

# Adaptation and Survival

## 3<sup>rd</sup> Grade Q2, Unit 3 (part 2)

This activity is suggested to be taught in 3 mini lessons to provide time for students to process and cover unit concepts. Make instructional decisions as needed.

### NGSS/Science Standards:

#### 3-LS3-2 **Heredity: Inheritance and Variation of Traits**

Use evidence to support the explanation that traits can be influenced by the environment. (Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.)

<http://www.nextgenscience.org/3ls3-heredity-inheritance-variation-traits>

#### 3-LS4-2 **Biological Evolution: Unity and Diversity**

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

#### 3-LS4-4 **Biological Evolution: Unity and Diversity**

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.\* [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]

<http://www.nextgenscience.org/3ls4-biological-evolution-unity-diversity>

**Science and Engineering Practices: Construct Explanations Using Evidence** (e.g., observations, patterns) to support an explanation. (3-LS3-2)

**Disciplinary Core Ideas: Variation of Traits:** Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1) The environment also affects the traits that an organism develops. (3-LS3-2)

**Crosscutting Concept: Patterns** (discover connections and patterns among animals. Look for patterns across animals and their habitats. **Compare-Contrast**

**Content Objectives:** Students will learn that living organisms have inherited traits that help them survive. Students will also learn that some traits are acquired due to interaction from the environment.

**Literacy Objective:** Students will observe how the environment and inherited traits affect a living organism's chances of survival. Students will write about their observations and participate in discussions with their peers.

## **Focus Questions:**

**Lesson 1: What traits are specific to plants and animals?**

**Lesson 2: How do traits help plants and animals survive?**

**Lesson 3: How will plants and animals adapt to change to their environment?**

## **Materials**

### **Lesson 1:**

- Mini science Journals, provided on Science Portal
- Adaption and Survival PPT Presentation

#### **Structure and Function Station 1**

- 3 Ziploc baggies (Quart size) (duct tape to secure seam)
- Vegetable ring (about ¼ can per glove to provide enough coverage around students hands)
- Paper towel to dry hands
- Bowl/pan to hold ice water

#### **Structure and Function Station 2**

- Sponge piece, 20-25 toothpicks, flashlight

#### **Structure and Function Station 3**

- Crayons

#### **Structure and Function Station 4**

- 2 plastic gloves,
- 2 thermometers,
- duct tape
- Beaker
- 2 cups/bowls that will hold the gloves
- Ice
- timer

### **Lesson 2:**

- Mini science Journals, provided on Science Portal
- Adaption and Survival PPT Presentation
- Environment Scenario Cards (per partnership or small group)

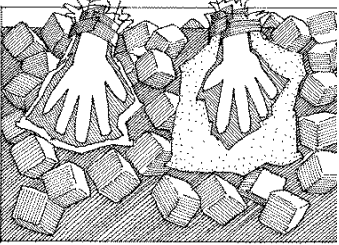
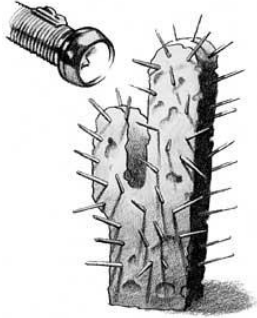

### **Lesson 3**

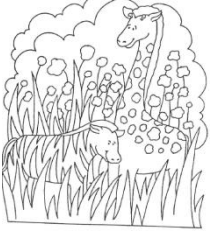
- Science Journals
- Adaption and Survival PPT Presentation
- Inherited and Acquired Cards (per partnership or small group)

Day 1:

**Engage:** Tell students today, they are going to be scientists! But first, you want to review CHAMPS for each station. Students will be working independently in small groups and with partners. (Station 4 will require the most help from teacher).

**Explore:** (approx. 30 min.) Each lab is designed to take approx. 8 minutes. That will provide a 2-3 minute clean-up/group change. Consider taking pictures for Day 2 Debriefing day.

