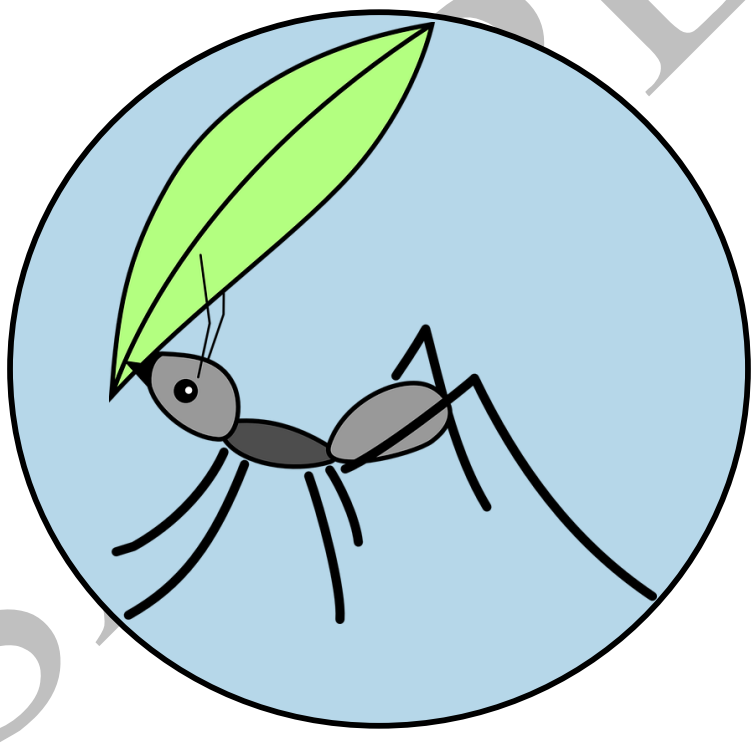
Advancing STEM

New York State Science Learning Standards

Traits and Behaviors:

Plants and Ants



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Major support for and work on this project has been provided by the Cattaraugus-Allegany-Erie-Wyoming BOCES and Erie 2 Chautauqua Cattaraugus BOCES Region school districts. Extended thanks and appreciation to the teachers involved in the curriculum writing process.

Cattaraugus-Allegany-Erie-Wyoming BOCES Participating Districts

Allegany-Limestone Central School
Andover Central School
Belfast Central School
Bolivar-Richburg Central School
Cattaraugus-Little Valley Central School
Cuba-Rushford Central School
Franklinville Central School
Friendship Central School
Genesee Valley Central School
Hinsdale Central School
Pioneer Central School
Randolph Central School
Scio Central School
Wellsville Central School
West Valley Central School
Whitesville Central School

Erie 2 Chautauqua Cattaraugus BOCES Participating Districts

Bemus Point Central School
Brocton Central School
Cassadaga Valley Central School
Chautauqua Lake Central School
Clymer Central School
East Aurora Union Free School
Forestville Central School
Holland Central School
Jamestown Public School
Lake Shore Central School
Panama Central School
Sherman Central School
Silver Creek Central School
Springville-Griffith Institute Central School

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Updated: July 2017

Thank you for selecting an Advancing STEM Kit to enhance the teaching of science in your elementary classroom. Much care has been taken to ensure these kits align with the New York State Science Learning Standards, are academically rigorous, developmentally appropriate, and provide students with hands-on, engaging, and relevant learning experiences. These kits were developed by classroom teachers in districts in the Cattaraugus-Allegany and Erie 2 Chautauqua Cattaraugus BOCES regions, and are under constant review. If you have feedback for our program, please do not hesitate to contact us.

Three Dimensional Teaching

The Next Generation Science Standards (NGSS), upon which the New York State Science Learning Standards are built, incorporate three dimensions of knowledge, skills, and practices. They are:

Dimension 1: Science and Engineering Practices

This dimension focuses on students emulating the behaviors of scientists and engineers. The focus is not just on skills, but on the incorporation of knowledge. These practices include building models and developing theories about the natural world.

Dimension 2: Crosscutting Concepts

This dimension incorporates knowledge that spans science and engineering fields, linking ideas from one area of science to another. The focus of this dimension is on explicitly teaching the concepts of: Patterns; Cause and Effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change.

Dimension 3: Disciplinary Core Ideas

The disciplinary core ideas are grouped into four domains: Life Sciences; Physical Sciences; Earth and Space Sciences; and Engineering, Technology and Applications of Science. To be considered core, ideas should meet at least two of the following criteria:

- Have **broad importance** across multiple sciences or engineering disciplines or be a **key organizing concept** of a single discipline;
- Provide a **key tool** for understanding or investigating more complex ideas and solving problems;
- Relate to the **interests and life experiences of students** or be connected to **societal or personal concerns** that require scientific or technological knowledge;

- Be **teachable and learnable** over multiple grades at increasing levels of depth and sophistication.

True NGSS-aligned instruction happens when teachers are able--through well-designed instructional practices and approaches--to merge these three dimensions into in-depth understanding for students.

Unit Design

This unit has been designed based on the 5E Lesson Planning structure. The 5E's provide a framework for curriculum, unit, and individual session design in the sciences.

The 5E's are:

Engage

This session initiates the learning tasks. The activities (1) activate prior knowledge and make connections between past and present learning experiences, and (2) anticipate activities and focus students' thinking on the learning outcomes of current activities. The learner should become mentally engaged in the concepts, practices, abilities, and skills of the curriculum unit.

Explore

This phase provides students with a common base of experiences within which they identify and begin developing concepts, practices, abilities, and skills. Students actively explore the contextual situation through investigations, reading, web searches, and discourse with peers.

Explain

This phase focuses on developing an explanation for the activities and situations students have been exploring. They verbalize their understanding of the concepts and practices. The teacher introduces formal labels, definitions, and explanations for concepts, practices, skills, and abilities.

Elaborate

This session extends students' conceptual understanding through opportunities for students to apply knowledge, skills, and abilities. Through new experiences, the learners transfer what they have learned and develop broader and deeper understanding of concepts about the contextual situation and refine their skills and abilities.

Evaluate

This phase emphasizes students assessing their understanding and abilities and provides opportunities for teachers to evaluate students' understanding of concepts and development of goals identified in learning outcomes.

You will notice that throughout the units, sessions have been designed to engage students and allow opportunities for exploration of topics and concepts, provide pausing points for teachers to explain and elaborate, and to evaluate the knowledge and application of the crosscutting concepts, disciplinary core ideas, and science and engineering practices.

Each unit begins with a driving question, a list of concepts covered, and a description of the culminating assessment. A unit may range from 15-20 learning experiences, and is intended to be taught over the course of 4-6 weeks. A typical learning experience may last between 25-40 minutes.

Assessments

Formative assessments have been embedded throughout the unit. The unit culminates with either an assessment utilizing the Engineering Design Process or a Performance Based Task. Please plan on these assessments taking anywhere from 3-7 days for students to accomplish the task. A rubric has been designed and embedded within the unit to aid in the evaluation process. Where applicable, answer keys (if needed) have been provided for your convenience.

Live Materials

Any Life Science based unit includes instructions for accessing and/or ordering live materials. Please read this information carefully and follow any timelines provided to ensure adequate shipping and arrival of live materials.

Scientist's Notebook

To help students track their understanding and growth, students are provided with a **Scientist's Notebook**. This is a collection of all of their worksheets, a glossary for their vocabulary, and a place for them to keep notes and/or observations.

Digital Resources

Throughout the units, you will notice links and references to digital resources. These may include videos, apps, and/or websites. If you need assistance accessing these materials, please do not hesitate to reach out to us.

Vocabulary

Vocabulary development and instruction are key components to high-quality science instruction and student achievement. As such, we highly encourage the use of explicit and direct instructional techniques when it comes to introducing and mastering key vocabulary terms within the science concepts and units. Included in the **Scientist's Notebook** is a glossary for students to document their new vocabulary, using the Frayer Model. The Frayer Model asks students to create a visual model of their learning by defining the target word and determining examples and non-examples. More information on the Frayer Model can be found at:
http://www.theteachertoolkit.com/index.php/tool/frayer-model

Traits and Behaviors: Ants and Plants

Grade 1

Unit Overview

Students explore, sort, compare, and experience the similarities, differences, and basic behaviors of animals. Students discuss how animal and plant parents and offspring are very similar to each other but not the same. Ants in this unit encourage careful observation using a hand lens, recording observations in words and pictures as students build on their intuitive ideas about the basic behaviors of animals. As a result, students will design a solution to solve a human problem that mimics a plant or animal feature.

