%
Lesson grouping structures	7.4%	92.6%
Lesson goals	0%	100%
Completing lessons in allotted time	37%	63%
Reasonable lesson planning time	11.1%	88.9%
Implementing without extensive additional support or resources	11.1%	88.9%

Data from University of Houston teacher survey from 2023-23 and 2023-24 implementations.
Data includes survey results from 7th grade and 9th grade participants.

Revisions and Development

- After each round of implementation, we reviewed teacher feedback including:
  - Weekly debriefings with teachers
  - Focus groups with teachers and coaches
  - Survey results
- We have made revisions based on some lower survey scores related to:
  - Discipline-specific reading comprehension
  - Writing and communication skills
  - Ability to complete activities in allotted time

Revisions and Development

- Revisions have included:
  - Creating more interactive and exploration activities
  - Incorporating additional local and real-world phenomena
  - Reducing the amount of content
  - Developing additional home language resources
  - Including more opportunity for peer, small group, and class discussion

Discussed during design principles section

Discussed during differentiation section

CSEL Science: Survey Results

Usability

	Disagree/ Strongly Disagree	Neutral	Agree/ Strongly Agree
I understand the instructional strategies and practices used in the lessons.	0%	3.7%	96.3%
The teacher materials provide the information I need to implement the lessons/activities.	0%	3.7%	96.3%
The student materials provide the information the students need to complete activities.	0%	3.7%	96.3%
The teacher materials are easy to use.	0%	7.4%	92.6%
The student materials are easy to use.	0%	7.4%	92.6%
The instructional practices and teacher materials can be used without extensive support or additional resources.	0%	0%	100%
The student materials can be used without extensive support or additional resources.	7.4%	7.4%	85.2%
I am able to use the lessons grouping structures with my class.	0%	7.4%	92.6%

Data from University of Houston teacher survey from 2023-23 and 2023-24 implementations.
Data includes survey results from 7th grade and 9th grade participants.

Social Validity

	Disagree/ Strongly Disagree	Neutral	Agree/ Strongly Agree
The lesson goals are appropriate for my students.	3.7%	3.7%	92.6%
The lessons and associated materials are appropriate for my students.	0%	11.1%	88.9%
The lessons address the standards I am expected to teach.	3.7%	7.4%	88.9%

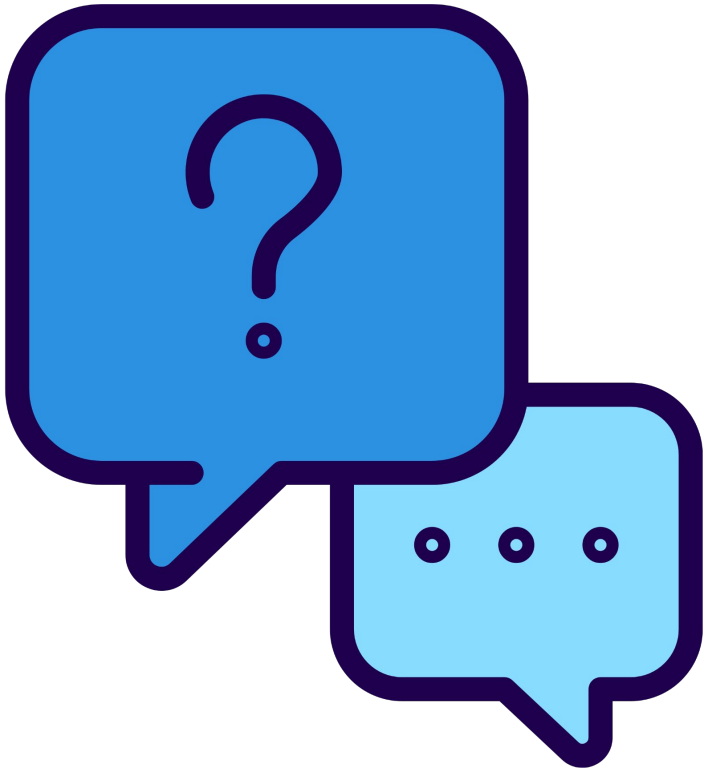
Data from University of Houston teacher survey from 2023-23 and 2023-24 implementations.
Data includes survey results from 7th grade and 9th grade participants.

Promise

	Disagree/ Strongly Disagree	Neutral	Agree/ Strongly Agree
The lessons provide the information and learning experiences necessary to support my students in meeting grade level expectations for the topics covered.	3.7%	7.4%	88.9%
The lessons will improve my students' knowledge of the content covered.	3.7%	7.4%	88.9%
The lessons will improve my students' general academic language.	0%	3.7%	96.3%
The lessons will improve my students' discipline-specific academic vocabulary.	0%	3.7%	96.3%
The lessons will improve my students' discipline-specific reading comprehension, writing, and communication skills.	7.4%	14.8%	77.8%
The lessons will be beneficial for my students.	0%	7.4%	92.6%

Data from University of Houston teacher survey from 2023-23 and 2023-24 implementations.
Data includes survey results from 7th grade and 9th grade participants.

Questions?



CSEL Science: Design Principles

Overview of Design Principles

- Align with:
  - State science and English language arts standards
  - District's scope and sequence
- Utilize:
  - Phenomenon-based learning
  - Three-dimensional design
  - 5E model for teaching science

Phenomenon-Based Learning

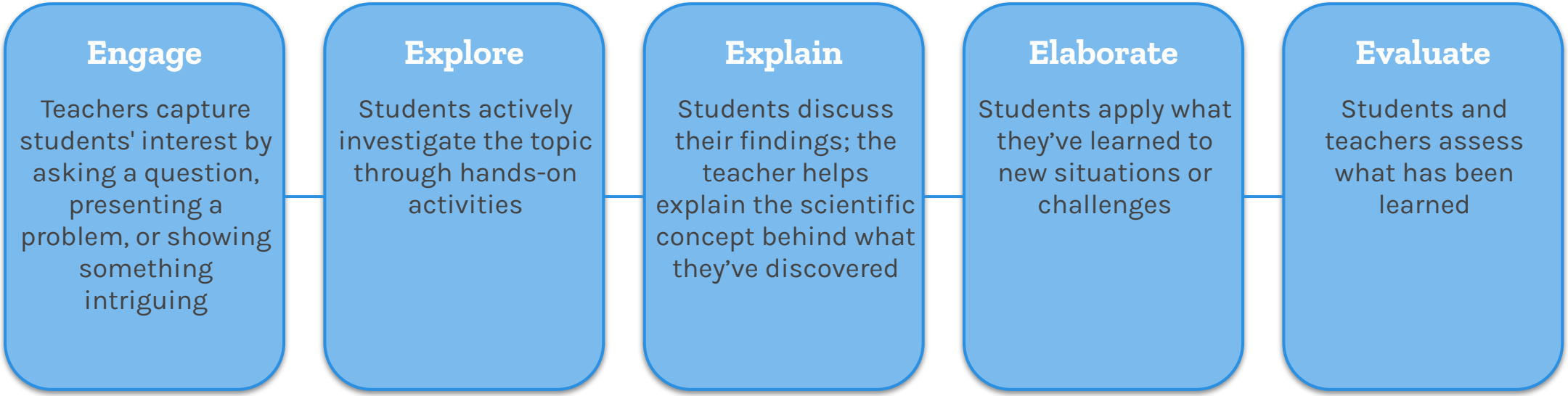
- CSEL science engages students in phenomenon-based learning.
  - Students learn by investigating natural events or occurrences
  - As a basis for teaching, CSEL Science uses events or occurrences that are: real, relatable, observable, and/or local.
  - *Examples appear on slides 29-34.*

Three-Dimensional Design

- **Disciplinary core ideas:**
  - Big ideas or key concepts in science that students need to know
- **Engagement in scientific practices:**
  - Doing things that scientists do, like developing models and analyzing data
- **Cross-cutting concepts:**
  - Ideas that apply to many different areas of science that help students connect what they learn in one area of science to another
- *Examples appear on sides 31-32.*

5-E Model of Science Instruction

- The 5E model is a teaching framework designed to promote active learning and help students build a deeper understanding of science concepts.
- The five stages are:



Alignment with Standards: Grade 7

Environmental Impact

Students learn how different environments support a variety of organisms and how biodiversity contributes to the sustainability of an ecosystem. Students explore how changes to an ecosystem impact organisms in the ecosystem.

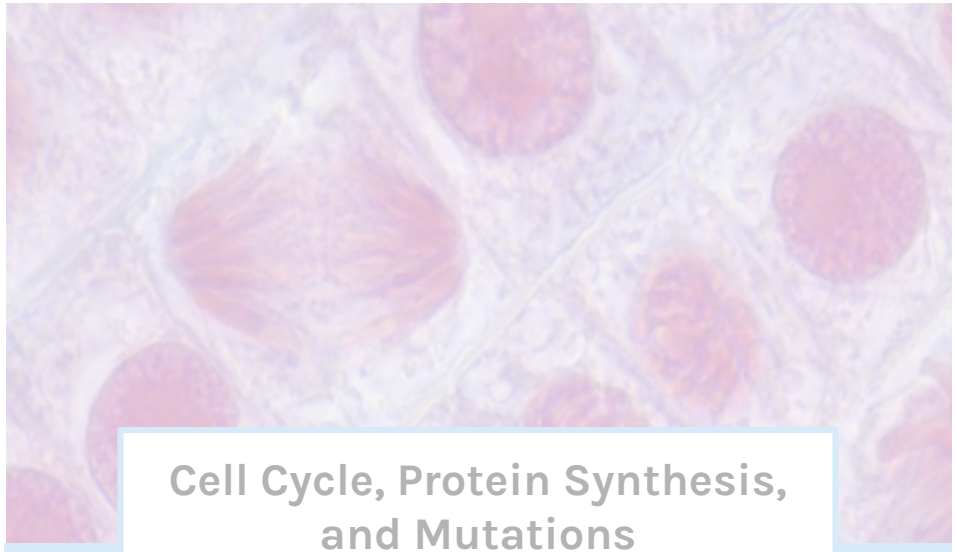
MS-LS 2-1; 2-4; 2-5

Populations in Balance

Students learn about the effect of disturbances on ecosystems and how ecosystems recover after disturbances. Students explore the flow of energy in ecosystems, using models like food chains, food webs, and energy pyramids.

MS-LS 2-2; 2-3; 2-4

Alignment with State Standards: Grade 9



Cell Cycle, Protein Synthesis, and Mutations

How does a multicellular organism grow and repair itself? What happens when there are problems in an organism's DNA?