LAB	Directions	Materials
<p>Station 1: blubber</p> 	<p><b>Create Two Gloves:</b></p> <ol style="list-style-type: none"> <li>1. <b>For the first glove</b>, place the vegetable shortening inside one of the zip bags.</li> <li>2. Turn the other zip bag inside out and match the zip sides of the bag to create a pouch to hold shortening.</li> <li>3. Optional: Place duct tape around the zippers to provide extra reinforcement.</li> <li>4. <b>For second glove</b>, use plain Ziploc baggie.</li> </ol> <p><b>Task:</b></p> <ol style="list-style-type: none"> <li>1. Slide one hand in shortening glove</li> <li>2. Slide other hand in the plain glove.</li> <li>3. Place both gloves in the ice water for 45 seconds to 1 minute. Try to keep the top of the bag from going underwater.</li> <li>4. Take hands out of water, remove gloves and dry off with paper towel.</li> </ol>	<p>3 Quart size Ziploc baggies</p> <p>Duct tape to secure seam.</p> <p>Vegetable shortening (about ¼ can per glove to provide enough coverage around students hands)</p> <p>Paper towel to dry hands</p> <p>Bowl/pan to hold ice water</p>
<p>Station 2: Shade/waxy skin</p>  	<p><b>Ahead of time:</b> Cut two sponges of equal size (rectangular is great!).</p> <p>Part 1:</p> <ol style="list-style-type: none"> <li>1. Take the dry sponge and place toothpicks all around.</li> <li>2. Stand it up.</li> <li>3. Shine a flashlight from different angles on the toothpicks.</li> </ol> <p>Part 2:</p> <ol style="list-style-type: none"> <li>1. Thoroughly color the cactus -leaving no white spaces with a crayon (in journal)</li> <li>2. Use a pipette or straw to add 3-5 tiny droplets of water onto the cacti.</li> <li>3. Record Observations</li> </ol>	<p>sponge</p> <p>20-25 toothpicks</p> <p>Flashlight</p> <p>Crayons</p> <p>paper</p> <p>Water</p> <p>pipet or straw</p>

<p>Station 3 Camouflage</p> 	<p>Color the two images, following directions in the mini science journal. Goal is for students to experience colorless vision and how the structure and function of camouflage can help animals survive against predators.</p>	<p>Crayons Mini science journal</p>
<p>Station 4 Size/heat</p> <p>Teacher assistance: Heating water &amp; Pouring into mitten and glove</p>	<p>Lab Safety: Wear Goggles</p> <p>Collect hot water. Record temperature.</p> <p><b>Make a Mitten:</b></p> <ol style="list-style-type: none"> <li>1. Wrap tape around five fingers of one glove to "close" off the fingers. This will be called the "mitten."</li> <li>2. Pour 200 mL of the water into the "mitten."</li> <li>3. Place thermometer inside and tightly close the top of the "mitten" with tape.</li> <li>4. Add a few ice cubes to a bowl or cup and rest the "mitten" on top.</li> </ol> <p><b>Make a Glove:</b></p> <ol style="list-style-type: none"> <li>1. Pour 200 mL of the water into the second glove so that water runs into the finger compartments.</li> <li>2. Place thermometer inside and tightly close the top of this glove with tape so it won't leak.</li> <li>3. Add a few ice cubes to a bowl or cup and rest the glove on top.</li> <li>4. Set timer for 5 minutes. Observe and record temperature for the mitten and glove</li> </ol>	<p>2 thermometers 2 plastic gloves Rubber bands Beaker 2 cups that will hold the gloves when filled with water Ice Duct tape</p>

**Closing:** Lab Clean up, if time complete the reflection questions in mini science journal.

## Day 2: Lab Debriefing Day

**Explain: (approx. 20-25 min)**

**Focus Question: How can traits help plants and animals survive?**

Students will need mini science journals.

**Discussion Points are made in the notes section of the PowerPoint Presentation.** It recommended you

print the PPT (with notes) to use as your facilitation guide or “teacher manual.”

The following vocabulary is included in the presentation.



