Coat Color and Camouflage

In the animal world, you are the hunter (predator) or the hunted (prey) and sometimes both. In order to escape predators, prey will rely on their adaptations. There are lots of adaptations, but most can be grouped into two categories: behavioral and physical. Physical adaptations are body parts that function to help the organisms to survive. Camouflage, the pattern, coloring, or shape of an animal that helps it to hide or blend in with its environment, is an example of a physical adaptation.

Objectives

- Students will be able to identify and list adaptations of various animals.
- Students will understand the difference between behavioral and physical adaptations.
- Students will construct an argument based on lab simulation that camouflage increases the likelihood of an organism's survival.
- Students will develop an understanding of how horses have adapted coat color overtime to meet their needs, escape predators, and continue those successful traits in their offspring.

Terms

These are terms that should be introduced prior to or during the lesson to provide additional understanding and support:

- domesticated
- species
- breed
- inherited traits
- steppes
- plains

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Kentucky Academic Science Standards

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.

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.

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.

4-LS1-1. Construct an argument that plants, and animals have internal and external structures that function and support survival, growth, behavior, and reproduction.

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Supplies/Resources

- Plain M&M's candies (10 of each color)
  About 2 oz. of candy needed per student group
- Skittles (at least 60 of each color)
  About 2.2 oz. of candy needed per student group
- Plastic snack or sandwich bags
- 1 Paper plate and 1 paper towel for each group
- Timer or stopwatch
- Groups of students (3-4)
- Student information and lab worksheets

Instructions & Teacher Suggestions

1. Sort the M&M candies and place 10 of each color in a plastic bag for each group. These candies will represent the "Chocos" (prey).
2. Sort the Skittles and place 60 of each color in a plastic bag. These will represent the habitats, "The Land of Rainbows." Each group will be given a different colored habitat. They will discover that finding the "Chocos" that are the same color as their habitat will be more difficult. You will notice that there are no blue Skittles (the blue "Chocos" will be easy to find). Purple Skittles and brown M&Ms will look similar.
3. When you are ready to conduct this lab, pour each color of Skittles onto a separate paper plate, one color for each group. Add one bag of M&Ms to each plate and mix. If you intend for students to eat their candies following the lab, you may want to use disposable gloves to sort and mix candies.
4. While the candies will have an "m" or an "s" printed on them, M&Ms and Skittles are generally difficult to tell apart. If time permits, we suggest that you flip the candies over so the letters cannot be seen, or have a student do this for you.
5. Cover each plate with a paper towel so they cannot look for different colors before the time starts.
6. Students groups will have 20 seconds to find each color of "Chocos" (M&Ms) from their plate (environment).
7. Assign students within the group a different color to select when it is their turn to be the "Picky Predator." Others in the group should not offer assistance when it is not their turn.
8. To unify individual groups, allow each group to share their results. Students will see that each group's observations and results are very similar even though their habitats may have been different (colors).
   - Creating a simple bar graph can quantitatively reiterate their findings.
   - This lesson can be used to introduce adaptations or reinforce adaptations, particularly camouflage.

Structures that help organisms survive in their surroundings are called adaptations. Wild animals have adapted to color change over time to help them blend into their environments. All domesticated animals have many different colorations and belong to the same species. You may have owned pets of the same species that have differing colors, such as dogs. Horses have also adapted their coloration over time for survival.

Horses were domesticated (the process of taming an animal and keeping it as a pet or on a farm) around 6,000 years ago, changing the way humans traveled and worked. With the domestication of the horse came the desire for humans to select color in the breed. Horses became images of power and beauty. Kings, noblemen and great conquerors chose stallions of color to express their power and separate themselves from ordinary people.

So, where does a horse's color come from? Inherited traits, characteristics that are passed from the parents to the offspring, are responsible for the different color patterns and markings on a horse. These inherited traits come from genes that give instructions to the cells to make traits. For example, genes tell the cells to produce black or red pigment in the horse's hair. Another gene gives instructions to produce white hairs in distinctive patterns. A single gene can create a color change.

Scientists know that every breed of horse carries the genes for the basic horse coat colors of bay, black, and chestnut.