This unit introduces students to the cell cycle, DNA replication, and protein synthesis using interactive lessons and hands-on labs. Students investigate what happens when mutations occur in DNA.

HS-LS 1-1; 1-4; 3-2(2)

Meiosis, Genetics, and Inheritance

How do parents pass traits to their offspring? Why can the offspring of the same parents have different traits? Students will learn why traits run in families and how they're passed on.

The unit introduces students to meiosis, with a focus on how the process leads to genetic variation. Students learn how parents pass alleles for traits to their offspring. Students diagram various inheritance patterns using Punnett squares and pedigree charts.

HS-LS 3-1; 3-2(1); 3-2(2); 3-3

Grade 7: Curriculum Example

ACTIVITY 1: SET THE CONTEXT

Directions: Listen and follow along as your teacher reads the text aloud. Work individually or with a partner to answer the questions in writing. Then, debrief as a class.

In this session, we will explore the feeding **relationships** of **organisms** in the Chesapeake Bay. Then, we will explore what happens when an **ecological disturbance** hurts a **species** that has an important *role (job)* in the ecosystem. You'll apply what you've learned to the problem in Guam.

The Chesapeake Bay

The Chesapeake Bay is a body of water on the east coast of the United States. Chesapeake Bay refers to a long, thin body of water between Maryland and Virginia.

The Chesapeake Bay is the largest estuary in the United States. An estuary is an area of water where rivers meet the ocean. The fresh water from rivers mixes with salty water in the ocean. When the water mixes, it creates *brackish (slightly salty)* water.

1. ***Where is the Chesapeake Bay?***

The Chesapeake Bay is...

2. ***What is an estuary?***

An estuary is an area of water where...

Partner Talk

What kinds of organisms do you think live in or around the Chesapeake Bay? Name one organism and say how you think that organism gets the energy it needs to live, grow, and *reproduce (have children)*.

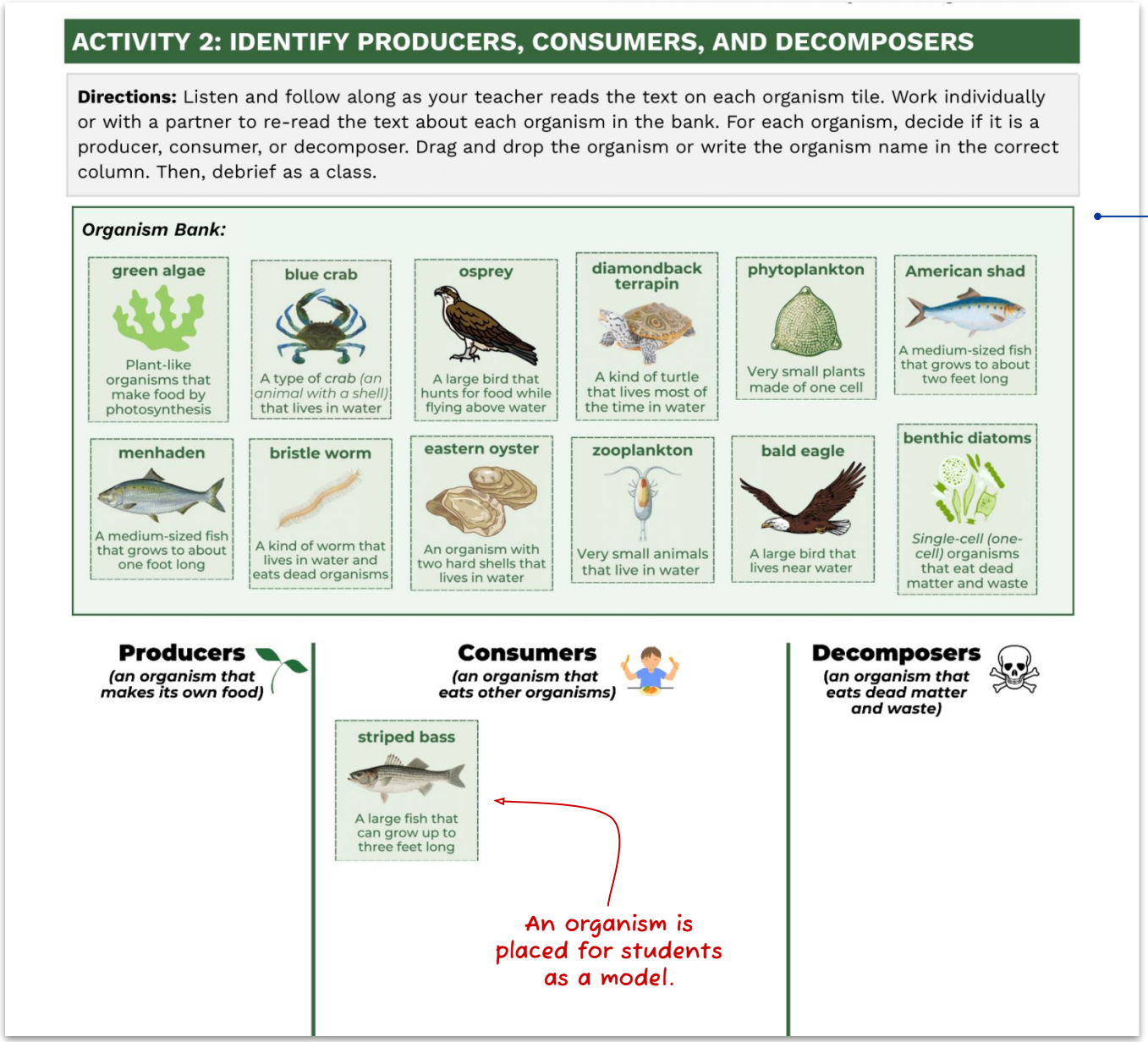
Each session starts with an activity called "Set the Context," which provides or activates essential background knowledge.

In this session, students develop a food web model for the Chesapeake Bay.

This activity provides essential background knowledge about what the Chesapeake Bay is, where it is located, and what kind of water body it is.

Keep It Local!
Students in Massachusetts develop a model of the Massachusetts Bay, students in Texas work with Galveston Bay.

Grade 7: Curriculum Example



ACTIVITY 2: IDENTIFY PRODUCERS, CONSUMERS, AND DECOMPOSERS

Directions: Listen and follow along as your teacher reads the text on each organism tile. Work individually or with a partner to re-read the text about each organism in the bank. For each organism, decide if it is a producer, consumer, or decomposer. Drag and drop the organism or write the organism name in the correct column. Then, debrief as a class.

Organism Bank:

- **green algae** — Plant-like organisms that make food by photosynthesis
- **blue crab** — A type of *crab (an animal with a shell)* that lives in water
- **osprey** — A large bird that hunts for food while flying above water
- **diamondback terrapin** — A kind of turtle that lives most of the time in water
- **phytoplankton** — Very small plants made of one cell
- **American shad** — A medium-sized fish that grows to about two feet long
- **menhaden** — A medium-sized fish that grows to about one foot long
- **bristle worm** — A kind of worm that lives in water and eats dead organisms
- **eastern oyster** — An organism with two hard shells that lives in water
- **zooplankton** — Very small animals that live in water
- **bald eagle** — A large bird that lives near water
- **benthic diatoms** — *Single-cell (one-cell)* organisms that eat dead matter and waste

Producers *(an organism that makes its own food)*	**Consumers** *(an organism that eats other organisms)*	**Decomposers** *(an organism that eats dead matter and waste)*
	striped bass — A large fish that can grow up to three feet long	

An organism is placed for students as a model.

Students become familiar with organisms in the Chesapeake Bay and sort them according to their role in the ecosystem.

The teacher reads text about 12 organisms in the Chesapeake Bay.

Students sort the organisms into categories (producers, consumers, and decomposers).

Grade 7: Curriculum Example

ACTIVITY 3: CREATE A MODEL OF THE CHESAPEAKE BAY FOOD WEB

Directions: Collect the materials listed in the green box below from your teacher. Listen and follow along as your teacher reads the feeding relationships of organisms in the Chesapeake Bay. Work individually or with a partner to use the feeding relationships to build your food web. Then, debrief as a class.

Materials:

- Organism Tile handout
- 1 sheet of flip-chart paper or poster board
- Scissors
- Pencil
- Glue or tape
- Marker

Building Your Food Web:

1. Cut out each organism tile along the dotted line.
2. Read the feeding relationship text below and lay out your tiles on the paper or poster board.
3. Draw arrows in pencil to show the flow of energy between organisms. Do not glue/tape your tiles to the poster yet.
4. Ask your teacher to review your layout. Make necessary changes.
5. Ask your teacher to approve your layout
6. Once your layout is approved, glue/tape the tiles to your poster and draw your arrows in marker.

Feeding Relationships:

- ☐ Phytoplankton and green algae are **producers**. Phytoplankton and green algae use the sun's **energy** to make their own food.
  - → Draw the sun in the top left-hand corner of your **food web** poster.
  - → Draw an arrow from the sun to the phytoplankton and green algae.
- ☐ Zooplankton eats phytoplankton.
- ☐ American shad eats zooplankton.
- ☐ Menhaden eats both zooplankton and phytoplankton.
- ☐ Oysters eat zooplankton, phytoplankton, and green algae.
- ☐ Blue crabs and diamondback terrapins eat oysters.
- ☐ Diamondback terrapins also eat blue crabs.
- ☐ Striped bass eat shad, menhaden, and blue crabs.
- ☐ Ospreys and bald eagles are *apex (top)* **predators**. Both ospreys and bald eagles eat striped bass.
- ☐ Bald eagles also eat diamondback terrapins.
- ☐ Bristle worms and benthic diatoms are **decomposers**.

Students use the feeding relationships to "solve the puzzle" and put together a food web model of the Chesapeake Bay.

See next slide for an example of student work

Disciplinary Core Idea:

Students engage in activities that help them diagram and analyze the flow of energy through a real ecosystem.

