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Smithsonian

STEAM Readers

Science ▪ Technology ▪ Engineering ▪ Arts ▪ Mathematics

Management Guide

Grade 4

Teacher Created Materials

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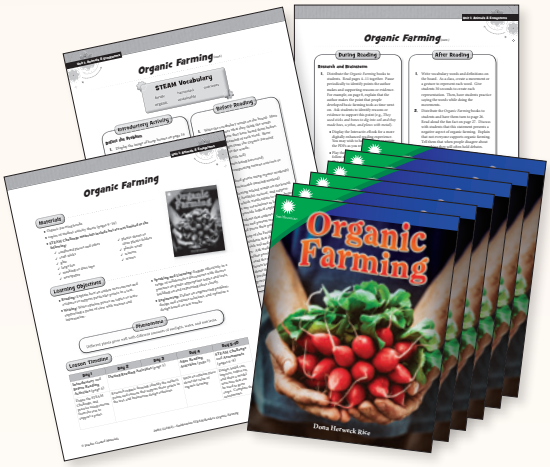
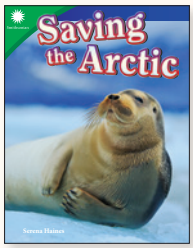
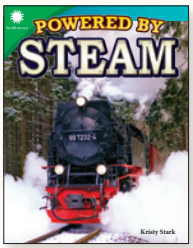
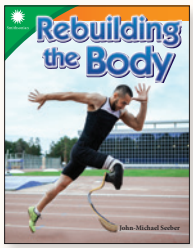
Kit Components

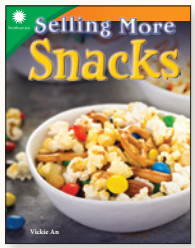
15 lesson plans with 6 copies of each book

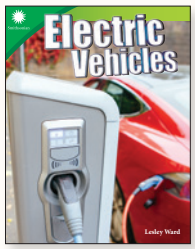


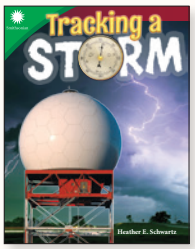


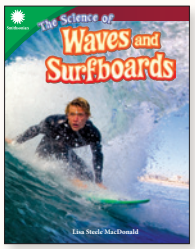




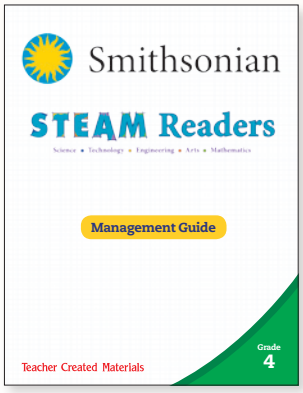




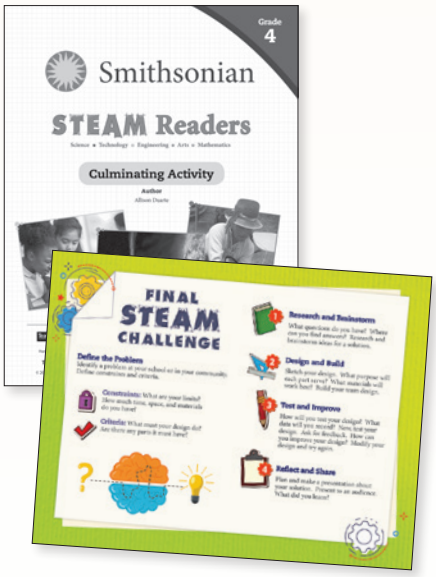




Management Guide



Culminating Activity



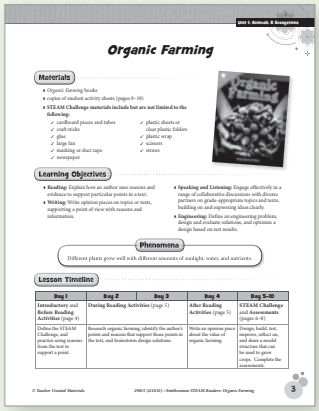
Digital and Audio Resources

Lesson Plan Components

Each ten-day lesson sequence is organized in a consistent format for ease of use.

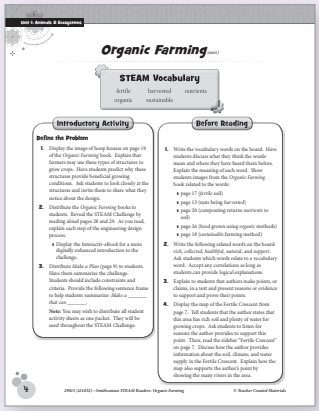
Overview

- The overview page includes learning objectives, a materials list, and a suggested timeline for lessons.



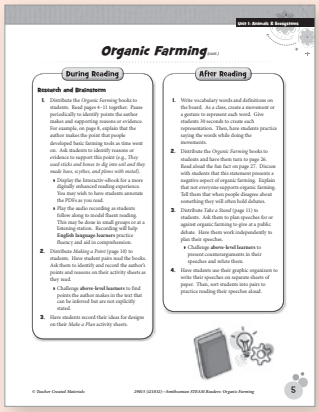
Day 1

- Students are introduced to the STEAM Challenge, vocabulary, and reading skill.