**Camouflage:** The hiding or disguising of something by covering it up or changing the way it looks.

**Survival:** The act or fact of living or continuing longer than another person or thing.

**Predator:** An animal that lives by killing and eating other animals.

**Prey:** An animal hunted or killed by another animal for food.

**Variation:** A change or difference

### Important Ideas:

- Living organisms possess or inherit traits that adapt them their environments.
- Camouflage can help animals survive longer which means there is a better chance that an animal will reproduce before it dies. Camouflage is inherited from parents and adapts an organism to its environment.
- There can be a variation of inherited traits within the same species, and often times these variations (adaptations) help organisms survive in their environment, which allows for reproduction of that species.

### **Evaluate: (15-20 minutes)**

Most birds have hollow bones to make their bodies light enough to stay in the air. But penguins' have heavy, solid bones that help them float in lower water. On **page 10** in the mini science journal, ask students to finish the chart. This activity will connect the labs and Explain portion of the lesson.

Provide partnerships or small groups a baggie with the *Environment Scenario Cards*.

Ask students to find the 3 environment heading cards: **Tropical Rainforest, Desert, Arctic Tundra**.

Quickly check for understanding of environments:


**Climate** is the long term pattern of weather in a particular area.

**Tropical Rainforest:** Hot, humid, wet, home to many plants and animals


**Desert:** Dry, very little rainfall

**Arctic Tundra:** Cold, wet from snow and ice, strong winds


Climate is the long term pattern of weather in a particular area.



**Arctic Tundra:**  
Cold, wet from snow and ice, strong winds



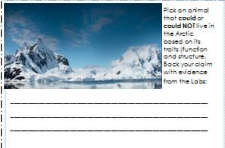
**Desert:**  
Dry, very little rainfall



**Tropical Rainforest:**  
Hot, humid, wet, home to many plants and animals

- Students will place the 3 environment heading cards at the top of their desk or table. They will work together reading the cards that describe different inherited traits of living organisms (plants and animals).
- Groups will need to discuss the traits listed on each card and decide which environment would best fit the organism that is being described.
- The teacher should monitor and ask probing questions as needed. Listen to group discussions to check for understanding.

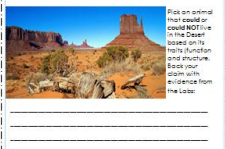
When most or all groups have completed sorting their cards pull the class back together for a group discussion of how groups sorted the cards. Students should be able to explain their reasoning of how they decided which organisms belong to which environment.



Place an animal that **could** or **could NOT** live in the Arctic based on its body function and structure. Back your claim with evidence from the label.

\_\_\_\_\_

\_\_\_\_\_



Place an animal that **could** or **could NOT** live in the Desert based on its body function and structure. Back your claim with evidence from the label.

\_\_\_\_\_

\_\_\_\_\_

**Closing:** Students record, Use student min journals to check for participation and understanding, **page 11** to name an animal that **could** or **could NOT** live in the Desert and Arctic based on its traits. Student s must back their claim with evidence.

Optional Additional Sentence Stem Idea:

- One example of a characteristic of a plant that it uses to survive is \_\_\_\_\_. The characteristic helps by \_\_\_\_\_.

## Day 3

### Elaborate:

Basset Hounds Discussion



Parent                      Puppy

Which statement(s) do you agree with? Be prepared to explain why.

1. The puppy inherited its short legs from his parents.
2. The puppy inherited the ability to fetch a ball from his parents.
3. The puppy acquired its short legs from interacting with the environment.







### Engage: (5-10 minutes)

Display images of Basset Hounds, This activity will connect previous learning of the difference between inherited and acquired traits.

Ask students to observe the adult Basset Hound in photo #1 and compare him to the puppy Basset Hound in image #2. In partnerships, Students can either discuss or you may choose to ask students to "Quick-Write" why they agree or disagree with statements 1-3.

Today we are going to look at inherited traits are different than individual characteristics caused or influenced by the environment. Individual characteristics caused by the environment have not been passed down from a parent. Instead, the organism has to adapt due to a change in its environment (a squirrel becoming thin due to not being able to find nuts and seeds because a drought is preventing trees and plants from developing as they normally would). Explain that camouflage is an inherited trait that, for some plants and animals, has happened over time due to their ancestors adapting to a change in their environment.

