CORE LESSON: Adaptation Rooms

Objectives and Summary: Students explore the concept of animal adaptation by modeling the benefit of an adaptation in the introduction (teacher led), and by observing and critically reflecting on some common adaptations in the three rotations (HS leader led) following the introduction; students will explore common adaptations found in the skulls, pelts, and tracks of regional animals. The class begins as a group for the introduction, before dividing into 3 smaller groups paired with HS leaders and rotating through 3 adaptation rooms. Teachers can opt to have leaders rotate with the groups, or stay in a specific room for all 3 rotations (recommended).

Background: An adaptation is a physical or behavioral trait developed by a *species* over many generations, via the process of natural selection, which allows members to more successfully survive and thrive in a given *habitat*. Consider some of the following common adaptations that many of your students will be familiar with.

Behavioral adaptations do not rely on a physical trait or physiology. Instead, these adaptations are characterized by *what* animals do to survive, opposed to *how* they do it. Common behavioral adaptations include:

- Group living: Many animals increase their chances of surviving and reproducing by making use of a social structure. This includes animals like wolves, bees, and humans.
- Migration: Annual or seasonal migration aids many creatures, such as geese, caribou, and salmon.
- Circadian Rhythms: Cyclic patterns of activity and sleep are used by many animals to evade predators, take advantage of food sources, or to avoid extreme heat or cold. Regional animals with *nocturnal* adaptations include raccoons and opossum. Animals that are awake in the day are called *diurnal*, while *crepuscular* animals that are active during the twilight periods in the morning and evening include coyote and rabbits.

Physical adaptations involve the use of specialized anatomy that aid in a species increased chance of survival:

- Teeth: The shape, size, number, and distribution of an animal's teeth are suited to that animal's diet and other needs. A *carnivore* eats meat and is equipped with sharp teeth well suited to killing prey and tearing flesh. Examples include mountain lions and bob cats. *Herbivores* have flat teeth suited to grind up plants, such as those found in deer and rabbits. *Omnivores* have intermediate or mixed sets of teeth. Examples include humans and bears.
- Camouflage/insulation/high contrast: Many animals have fur that matches the color of their environment and aides in hunting prey or evading predators. Others, like deer, have microscopically hollow hair that act on the same principal as a vacuum thermos, insulating the animal from extreme heat or cold. Another adaptation concerning an animal's fur can be found in examples of highly contrasting coats. In the case of raccoons this may aid in identifying members of the same species, while in skunks, serves to warn potential predators of the skunk's defensive musk.

- Foot shape: The shape and size of an animal's feet and the presence or absence of claws are also commonly adapted to a particular environment. Beavers have large webbed feet to aid in swimming, while grizzly bears have large hooked claws that enhance digging ability.

Standards:

Materials: Materials for this lesson will be set up by Waskowitz staff and can be found in the Ed Rooms 1-4. Students will need their **Discovery Guides and Pencils**.

Location and Duration

- **Introduction:** Ed 1, 15-20min
- **Pelts:** Ed 4, 20-30min
- **Skulls:** Ed 3, 20-30min
- **Tracks:** Ed 2, 20-30min

HS Leader Role: High school leaders are trained and prepared to facilitate and instruct in the pelt, skull, and track rooms. The classroom teacher should be prepared to instruct the introductory activity (in Ed 1), cue the class at the appropriate rotation times, and generally supervise and support the HS leaders in the rotation rooms.

Procedure

Introduction: Have 2 volunteers sit facing each other. Place 1 bowl in front of each person. Tape 1 volunteer's right thumb to the side of their right palm (so they are unable to use their thumb). The other volunteer can use their hand as normal. Pour the beans/macaroni out on the table between the pair. Ask both volunteers to use only their right hand and pick up as many beans/macaroni they can in 1 minute. They can only pick up 1 piece at a time and need to place it in their bowl. Have the rest of the class observe. If desired and depending on available materials, conduct the test with more than a single pair.

Discuss: What happened and why (most likely the volunteer with no tape picked up more because of having a thumb). No other animal has a thumb as movable as humans do. How would a thumb have helped early humans survive (the dexterity afforded by a thumb has many advantages, including tool use)? Did early humans decide that their thumb should look and work that way? No, DNA instructed our bodies to be built in that way. The human thumb is an example of an *adaptation*. In this case, the thumb is a physical characteristic that humans have developed over time and that helped us survive. *If desired, discuss the distinction between physical and behavioral adaptations.*

Class Brainstorm or Think + Pair + Share: An adaptation is a behavioral or physical trait that helps a living thing survive in its habitat. Adaptations are passed from parents to offspring in DNA and are not chosen. Every living thing has adaptations, not just humans. If all living things have adaptations to help them survive, first we must decide what all living things need to do or find in order to survive over time.