Driving Question

The driving question is a way to organize instruction so that all learning revolves around more deeply finding answers to the question. The question can be addressed during the entire unit at any time after learning has occurred. The question is asked at the beginning of the unit and throughout. Answers should be redefined and developed as the unit progresses.

- How are parents and their young similar and different?
- What are some ways plants and animals meet their needs so that they can survive, grow, and reproduce?

Scheduling

This kit contains two strands and an Engineering Design Challenge.

- Strand One focuses on how some young plants and animals are similar to, but not exactly like, their parents and offspring inherit certain traits from their parents. This strand contains five sessions.
- Strand Two focuses on how parents help their offspring to survive. The strand contains five sessions.
    - This strand initiates student observations by setting up the Ant Farm provided in the kit. Be sure to order the live ants at least 3-4 days before the Engage session.
- The Engineering Design Challenge focuses on students designing a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow and meet their needs.
- Please note that a session may take more than one class period.

Safety Concerns

Please read instructions for using and setting up the Ant Farm. Ants will sting and bite if not handled properly.

Extra Materials

Most materials for this unit are included; however, some materials will need to be provided by the teacher.
These include:

- chart paper or use of classroom whiteboard
- hole punch
- scissors

Reminders

- Please follow all safety protocols as listed in the manual.
- Always remind students to wash their hands after handling any of the materials in the kit.
- Small objects should be handled with care.
- All materials in this kit are intended for instructional use only.
- Please return any extra consumable materials to help control costs of the kits.

Suggested Timeline

	Day 1	Day 2	Day 3	Day 4	Day 5
Week 1	Strand One: Engage	Strand One: Explore		Strand One: Explain	
	Pages: 8-26	Pages: 27-86		Pages: 87-91	
	• Observe similarities or differences between parents and offspring	• Match pictures of plant and animal parents with their offspring • Introduce comparison anchor chart		• Describe similarities and differences between parent and its offspring	
Week 2	Strand One: Elaborate			Strand One: Evaluate	Strand Two: Engage
	Pages: 92-103			Pages: 104-107	Pages: 110-116
	• Order ants 3 to 4 days prior to the beginning of Strand Two: Engage • Observe and list the inherited traits of humans, plants and animals • Complete Human Traits Checklist • Complete Animal Traits Checklist • Complete Plant Traits Checklist			• Complete Ant Traits Checklist	• Daily Ant Fun Fact • Assemble Ant farm • Sketch of ant colony and ant
Week 3	Strand Two: Engage (continued)	Strand Two: Explore			Stand Two: Explain
	Pages: 110-116	Pages: 117-122			Pages: 123-127
	• Daily Ant Fun Fact • Assemble Ant farm and observe Ant behavior	• Daily Ant Fun Fact • Read How Animal Babies Stay Safe by Mary Ann Fraser • Various plant and animal videos • Ant drawing showing how they care for each other. Sentence that describes drawing			• Daily Ant Fun Fact • Sketch of ant colony and ant
Week 4	Stand Two: Explain (continued)	Strand Two: Elaborate	Strand Two: Evaluate		
	Pages: 123-127	Pages: 128-132	Pages: 133-136		
	• Daily Ant Fun Fact • Drawing of Parent Behaviors • Sentence that describes drawing	• Daily Ant Fun Fact • Label ant body parts	• Daily Ant Fun Fact • Complete Ant and Animal Behaviors Checklist • Sketch of ant colony and ant		

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Week 5	Engineering Design Challenge Unit Assessment - Session 1: Ask	Engineering Design Challenge Unit Assessment - Session 2: Imagine	Engineering Design Challenge Unit Assessment - Session 3: Plan	Engineering Design Challenge Unit Assessment - Session 4: Create	Engineering Design Challenge Unit Assessment - Session 5: Improve
	Pages: 138-140	Page: 140	Page: 140	Page: 141	Page: 141
	• Introduce design challenge and the question: How does land change and what solutions can humans use to prevent the change?	• Display materials to be used in the challenge • Imagine solutions to the problem	• Plan with partners by drawing the design idea and creating a materials list	• Complete Engineering Design Process: Create	• Complete Engineering Design Process: Improve

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Dear Families,

Learning about our natural world is an exciting part of the elementary school curriculum. As we explore, we will come back time and again to elements of STEM: Science, Technology, Engineering, and Math.

Shortly, we will begin our next topic of study, which will focus on Structure, Function, and Information Processing, a domain of Life Sciences.

As we explore this topic, essential understandings will include:

- observing that parents and their offspring are similar, but not exactly alike
- identifying patterns in behavior of parents to help their offspring survive.

Our final assessment for this unit will consist of designing a solution to a human problem that resembles how plants and/or animals use their external parts to help them survive and grow, which is an Engineering Design Challenge. Students will be asked to choose from various materials to plan and create a solution to a human problem that they have identified. They will share their design solutions with the class and learn from each other.

As always, please do not hesitate to contact me with any questions.

Thanks!

Strand One: Introduction

1. Structure, Function, and Information Processing		
Students who demonstrate understanding can: **1-LS3-1. Make observations to construct an evidence-based account that some young plants and animals are similar to, but not exactly like, their parents.** [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1)	**LS3.A: Inheritance of Traits** • (NYSED) Some young animals are similar to, but not exactly, like their parents. Some young plants are also similar to, but not exactly, like their parents. (1-LS3-1) **LS3.B: Variation of Traits** • Individuals of the same kind of plant and animal are recognizable as similar but can also vary in many ways. (1-LS3-1)	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS3-1)

Common Core State Standards Connections:

ELA/Literacy

RI.1.1 Ask and answer questions about key details in a text. (1- LS3-1)

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS3-1)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-LS3-1)

Mathematics

MP.2 Reason abstractly and quantitatively. (1-LS3-1)

MP.5 Use appropriate tools strategically. (1-LS3-1)

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-LS3-1)

Concepts

- observing that parents and their offspring are similar, but not exactly alike;

Standards Progression

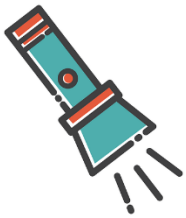
The NYS Science Learning Standards are a progression of core ideas that are introduced and elaborated upon throughout the grade levels. The standards for this grade level are detailed above.

Students will interact with these core ideas again in grades 3 and 4.

Strand Summary

In this strand, session will focus on helping students realize the similarities and differences between parents and their young. Students will match pictures of parents and offspring and explain why they think they are related. Students are also asked to describe the similarities and differences between a cat and her kittens, and asked if they are exactly alike. The focus of the strand is on the Driving Question: How are parents and their young similar and different. In order to go deeper and answer the question Why, students learn about inherited traits and are able to list the observable traits for humans, animals, and plants. The assessment has students creating a concept map for an animal or plant of their choice listing the inherited traits they observe.

Strand One: Engage



Remember: This session initiates the learning tasks. The activities (1) activate prior knowledge and make connections between past and present learning experiences, and (2) anticipate activities and focus students' thinking on the learning outcomes of current activities. The learner should become mentally engaged in the concepts, practices, abilities, and skills of the curriculum unit.

Objectives

I can identify how some young children, plants, and animals are similar to, but not exactly like their parents.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Make observations (first hand or from media) to construct an evidence-based account for natural phenomena.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- 15 **Parent and Young** photographs

For each student:

- 1 blue sticky note
- 1 green sticky note
- **Scientist's Notebook**

Preparation

- Preview the ten **Parent and Young** photographs and note the similarities and differences between the parent and their offspring.
- Write this question on the board. (How are young children, animals, and plants similar to their parents?)

Assessment

Students will record their observations, thoughts, and questions based on the **Parent and Young** photographs.