### Explore: (15 minutes)

 <p>Kari and her dad ride the waves on surfboards.</p>	 <p>Ben's favorite music is rap.</p>
 <p>His dog can play fetch with a Frisbee.</p>	 <p>I watched an elephant balancing on a ball at the circus.</p>
 <p>The parrot at the pet store can say "hello".</p>	 <p>I can speak English and Spanish.</p>

Print cards with descriptions of inherited traits and learned characteristics for each group. Print eight cards for each group, ideally 4 inherited trait examples and 4 learned characteristics examples. Groups can have the same examples.

### Science Talk:

- Include both plant and animal examples.
- Not all physical characteristics are inherited.
- Not all behaviors are learned. Some behaviors are instinctive, which means behaviors that are not learned, like a cat flipping over in the air when falling.
- Not all ACQUIRED characteristics are learned; an example would be a 'torn ear' which his not inherited, but is not learned either; it is acquired.
- All traits are actually a combination of inherited (Nature) and acquired (Nurture); without the environment you do not have the expression of any trait; for example, without calcium in its environment an organisms cannot create a tooth, even though a tooth is typically thought of as 'inherited'; this may be too complicated for students to understand but teachers need to be aware of it.

Card Answers: [http://rescu.rice.edu/scope/29/teacher\\_guide](http://rescu.rice.edu/scope/29/teacher_guide)



**Explain: (approx. first 10 minutes)**

Watch the awesome video about Lizards living in different vertical spaces how the scientist tested their ability to adapt.

**How did the lizards adapt to change to their environment?**

Additional Resources:

- Information on Environment Changes:
  - <http://ecologyandevolution.cornell.edu/research/environment-sustainability-conservation/environmental-change-biodiversity.cfm>
  - <http://www.cotf.edu/ete/modules/mse/earthsysflr/change.html>
- Information on Camouflage:
  - <http://animals.howstuffworks.com/animal-facts/animal-camouflage.htm>
  - <http://www.boredpanda.com/animal-camouflage/>
  - Elaborate Camouflage Activity: Missing Moths, found in *Critters AIMS* resource.

Extension Ideas:

Design a totally new animal that is also well-adapted for the cold. Make a picture of the animal.

Model it from play-dough and ask students explain the rationale behind the design of their animals and habitats. Does it reflect traits learned from labs?

Build a Kangaroo Rat Burrow Box (see PPT-last slides)

Take a Climate Change Expedition (see PPT-last slides)

Lesson was adapted from:

<http://www.oceanoasis.org/teachersguide/activity8.html>

<http://www.connectionsacademy.com/blog/posts/2013-12-11/Protect-Yourself-from-Arctic-Temperatures-with-This-Blubber-Glove-Activity.aspx>

Camouflage pics

[http://www.huffingtonpost.com/2009/10/11/amazing-camouflage-animal\\_n\\_316008.html?slidenummer=3#slide\\_image](http://www.huffingtonpost.com/2009/10/11/amazing-camouflage-animal_n_316008.html?slidenummer=3#slide_image)

<http://www.dailymail.co.uk/sciencetech/article-1080207/Masters-disguise-Stunning-pictures-tricks->



### 3-LS3-2 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

- 3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Constructing Explanations and Designing Solutions</b> Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.</p> <ul style="list-style-type: none"> <li>Use evidence (e.g., observations, patterns) to support an explanation.</li> </ul>	<p><b>LS3.A: Inheritance of Traits</b></p> <ul style="list-style-type: none"> <li>Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.</li> </ul> <p><b>LS3.B: Variation of Traits</b></p> <ul style="list-style-type: none"> <li>The environment also affects the traits that an organism develops.</li> </ul>	<p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Cause and effect relationships are routinely identified and used to explain change.</li> </ul>