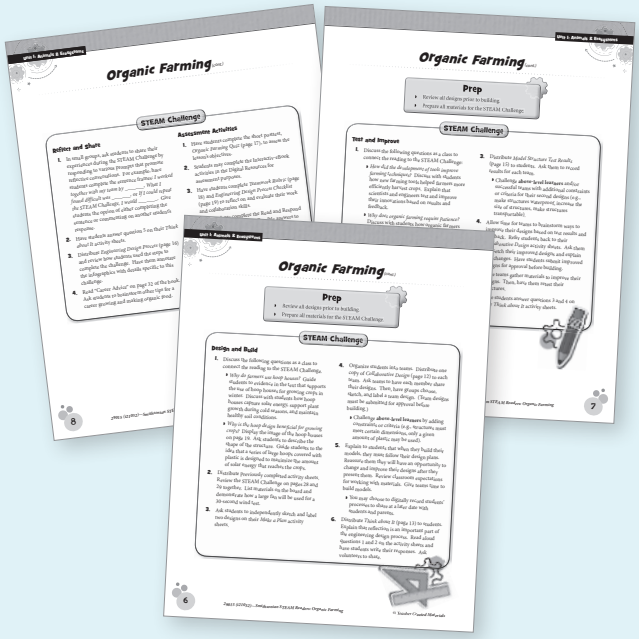
Days 2–4

- Students complete reading and writing activities as they gain knowledge that will help them with the STEAM Challenge.



Days 5–10

- Students take what they've learned and apply it to design, build, test, and improve a solution.
- Students reflect, share work, and take assessments.



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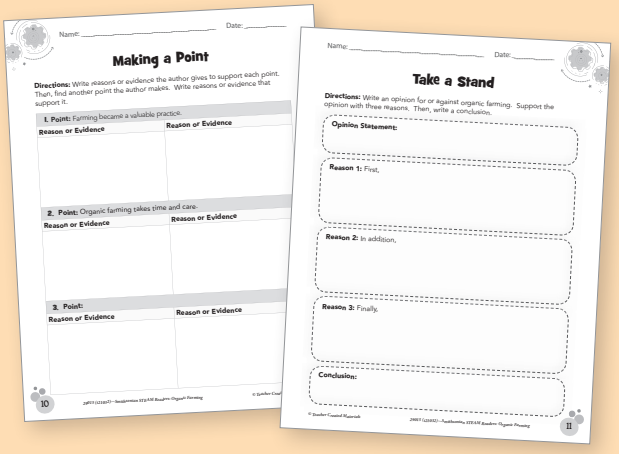
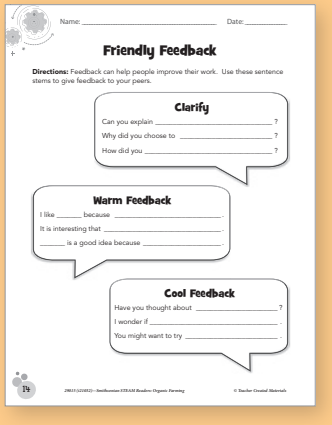
Lesson Plan Components *(cont.)*

Student Activity Sheets

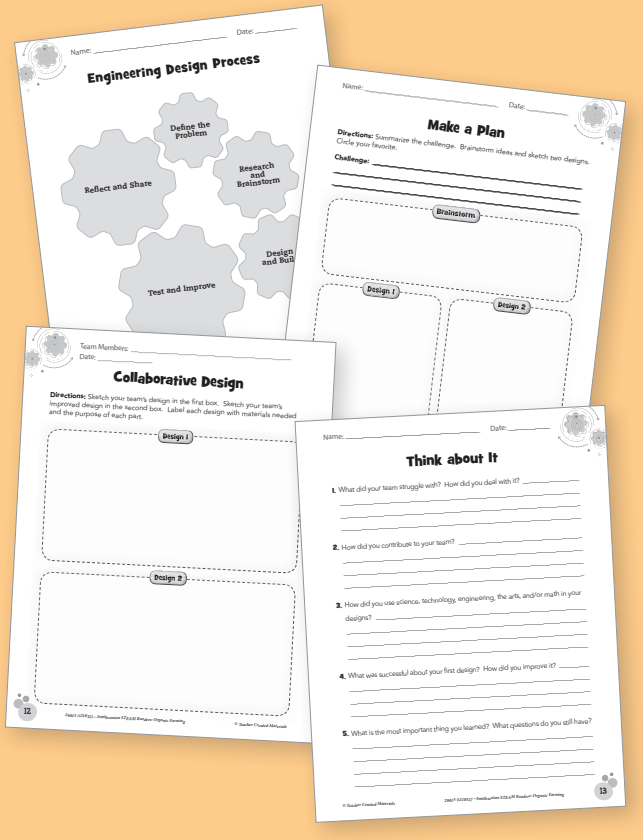
Literacy skills are supported with meaningful activities that **promote higher-order thinking skills**.