Vocabulary

- different
- exactly
- similar

Engage Activity

1. Pass out one blue sticky note and one green sticky note to each student. Instruct students to write their name on each sticky note. Instruct students to place their sticky notes on their desk and to join you near the board on the floor. Explain that students will use their sticky notes later.

2. Read and discuss the driving question that was written on the board. (How are young children, animals, and plants similar to their parents?). Record student answers on the chart or under the question.
    a. **Note:** At this time, accept all student answers in order to see how they change as the unit progresses. Keep this chart or question visible for the entirety of the unit. You may need to review definitions of the vocabulary words different, similar and/or exactly.

3. Explain to students that they are going to use pictures of people and animals (**Parent and Young** photographs) to observe how the parent and their young resemble each another.

4. As students are sitting in a circle on the floor, pass out laminated **Parent and Young** photographs to pairs of students. Tell students to examine what is happening in their photograph and be prepared to share their photograph with the class.

5. Instruct students to observe their photograph.
    a. **Ask:** What does similar mean? What does different mean? What do you notice about your photograph? Is there anything that is similar in the photograph? Is there anything that is different in the photograph? Do you think the animals or humans in the photograph are related? Why?

6. Instruct students to locate something that is similar in their photograph. Allow students to discuss observations with their partner. Then discuss observations with the class.
    a. Students may say their animals have similar fur color, eyes color/shape, number of legs, or that the humans have similar hair and eye color.

7. Instruct students to locate something that is different in their photograph. Allow students to discuss observations with their partner. Then discuss observations with the class. Students may say their animals have different fur color, size, or shape or that humans are different size and shape.
    a. **Ask:** Do you think the animals or humans are related? Why? What is your evidence?
    b. **Note:** While it may seem that all animals and humans in each photograph are all related, that may or may not be the case. Demand that students site evidence for their claim.

8. Place all photographs in random order on the floor so that all photographs are displayed. Direct students to return to their desk, get their two sticky notes, and stand in a circle around the photographs.

9. Play the game *Similar or Different* by announcing to the class to place their green sticky note on a photograph where you see the fur or hair color is similar and to place their blue sticky note on a photograph where you see the fur or hair color is different.

10. Debrief student responses. Direct students to collect their two sticky notes and return to the circle.

11. Play another round this time announce to the class to place their green sticky note on a photograph where you see the size or height is similar and to place their blue sticky note on a photograph where you see the size or height is different.

12. Debrief student responses. Direct students to collect their two sticky notes and return to the circle.

13. Play another round this time announce to the class to place their green sticky note on a photograph where you see the number of hands and feet is similar and to place their blue sticky note on a photograph where you see the number of hands and feet is different.

14. Debrief student responses. Direct students to collect their two sticky notes and return to the circle.
15. Play another round. This time, solicit a similarity and difference that could be used from students.
    a. **Note:** Students may select any visible feature (or trait). Examples could include: eye color, ear shape, etc.

16. Debrief student responses. Direct students to collect their two sticky notes and return to the circle.

17. Direct students to return to their seats and to locate their **Scientist's Notebook**. Read the Dear Scientist letter aloud to the class.
    a. **Ask:** What does similar mean? What does different mean? What are ways young children and animals similar to their parents? How are young plants similar to their parents?

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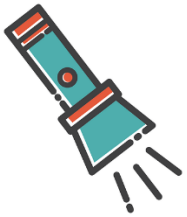
Strand One: Explore



Remember: This phase provides students with a common base of experiences within which they identify and begin developing concepts, practices, abilities, and skills. Students actively explore the contextual situation through investigations, reading, web searches, and discourse with peers.

Objectives

I can match a picture of a plant or animal parent with a picture of its offspring.
I can identify, and compare and contrast, traits of plants and animals.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Make observations (first hand or from media) to construct an evidence-based account for natural phenomena.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- **What Traits Are Similar and Different?** chart
- 1 set **Parent and Offspring Picture Cards**
- dry erase marker

For each student:

- **Scientist's Notebook**

Preparation

- Be sure to include both the parent and the offspring pictures in the activity. If there are an odd number of students, the teacher will also participate in the activity so that parent/offspring pairs form.

Vocabulary

- offspring
- parent

- trait

Assessment

Students will complete a page in their **Scientist's Notebook** that has them matching a parent with its offspring. The class will compare traits of at least one plant or animal using the **What Traits Are Similar and Different?** chart.

Explore Activity

1. Explain to students that they are going to match pictures of a parent with its offspring. Pass out one of the **Parent and Offspring Picture Cards** to each student. The teacher should keep the picture of the mother dog to model the activity.
    a. **Note:** You may need to review or introduce the definitions of parents and offspring.

2. Hold up the picture card of the mother dog and ask the students to look at the picture they were given. Tell the students that you have a picture of a mother dog, and ask if anyone has a picture of her young puppy. When the student with the picture of the puppy raises their hand, ask them to come to you with their picture and explain why they think the two pictures match each other.
    a. **Ask:** Can you explain to the class why you think your picture goes with mine?
    b. **Note:** If needed, help the student make connections between the similarities between the two pictures – i.e. same breed of dog.

3. Instruct the students to get up and move around the room until they find the parent-offspring match to their picture much like the demonstration.

4. When they find their match, have them stand together until everyone has found their pair.
    a. **Note**: If any parent/offspring pairs are incorrect, redirect the students to look for certain features unique to their plant or animal.

5. Go around the room and ask each pair of students to explain to the class why they think the two pictures match each other as parent and offspring. Encourage them to be specific.

6. Allow students to return to their seats and revisit the class chart or white board where the driving question is posed.
    a. **Ask:** Is there anything you would like to add to the chart.

7. Depending on students' responses, you may wish to debrief the activity by exploring some of their observations or revisiting the pairs of parent/offspring pictures and make additional observations to show how offspring are similar to, but not always exactly alike their parents.

8. Explain to students that they were able to match the parent with their offspring because of similar features, or traits.

9. Write the word trait on the board.

10. Inform students to complete the **Match the Parent with Their Offspring** page in their **Scientist's Notebook.**

11. Debrief the **Match the Parent with Their Offspring** page in the **Scientist's Notebook** using the **What Traits Are Similar and Different?** chart. Use the sample answer key for assistance in using this anchor chart.

12. Decide on, through class discussion, traits/features students see that are similar and/or different. List them in the criteria boxes. There is room for four criteria. Examples could include: fur color, ear shape, nose and head shape (see example). Rely on students to describe each animal using that criteria. Use sample answer key for an example of the yellow Labrador and its offspring.
    a. **Ask**: Is this trait similar or different and place an "x" in the appropriate box.

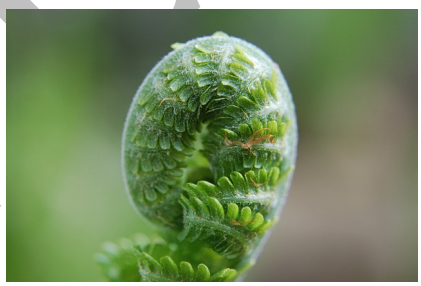
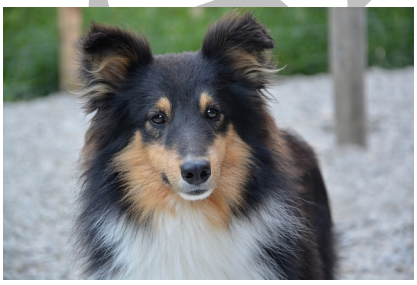
13. Examine any patterns once all criteria are examined.
    a. **Ask:** What patterns do you notice?

14. Repeat with other plants or animals from the **Match the Parent with Their Offspring** page if time allows.

15. Debrief the concept of traits.
    a. **Ask:** What is a trait? Are traits in plants and animals exact?

Name: _____

Match the Parent with Their Offspring

#1: parent	#2: offspring
	
	
	
	

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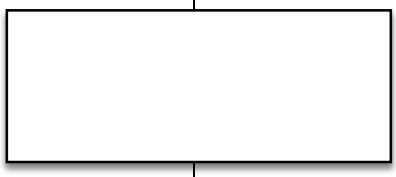
What Traits Are Similar and Different?

