

Adaptation Stations



Grade: 1, 4

Length: 20-30 minutes

Big Ideas: Adaptations

Topic: Adaptations are essential to survival

Summary: Adaptations are important for survival for all living things, even for humans. Living things (plants and animals, including humans) have external features that allow them to survive in a variety of environments. Through experimentation, students will discover how difficult it is to manage simple tasks without the use of their thumbs. They will also learn about some adaptations other animals have that help them survive without thumbs.

Standard 1.2.2 Construct an explanation by observing patterns of external features of living things that survive in different locations. Emphasize how plants and nonhuman animals, found in specific surroundings, share similar physical characteristics. Examples could include that plants living in dry areas are more likely to have thick outer coatings that hold water, animals living in cold locations have longer and thicker fur, or most desert animals are awake at night. (LS1.A, LS1.D)

Science & Engineering Practices	Connection to Classroom Activity
Constructing Explanations: Students construct explanations about the world and design solutions to problems using observations that are consistent with current evidence and scientific principles.	Students will attempt to complete daily tasks that humans use to survive without using their thumbs. They will explain how the absence of an opposable thumb would make it hard to survive and the solutions they found to complete the tasks without their thumbs.
Crosscutting Concepts	Connection to Classroom Activity
Patterns: Students observe patterns to organize and classify factors that influence relationships.	Students will observe patterns of adaptations different animals have in similar and different environments, as well as how the animals use these adaptations.
Disciplinary Core Ideas	Connection to Classroom Activity

<p>Life Sciences: LS1-A - Structure and Function - <i>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</i></p> <p>LS1.D - Information Processing - <i>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.</i></p>	<p>Students will observe and understand that organisms have different physical and behavioral adaptations that help each organism protect themselves, find food, water, space and shelter.</p>
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Standard 4.1.1 Construct an explanation from evidence that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Emphasize how structures support an organism’s survival in its environment and how internal and external structures of plants and animals vary within the same and across multiple Utah environments. Examples of structures could include thorns on a stem to prevent predation or gills on a fish to allow it to breathe underwater. (LS1.A)

<p>Constructing Explanations: Students construct explanations about the world and design solutions to problems using observations that are consistent with current evidence and scientific principles.</p>	<p>Students will attempt to complete daily tasks that humans use to survive without using their thumbs. They will explain how the absence of an opposable thumb would make it hard to survive and the solutions they found to complete the tasks without their thumbs. They will explain the structure and function of the thumb and how it is used by humans to survive in their environment.</p>
<p style="text-align: center;">Crosscutting Concepts</p>	<p style="text-align: center;">Connection to Classroom Activity</p>
<p>Structure and Function: Students relate the shape and structure of an object or living thing to its properties and functions.</p>	<p>Students will observe patterns of adaptations different animals have in similar and different environments, as well as how the animals use these adaptations. Students observe how structures and functions support</p>

	survival.
Disciplinary Core Ideas	Connection to Classroom Activity
Life Sciences: LS1-A - Structure and Function - <i>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.</i>	Students will observe and understand how different structures of adaptations and different functions of those adaptations aid in survival, growth and behavior.

Essential Questions:

- What is an adaptation?
- Why are adaptations important for survival?
- How have animals, including humans, adapted to their surroundings?
- What are the structures and functions of these adaptations?

Enduring Understandings:

- Adaptations are important for animals to survive in their homes or habitats.
- Adaptations are important for survival for all living things, including humans.
- Different animals have different traits to help them survive in their habitats.
- Structure and function of internal and external structures influence how they are used.

Objectives:

Students will...

- Explore the importance of thumbs as an adaptation by completing a task assigned them without the use of their thumbs.
- Identify 3 different animals and their feet adaptations that help them live in their habitat.

Materials:

- 2 jars
 - 1 jar with a closable lid(more than one might be needed if there is a large number of students in a group)
 - 1 jar with no lid for pennies to be dropped into
- 15-20 pennies or other coins
- Play dough or other clay-like substance
- Fork (1 or multiple if you want each student in a group to have one)
- Crayons/writing utensil
- Paper

- Graphics (provided)
 - Mountain cottontail and its adapted feet
 - Desert tortoise and its adapted feet
 - Great horned owl and its adapted feet

Background Information:

Evolution of thumbs: It is suggested that the thumb was evolved in humans about 1 million years ago. There are a handful of other creatures in the world that also have a 5th thumb like digit and others that while they don't have 5 digits, have a digit that is opposable like the thumb. These appendages have a variety of important uses mostly centering on the need to grasp things (for example, many birds have an opposable digit that is important for perching or grabbing and crushing prey). Research suggests that it's possible that grasping and the use of the thumb preceded walking upright (Harcourt-Smith, Aiello, 2004).