#### Observable features of the student performance by the end of the grade:

1	Articulating the explanation of phenomena						
	a Students identify the given explanation to be supported, including a statement that relates the phenomenon to a scientific idea, including that many inherited traits can be influenced by the environment.						
2	Evidence						
	a Students describe the given evidence that supports the explanation, including: <table border="1" style="width: 100%; margin-left: 20px;"> <tbody> <tr> <td>i.</td> <td>Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, amount of exercise an animal gets, chemicals in the water) that may influence organisms' traits.</td> </tr> <tr> <td>ii.</td> <td>Inherited traits that vary between organisms of the same type (e.g., height or weight of a plant or animal, color or quantity of the flowers).</td> </tr> <tr> <td>iii.</td> <td>Observable inherited traits of organisms in varied environmental conditions</td> </tr> </tbody> </table>	i.	Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, amount of exercise an animal gets, chemicals in the water) that may influence organisms' traits.	ii.	Inherited traits that vary between organisms of the same type (e.g., height or weight of a plant or animal, color or quantity of the flowers).	iii.	Observable inherited traits of organisms in varied environmental conditions
i.	Environmental factors that vary for organisms of the same type (e.g., amount of food, amount of water, amount of exercise an animal gets, chemicals in the water) that may influence organisms' traits.						
ii.	Inherited traits that vary between organisms of the same type (e.g., height or weight of a plant or animal, color or quantity of the flowers).						
iii.	Observable inherited traits of organisms in varied environmental conditions						
3	Reasoning						
	a Students use reasoning to connect the evidence and support an explanation about environmental influences on inherited traits in organisms. In their chain of reasoning, students describe a cause-and-effect relationship between a specific causal environmental factor and its effect of a given variation in a trait (e.g., not enough water produces plants that are shorter and have fewer flowers than plants that had more water available).						

### 3-LS4-2 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- 3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

#### Science and Engineering Practices

##### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to construct an explanation.

#### Disciplinary Core Ideas

##### LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

#### Crosscutting Concepts

##### Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

### Observable features of the student performance by the end of the grade:

1	Articulating the explanation of phenomena
a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
b	Students use evidence and reasoning to construct an explanation for the phenomenon.
2	Evidence
a	Students describe the given evidence necessary for the explanation, including: <ol style="list-style-type: none"> <li>A given characteristic of a species (e.g., thorns on a plant, camouflage of an animal, the coloration of moths).</li> <li>The patterns of variation of a given characteristic among individuals in a species (e.g., longer or shorter thorns on individual plants, dark or light coloration of animals).</li> <li>Potential benefits of a given variation of the characteristic (e.g., the light coloration of some moths makes them difficult to see on the bark of a tree).</li> </ol>
3	Reasoning
a	Students use reasoning to logically connect the evidence to support the explanation for the phenomenon. Students describe a chain of reasoning that includes: <ol style="list-style-type: none"> <li>That certain variations in characteristics make it harder or easier for an animal to survive, find mates, and reproduce (e.g., longer thorns prevent predators more effectively and increase the likelihood of survival; light coloration of some moths provides camouflage in certain environments, making it more likely that they will live long enough to be able to mate and reproduce).</li> <li>That the characteristics that make it easier for some organisms to survive, find mates, and reproduce give those organisms an advantage over other organisms of the same species that don't have those traits.</li> <li>That there can be a cause-and-effect relationship between a specific variation in a characteristic (e.g., longer thorns, coloration of moths) and its effect on the ability of the individual organism to survive and reproduce (e.g., plants with longer thorns are less likely to be eaten, darker moths are less likely to be seen and eaten on dark trees).</li> </ol>

### 3-LS4-3 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- 3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<b>Engaging in Argument from Evidence</b> Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). <ul style="list-style-type: none"> <li>Construct an argument with evidence.</li> </ul>	<b>LS4.C: Adaptation</b> <ul style="list-style-type: none"> <li>For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.</li> </ul>	<b>Cause and Effect</b> <ul style="list-style-type: none"> <li>Cause and effect relationships are routinely identified and used to explain change.</li> </ul>

