

UNIT OVERVIEW

All living things change. Over long periods of time, species must gradually adapt to meet the challenges of their environment or they will not survive. The Adaptations unit helps students explore how and why plants, animals (including humans), and other organisms adapt to their environment. It addresses the difference between physical and behavioral adaptations as well as distinguishing between behaviors that are instinctive and those that are learned.

Certain reading resources are provided at three reading levels within the unit to support differentiated instruction. Other resources are provided as a set, with different titles offered at each reading level. Dots on student resources indicate the reading level as follows:

- low reading level
- middle reading level
- high reading level

THE BIG IDEA

Plants and animals, including humans, have to adapt to changes in the environment. These changes can range from global to microscopic and may include changes in the climate, the population of other species sharing the same habitat, and the availability of essential resources for survival. Physical adaptations are natural occurrences, not deliberate choices. Behavioral adaptations are usually responses to environmental conditions and are not momentary decisions made by individuals. Some adaptations turn out to be successful, and others do not. Only those organisms that adapt successfully survive and pass on their genes to future generations. Many different adaptations are often successful, which has led to incredible diversity in nature.

Organisms are affected by their environment, but they also affect their environment. Over the course of this unit, students may consider the effect that human activity has on nature and how plants and animals have to adapt to changes in ecosystems and environments caused by modern society.

Other topics

This unit also addresses topics such as: how species adapt to extreme environments, plant behavior, animal communication and camouflage, human impact of natural selection, and how dog breeds are designed.

SPARK

The spark is designed to get students thinking about the unit's topics and to generate curiosity and discussion.

Materials

- paper and pencil

**Activity**

Place students in pairs. Have them take turns telling their partner their favorite food without speaking or writing. They may use any other method, which may include drawing the food in the air or on paper, making one's body take on the shape of the food, using sign language, or displaying an image of the food on a computer screen. Give the pairs a few moments to plan how they will communicate with each other.

Invite paired volunteers to attempt the task in front of the class. Encourage the rest of the class to observe the methods used.

Below are questions to spark discussion.

If you could no longer speak, how would you communicate? Why?

If we gradually lost the ability to speak over thousands of years, do you think anything would change about our behavior or our bodies?

How do animals communicate?

Do you think any animals will ever learn to speak?

Why or why not? If so, how?

Use this activity to begin an introductory discussion about adaptations. Explain that organisms adapt as their needs change. But unlike this activity, changes in nature usually happen very slowly—over many thousands or even millions of years—which gives each plant or animal species a long time to adapt to the change. Throughout the unit, students will learn more about adaptations.

Many of the unit's vocabulary terms are related to the spark activity and can be introduced during the spark. For vocabulary work, see the Vocabulary section in this *Unit Guide*.

PRIOR KNOWLEDGE

Invite students to explain their understanding of what it means to adapt and to identify any familiar adaptations. Discuss what would happen to plant and animal species if they did not adapt.

Probing Questions to Think About

Use the following questions to have students begin thinking of what they know about adaptations.



- What is an example of an adaptation?
- What types of things adapt?
- Does an animal or a plant choose to adapt? Explain.
- Do animals learn how to behave from their parents? Explain.
- What kinds of animal adaptations might occur if a new predator began to live in a habitat?
- What kinds of plant adaptations might occur if an area gradually became much drier?
- What kinds of adaptations might occur if there were a change in temperature?
- Are adaptations always successful? Why or why not?

Tell students they will learn more about these topics soon.

UNIT MATERIALS

Each unit provides a wide variety of resources related to the unit topic. Students may read books and other passages, work in groups to complete hands-on experiments and investigations, discuss science ideas as a class, watch videos, complete writing tasks, and take assessments.

Resources are available for printing or projecting, and many student resources are also available for students to access digitally on [Kids A-Z](#).

Selected unit resources are available in more than one language.

For a complete list of materials provided with the unit, see the Adaptations unit page on the Science A–Z website.

VOCABULARY



Use the terms below for vocabulary development throughout the unit. They can be found in boldface in the *Nonfiction Book*, the *Quick Reads*, and/or other unit resources. These terms and definitions are available on *Vocabulary Cards* for student practice. Additional vocabulary lists are provided in the teaching tips for *Investigation Packs* and *FOCUS Books*.

Core Science Terms

These terms are crucial to understanding the unit.

adapt	to change physical features or behaviors of a species in response to changes in the environment
adaptation	a specific change to a physical feature or behavior of a species that helps the species survive
behavior	a way of reacting to a certain set of circumstances
characteristic	a physical feature that helps identify an organism
environment	all of the conditions affecting an organism in a specific area, including plants, animals, water, soil, weather, landforms, and air

extinct	no longer in existence
habitat	the natural conditions and environment in which a plant or animal lives
inherited	passed on from parent to child, as in a physical characteristic
instinct	inherited behavior that leads animals of the same species to act certain ways in certain situations
mutation	a change a living thing is born with that may alter how it grows and what it can do
naturalist	a person who studies plants and animals
organism	a living thing
reflex	a purely automatic response
species	a group of related organisms with characteristics that distinguish them from other groups of organisms

Other Key Science Terms

The following vocabulary is not essential for comprehending the unit but may enrich students' vocabulary.

biome	a community of plants and animals that occupy a specific type of habitat
blowhole	a hole at the top of a whale or dolphin's head, through which it breathes
canopy	the part of a forest where the tops of the trees form a dense layer of foliage
drip tip	a long, pointed tip on a leaf of many rainforest plants that allows water to run off quickly
echolocation	a method of locating objects using sound waves that are reflected back when they strike an object
generation	all the organisms of a species born around the same time; the time between when a group of organisms and their offspring are born
microorganism	a very tiny, microscopic organism
pod	a group of dolphins that live together
predator	an animal that hunts, kills, and eats other animals in order to survive
prey	an animal that a predator hunts and eats

survival of the fittest	a theory explaining that the organisms best suited to live in a particular environment are those most likely to survive
taste buds	small groups of cells on the surface of the tongue that sense taste and report it to the brain

Vocabulary Activities

You may choose to introduce all the terms that will be encountered in the unit before assigning any of the reading components. *Vocabulary Cards* with the key science terms and definitions are provided. Dots on the cards indicate the reading levels of the *Nonfiction Book* or the *Quick Reads* in which each term can be found. If all level dots appear, the term may come from another resource in the unit. Students can use these cards to review and practice the terms in small groups or pairs. The cards can also be used for center activity games such as Concentration.