Mountain Cottontail: Rabbits are specialized to their environment with many adaptations. One of the more obvious adaptations would be their long, large ears, which are perfect for hearing and detecting predators. Another, which we will focus on in this lesson, are their feet. These are adapted to make them excellent runners which is important for avoiding predators. Their back feet are greatly elongated compared to their front feet and are often also covered in hair to help them grip while they are running. This allows them to easily change direction quickly. Strong claws on all of their toes also assist in gripping the ground when they run.

Desert Tortoise: One of the most noticeable adaptations the tortoise has is its shell which acts as portable shelter and protection from predators and the elements. There are many other adaptations Desert tortoises have to help them live in their climate, and their feet are one of the most important. Their front feet have long, claw-like scales that help them dig. Because they have to regulate their own body temperature, they dig holes to hide in to cool down in the summer and keep warm in the winter. Digging is also important for making nests to protect their eggs. Tortoises have long, strong back legs that help them move.

Great Horned Owl: The list of adaptations owls have is long and varied, but one of the most important are their well-adapted talons. Owls have 4 talons. Two that face forward, one that faces backward, and the 4th one can swivel to face forward *and* backward depending on what they need it for. Often when flying you will see three talons in the front and one in the back. They also generally do this while perching. Sometimes when perching and when capturing and crushing prey, they swivel one of their talons and have two in back and two in front. Since owls don't have teeth they must kill their prey with their feet. Great Horned Owls have a crushing strength of 200-500 pounds per square inch (PSI) in their feet. In comparison, humans only have an average of about 40-50 PSI (Lee, 2006).

Key Vocabulary:

- Thumb: The first digit of the hand

- Adaptation: Is something that helps an animal live in its environment/home
- Opposable: Capable of moving toward and touching the other digits on the same hand

Procedure:

1. Have the students brainstorm some things that humans can do or that they have on their bodies that most other creatures don't have. (i.e.-we wear clothes, we walk on two legs most of our lives, etc.). You can tell them a few as well and eventually end with talking about our thumbs. What is a thumb and why is it important? It's the first digit on our hands and there are so many things that are really to do if we don't have thumbs.
2. Have the students break into 5 small groups and tell them you will be taping their thumbs to their hands so they can't use them. Each group must then complete a task with their taped hands. No cheating and using their thumbs. Below are the different tasks to complete. Each group will only do the one task they are given and at the end the students will discuss the tasks they had to complete. **(If you are doing this at home, give your student(s) one or two of the activities and maybe try one for yourself)**
 - a. Write your name or draw a picture: Give each student in the group a writing utensil (crayons are recommended to make it a little more challenging) and a piece of paper. Have them try to write their name using their taped hands. If they can't write their name, have them draw a simple picture like a dog, cat, flower, etc.
 - b. Put pennies in a jar: Give this group an open jar and a pile of pennies/other coins. Have them take turns trying to pick up a coin and put it in the jar using only their taped hands.
 - c. Open a jar: Have a jar with a lid on it (or multiple jars depending on group size). Have students take turns trying to get the lid off the jar using their taped hands.
 - d. Make something out of clay: Give each student a little play-dough or clay and have them make something using their taped hands. (Use your creativity here. Something simple but not too easy. Some examples might be a star or a doughnut or a snail).
 - e. Use a fork to spear something: You can either have a fork for each student in the group or have one and pass it around. Have some balls of clay or play-dough on the table and have students try to spear these items with the fork using their taped hands.
3. Give each group about 5-7 minutes to complete their task then have everyone un-tape their hands and turn their attention to you. Ask the class how hard or easy it was to complete their task without using their thumbs. Have a volunteer from each group talk about what things they did to try and accomplish their task. Ask if they think it would have been easier or harder without thumbs? Tell students about how thumbs are an adaptation humans have to help them live in their environment/home. You can mention other human things that we do that would be very hard without thumbs (texting, using a video game controller, etc.)

4. Next bring out the graphics of each of the animals. Ask students based on their pictures what adaptations they think these animals have. Then discuss each adaptation described in the background information above. Ask students how they think these animals' lives would be a little more challenging if they didn't have these adaptations. **If you participated with your student, share your challenges and solutions to not having a thumb as well.**
5. As a wrap-up, give each student a piece of paper and something to color with and have them draw something they like to do at home that uses their thumbs.

Citation: Lee, Carol (March 26, 2006). "Powerful feet and talons help birds of prey make their living". *Lubbock Avalanche-Journal*. Retrieved August 29, 2018 from https://en.wikipedia.org/wiki/Great_horned_owl#cite_note-Lubbock-18