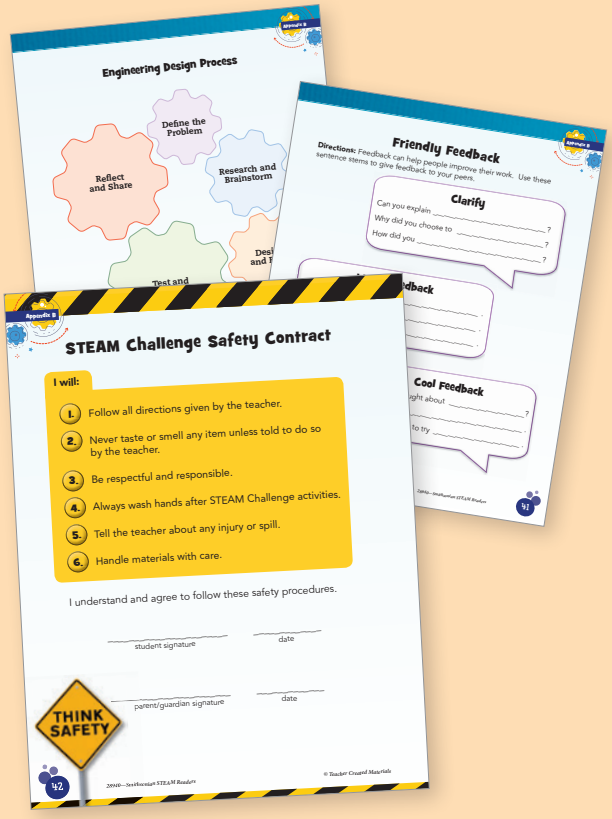
Effective feedback techniques are supported with **sentence frames** to help students provide feedback to peers and to facilitate productive classroom dialogue.



STEAM Challenge activity sheets support students throughout the **engineering design process**.



Appendix B includes quick reference sheets for students and teachers.



Assessments

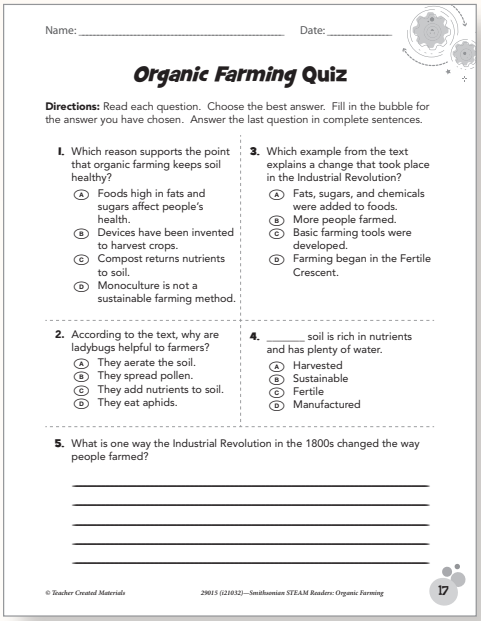
Assessment guides teacher decisions and improves student learning. *Smithsonian STEAM Readers* offers balanced assessment opportunities. Assessments require students to demonstrate analytical thinking, comprehend informational texts, and write evidence-based responses.

Quizzes

Each lesson plan includes a quiz with multiple-choice questions and a short-answer question. These assessments include text-dependent questions and may be used as open-book evaluations. Answer keys are provided on page 2 of each lesson.

STEAM Challenge

STEAM Challenges include a *Teamwork Rubric* and an *Engineering Design Process Checklist*. These guide students to reflect on and evaluate their work and collaboration skills.



Name: _____ Date: _____

***Organic Farming* Quiz**

Directions: Read each question. Choose the best answer. Fill in the bubble for the answer you have chosen. Answer the last question in complete sentences.

1. Which reason supports the point that organic farming keeps soil healthy?
- (A) Foods high in fats and sugars affect people's health.
- (B) Devices have been invented to harvest crops.
- (C) Compost returns nutrients to soil.
- (D) Monoculture is not a sustainable farming method.

2. According to the text, why are ladybugs helpful to farmers?
- (A) They aerate the soil.
- (B) They spread pollen.
- (C) They add nutrients to soil.
- (D) They eat aphids.

3. Which example from the text explains a change that took place in the Industrial Revolution?
- (A) Fats, sugars, and chemicals were added to foods.
- (B) More people farmed.
- (C) Basic farming tools were developed.
- (D) Farming began in the Fertile Crescent.

4. _____ soil is rich in nutrients and has plenty of water.
- (A) Harvested
- (B) Sustainable
- (C) Fertile
- (D) Manufactured