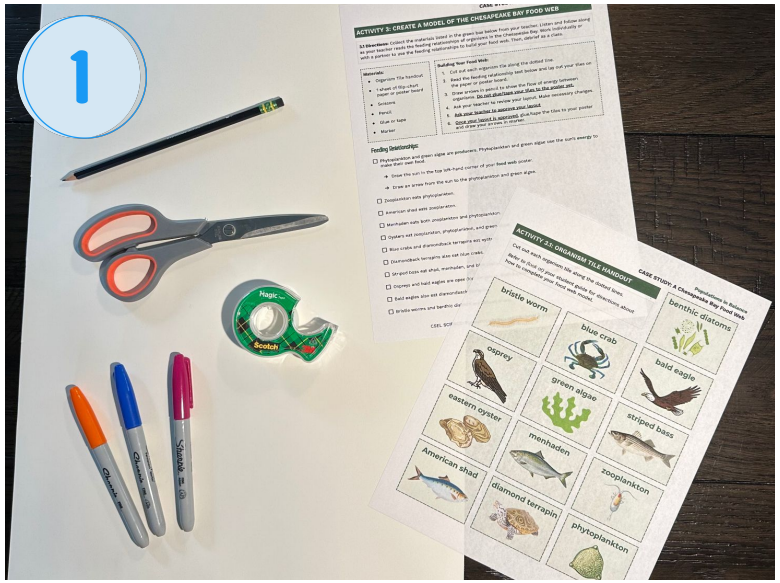
Scientific Practice:

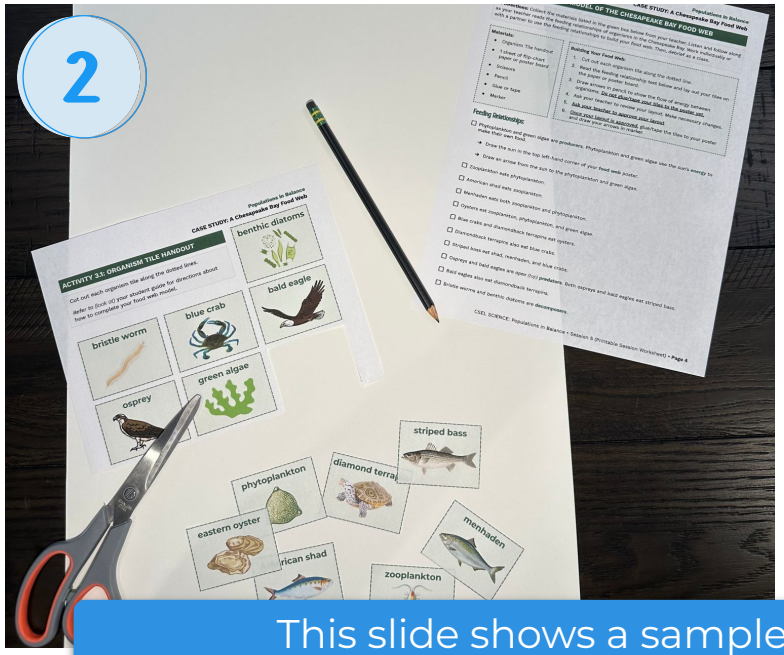
Develop models to represent systems.

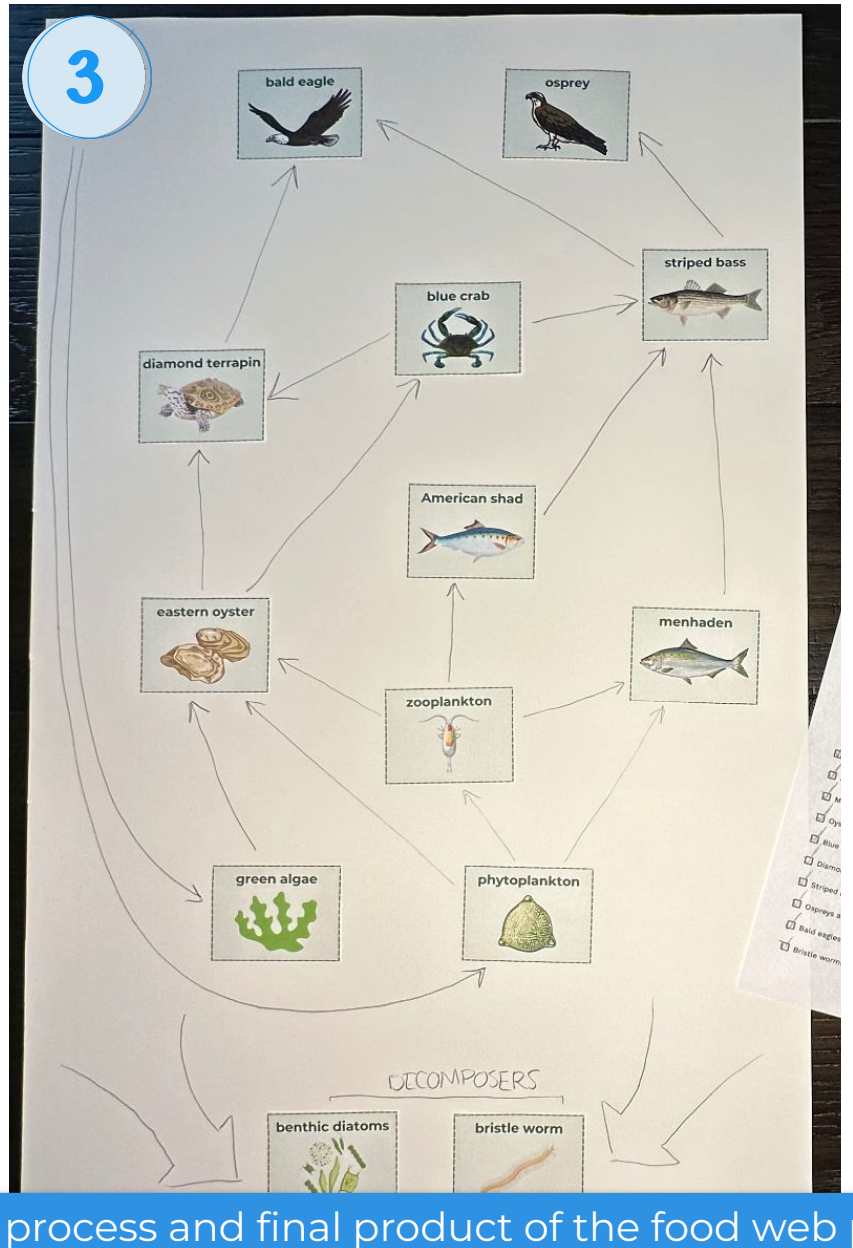
Cross-Cutting Concept:

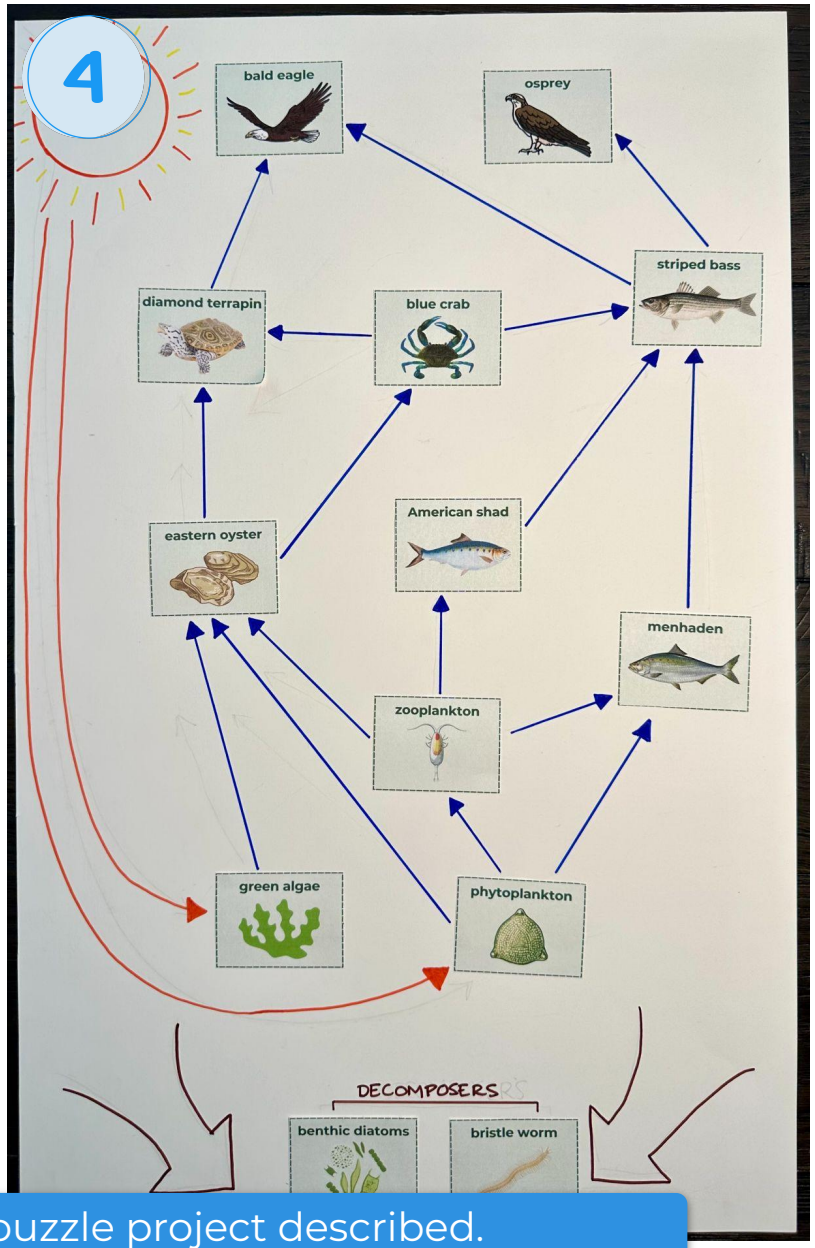
The total energy in a system does not change, but can be transferred between objects in a system