#1: parent	#2: offspring	
		similar
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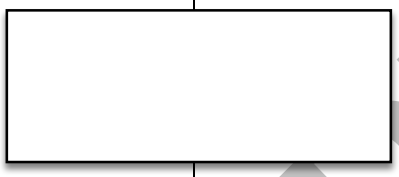		similar
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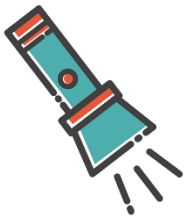
Strand One: Explain



Remember: This phase focuses on developing an explanation for the activities and situations students have been exploring. They verbalize their understanding of the concepts and practices. The teacher introduces formal labels, definitions, and explanations for concepts, practices, skills, and abilities.

Objectives

I can describe similarities and differences between two sets of parents and their offspring.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Make observations (first hand or from media) to construct an evidence-based account for natural phenomena.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- **How Are They Similar and Different?** chart

For each student:

- **Scientist's Notebook**

Preparation

- Display the **How Are They Similar and Different?** chart for all students to view.

Assessment

Students will be constructing explanations about parents and offspring by observing and describing how they are similar and different.

Vocabulary

- similar
- different
- exactly
- offspring
- parent

Explain Activity

1. Explain to students that in this activity, they are going to learn how to compare two sets of parent-offspring pairs by describing how they are alike and how they are different. They will help fill in a graphic organizer that asks them to list three ways they are the same, and three ways they are different.
    a. **Note:** You may decide to list more than three ways, depending on student responses.

2. Reference the **What Traits Are Similar and Different?** chart to students to show what parents and offspring they will be comparing. The organizer is also in their **Scientist's Notebook.**

3. Ask students to look at the picture of the white dogs, and then of the brown dogs. Tell them that both pictures are of a mother dog and her puppy. Explain that all dogs have certain things in common, but the students should focus on just these two pictures for the activity.
    a. **Ask**: How are the dogs in both pictures alike?
        i.
4. Allow students time to think, and then ask them to share one way they are the same. Record at least three ways the dog pairs are the same on the graphic organizer while students record on their page.
    a. **Note:** Some of the ways the parents-offspring pairs are the same may include the following: they all have two eyes, two ears, a large nose, toes, nails. Not pictured but possible answers: they all have teeth or four legs.

5. Return to the classroom size graphic organizer and explain that even though they are all dogs, they do not look the same. Each puppy resembles their mother, but both parent-offspring pairs are different from each other.
    a. **Ask**: How are the dogs in both pictures different?

6. Allow students time to think, and then ask them to share one way they are different. Record at least three ways the dog pairs are different on the graphic organizer while students record on their page.
    a. **Note:** Some of the ways the parents-offspring pairs differ may include the following: color of their fur, long hair vs. short hair, shape of their ears, color of their eyes, color of their nose.

7. Explain to the students that even though they have similar things in common, they are very different, but you can notice that the puppies are very similar to their moms.
    a. **Ask:** Are the puppies exactly the same as their mom? How do you know? Do you think all four dogs are related?

8. After discussion with students, have them work with a partner or group to discuss a different parent and offspring and notice similarities and differences using **Similar and Different Cats** page in their **Scientist's Notebook.** Remind the students to use the picture of the cat with her kittens to help them explain their answers to the questions.

9. Lead a discussion to review student answers.

Name: _____

How Are They Similar and Different?

white	fur	similar
		different ✖
brown	legs	similar
		different
	ears	similar
		different
		similar
		different

Do you think the dogs are related? Yes or No

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Similar and Different Cats

cat	kittens	
fur		similar
		different
legs		similar
		different
ears		similar
		different
		similar
		different

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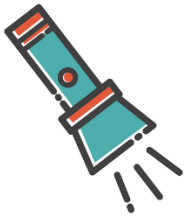
Do you think the cats are related? Yes or No

Strand One: Elaborate



Remember: This session extends students' conceptual understanding through opportunities for students to apply knowledge, skills, and abilities. Through new experiences, the learners transfer what they have learned and develop broader and deeper understanding of concepts about the contextual situation and refine their skills and abilities.

Objectives

I can list of the inherited traits of humans, plants, and animals that I see.
I can compare and identify patterns of traits.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Make observations (first hand or from media) to construct an evidence-based account for natural phenomena.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- **Inherited Traits** PowerPoint

For each student:

- **Scientist's Notebook**

Preparation

- Preview the **Inherited Traits** PowerPoint before the session.

Assessment

Students will observe and identify traits common within a parent and its offspring. Students will work with a partner to independently investigate the traits of humans, animals, and plants.

Vocabulary

- inherit
- traits

Elaborate Activity

1. Use the **Inherited Traits** PowerPoint to guide the session. Explain to students that this activity explains why offspring are similar to, but not exactly like their parents.

2. Begin the presentation by explaining **slide 1** through **3**. These slides define inherited traits.

3. Direct students to the **Human Trait Examples** page in the **Scientist's Notebook** and review **slide 4.**
    a. **Note:** The four examples in the **Scientist's Notebook** are only examples, as there are many traits of humans.
    b. **Ask:** What other traits do humans have that are not listed?

4. Advance to **slide 5**. Begin to compare the traits of two humans. **Slide 6** will help you explore four traits.
    a. **Ask:** Are traits exact? Are they all similar?

5. Repeat the previous steps for animals and plants, using the PowerPoint slides and the **Scientist's Notebook**.

6. Place the three large comparison posters in different locations of the room.

7. With a partner, direct students to visit each station to compare the traits of humans, plants, and animals using the **Traits Checklists** page found in their **Scientist's Notebook**.
    a. **Note:** You will notice each checklist contains a blank criteria field. Allow students to select one criteria for each station independently.

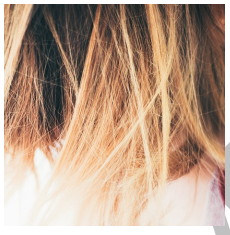
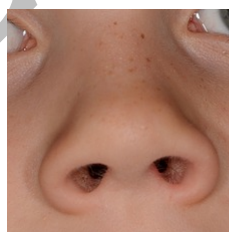
8. During this activity, students will list the traits they observe in the pictures. In the PowerPoint, students will be directed to put a checkmark next to the traits that both students have listed, and circle any traits that are unique to their list. For each picture in the slide show, students should first work independently and then pair up with a different student.

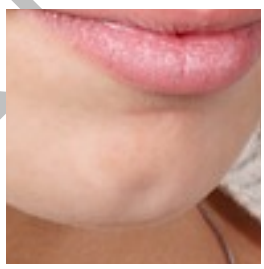
9. Review the first few slides of the PowerPoint. Explain to students that living things get their traits (observable features) from their parents. There are always slight differences between offspring and parents because no two living things have the exact same DNA (unless we are talking about identical twins).

10. At the end, or during the activity, revisit the class chart of the driving question and add any observations or questions that the students share.

Human Trait Examples

eye	hair	skin	nose
			

shape	texture	color	size
			

dimples	cleft chin	roll tongue
		

left handed	right handed	earlobe
		

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Name: _____

Human Traits Checklist

What traits are similar and different?

Person #1	Person #2	
eye color		similar
		different
hair texture		similar
		different
height		similar
		different
		similar
		different

Are their traits exactly alike? Yes or No

What patterns do you notice?

Strand Two: Introduction

1. Structure, Function, and Information Processing		
Students who demonstrate understanding can: **1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring.)		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2) --- *Connections to Nature of Science* **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world. (1-LS1-2)	**LS1.B: Growth and Development of Organisms** • Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2)	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2)

Common Core State Standards Connections:

ELA/Literacy

RI.1.1 Ask and answer questions about key details in a text. (1-LS1-2)

RI.1.2 Identify the main topic and retell key details of a text. (1-LS1-2)

RI.1.10 With prompting and support, read informational texts appropriately complex for grade. (1-LS1-2)

Mathematics

1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results or comparisons with the symbols >, =, and <. (1-LS1-2)

1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two digit-numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1-LS1-2)

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than a number, without having to count; explain the reasoning used. (1-LS2-1)

1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (1-LS1-2)

Concepts

- identifying patterns in behavior of parents to help their offspring survive.