5. What is one way the Industrial Revolution in the 1800s changed the way people farmed?

_____

_____

_____

_____

_____

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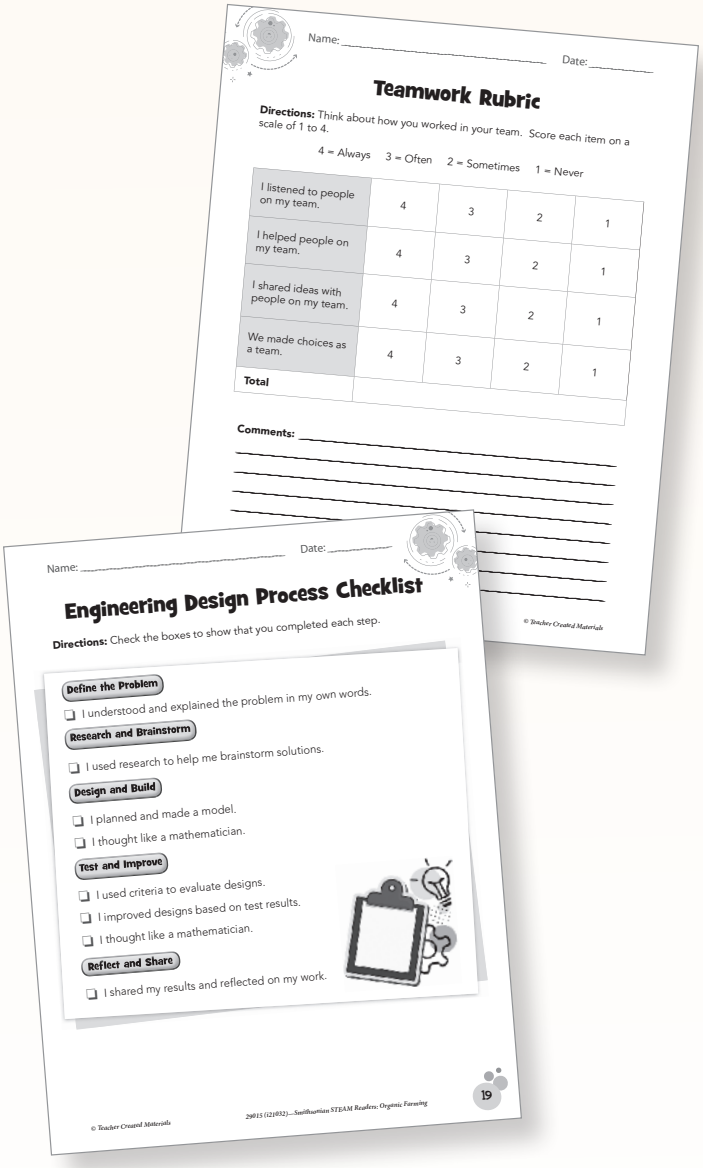

Name: _____ Date: _____

Teamwork Rubric

Directions: Think about how you worked in your team. Score each item on a scale of 1 to 4.

4 = Always 3 = Often 2 = Sometimes 1 = Never

I listened to people on my team.	4	3	2	1
I helped people on my team.	4	3	2	1
I shared ideas with people on my team.	4	3	2	1
We made choices as a team.	4	3	2	1
Total				

Comments: _____

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Name: _____ Date: _____

Engineering Design Process Checklist

Directions: Check the boxes to show that you completed each step.

Define the Problem
- ❑ I understood and explained the problem in my own words.

Research and Brainstorm
- ❑ I used research to help me brainstorm solutions.

Design and Build
- ❑ I planned and made a model.
- ❑ I thought like a mathematician.

Test and Improve
- ❑ I used criteria to evaluate designs.
- ❑ I improved designs based on test results.
- ❑ I thought like a mathematician.

Reflect and Share
- ❑ I shared my results and reflected on my work.

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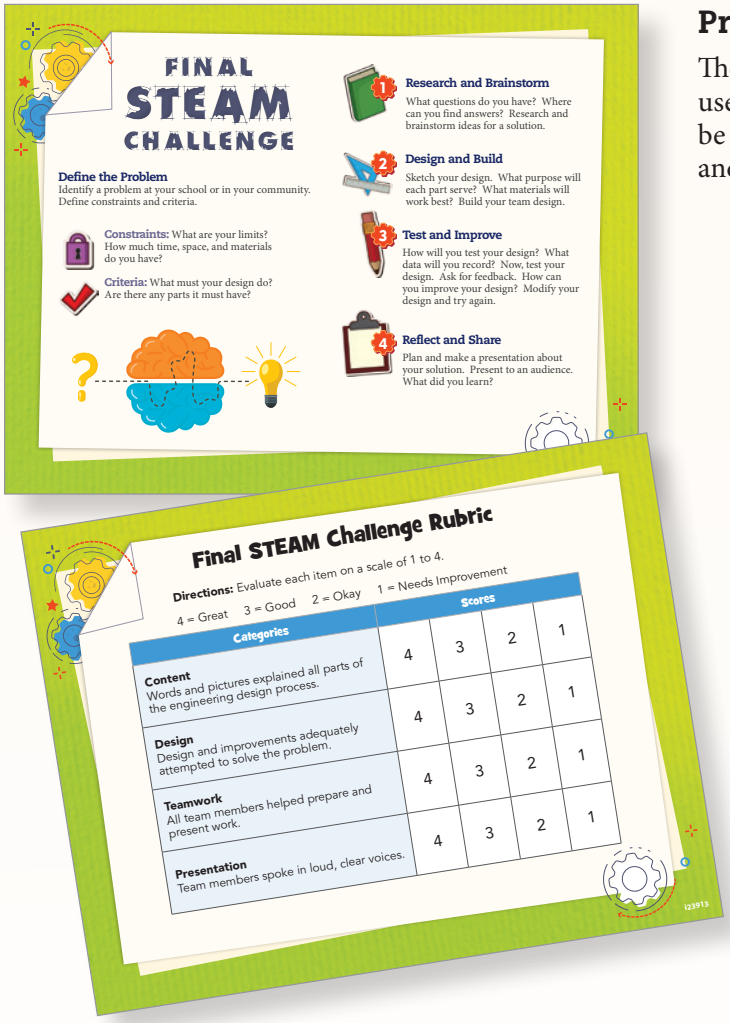
Assessments *(cont.)*

Culminating Activity

The Culminating Activity asks students to apply what they have learned in an engaging and interactive way. Students use what they have learned to solve real-world problems in a final STEAM Challenge.