Example of Student Work









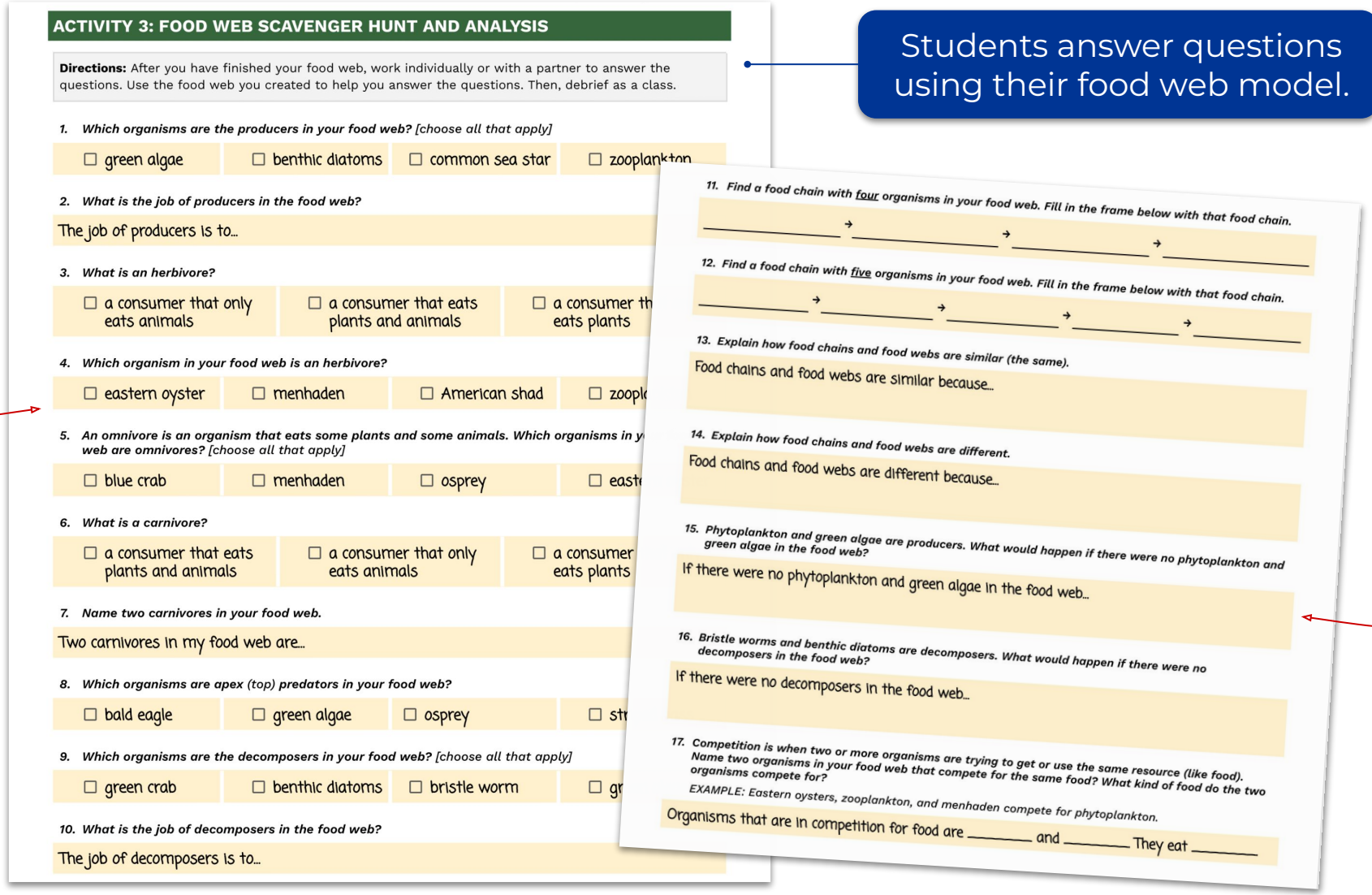
This slide shows a sample process and final product of the food web puzzle project described.

Grade 7: Curriculum Example

Students answer questions using their food web model.

Some questions ask students to find concrete information in their food web model.

Other questions require higher-order thinking



ACTIVITY 3: FOOD WEB SCAVENGER HUNT AND ANALYSIS

Directions: After you have finished your food web, work individually or with a partner to answer the questions. Use the food web you created to help you answer the questions. Then, debrief as a class.

1. ***Which organisms are the producers in your food web?*** *[choose all that apply]*

☐ green algae ☐ benthic diatoms ☐ common sea star ☐ zooplankton

2. ***What is the job of producers in the food web?***

The job of producers is to...

3. ***What is an herbivore?***

☐ a consumer that only eats animals ☐ a consumer that eats plants and animals ☐ a consumer th eats plants

4. ***Which organism in your food web is an herbivore?***

☐ eastern oyster ☐ menhaden ☐ American shad ☐ zoopl

5. ***An omnivore is an organism that eats some plants and some animals. Which organisms in y web are omnivores?*** *[choose all that apply]*

☐ blue crab ☐ menhaden ☐ osprey ☐ east

6. ***What is a carnivore?***

☐ a consumer that eats plants and animals ☐ a consumer that only eats animals ☐ a consumer eats plants

7. ***Name two carnivores in your food web.***

Two carnivores in my food web are...

8. ***Which organisms are apex (top) predators in your food web?***

☐ bald eagle ☐ green algae ☐ osprey ☐ st

9. ***Which organisms are the decomposers in your food web?*** *[choose all that apply]*

☐ green crab ☐ benthic diatoms ☐ bristle worm ☐ gr

10. ***What is the job of decomposers in the food web?***

The job of decomposers is to...

11. ***Find a food chain with four organisms in your food web. Fill in the frame below with that food chain.***

_____ → _____ → _____ → _____

12. ***Find a food chain with five organisms in your food web. Fill in the frame below with that food chain.***

_____ → _____ → _____ → _____ → _____

13. ***Explain how food chains and food webs are similar (the same).***

Food chains and food webs are similar because...

14. ***Explain how food chains and food webs are different.***

Food chains and food webs are different because...

15. ***Phytoplankton and green algae are producers. What would happen if there were no phytoplankton and green algae in the food web?***

If there were no phytoplankton and green algae in the food web...

16. ***Bristle worms and benthic diatoms are decomposers. What would happen if there were no decomposers in the food web?***

If there were no decomposers in the food web...

17. ***Competition is when two or more organisms are trying to get or use the same resource (like food). Name two organisms in your food web that compete for the same food? What kind of food do the two organisms compete for?***

EXAMPLE: Eastern oysters, zooplankton, and menhaden compete for phytoplankton.

Organisms that are in competition for food are _____ and _____ They eat _____

Grade 7: Curriculum Example

Students apply what they learned to Guam's ecosystem by analyzing part of the food web before and after an invasive species was introduced.

ACTIVITY 6: CONSIDER THE ROLE OF GUAM'S BIRDS IN THE ECOSYSTEM

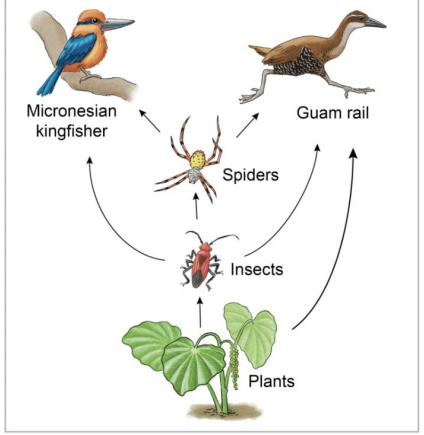
Directions: Listen and follow along as your teacher reads the text and reviews the section of a Guam food web. Work individually or with a partner to answer the questions. Use the illustrations to help you answer the questions. Then, debrief as a class.

Think about what you learned from the Chesapeake Bay case study to *consider (think about)* how the extinction of two bird **species** in Guam—the Guam rail and Micronesian kingfisher—could impact other **organisms** in Guam's **food web**.

Use the food web below to answer Questions 1-3.

REMINDER: Invasive brown tree snakes in Guam eat native bird species like the Guam rail and Micronesian kingfisher. The invasive brown tree snakes almost caused these two bird species to become *extinct*. *Extinct means there are no living members of a species.*

Before Brown Tree Snakes:



1. ***What do Micronesian kingfishers eat?***

☐ spiders ☐ insects ☐ plants

2. ***What do Guam rails eat?***

☐ spiders ☐ insects ☐ plants

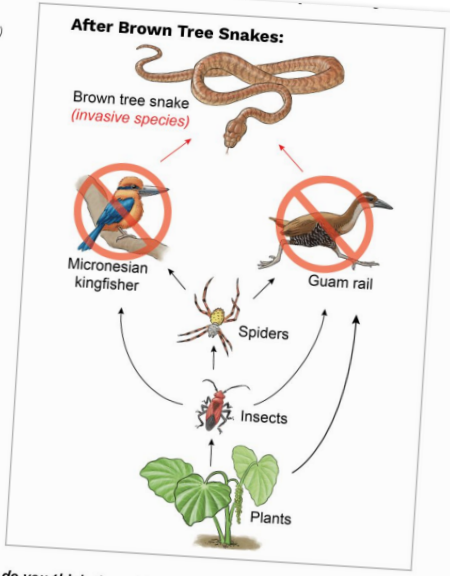
3. ***The two bird species compete with another species to eat insects. What species do they comp***
   → *Note: Spiders are in a class of animals called arachnids. They are not insects.*

The birds compete with _____ to eat insects.

The food web to the right shows how Guam's food web *was impacted (changed)* when brown tree snakes were *introduced (brought in)* to the ecosystem.

Use this food web to answer Question 4.

After Brown Tree Snakes:



4. ***If the two native bird species went extinct do you think the spider population would increase (get bigger) or decrease (get smaller)? Why?***
   → *Hint: Look at the food web. Do any other organisms in the food web eat spiders?*

I think the spider population would _____ [increase or decrease] because_

Some questions ask students to find concrete information in the food web.