Standards Progression

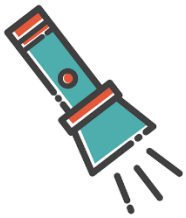
The NYS Science Learning Standards are a progression of core ideas that are introduced and elaborated upon throughout the grade levels. The standards for this grade level are detailed above.

Students will interact with these core ideas again in grades 3 and 4.

Strand Summary

In this strand, this session will focus on helping students realize how parents perform certain behaviors to help their offspring survive. Students will be observing an ant farm and behaviors they notice. They will explore how the behaviors of animals and plants that help them survive and grow by reading texts and listening to video clips. The students will also learn more about external body parts and their functions using the ants as an example. The focus of the strand is on the Driving Question: What are some ways plants and animals meet their needs so that they can survive, grow and reproduce? The Engineering Design Challenge Assessment has students has students using their new knowledge of plant and animal behavior, including the functions of external body parts to design and build a model of a device that solves a human problem.

Strand Two: Engage



Remember: This session initiates the learning tasks. The activities (1) activate prior knowledge and make connections between past and present learning experiences, and (2) anticipate activities and focus students' thinking on the learning outcomes of current activities. The learner should become mentally engaged in the concepts, practices, abilities, and skills of the curriculum unit.

Objectives

I can help build and start an ant farm.
I can make and record observations of ant behavior.
I can make and record observations of an ant colony.

Science and Engineering Practices

Obtaining, Evaluating and Communicating Information

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- ant farm
- 10 hand lenses
- **Daily Ant Fun Fact** sheets

For each student:

- **Scientist's Notebook**

Preparation

- Preview the directions to start the ant farm provided in the kit materials.
- To populate your live ant farm, **be sure you have filled out and sent in your live ant order form**. The ants that will be sent are nonbreeding worker ants. If you prefer, you can populate the ant farm with ants from your neighborhood.
- Prepare **Daily Ant Fun Facts**. There are a total of ten facts.

Assessment

Students will complete the **What I See** sheet in their **Scientist's Notebook.** Students will observe and sketch the ant colony and an ant.

Vocabulary

- observation
- behavior
- colony

Engage Activity

1. Announce to the class that they will build a class ant colony and study how ants live to meet their needs. Share that, daily, the class will hear a **Daily Ant Fun Fact** so that students can learn some interesting facts about ants. Share the **Daily Ant Fun Fact**.
    a. **Daily Ant Fun Facts** are provided and should be read every day to help build ant schema. Daily Ant Fun Facts are numbered and should be read in order.
    b. **Note:** It is not critical that students memorize ant facts or content. The purpose of this strand is to instill in students that parent and offspring live together and behave in ways that meet their needs.

2. Unpack the materials from the ant farm and review the instructions to start the ant farm with your students. There may be directions for different versions of ant farm, so be sure to read the directions for the correct ant habitat provided with this kit.
    a. **Caution**: Never handle or touch the ants directly. They can bite or sting to defend themselves if they feel threatened. Never mix ants from different locations or colonies. Never overfeed your ants. Never leave your live ant habitat in direct sunlight or near other sources of heat, such as a lamp or heater. Keep your ant habitat in a quiet place. Don't shake or tilt it. Treat your ants with respect.

3. When you have completed the set-up of the live ant farm, begin making observations with your students. You can use a hand lens or just observe the general patterns in their behavior. Ant farms are a good example of community cooperation. You may notice that some ants like to lead, while others prefer to follow.
    a. **Note:** It may take some time for your ants to become active.

4. Ask students to open their **Scientist's Notebook** to the **What I See** page and create a sketch of the current view of the ant colony and an ant.

Encourage the use of magnifying glasses to make observations of ants. Students will have time to observe and complete their ant sketch in the following session.

a. **Ask**: What do you notice? What do you wonder?
b. **Note**: You may want to explain to students that a sketch is a helpful way to document observations. Typically sketches resemble what is seen and take less time to create because they are not as artful as drawings or paintings.

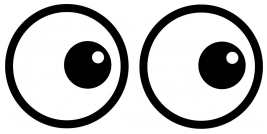
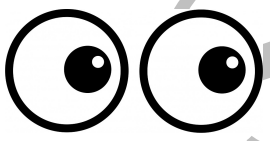
5. Create a list of student "wonders" on the board.

6. Revisit the classroom wonder list daily to add student observations and use this information to focus instruction around your student's questions.

Name: _____

What I See

Create a sketch of colony. Create a sketch of ant. Use a hand lens.

What I See . . .  **The Ant Colony**	
What I See . . .  **An Ant**	

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What do you wonder about ants?

Daily Ant Fun Fact

#1: Ants live in groups called colonies.

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#2: Scientists know that ants actually teach their offspring how to work in the colony. Ants are taught to perform jobs within their colony, like workers, foragers, and soldiers.

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#3: Male ants are called "drones" and female ants are called "queens".

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#4: Ants have an exoskeleton. That means their skeleton is on the outside of their body.

Source: https://en.wikipedia.org/wiki/Ant

Daily Any Fun fact

#5: Ants have two "antennae" on their head. Ants use these to feel their environment.

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#6: Ants have five eyes, two large eyes plus three small eyes.

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#7: Male ants usually live a few weeks. Queen ants can live up to 30 years!

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#8: Ants identify their family by their scent.

Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#9: Ants have mandibles, jaws, that help them carry, move, and make things.

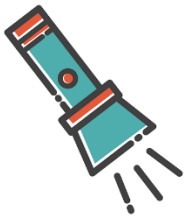
Source: https://en.wikipedia.org/wiki/Ant

Daily Ant Fun Fact

#10: You can find ants in every part of the world, except Antarctica.

Source: https://en.wikipedia.org/wiki/Ant

Strand Two: Explore



Remember: This phase provides students with a common base of experiences within which they identify and begin developing concepts, practices, abilities, and skills. Students actively explore the contextual situation through investigations, reading, web searches, and discourse with peers.

Objectives

I can see how parents of different animals behave so that their babies stay safe and grow.
I can observe plant behaviors that help them survive and grow.
I can write a sentence that describes how my parent takes care of me.

Science and Engineering Practices

Obtaining, Evaluating and Communicating Information

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- **Parent and Offspring** anchor chart
- **Daily Ant Fun Fact** sheets
- *How Animal Babies Stay Safe* by Mary Ann Fraser
- Puppy Whines for Momma video: https://www.youtube.com/watch?v=BIGdC7p29Pg
- Bald Eagle Feeding its Babies video: https://www.youtube.com/watch?v=_iQHcx0SLNo
- Mother Elephant Protects Calf from Tourists video: https://www.youtube.com/watch?v=6mtKGvrlZ4c
- Cardinals Feeding Baby Birds video: https://www.youtube.com/watch?v=1tWLDhJ6mjQ&t=37s
- Life - Venus Flytraps: Jaws of Death video: https://www.youtube.com/watch?v=O7eQKSf0LmY

- Tomato Plants Turning Toward the Sun Timelapse video: https://www.youtube.com/watch?v=j-dZ3VKjJEw
- Animal Ant Teamwork video: https://www.youtube.com/watch?v=c7gF3hDoUqk
- Army of Ants Working Together video: https://www.youtube.com/watch?v=b79ngWcOTIo

For each student:

- **Scientist's Notebook**

Preparation

- Read the book ahead of time to be familiar with the content.
- Preview and cue up the video links before the session.

Assessment

Students will create a drawing that shows how an ant takes care of others.
Students will create a sentence stating how they are taken care of by a parent.

Vocabulary

- parent
- offspring
- behavior
- instinct
- camouflage
- predator
- survive

Explore Activity

1. Share the **Daily Ant Fun Fact** with students. Continue to share **Daily Ant Fun Facts** for the duration of the strand. You may want to share two per day depending on your timing of the strand.
    a. **Ask:** How do you think ants take care of their offspring? Students may infer information from the **Daily Ant Fun Fact**, stating that ants are teachers so that their offspring learn behaviors that help the colony thrive.
    b. **Ask:** How do your parents take care of you?

2. Read the book, *How Animal Babies Stay Safe* by Mary Ann Fraser, as a read aloud for the class. Do not read page 32; you will engage students with this page in the next session.
    a. Use read aloud strategies such as book preview, predictions based

on the table of contents, picture walk of the illustrations, gathering background knowledge on the topic, etc.