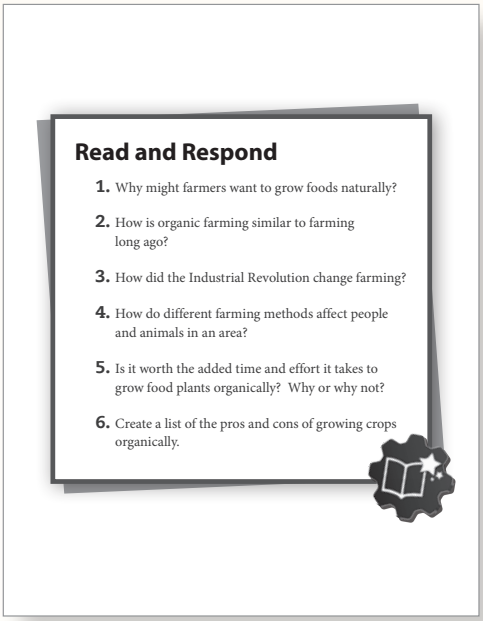


Read and Respond

Read and Respond questions can be found on the inside back covers of the books. Questions require various levels of critical thinking and can be used for instruction or assessment. Answer keys are provided in the digital resources.

Progress Monitoring

There are several points throughout each lesson when useful evaluations can be made. These evaluations can be based on group, paired, and individual discussions and activities.