The last question requires higher-order thinking

Activity 1

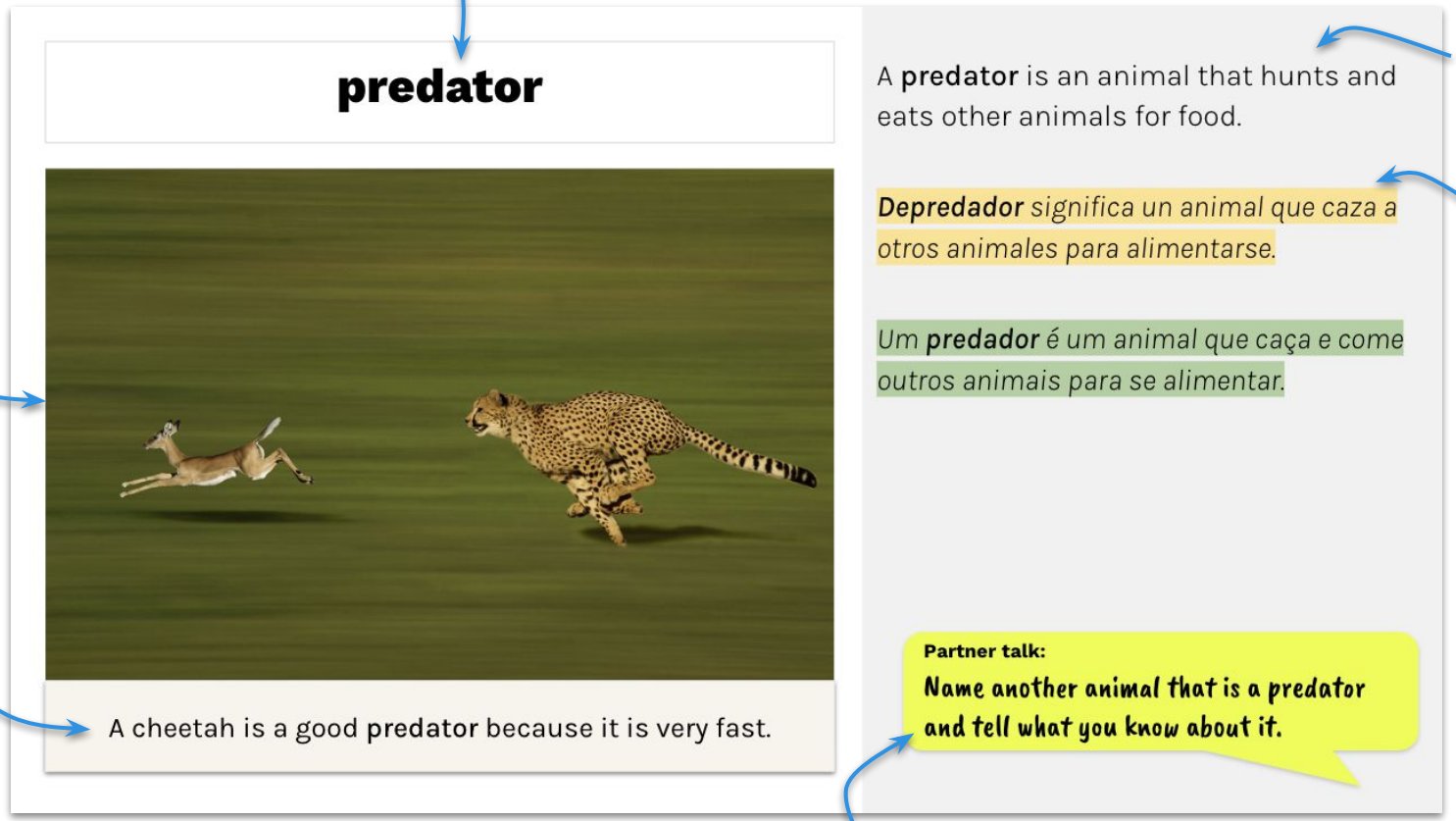
- With your table…
- Review:
  - The CSEL science descriptions of the 5-E model on page 1 of the Content Handout
  - The student activities on the Content Handout (pages 2-6)
- Discuss how the student activities align with the 5E model.
    - **Example:** The activity on page 2 of the Content Handout aligns with “engage.” The teacher captures students' interest by showing a labeled illustration of the Chesapeake Bay and asking students to think of organisms that might live around the Chesapeake Bay and how the organisms get energy.
- We will reconvene and debrief as a group.

CSEL Science: Methods and Resources to Support Learning

Linguistic and Visual Supports

Previewing Key Science Academic Vocabulary with Picture Cards

Prior to each session, teachers preview key academic vocabulary that appears in the session using slides.



Defining Vocabulary in Context and in the Margins, Interactive Questioning and Labeled Visuals

Defining in context provides definitions for challenging words and phrases within the text itself

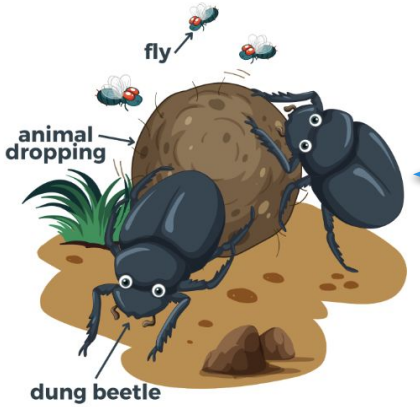
2.3 Directions: Listen and follow along as your teacher reads the text about decomposers. Work individually or with a partner to answer the questions in writing. Then, debrief as a class.

Decomposers are **organisms** that eat dead organisms and all the waste that **organisms** get rid of during their lives.

Most decomposers are *microscopic (very small)* organisms, like bacteria.

Other **decomposers** are big enough to see without a microscope. For example, dung beetles and flies are **decomposers** that eat animal droppings.

Decomposers make sure that no food is left unused. They get the last bits of available **energy** out of waste and dead **organisms**. **Decomposers** *recycle* ***nutrients*** *(put nutrients back into the environment). A nutrient is any substance an* ***organism*** *needs to live and grow.* Plants then use nutrients to grow. Herbivores eat the plants, and the cycle starts again.



Labeled visual supports illustrate important information

NOTE: Waste is anything that a living thing takes in or makes but does not need or have use for and gets rid of.

1. ***What do decomposers eat?***

Decomposers eat...

2. ***Name three organisms that are decomposers.***

Three organisms that are decomposers are...

3. ***In your own words explain the role (job) decomposers have in an ecosystem.***

The role decomposers play is...

Interactive questioning and discussion supports supports students in understanding the text

Defining in the margins provides definitions for glossary words as they appear in the text

→ ***decomposers:*** *organisms that break down dead matter*

→ ***organism:*** *a living thing such as a plant or animal*

→ ***energy:*** *what is needed to do work (like moving) or make changes (like growing)*

Differentiation

Differentiated Support for Responding

You'll notice that all students are exposed to the same core content.

Decomposers

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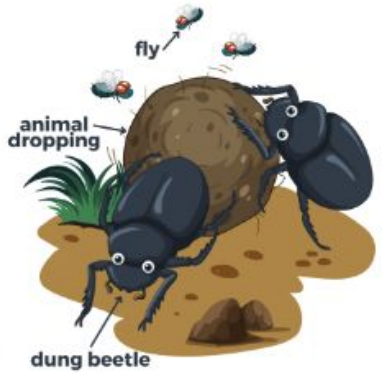

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Group 1

Sentence stems and sentence frames to support students in answering questions.

Decomposers

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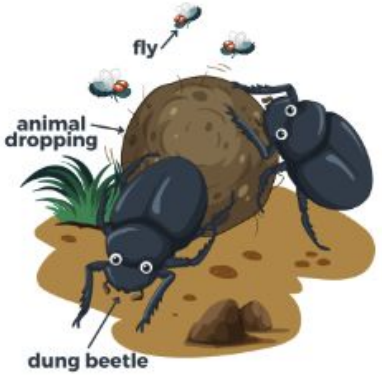

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1. ***What do decomposers eat?***

2. ***Name three organisms that are decomposers.***

3. ***In your own words explain the role (job) decomposers have in an ecosystem.***

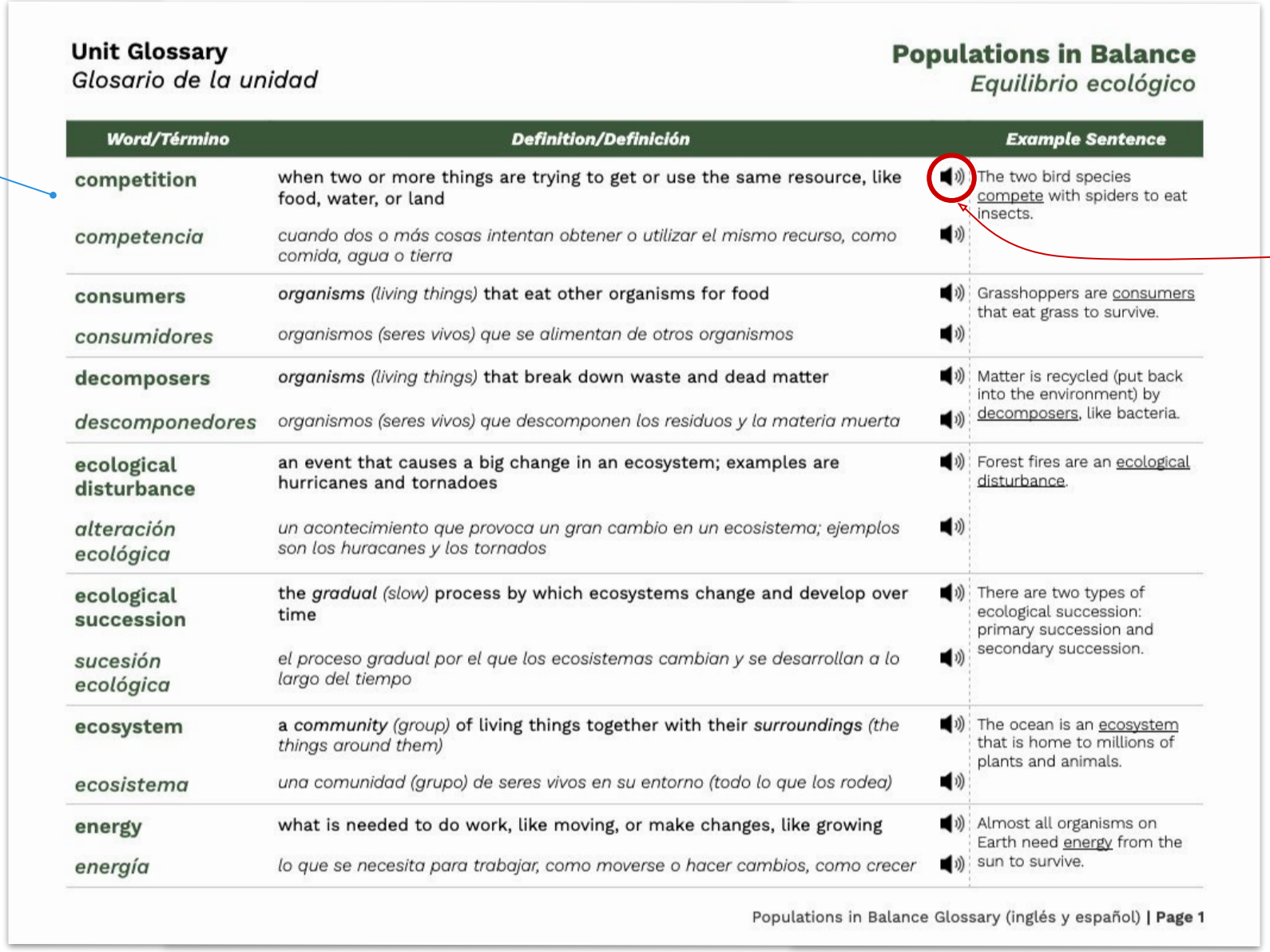
Group 2

No sentence stems or sentence frames

Students can click on the speaker button to hear the word and definition read aloud

Providing Home Language Support: Example 1

Bilingual unit glossaries translate target words and definitions into a student's home language.