3. Explain to students that they are going to watch several video clips on animal and plant behaviors. Turn to page 10 in the book and reread the sentence about puppies. Show the video segment *Puppy Whines for Momma*.
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

4. Turn to page 11 in the book and reread the sentence about eagle chicks. Show the video segment *Bald Eagle Feeding Its Babies*. After watching the video, discuss with students if there is any information to add to the class chart.
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

5. Turn to page 27 in the book and reread the sentences about elephant behaviors. Show the video segment *Mother Elephant Protects Calf from Tourists.*
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

6. Turn to page 30-31 in the book and reread the pages. Show the video segment *Cardinals Feeding Baby Birds*.
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

7. Explain to students that plants can behave in certain ways that help them survive, grow, and reproduce. Some plants that live in very dry areas – like cacti – have different shapes that allow them to store water in order to survive. Some plants – like maple trees – drop their leaves in the fall in order to survive very cold winters. Some plants will even eat insects for food. Show the video segment *Life - Venus Flytraps: Jaws of Death*.
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

8. Explain to students that most plants grow toward the sun. You can observe this behavior over time by looking at the direction that plants face in a window. Show the video segment *Tomato Plants Turning Towards the Sun*.
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

9. Turn to ants now.
    a. **Ask:** Has anyone observed our ants taking care of each other?

10. Explain to students even ants can behave in certain ways that help them survive, grow, and reproduce. Show the video segments *Animal Ant Teamwork* and *Army of Ants Working Together*.
    a. **Ask:** How did these animals take care of their offspring?
    b. Add responses to the **Parents and Offspring** anchor chart.

11. Direct students to the **Ant Behaviors** sheet in their **Scientist's Notebook**. Instruct students to draw a picture of how ants take care of their offspring so their colony thrives. Then instruct students to draft a short sentence that states how their parents take care of them.

12. Debrief drawings and sentences with the class.

Parent and Offspring

How do parents care for their offspring?

dogs	
eagles	
elephants	
cardinals	
Venus flytraps	
tomato plants	
ants	

Name: _____

Ant Behaviors

Draw a picture that shows how an ant may keep its offspring alive.

How do your parents keep you alive? Write a sentence.

1. _____

_____

Strand Two: Explain

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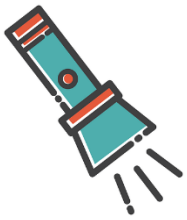


Remember: This phase focuses on developing an explanation for the activities and situations students have been exploring. They verbalize their understanding of the concepts and practices. The teacher introduces formal labels, definitions, and explanations for concepts, practices, skills, and abilities.

Objectives

I can explain what behaviors parents demonstrate to help their young survive.

Science and Engineering Practices

Obtaining, Evaluating and Communicating Information

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- *How Animal Babies Stay Safe* by Mary Ann Fraser
- **Daily Ant Fun Fact** sheets

For each student:

- **Scientist's Notebook**

Preparation

- Preview the ending activity and help students identify an example, if required. Encourage students to choose an example that interests them.

Assessment

Students will identify their favorite animal from the book or Internet and describe how the parent keeps their young safe in their **Scientist's Notebook**. Students will also draft a sentence that describes their drawing.

Vocabulary

- parent
- offspring
- behavior
- survive
- predator
- instinct
- camouflage

Explain Activity

1. At this point, the class ant farm should be quite active. Instruct students to create another sketch of the ant farm on the **What I See** sheet in the **Scientist's Notebook**.

2. Begin the session by sharing a **Daily Ant Fun Fact**.

3. Re-read the book *How Animal Babies Stay Safe* by Mary Ann Fraser.

4. Turn to page 32 in the book. Read the sentences about 'Beaver Babies'.
   a. **Ask**: What do you live in, and how does it keep you safe?

5. Read the sentence about 'A Baby Chimpanzee'.
   a. **Ask**: How do you stay near your parents when you go places with them?

6. Read the sentence about 'A Baby Opossum'.
   a. **Ask**: When you travel, how do you stay safe?

7. Read the sentence about 'Mara Babies'.
   a. **Ask**: When your parents must leave, who takes care of you?

8. Read the sentence about 'Mountain Goats'.
   a. **Ask**: How do your parents warn you about a dangerous situation? Can you think of some more ways you stay safe?

9. Relate their new learning to any of their ant observations.
   a. **Ask:** How might ants keep their young safe? How are the ants keeping the community safe?

10. Ask students to open their **Scientist's Notebook** to the **Parent Behaviors** page and complete the activity using their favorite animal from the book or videos from the Explore session to describe how the parents behaved in order to keep their young safe. Then instruct students to draft a sentence

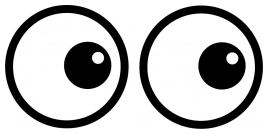
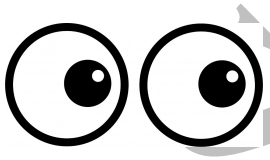
that describes their drawing.

11. Debrief student drawings and sentences with the class.

Name: _____

What I See

Create a sketch of colony. Create a sketch of ant. Use a hand lens.

What I See . . .  **The Ant Colony**	
What I See . . .  **An Ant**	

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Name: _____

Parent Behaviors

Draw a picture that shows how an animal may keep their offspring alive.

Write a sentence that describes your drawing.

1. _____

_____

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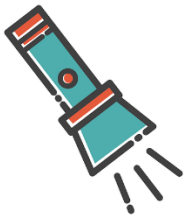
Strand Two: Elaborate



Remember: This session extends students' conceptual understanding through opportunities for students to apply knowledge, skills, and abilities. Through new experiences, the learners transfer what they have learned and develop broader and deeper understanding of concepts about the contextual situation and refine their skills and abilities.

Objectives

I can label the body parts of an ant and observe how ants use their body parts.
I can state ways ants use their body parts to survive and thrive in the colony.

Science and Engineering Practices

Obtaining, Evaluating and Communicating Information

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Materials

For the class:

- **Body Parts of the Ant** poster

For each student:

- **Scientist's Notebook**

Preparation

- Preview the names and functions for each of the ant body parts.
- Display the **Body Parts of the Ant** poster.

Assessment

Students will label the body parts of an ant in their **Scientist's Notebook**.

Vocabulary

(Please note these words do not appear in the glossary.)

- abdomen
- antennae
- claws
- eyes
- head
- legs
- mandibles
- thorax

Elaborate Activity

1. Direct students to gather around the ant farm and observe more ant behavior.
    a. **Ask**: Can you see that the ants are made up of different body parts? Does anyone know the actual names of those parts? Can anyone tell me by looking at the ant farm what one of the ant's body parts does?

2. Explain to students that they are going to learn the scientific names of the different body parts of the ant and discuss what each body part does.

3. Reference the **Body Parts of the Ant** poster and direct students to open their **Scientist's Notebook** to the corresponding page and look at the diagram of an ant.

4. Teach students the pronunciation and names for the different body parts of an ant. Explain the function of each body part using the information on the chart below.