The *Word Work* activity sheets offer fun puzzles and practice with key vocabulary terms from the unit. For further vocabulary practice and reinforcement, you can choose from the vocabulary *Graphic Organizers*. To build customized vocabulary lessons with terms related to the topic, see **Vocabulary A-Z**.

Students can use the *Word Smart* vocabulary *Graphic Organizer* to organize information on the science terms. You may want to assign each student one to three words to share his or her *Word Smart* knowledge with classmates. Students who have the same word should first compare their *Word Smart* sheets with each other and then report to the larger group.

The science terms can be used in oral practice. Have students use each term in a spoken sentence.

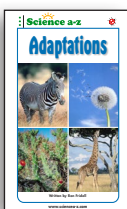
As students read, encourage them to create a science dictionary by recording new vocabulary terms and definitions in their *SAZ Journal*.

BACKGROUND AND MISCONCEPTIONS

Use this section as a resource for more background knowledge on unit content and to clarify the content for students if misconceptions arise. Refer to Using the Internet below for more ways to extend the learning.

Q: *Do organisms adapt intentionally?*

A: No. Organisms do not control how they adapt. Adaptations occur randomly over time and may or may not provide a helpful behavioral or physical change that allows for a successful response to environmental demands. Many adaptations result from mutations that lead to a better chance of survival. An individual organism may exhibit a new behavior due to environmental circumstances—such as a bear eating potato chips because they’re available—but it is not considered an adaptation unless a whole population adopts the behavior.



Q: *Do the bigger, stronger members of a species pass on their traits and replace the smaller, weaker ones? Isn't that what "survival of the fittest" means?*

A: Size and strength do not determine whether an organism passes on its traits. The question is whether traits help an organism survive, given its environmental conditions. Being small and slight in one environment might be advantageous, while being big and strong in a different environment might be equally advantageous. In the phrase "survival of the fittest," *fittest* does not necessarily mean the toughest, strongest, smartest, or fastest. It refers to the plants or animals with the traits best suited to their environment. The fittest often have better rates of survival and better chances of passing on their traits to the next generation. Also, *survival* in this phrase refers to reproductive success, not an individual's lifespan. Organisms with traits that are less well suited to a particular environment might pass on their traits as well, though unsuccessful traits are more likely to get weeded out by natural selection.

Q: *Are mutations harmful or dangerous?*

A: Mutations are natural, random occurrences. Successful mutations allow for better survival. Ineffective mutations sometimes cause an organism to not survive. Movies sometimes depict mutants as monsters, but a mutation is simply a natural change, not necessarily for the worse.

Q: *Did humans cause dinosaurs to become extinct? What about other species?*

A: Despite depictions in cartoons and elsewhere, dinosaurs were extinct long before humans existed. So people could not have been responsible for killing off the dinosaurs. We have, however, caused the extinction of many other species, including China's Yangtze River dolphin, the dodo, the Tasmanian wolf, Stellar's sea cow, the ground sloth, and thousands of other species of plant and animal. These species had no chance to adapt to the changes that people wrought in their environments, including hunting, competing for the same food sources, and forcing species out of their habitats.

Q: *Is all behavior learned?*

A: No. Some behavior is inherited by instinct. Scientists have proven this by studying species forced to live isolated from other members of their species. When they exhibit the same behavior as those living in groups, it becomes clear that they did not learn the behavior.

EXTENSION
ACTIVITIES

Using the Internet

Most search engines will yield many results when the term *adaptation* is paired with an animal (for example, snake adaptation, fish adaptation). You can also search for more on a known adaptation, such as the giraffe's neck. Be aware that some sites may not be educational or intended for the elementary classroom. More specific inquiries are recommended, such as:

- dog instincts
- genetic mutations
- dinosaur extinction
- cat behavior
- insect camouflage
- endangered species of China

Projects and Activities



- **Writing:** For a creative writing project, have students write a science fiction story about human adaptations far into the future. They can supplement it with an art project showing how humans may look or behave someday.
- **Arts:** Discuss the special adaptations of superheroes from comic strips, cartoons, and movies. Are some just exaggerations of real human or other animal characteristics? Then invite students to draw a picture of themselves and add adaptations to turn themselves into a superhero.
- **Arts:** Have students clip pictures from magazines that show animals with interesting physical adaptations. They can glue these onto posterboard to create a collage, or they can make a mobile with pictures on one side and explanations of the adaptations on the other.
- **Project:** Play an adaptation game, making up your own rules. For example, you might have groups of students choose an animal to portray. Then you can announce simulated environmental changes and have students logically adapt their animal based on each change.
- **Project:** Invite students to bring in a stuffed animal and design adaptations for it based on a mock change to its environment.
- **Community Service:** Provide students with opportunities to take part in an effort to protect endangered species.
- **Research:** Help students conduct research to compare how one animal or plant species has adapted to living in two different regions (for example, a desert coyote versus an arctic coyote).
- **Research/Home Connection:** Students can conduct research as a family/home project or in the library/media center to extend the learning about a topic in one of the *Quick Reads* or other unit resources.