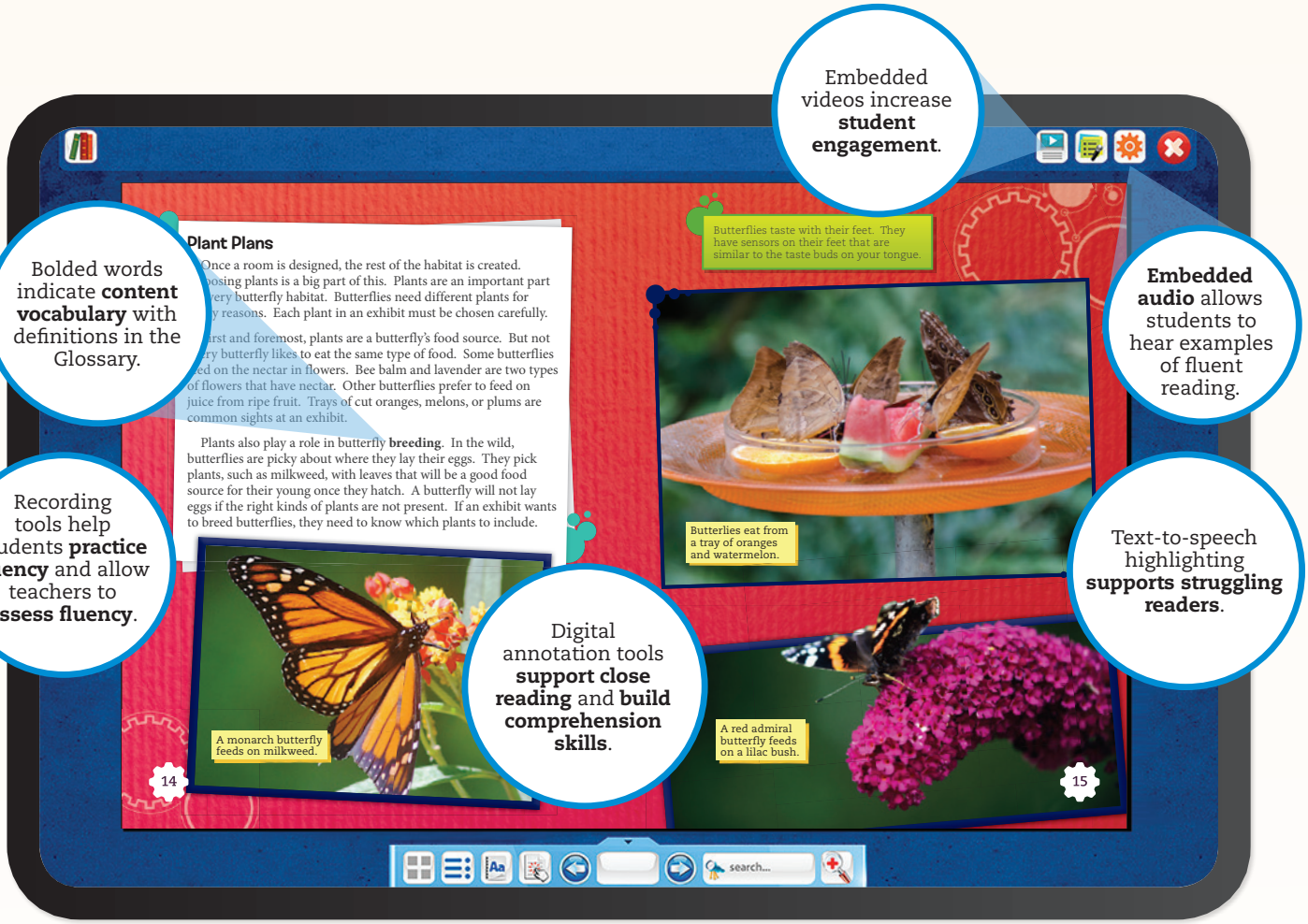
Digital Resources

Each kit in this series features a variety of digital resources that help teachers weave technology into literacy instruction (see pages 43–46 for more information).

- Interactiv-eBooks
- professional audio recordings of the books
- PDF of each book
- student reproducibles and assessments

Interactiv-eBook

Interactiv-eBooks provide a digital space in which students can interact with reader content.



Audio Recordings

Smithsonian STEAM Readers includes professional audio recordings for each of the books. The recordings can develop the fluency of English language learners and below-level learners. They provide students with models for appropriate phrasing, intonation, and expression.

Additional Digital Resources

The digital resources also include student reproducibles used in the lessons. These files can easily be shared through cloud sharing services, displayed on interactive whiteboards, or printed and distributed.

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Using Interactiv-eBooks

Build Literacy

Interactiv-eBooks have a variety of features that build literacy and engage readers:

- Text-to-speech highlighting supports struggling readers.
- Professional audio recordings promote fluency and vocabulary development.
- Interactive activities enrich the reading experience.
- Annotation tools offer opportunities to interact with the text and build key comprehension skills.
- Writing activities offer opportunities to make reading-writing connections.

Build Content Knowledge

Interactiv-eBooks have many features that build STEAM content knowledge:

- Digital activities can be used to introduce, reinforce, or assess learning.
- Easy-to-use tools give students power to increase comprehension and master vocabulary.
- IeBs allow for comprehension of content from diverse media.

Interactiv-eBook Digital Tools

	■ **Pencil**—Write notes on a page or annotate pictures.
	■ **Highlighter**—Highlight main ideas or details.
	■ **Notes**—Write and save thoughts and observations about the text.
	■ **Zoom**—Look closely at graphic elements (such as illustrations) for observation and analysis.
	■ **Audio Notes**—Have students record themselves, analyze fluency, or record personal responses to text as they read.

Pacing and Instructional Setting Options

Smithsonian STEAM Readers is flexibly designed and can be used in tandem with a core curriculum within a science block/STEAM/STEM block, and/or literacy block. It can also be used in makerspaces to integrate literacy with the engineering design process. Teachers should customize pacing according to student need and the teacher's preferred instructional framework, such as Balanced Literacy.

***Smithsonian STEAM Readers* within the Balanced Literacy Framework**	
Modeled and Shared Reading/Writing	The Before, During, and After Reading activities in each lesson of this series offer opportunities for teachers to activate students' prior knowledge, as well as model fluency and metacognition as they read aloud from the text and guide students through reading and writing activities.
Small-Group Reading/ Workshop	The During Reading, After Reading, and STEAM Challenge activities in each lesson of this series can be completed during small-group instruction, in centers, or at workstations, depending on students' previous learning experiences and their need for teacher support.
Independent Reading	Professional audio recordings, PDFs of the books, and Interactiv-eBooks are provided to support independent reading at workstations and listening centers.
Assessment	This series offers multiple formative and summative assessment opportunities that can be used to guide instruction and assess learning (see pages 20–21 for details).

The following pacing and instructional setting options show suggestions for how to use this product. Two pacing options are provided.

Option 1 includes both literacy and STEAM Challenge activities. This option spans 10 instructional days and requires approximately 30–45 minutes a day, for a total of 75–112.5 hours over the course of 150 days.

Day 1	Day 2	Day 3	Day 4	Days 5–10
Introductory and **Before Reading Activities**	**During Reading Activity**		**After Reading Activity**	**STEAM Challenge** and **Assessments**

Option 2 includes only literacy activities. This option spans five instructional days and requires approximately 30–45 minutes a day, for a total of 37.5–56.25 hours over the course of 75 days.

Day 1	Day 2	Day 3	Day 4	Day 5
Before Reading Activity	**During Reading Activity**		**After Reading Activity**	**Assessment Activities**