Head	
antennae	used to smell, touch, feel, and communicate with other ants
mandible	jaw like used for cutting, holding, fighting, and digging
eyes	used to see movement
Thorax	
legs	six legs: three on each side are attached to the thorax to move around
claws	used to grip onto surfaces
Abdomen	
abdomen	contains the ant's organs

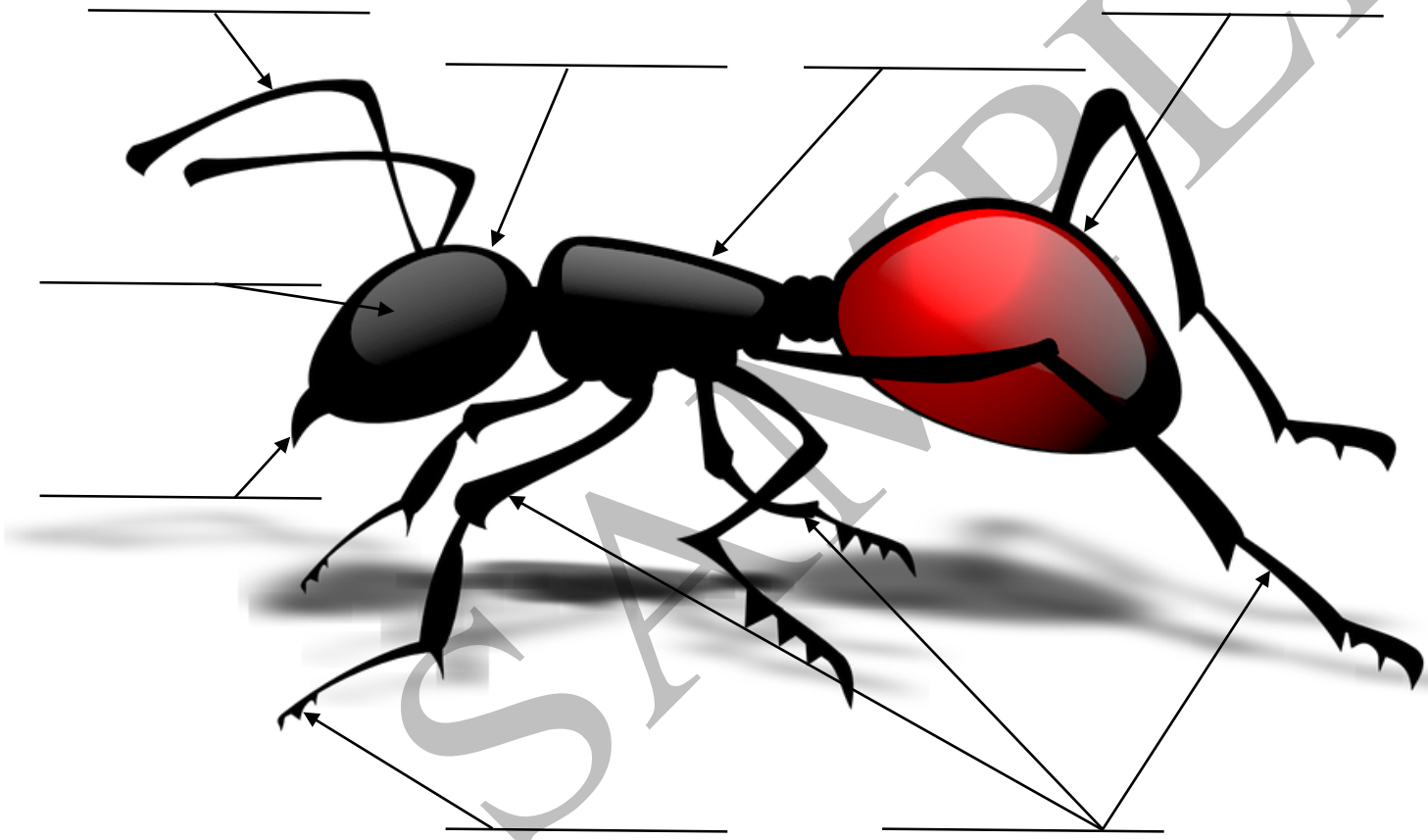
5. Have students label the main body parts on the ant diagram in their **Scientist's Notebook** on the **Body Parts of the Ant** page. See the example of completed diagram for reference.

6. Explain to students that some animals use their body parts to help protect and feed their young. In the next session, you will assess students' understanding of the behavior of parents and offspring that help their young survive.

7. Discuss the body parts of the ant.
    a. **Ask:** Do ants parts and human parts have anything in common? How can ants use their body parts to help them thrive in their colony?

Name: _____

Body Parts of the Ant



legs

claws

eyes

head

thorax

abdomen

antennae

mandible

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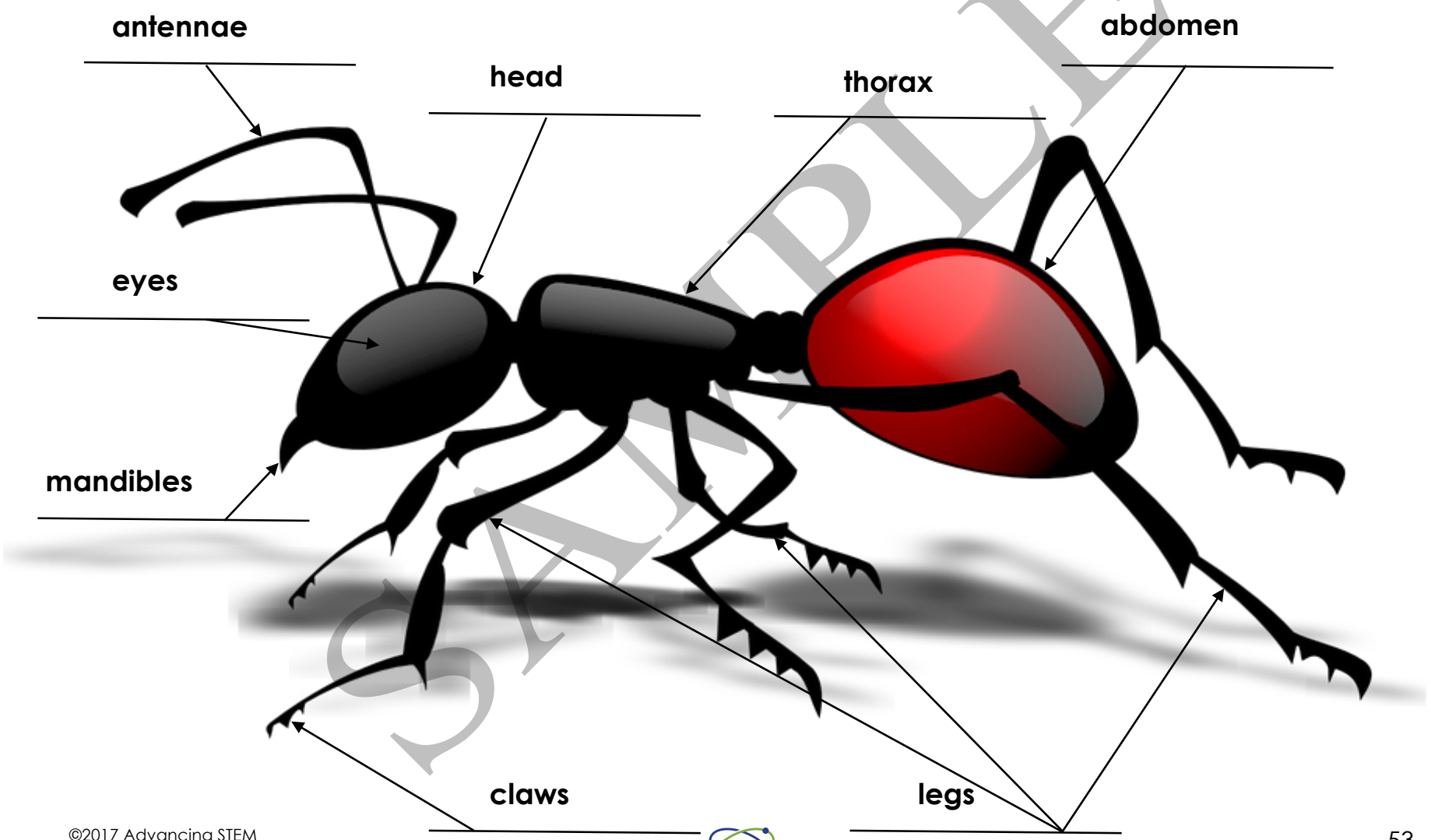
Body Parts of the Ant

(answer key)



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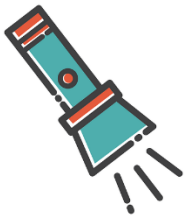
Strand Two: Evaluate



Remember: This phase emphasizes students assessing their understanding and abilities and provides opportunities for teachers to evaluate students' understanding of concepts and development of goals identified in learning outcomes.

Objectives

I can describe the behaviors of ants and another animal.
I can identify patterns in behaviors of ants and another animal.

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Materials

For each student:

- **Scientist's Notebook**

Preparation

- None

Assessment

Students will compare the behaviors of ants and another animal and identify patterns between them. They will answer the question: How do these animals survive and thrive?