Unit Glossary
Glosario de la unidad

Populations in Balance
Equilibrio ecológico

Word/Término	Definition/Definición	Example Sentence
competition	when two or more things are trying to get or use the same resource, like food, water, or land	The two bird species compete with spiders to eat insects.
competencia	*cuando dos o más cosas intentan obtener o utilizar el mismo recurso, como comida, agua o tierra*	
consumers	*organisms (living things)* that eat other organisms for food	Grasshoppers are consumers that eat grass to survive.
consumidores	*organismos (seres vivos) que se alimentan de otros organismos*	
decomposers	*organisms (living things)* that break down waste and dead matter	Matter is recycled (put back into the environment) by decomposers, like bacteria.
descomponedores	*organismos (seres vivos) que descomponen los residuos y la materia muerta*	
ecological disturbance	an event that causes a big change in an ecosystem; examples are hurricanes and tornadoes	Forest fires are an ecological disturbance.
alteración ecológica	*un acontecimiento que provoca un gran cambio en un ecosistema; ejemplos son los huracanes y los tornados*	
ecological succession	the *gradual (slow)* process by which ecosystems change and develop over time	There are two types of ecological succession: primary succession and secondary succession.
sucesión ecológica	*el proceso gradual por el que los ecosistemas cambian y se desarrollan a lo largo del tiempo*	
ecosystem	a *community (group)* of living things together with their *surroundings (the things around them)*	The ocean is an ecosystem that is home to millions of plants and animals.
ecosistema	*una comunidad (grupo) de seres vivos en su entorno (todo lo que los rodea)*	
energy	what is needed to do work, like moving, or make changes, like growing	Almost all organisms on Earth need energy from the sun to survive.
energía	*lo que se necesita para trabajar, como moverse o hacer cambios, como crecer*	

Providing Home Language Support: Example 2

Summaries of core content and associated questions in students' home languages.

Text and questions are presented side-by-side in English and the student's home language.

¿Cómo obtienen energía los grupos de organismos?

Podemos agrupar los organismos en tres categorías en función de cómo obtienen la energía que necesitan.

Productores

Los productores son organismos que utilizan la energía del sol para fabricar su propio alimento. Fabrican su propio alimento mediante la fotosíntesis. Las plantas, las bacterias y las algas, como el fitoplancton, son ejemplos de productores.

¿Qué es la fotosíntesis?

La fotosíntesis es el *proceso (serie de acciones)* en el que las plantas utilizan la luz solar, el dióxido de carbono y el agua para fabricar su propio alimento. Durante la fotosíntesis, las plantas producen oxígeno y lo liberan al aire.

5. ¿Qué son los productores?

Los productores utilizan la energía del sol para

4. ¿Cuáles de los siguientes son productores?

- ☐ saltamontes
- ☐ árbol
- ☐ flor
- ☐ rana
- ☐ fitoplancton

How do groups of organisms get energy?

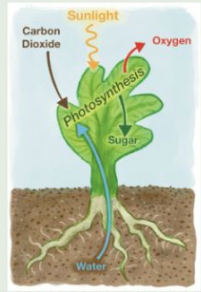
We can group organisms into three categories based on how they get the energy they need.

Producers

Producers are organisms that use energy from the sun to make their own food. They make their own food through photosynthesis. Plants, bacteria and algae, like phytoplankton, are examples of producers.

What is photosynthesis?

Photosynthesis is the *process (series of actions)* in which plants use sunlight, carbon dioxide, and water to make their own food. During photosynthesis, plants *produce (make)* oxygen and *release (let out)* the oxygen into the air.



5. What are producers?

Producers use energy from the sun to make their own...

6. Which of the following are producers?

- ☐ grasshopper
- ☐ tree
- ☐ flower
- ☐ frog
- ☐ phytoplankton

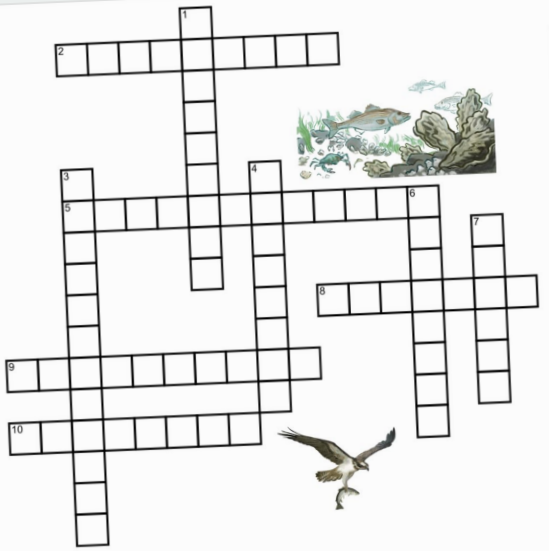
Providing Extension Activities

Name: _____

Populations in Balance Crossword Puzzle

Words in this puzzle appeared in Sessions 4-5.

Directions: Work individually or with a partner to complete the crossword puzzle. Use the clues to figure out where vocabulary words belong in the crossword puzzle. There is a word bank to help you.



Word Bank

consumer
decomposer
ecosystem
energy
food chain
food web
predator
producer
relationship
trophic level

Across Clues

2 a simple model that shows the order in which organisms get energy by eating

5 a connection between two or more things

8 a complex model that shows how food chains connect with each other

9 an organism that breaks down dead matter

10 an animal that hunts and eats other animals for food

Down Clues

1 a group of living things together with their *surroundings* (the things around them)

3 a group of organisms that are at the same feeding level

4 an organism that eats other organisms for food

6 an organism that makes their own food

7 what is needed to do work (like moving) or make changes (like growing)

Shorter extensions like crossword puzzles, word searches, and Blooket question sets can be used to fill shorter gaps of time.

EXTENSION ACTIVITY: FIND AN AT-RISK SPECIES IN YOUR AREA

Part 1 Directions: Find a species in your area that is at-risk. Describe the species and where it lives. Research and describe why the species is at-risk. An example is completed for you.

→ Use this website to help you find a local at-risk species.

MODEL

Species Name: Piping Plover

Habitat, or where it lives: Piping plovers build their nests on coastal beaches in the United States and Canada

Description (color, size, etc.): Small white or tan bird that is about seven inches long

Picture/Drawing:

Why is it at risk?

→ **Threats with Natural Causes:** Flooding and erosion of nesting areas. Erosion is when water, wind, or storms *wear away (hurt)* the piping plovers build nests. Flooding is when there is a sudden strong flow of water.

→ **Threats with Human Causes:** Human activity that damages their nesting habitat or crushes eggs. For example, people and pets us the summer bother nests if they get too close. Piping plovers only lay about four eggs each year in summer months.

YOUR TURN

Species Name:

Habitat, or where it lives:

Description (color, size, etc.):

Picture/Drawing:

Why is it at risk?

→ **Threats with Natural Causes:**

→ **Threats with Human Causes:**

Part 2 Directions: Research what is being done to protect the species you chose above. Then, describe what else you think could be done to protect the species. An example is completed for you.

EXAMPLE

Is anything being done to protect the species? ☑ Yes ☐ No

Describe what is being done to protect the species.

- Signs are posted at beaches where piping plovers lay eggs. The signs tell people to stay away from nesting areas
- Fences are put up around sand dunes to protect nesting areas from humans, pets, and predators
- Beach clean-ups to remove (take away) trash and food scraps that attract predators
- Captive-rearing. This means piping plover eggs that have been *abandoned (left behind)* are hatched and raised by scientists and zookeepers in safe places. When the piping plovers are able to fly, they are released *(set free)* in the wild.

YOUR TURN

Is anything being done to protect the species? ☐ Yes ☐ No

Describe what is being done to protect the species.

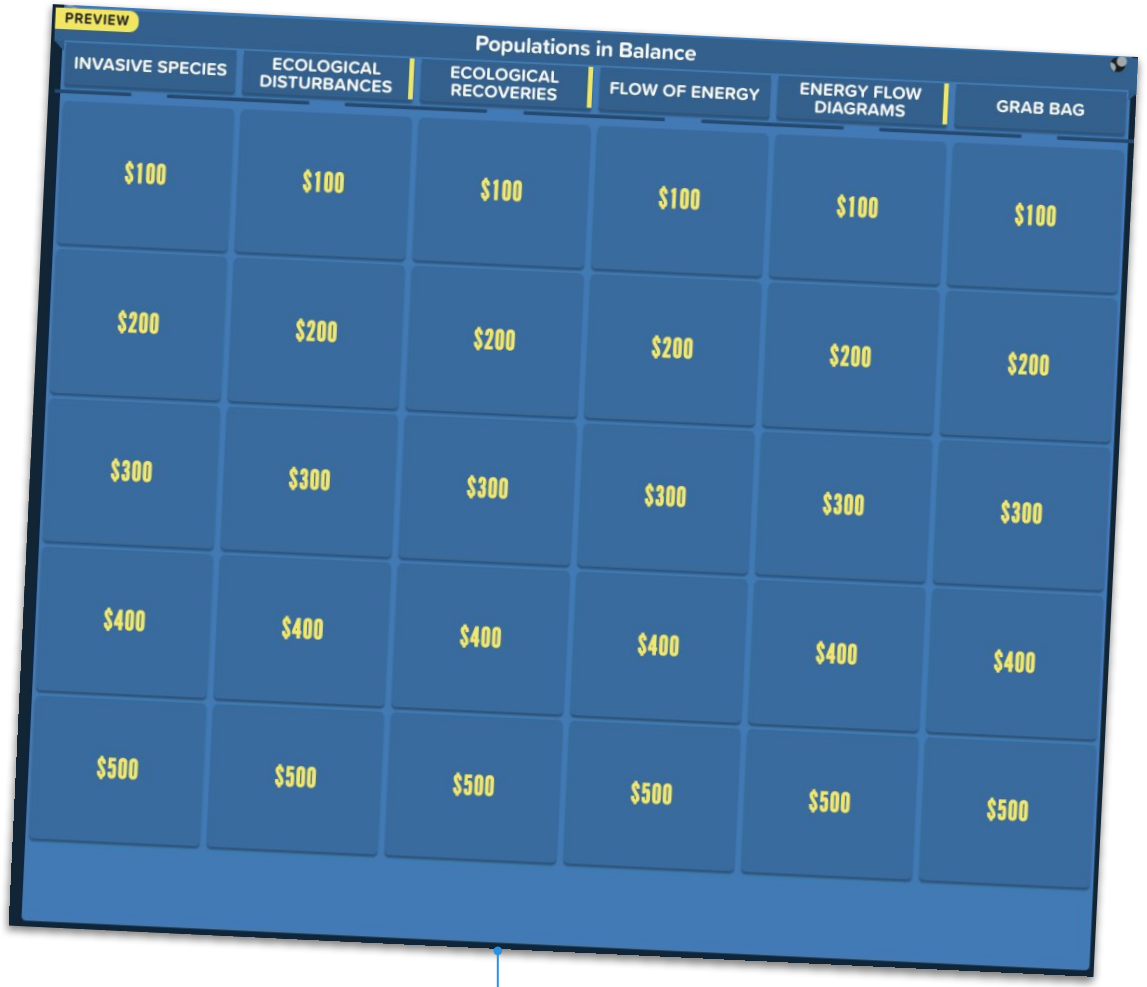
Describe what else you think could be done to protect the species.