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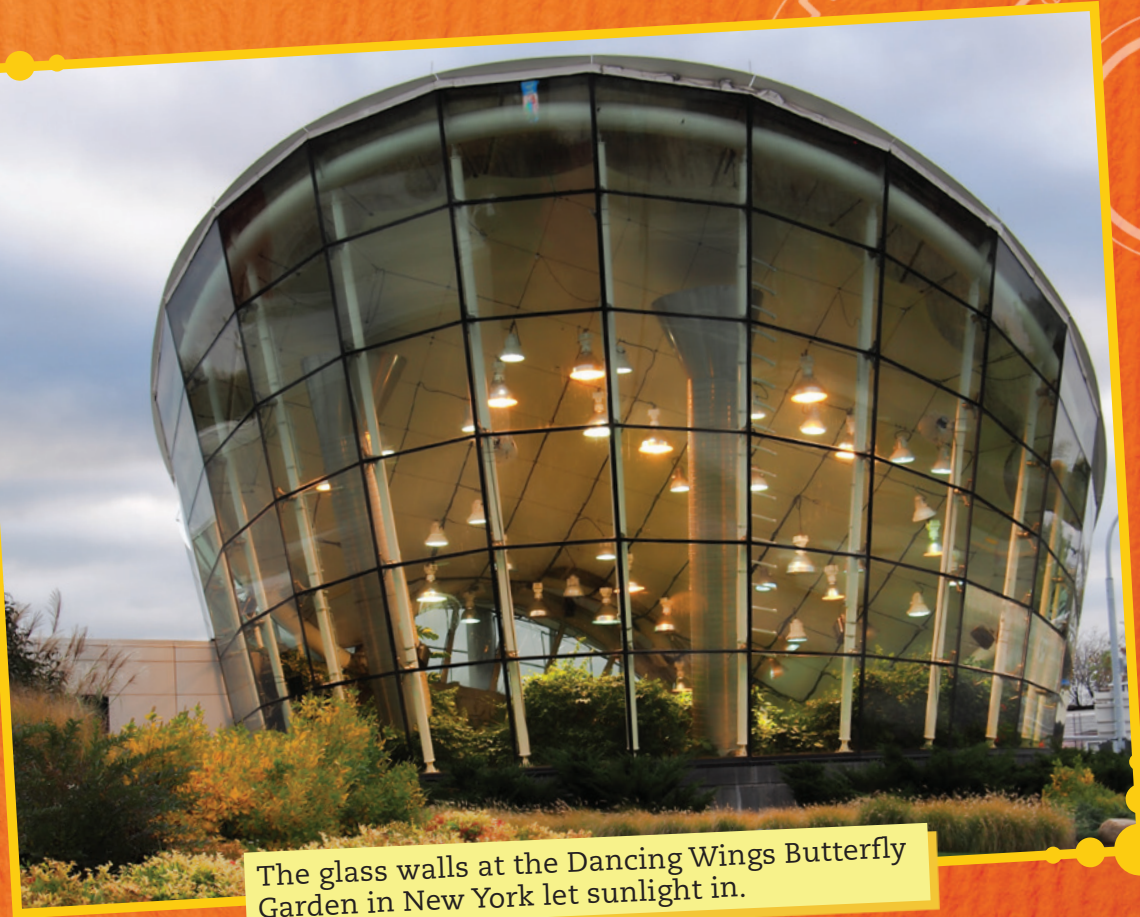
The Design Process

Butterfly exhibits can be found all over the world. They are great places to see butterflies up close. In these spaces, you can see butterflies act as they would in the wild. You might even see caterpillars or **pupas** (PYOO-puhs) on display.

Every detail in a butterfly exhibit is carefully thought out long before insects and plants are brought in. Each exhibit must be a safe space where butterflies can **thrive**. Designers use what they know about butterflies in the wild to help them build the exhibits.

Designing starts with the room that will be used. Some rooms are much better for butterfly exhibits than others. For example, exhibits often have lots of windows. This is because butterflies love sunlight. They need it to live. Windows bring in light from outside. Special lights can be added to give butterflies even more heat and light.

pupas on display at an exhibit



The glass walls at the Dancing Wings Butterfly Garden in New York let sunlight in.

ARTS

Living Art

Butterflies have inspired artists for thousands of years. Drawings of butterflies have even been found in caves! Some artists like butterflies' bright colors and the way they look as they float through the air. Others are interested in their **compelling** life cycles. Many cultures have linked butterflies to the human soul. In fact, the ancient Greek word for "soul," *psyche* (SIGH-kee), was also used for butterfly.

butterflies in Korean art

Helping Our Winged Friends

Butterflies need our help. Many butterfly species are **endangered**. They may soon be gone forever. Scientists all over the world have made it their goal to tackle this problem. They have found many ways to help butterflies. But they can't save them alone. One way people can help is by planting milkweed in their gardens. It will attract butterflies and give them places to lay their eggs.

People can also help scientists by keeping track of butterflies in their backyards. They can count how many butterflies they see. They can also take notes on sizes and species. This data can be added to butterfly count websites.

Need more reasons to save butterflies? Visit a butterfly exhibit. You will see hundreds of reasons flying around! Yes, they are beautiful. They are also important to ecosystems and to the future of our world.

There are around 20,000 species of butterflies on Earth.

STEAM CHALLENGE

Define the problem:

Butterflies around the world are losing their habitats. Some people have removed plants that butterflies depend on. One way we can help is by making butterfly feeders. Your task is to design and build a butterfly feeder that will attract local butterflies.

Constraints: You can only use recycled or found items to build your butterfly feeder.

Criteria: Your feeder must have a way to attract butterflies. To appeal to many people, your feeder's height must be adjustable to at least two different heights.

Research and Brainstorm

What do butterflies eat? What are butterflies attracted to? How big should you make your butterfly feeder?