#### Observable features of the student performance by the end of the grade:

1	Supported claims
	a Students make a claim to be supported about a phenomenon. In their claim, students include the idea that in a particular habitat, some organisms can survive well, some can survive less well, and some cannot survive at all.
2	Identifying scientific evidence
	a Students describe the given evidence necessary for supporting the claim, including: <ol style="list-style-type: none"> <li>Characteristics of a given particular environment (e.g., soft earth, trees and shrubs, seasonal flowering plants).</li> <li>Characteristics of a particular organism (e.g., plants with long, sharp leaves; rabbit coloration).</li> <li>Needs of a particular organism (e.g., shelter from predators, food, water).</li> </ol>
3	Evaluating and critiquing evidence
	a Students evaluate the evidence to determine: <ol style="list-style-type: none"> <li>The characteristics of organisms that might affect survival.</li> <li>The similarities and differences in needs among at least three types of organisms.</li> <li>How and what features of the habitat meet the needs of each of the organisms (i.e., the degree to which a habitat meets the needs of an organism).</li> <li>How and what features of the habitat do not meet the needs of each of the organisms (i.e., the degree to which a habitat does not meet the needs of an organism).</li> </ol>
	b Students evaluate the evidence to determine whether it is relevant to and supports the claim.
	c Students describe whether the given evidence is sufficient to support the claim, and whether additional evidence is needed.
4	Reasoning and synthesis
	a Students use reasoning to construct an argument, connecting the relevant and appropriate evidence to the claim, including describing that any particular environment meets different organisms' needs to different degrees due to the characteristics of that environment and the needs of the organisms. Students describe a chain of reasoning in their argument, including the following cause-and-effect relationships: <ol style="list-style-type: none"> <li>If an environment fully meets the needs of an organism, that organism can survive well within that environment.</li> <li>If an environment partially meets the needs of an organism, that organism can survive less well (e.g., lower survival rate, increased sickness, shorter lifespan) than organisms whose needs are met within that environment.</li> <li>If an environment does not meet the needs of the organism, that organism cannot survive within that environment.</li> <li>Together, the evidence suggests a causal relationship within the system between the characteristics of a habitat and the survival of organisms within it.</li> </ol>

### 3-LS4-4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- 3-LS4-4. **Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.\*** [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Engaging in Argument from Evidence</b> Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.</li> </ul>	<p><b>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</b></p> <ul style="list-style-type: none"> <li>When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. <i>(secondary)</i></li> </ul> <p><b>LS4.D: Biodiversity and Humans</b></p> <ul style="list-style-type: none"> <li>Populations live in a variety of habitats, and change in those habitats affects the organisms living there.</li> </ul>	<p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>A system can be described in terms of its components and their interactions.</li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;"><i>Connections to Engineering, Technology, and Applications of Science</i></p> <p><b>Interdependence of Engineering, Technology, and Science on Society and the Natural World</b></p> <ul style="list-style-type: none"> <li>Knowledge of relevant scientific concepts and research findings is important in engineering.</li> </ul>

#### Observable features of the student performance by the end of the grade:

1	Supported claims
	a Students make a claim about the merit of a given solution to a problem that is caused when the environment changes, which results in changes in the types of plants and animals that live there.
2	Identifying scientific evidence
	a Students describe the given evidence about how the solution meets the given criteria and constraints. This evidence includes:
	i. A system of plants, animals, and a given environment within which they live before the given environmental change occurs.
	ii. A given change in the environment.
	iii. How the change in the given environment causes a problem for the existing plants and animals living within that area.
	iv. The effect of the solution on the plants and animals within the environment.
	v. The resulting changes to plants and animals living within that changed environment, after the solution has been implemented.
3	Evaluating and critiquing evidence
	a Students evaluate the solution to the problem to determine the merit of the solution. Students describe how well the proposed solution meets the given criteria and constraints to reduce the impact of the problem created by the environmental change in the system, including:
	i. How well the proposed solution meets the given criteria and constraints to reduce the impact of the problem created by the environmental change in the system, including:
	1. How the solution makes changes to one part (e.g., a feature of the environment) of the system, affecting the other parts of the system (e.g., plants and animals).
	2. How the solution affects plants and animals.

	b	Students evaluate the evidence to determine whether it is relevant to and supports the claim.
	c	Students describe whether the given evidence is sufficient to support the claim, and whether additional evidence is needed.