Humans are not the only ones who have influenced the adaption of coat color over time. Scientists have learned through research that the black coat adapted into a more common color when climate change forced horses in Europe into forests full of predators approximately 11,000 years ago. After our most recent ice age, the climate began to warm resulting in plant life and forest regrowth. This forced many animals who relied on plants found in the ever-disappearing steppes and plains to adapt to new foods and move into forests, where there were predators like wolves, who could hide and attack more easily. Many species became extinct, including a then-abundant mammoth. But horses adapted to their new surroundings. Those horses of darker color where able to camouflage with the darker forests, avoid their predators, and resulted in those darker coat-color genes to be passed on to their offspring. In other words, darker horses were able to blend in with the forest, allowing them to "hide" from their predators in comparison to lighter or even white horses. Because more darker horses survived, they went on to have more offspring like themselves…darker in color.

Common Horse Colors

Bay - Dark to reddish brown coat with black mane, tail, and lower legs.

Chestnut - Dark brownish-red to bright copper coat, mane, and tail. This color may also be called sorrel.

Black - A true black horse will have black hooves and no brown-reddish hair near their eyes and muzzle (nose).

Gray - A gray horse can be born any color, but the hairs will start to gray and may eventually turn white. Gray horses have black skin and dark eyes. A true white horse will have pink skin and light eyes.

More About Adaptations

In the animal world, you are the hunter (predator) or the hunted (prey) and sometimes both. In order to escape predators, prey will rely on their adaptations. There are lots of adaptations, but most can be grouped into two categories: behavioral and physical. Behavioral adaptations are responses or actions that an animal does. Some behavior is instinctive, meaning they inherited the behavior from their parents and are born knowing how to do the action. For example, migration is an instinctive behavioral adaptation. Some behavioral adaptations are learned. These behaviors are learned by watching other animals and repeating their behaviors. An example of this would be a young chimp learning how to find insects using a twig as a tool. Physical adaptations are body parts that function to help the organisms to survive. Camouflage is an example of a physical adaptation. Camouflage is the marking, coloring, or shape of an animal that helps it to hide or blend in with its environment. In the reading selection on the first page you read,

> *But horses adapted to their new surroundings. Those horses of darker color where able to camouflage with the darker forests, avoid their predators, and resulted in those darker coat-color genes to be passed on to their offspring. In other words, darker horses were able to blend in with the forest, allowing them to "hide" from their predators in comparison to lighter or even white horses. Because more darker horses survived, they went on to have more offspring like themselves…darker in color.*

Because darker horses were able to camouflage with the darker forests, this increased their chance of survival and allowed them to go on to produce more offspring just like themselves.

Examples of PHYSICAL Adaptations	Examples of BEHAVIORAL Adaptations
Fish have gills for breathing under water.	Bears hibernate when food is scarce.
Ducks have webbed feet for paddling in water.	Birds migrate to find food in warmer climates.
Birds have hollow bones for flight.	Newborn ducks copy their mother to find food.
Horses have eyes on the sides of their heads to help them see predators.	Horses watch the body movements of others in their herd to react quickly.
Your turn to name two more:	**Your turn to name two more:**

CANDY CAMOUFLAGE CHALLENGE

Let's test how the physical adaptation of camouflage works by conducting a simulation lab.

Instructions:

1. Your teacher will assign your group a plate of mixed candies. Some are M&Ms and some are Skittles.
   PLEASE DO NOT EAT YOUR SIMULATION LAB SUPPLIES!
2. The Skittles represent the environment, the Land of Rainbows. Most of your candies will be one color.
3. The M&Ms represent the animals, the Chocos.
4. Your hands represent the predator, Picky Predators.
5. Picky Predators love the many different colors and taste of Chocos, but anything from the Land of Rainbows make them very sick. So, they avoid eating anything other than Chocos.
6. Picky Predators can use only their pointer finger and thumb to collect the Chocos in the Land of Rainbows.
7. Each team member be assigned a color to collect, and they will have 20 seconds to gather as many Chocos of that color as they can. The paper towel should be placed back on top of the plate after each round.
8. Picky Predators cannot begin hunting until the teacher gives the signal. So be a good Picky Predator…watch, listen, wait, and be ready.
9. Record your "Habitat Color" (color of Skittles your group was assigned): _____
10. Record the number of each Chocos (M&Ms) your group picked:

Red	Blue	Green	Yellow	Orange	Brown

Questions:

A. Which color of Chocos (M&Ms) did your group pick the least of? _____

B. Why do you think these Chocos were picked the least? _____

_____

C. How does this exploration activity show how camouflage works in an animal's habitat?

_____

D. In your own words, describe what camouflage is and the benefits of this adaptation?

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