Vocabulary

- parent
- offspring
- behavior
- survive

Evaluate Activity

1. Direct students to the **Parent Behaviors** sheet in their **Scientist's Notebook**. Assemble groups of students who created a drawing of the same animal. Direct students to select a partner within that group so that pairs of students have the same animal.
    a. **Ask:** What were ways your animal kept their offspring safe? Were there other ways too?

2. Direct students to their diagram of the ant they labeled.
    a. **Ask:** Wat were ways ants kept each other safe?

3. Explain to students that in this session they will work with a partner to compare how ants and another animal keep their offspring safe and able to survive in the environment. Direct students to the **Ant and Animal Behaviors Checklist** sheet in their **Scientist's Notebook**.

4. Debrief the sheet with students to ensure they understand the criteria: find food, stay safe, use body parts, and live with others. Remind students that they are to either sketch or write how ants and another animal behave in each of those criteria. Students are then to identify if their behaviors are similar or different by placing a check mark in the appropriate box.

5. Debrief their work.
    a. **Ask**: What patterns do you notice? Are ants and your animal similar in any way? How so?

6. Allow students to sketch the status of the ant farm one more time.
    a. **Ask:** How did our ant farm change over time? Why? Did our ants survive and thrive? How so? Why?

Name: _____

Ant and Animal Behaviors Checklist

What behaviors are similar and different?

Ant Behaviors	Animal Behaviors	
find food		similar / different
stay safe		similar / different
use body parts		similar / different
live with others		similar / different

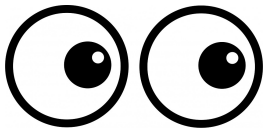
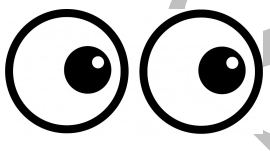
Are their behaviors similar? Yes or No

What patterns do you notice?

Name: _____

What I See

Create a sketch of colony. Create a sketch of ant. Use a hand lens.

What I See . . .  **The Ant Colony**	
What I See . . .  **An Ant**	

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Engineering Design Challenge Unit Assessment

1. Structure, Function, and Information Processing		
S Students who demonstrate understanding can: **1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*** [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)	**LS1.A: Structure and Function** • All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1) **LS1.D: Information Processing** • Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)	**Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1) --- *Connections to Engineering, Technology, and Applications of Science* **Influence of Engineering, Technology, and Science on Society and the Natural World** • Every human-made product is designed by applying some knowledge of the natural world and is built by using materials derived from the natural world. (1-LS1-1)

Common Core State Standards Connections

ELA/Literacy

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS1-1)

Mathematics

None

Inquiry Question

What human problem can be solved by mimicking how plants or animals use their external body parts to help them survive?

Challenge

Using any of the materials provided, students will design and build a model of something that can be used to solve a problem that humans experience.

Materials

For the class:

- clay
- tissue paper
- pipe cleaners
- straws
- stocking
- foam sheets
- toothpicks
- craft sticks
- aluminum foil
- fiber fill
- rubber bands
- stick-on eyes
- tape
- glue
- brass fasteners

For each student:

- **Scientist's Notebook**

Preparation

- Display the materials on a table for students to access. Remind students that they should not try to use all of the materials for their model, just the materials that are appropriate.

Vocabulary

- external
- mimicking
- solution
- survive

Assessment Activities

Session 1: Ask

1. In this design challenge, students will use the materials provided to design a model of a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

2. Write the question, what human problem can be solved by mimicking how plants or animals use their external body parts to help them survive? on the board or chart paper.
    a. **Note:** Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; detecting intruders by mimicking eyes and ears.

3. Review the definitions of the vocabulary words: mimicking, solution, external, and survive. If necessary, give some examples of external body parts of plants and animals.

4. Ask students to open their **Scientist's Notebooks** and to the **Engineering Design Process: Ask** page. Read the question aloud and give students a few minutes to think about their response.

5. Explain to students that this design challenge is seeking to solve a problem that humans experience. Encourage them to think about what they wondered earlier in the unit, what they learned and how to apply that learning to solve a problem.
    a. **Note:** If the students are having difficulty with the question, a great example to share is the invention of Velcro. Many sneakers use Velcro to fasten them together vs. shoelaces. Shoelaces can easily come loose and most young children have trouble tying knots, so using Velcro as a fastener was an obvious solution to this problem. Parents and caregivers no longer have to stop what they are doing to tie shoelaces for their young. Children are now able to put footwear on themselves. Elderly people also benefit from Velcro fasteners. Velcro was invented by Swiss electrical engineer George de Mestral. The idea came to him in 1941, when he went for a walk in the woods. He noticed that burrs stuck to his pants and to the fur of his dog, and he wondered if that kind of attachment could be turned into something useful. He patented his idea in 1955 and subsequently refined and developed its practical manufacture until its commercial introduction in the late 1950's. The fastener consisted of two components: a lineal fabric strip with tiny hooks that could connect with another fabric strip with smaller loops, attaching temporarily, until pulled apart. The first model was made of cotton. As different materials were tested and the design improved, the product was finally made from nylon and polyester.

6. Explain to the students that this example shows how an idea that came from observing what happens in nature turned into a solution for humans, and the design was improved by changing the material from cotton to nylon and polyester. Have the students look for an example of Velcro in your classroom to show students how it fastens together, and pulls apart.

Session 2: Imagine

1. Explain to students that they are going to design and build a model of a solution. The model will help other people understand their solution when they present their idea during the Create phase.

2. Ask students to open their **Scientist's Notebooks** and turn to the **Engineering Design Process: Imagine** page. Have students complete the page by answering the questions in the bubble using words and/or pictures.
    a. **Note:** In this initial design phase, do not discourage any ideas that the students have. This is a time for them to be creative.

3. You may choose to have students work independently or in pairs.

Session 3: Plan

1. Ask students to open their **Scientist's Notebooks** and turn to the **Engineering Design Process: Plan 1** page.

2. Give students 3-5 minutes to explore the materials table for this challenge.

3. Direct students to circle the materials that they will use to create their model. Remind the students that they should not use all of the materials, only the materials that are appropriate for their design.

4. Direct students to draw or describe their design solutions in their **Scientist's Notebooks** on the **Engineering Design Process: Plan 2** page in the space provided.
    a. **Ask**: Why is it important to make a plan?

5. Encourage students to discuss their plans and material choices with a partner, before they create their model. Give students time to revise their plans, if needed.

Session 4: Create

1. Ask students to review with their partner the plan on the **Engineering Design Process: Plan 1 & 2** pages in their **Scientist's Notebook.**
2. Allow students time to create their collaborative design idea. Circulate the room helping students when needed.

3. When everyone has finished, have students present the problem that they chose to solve and describe and explain their solution using the models that they created.

4. Allow students to ask questions and give feedback on the class solutions.

Session 5: Improve

1. Ask students to open their **Scientist's Notebooks** and turn to the **Engineering Design Process: Improve** page to complete and discuss as a class when finished.

2. Use the **Engineering Design Assessment Rubric** to assess student's work.

Name: _____

Engineering Design Process: Ask

Ask

What human problem can be solved by mimicking how plants or animals use their external body parts to help them survive?

Name: _____

Engineering Design Process: Imagine

Imagine

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What human problem do you want to solve?
What external part of a plant or animal will help solve this problem?
What will it look like?

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Glossary

behavior	the way in which an animal or person acts in response to a particular situation
camouflage	objects that blend in to the background
colony	home to a group of ants
different	not the same as another or each other
exactly	100% the same in every way
external	belonging to or forming the outer surface or structure of something
inherit	a quality, characteristic, obtained genetically from one's parents or ancestors
instinct	an innate, typically fixed pattern of behavior in animals in response to certain stimuli
mimicking	to Imitate, impersonate, or copy something
observation	to notice or look at something
offspring	the product of the reproductive processes of an animal or plant
parent	a person who brings up and cares for another; an animal or plant that is regarded in relation to its offspring
predator	one that preys, destroys, or devours
similar	having characteristics in common
solution	an answer to a problem
survive	to remain alive or in existence
trait	an inherited characteristic
variation	divergence in the structural or functional characteristics of an organism from the species average