Design and Build

Sketch your design. What about your feeder design will attract butterflies? What materials will work best? Build your feeder.

Test and Improve

Present your design to other students. Explain how it will attract butterflies. Set up your butterfly feeder. Test it by adjusting it to a different height. Does it stay in place? Is it stable? Get feedback. Modify your design and try again.

Reflect and Share

What materials would you use if they did not have to be recycled? What are other ways you could help butterflies? Which part of the process was most challenging?

CAREER ADVICE
from Smithsonian

Do you want to work with butterflies?
Here are some tips to get you started.

"There are many plant species that attract butterflies in the Smithsonian's Butterfly Garden. Butterflies feed from nectar plants. They lay eggs on host plants. It is important to learn about plants, gardening, insects, and even chemistry to grow a garden that attracts butterflies."—***James Gagliardi, Horticulturalist***

"I've always loved nature. I studied frogs and insects as a child. I earned a college degree in entomology, the study of insects. A love of nature and insects is very important, as is traveling and exploring. I collect new insect species wherever I go."—***Nate Erwin, Former Manager of the Orkin Insect Zoo and Butterfly Pavilion***

Designing Butterfly Exhibits

Materials

- *Designing Butterfly Exhibits* books
- copies of student activity sheets (pages 9–19)
- index cards
- pocket chart or chart paper
- sheets of paper for 3 × 3 grids
- bingo markers
- **STEAM Challenge materials include but are not limited to the following**:
  - ✓ cardboard pieces
  - ✓ construction paper
  - ✓ craft sticks
  - ✓ empty paper towel or toilet rolls
  - ✓ markers
  - ✓ masking tape
  - ✓ newspaper
  - ✓ paper bags
  - ✓ paper cartons
  - ✓ paper plates
  - ✓ scissors
  - ✓ sponges
  - ✓ string or twine

Learning Objectives

- **Reading:** Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade-appropriate topic or subject area.
- **Writing:** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- **Speaking and Listening:** Engage effectively in a range of collaborative discussions with diverse partners on grade-appropriate topics and texts, building on and expressing ideas clearly.
- **Engineering:** Define an engineering problem, design and evaluate solutions, and optimize a design based on test results.

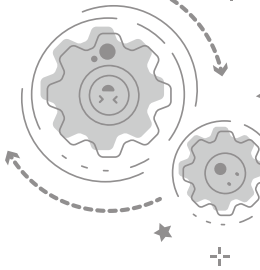
Phenomena

Plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Lesson Timeline

Day 1	Day 2	Day 3	Day 4	Day 5–10
Introductory and **Before Reading Activities** (page 4)	**During Reading Activities** (page 5)		**After Reading Activities** (page 5)	**STEAM Challenge** and **Assessments** (pages 6–8)
Define the STEAM Challenge, and practice using text features to find the meaning of words in the text.	Research butterfly exhibits, use clues in the text to help determine the meaning of new or interesting words, and brainstorm design solutions.		Write a script to guide visitors at a butterfly exhibit.	Design, build, test, improve, reflect on, and share a butterfly feeder. Complete the assessments.

Name: _____ Date: _____



Make a Plan

Directions: Summarize the challenge. Brainstorm ideas and sketch two designs. Circle your favorite.

Challenge: _____

_____

_____

Brainstorm

Design 1

Design 2

Name: _____ Date: _____

Finding Meaning with Text Features

Directions: Find new or interesting words as you read. Check a box to show which context clue was most helpful when making meaning. Then, write each word in a sentence, write a definition, and draw a picture.

Helpful Context Clue

- ❑ sentence with word
- ❑ sentence before or after word
- ❑ illustration
- ❑ caption
- ❑ heading

Used in a Sentence

Word

Definition

Picture

Helpful Context Clue

- ❑ sentence with word
- ❑ sentence before or after word
- ❑ illustration
- ❑ caption
- ❑ heading

Used in a Sentence

Word

Definition

Picture

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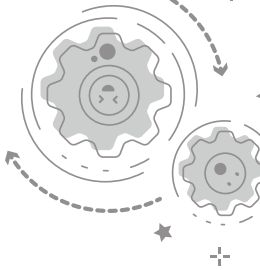
Name: _____ Date: _____



Butterfly Feeder Test Results

Directions: Write the materials each team used. Explain how feeders attract butterflies. Mark the results of each team's test by circling *yes* or *no*. Then, answer the question.

Team	Recycled Materials Used	How does the feeder attract butterflies?	Can the feeder be adjusted to two heights?
			yes/no
			yes/no
			yes/no
			yes/no
			yes/no
			yes/no

How can you improve your feeder to attract butterflies in different ways?

_____

_____

_____

Name: _____ Date: _____

Engineering Design Process Checklist

Directions: Check the boxes to show that you completed each step.

Define the Problem

- ❑ I understood and explained the problem in my own words.

Research and Brainstorm

- ❑ I used research to help me brainstorm solutions.

Design and Build

- ❑ I planned and made a model.
- ❑ I thought like a mathematician.

Test and Improve

- ❑ I used criteria to evaluate designs.
- ❑ I improved designs based on test results.
- ❑ I thought like a mathematician.

Reflect and Share

- ❑ I shared my results and reflected on my work.