More elaborate extensions are included at the end of most sessions. These extensions relate to and extend student learning from the session.

Review and Assessment

Review Games

Board game to review unit vocabulary in small groups



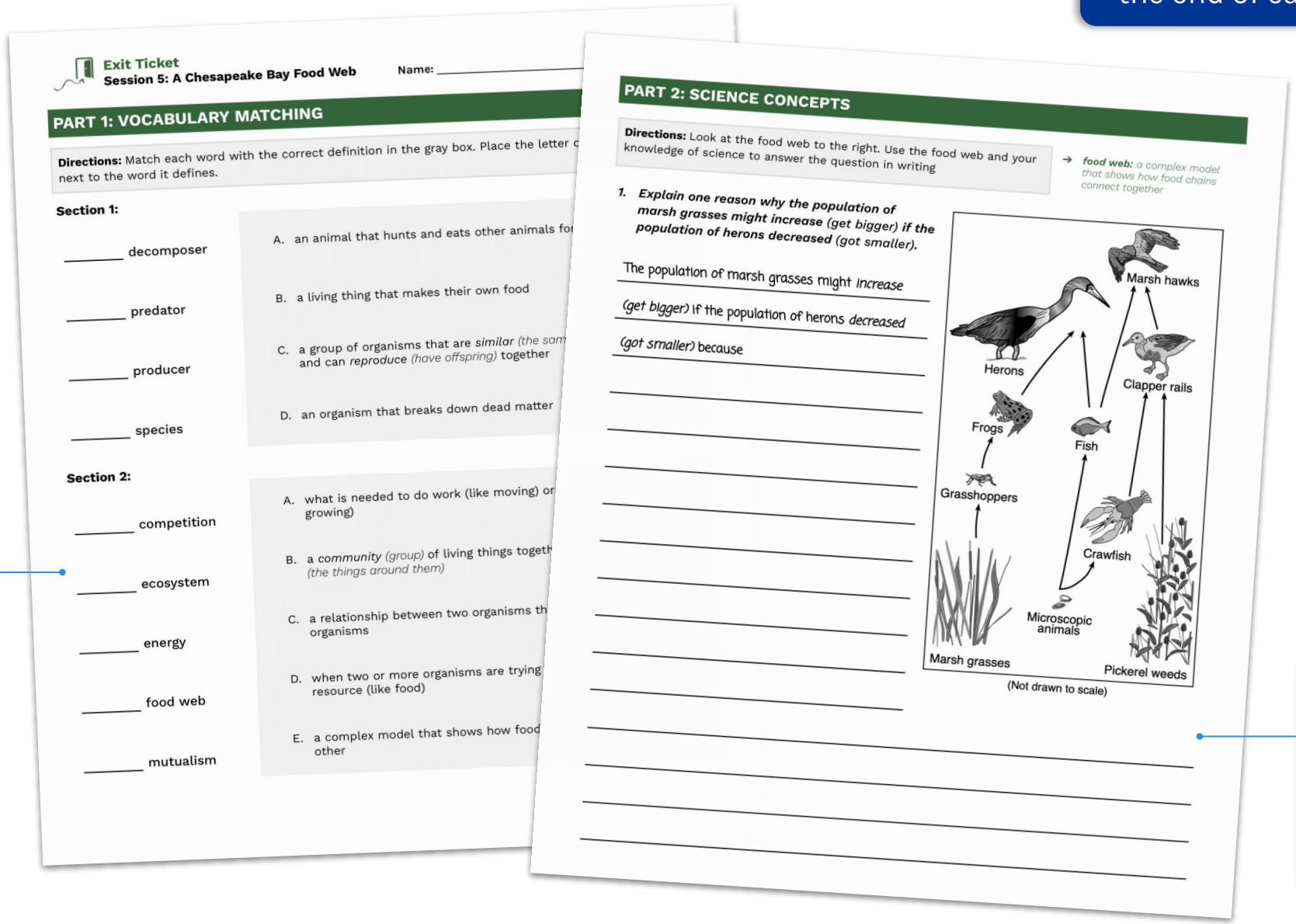
Jeopardy to review key science concepts as a class with students working in teams

Exit Tickets

There is an exit ticket at the end of each session.

The first part of each exit ticket is an academic language exercise, generally vocabulary matching.

The second part focuses on key science concepts from the session, generally a released state assessment item.



Exit Ticket
Session 5: A Chesapeake Bay Food Web

Name: _____

PART 1: VOCABULARY MATCHING

Directions: Match each word with the correct definition in the gray box. Place the letter c
next to the word it defines.

Section 1:

_____ decomposer

_____ predator

_____ producer

_____ species

A. an animal that hunts and eats other animals fo

B. a living thing that makes their own food

C. a group of organisms that are *similar* (the sam
and can *reproduce* (have offspring) together

D. an organism that breaks down dead matter

Section 2:

_____ competition

_____ ecosystem

_____ energy

_____ food web

_____ mutualism

A. what is needed to do work (like moving) or
growing)

B. a *community* (group) of living things togeth
(the things around them)

C. a relationship between two organisms th
organisms

D. when two or more organisms are trying
resource (like food)

E. a complex model that shows how food
other

PART 2: SCIENCE CONCEPTS

Directions: Look at the food web to the right. Use the food web and your knowledge of science to answer the question in writing

→ ***food web:*** *a complex model that shows how food chains connect together*

1. ***Explain one reason why the population of marsh grasses might increase (get bigger) if the population of herons decreased (got smaller).***

The population of marsh grasses might *increase*
(get bigger) if the population of herons *decreased*
(got smaller) because

(Not drawn to scale)

Quizzes

There are quizzes after chunks of content.

Quizzes include multiple choice questions related to unit content, science concepts, and vocabulary.

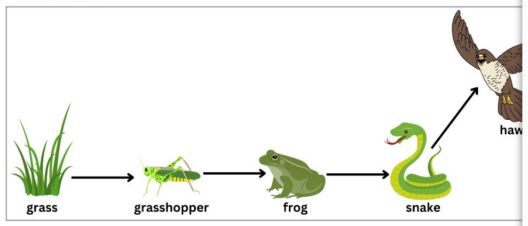
Quizzes may also include: matching activities, labeling activities, and/or interpreting data and diagrams

PART 3: MULTIPLE CHOICE QUESTIONS

Directions: Read each question carefully and choose the **best** answer. Circle the letter in front of the answer you choose.

Use the food chain to answer questions 1-4.

Food Chain:



1. In the food chain above, which organism **gives** energy to the frog?
   a. snake
   b. grasshopper
   c. hawk
   d. grass

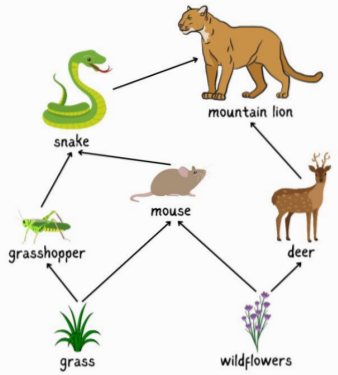
2. In the food chain above, which organism ***receives*** *(gets)* energy from
   a. frog
   b. grasshopper
   c. hawk
   d. grass

3. In the food chain above, what **gives** energy to the grass?
   a. grasshopper
   b. sun
   c. hawk
   d. *soil (dirt)*

4. What *type (kind)* of organisms are **missing** from the food chain abov
   a. plants
   b. primary con
   c. animals
   d. decomposer

PART 4: FLOW OF ENERGY OPEN-RESPONSE QUESTIONS

Directions: Read each question carefully. Then, answer each question in writing. Use the food web to help you answer the questions.



1. ***Find and list three food chains from the food web above. An example is provided for you.***

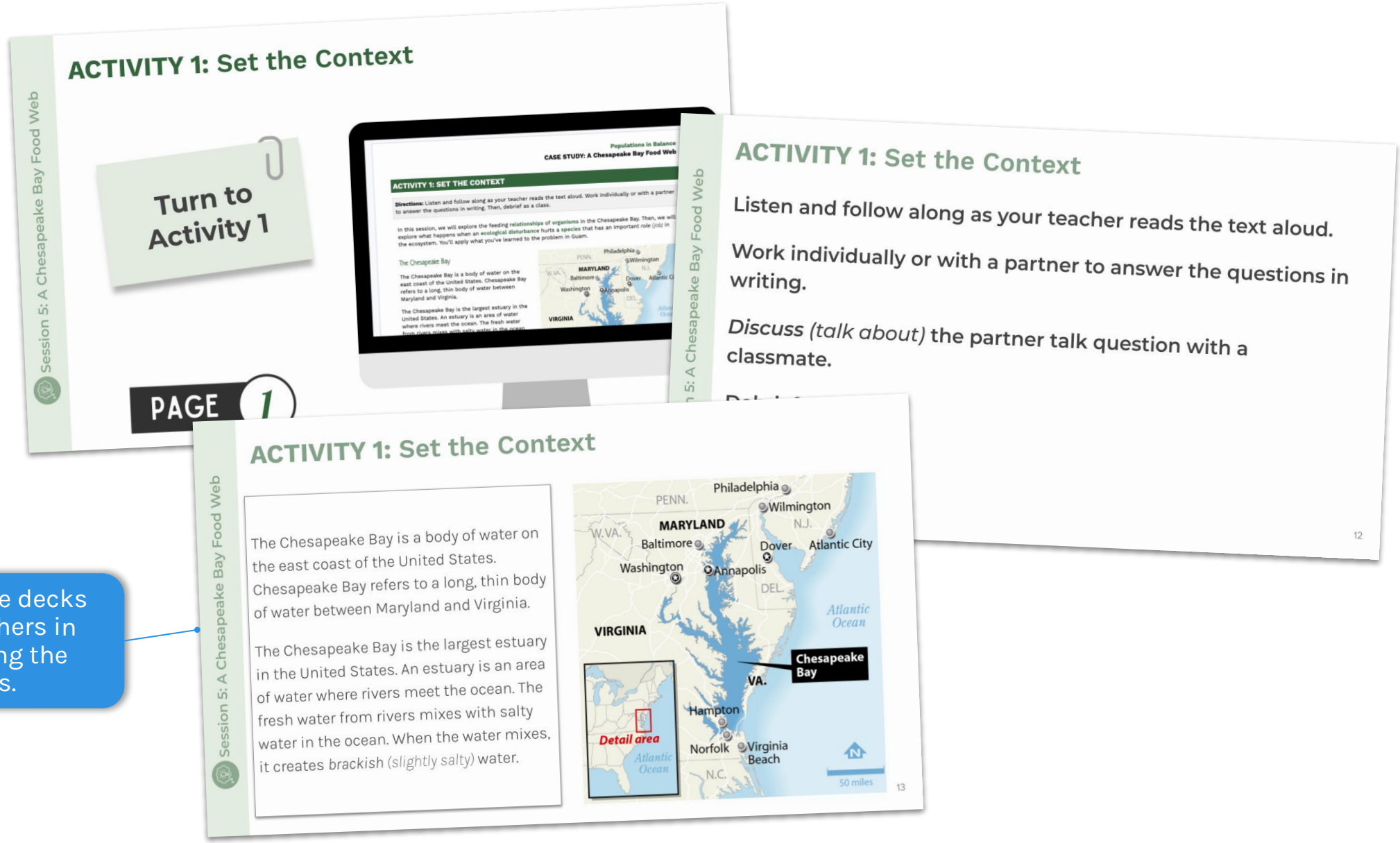
Example	wildflowers	→	deer	→	mountain lion	
a.	_____	→	_____	→	_____	→ _____
b.	_____	→	_____	→	_____	→ _____
c.	_____	→	_____	→	_____	→ _____

2. ***If grass was removed*** *(taken out)* ***from the food web, do you think the population of snakes would increase*** *(get bigger)* ***or decrease*** *(get smaller)****? Say why you think that.***

I think the population of snakes would _____ [increase or decrease] because _____

Support for Teachers

Teaching Slides



Pre-made slide decks support teachers in implementing the sessions.

Teacher Guides

Student directions and additional guidance for teachers appears in the left column.

Additional guidance includes materials, preparation, other tips, and connections to other science content.

2. Identify Producers, Consumers, and Decomposers *(20 minutes)*

STUDENT DIRECTIONS

Listen and follow along as your teacher reads the text on each organism tile. Work individually or with a partner to re-read the text about each organism in the bank. For each organism, decide if it is a producer, consumer, or decomposer. Drag and drop the organism or write the organism name in the correct column. Then, debrief as a class.

ADDITIONAL GUIDANCE FOR TEACHERS

- If students are working on paper (printed sessions worksheet), have them write the name of each organism in the correct column.

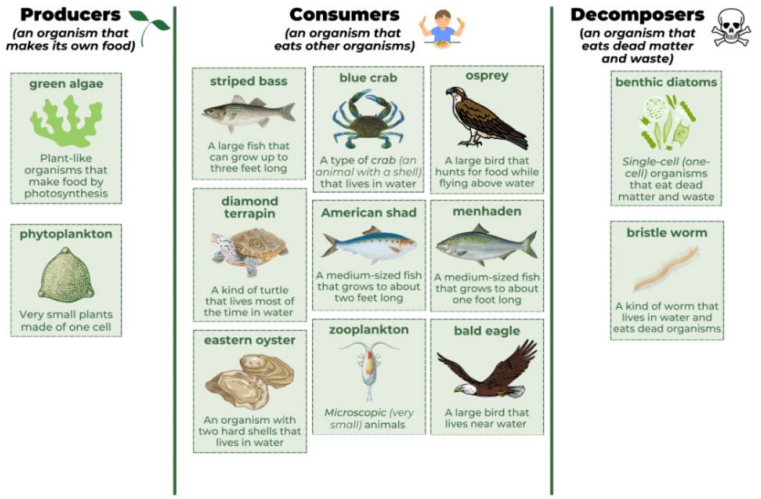
TEACHER EDITION: ANSWER KEY

Populations in Balance
CASE STUDY: A Chesapeake Bay Food Web

ACTIVITY 2: IDENTIFY PRODUCERS, CONSUMERS, AND DECOMPOSERS

Directions: Listen and follow along as your teacher reads the text on each card about organisms in the Chesapeake Bay. Work individually or with a partner to re-read the text about each *organism (living thing)* in the organism bank. For each organism, decide if it is a producer, consumer, or decomposer. Drag and drop the organism or write the organism name in the correct column below. Then, debrief as a class.

Organism Bank:



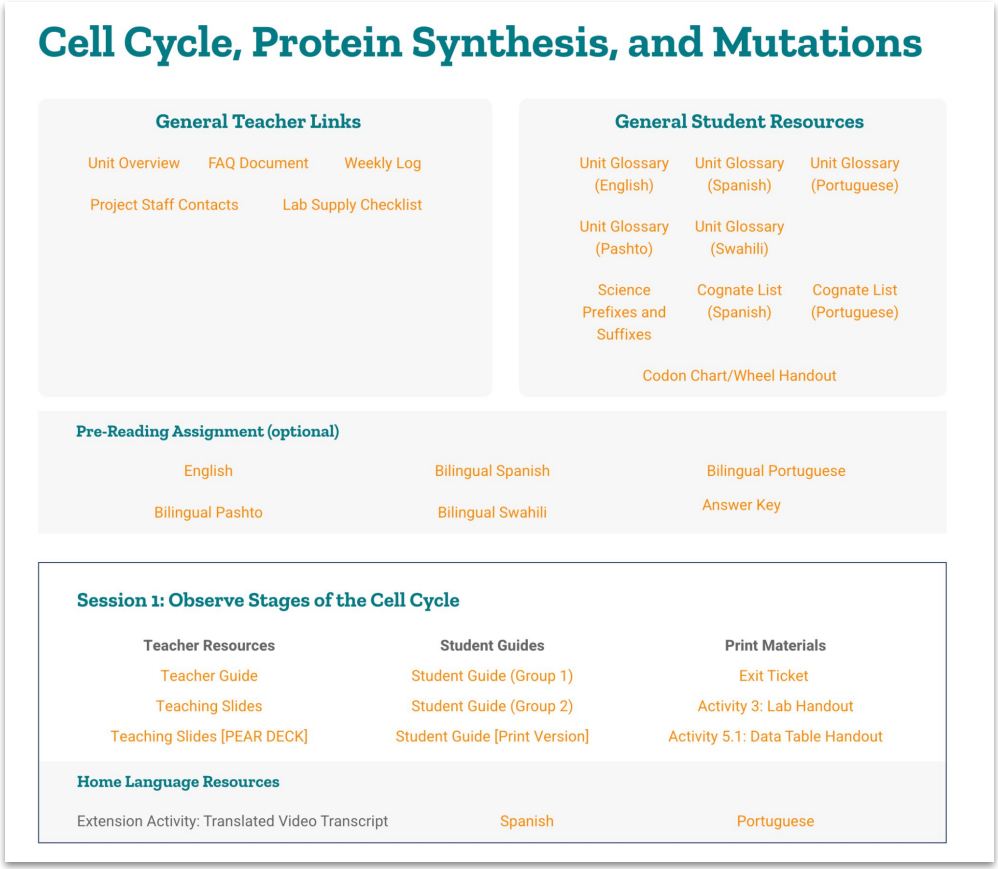
Answer key version of student materials

Curriculum Resources

CSEL Science Resources:

- Student Materials:
  - Digital and print-ready student materials
  - Glossaries (*bilingual available*)
  - Content summaries (*bilingual available*)
  - Extension activities
- Review and Assessment:
  - Review activities and games
  - Exit tickets
  - Quizzes
- Teacher Materials:
  - Digital teaching slides and teaching guides

Teachers access all materials from the website hub

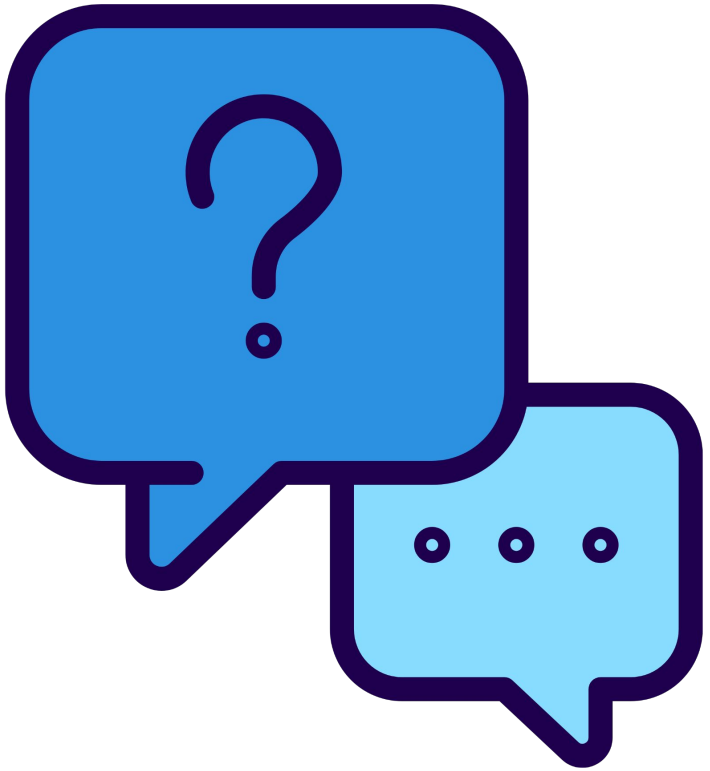


Activity 2

XX:XX min.

- Break into groups of two or three.
- Review the methods and resources to support learning on pages 7-12 of the Content Handout.
- Discuss:
    - How well these supports might help MLLs and their English-proficient classmates in science classrooms
    - Any changes you might make to the supports so they work better in your context
- We will reconvene and debrief as a group.

Questions?



Conversation with a Teacher

Conversation with a Teacher

Megan Rogozenski

Department Head, Science
Worcester Public Schools

Megan Rogozenski is the Science Department Chair at Worcester East Middle School in Worcester, MA.

She holds a Master's in Curriculum and Instruction and currently teaches 7th and 8th grade Science. Megan brings 10+ years of teaching experience, 8 of which have been in Worcester.

She is passionate about fostering curiosity and critical thinking in students through hands-on experiments and real-world connections in science education

- Megan implemented CSEL Science during the 2023-24 school year.

- **What questions do you have for Megan related to her experience using CSEL Science methods and resources?**

Questions or Comments?

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