What can you think of? *Food, water, shelter, evading predators, finding mates, etc.* All organisms have particular adaptations that help them accomplish all those things. Can you think of some adaptations? (big teeth, big claws, poison/venom, camouflage, etc.

Transition to adaptation rooms: Explain that in each adaptation room, they will be investigating different kinds of animal adaptations or clues about adaptations and figuring out how they help animals survive.

Lesson/Activity

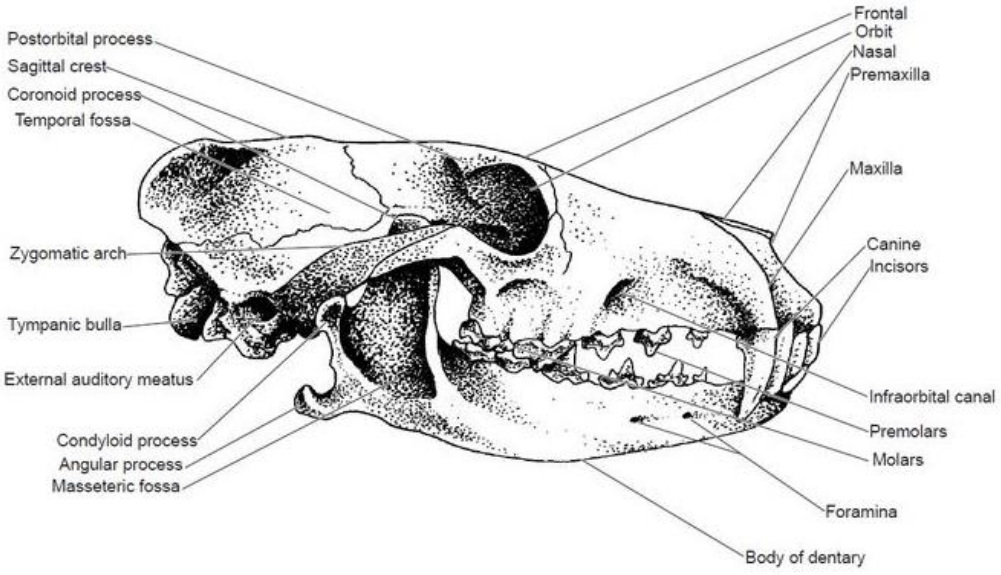
Skull Room

1. Have students walk around the table to look at the skulls, then sit down.

2. Tell students that it is ok to handle the skulls but they must be careful. Hold with both hands, be gentle, don't goof around, etc.

3. Open Discovery Guides to the corresponding "Skulls" page. Encourage students to make careful observations to figure out all the things the skull can tell them about the animal. Students have a clue sheet and ruler to help. **Some clues about skulls to share with students:**

- **Shape:** Long and slender skulls *might* be from the dog family (wolves, coyotes); Round skulls are often cats (mountain lions, lynx, bobcats).
- **Eyes:** Predator eye sockets both point forward from the front of the skull and help to judge distance. Prey eye sockets are to the sides to give a broader field of vision.
- **Size:** The size of a skull can give you an idea on the overall size of the animal
- **Teeth:** Describe the difference in the teeth of a carnivore vs herbivore vs omnivore.
- **Detailed Skull Anatomy Diagram (Coyote, Sample):** Though the diagram below is a coyote, different species may share similar features. Use the Diagram below to invite comparisons between different skulls.



4. Hand each student their skull's corresponding picture/information page. Ask them to look at the pictures and read the information for both skulls they investigated. Each student can share what their skull was and one cool thing they read/learned about that animal with the class. Any surprises?

5. Students can present their findings to the rest of the group.

6. Repeat this process with a 2nd skull if there is time.

Skulls Key

1. **Striped Skunk**: Omnivore. Nocturnal.

2. **Bobcat**: Carnivore. Nocturnal.

3. **Red Fox**: Omnivore. Nocturnal

4. **Short-Tailed Weasel/Ermine**: Carnivore. Feeds primarily on small rodents and rabbits

5. **Western Gray Squirrel**: Mostly an herbivore known for its food cache behavior; occasionally eats insects

6. **Raccoon**: Omnivore. Nocturnal.

7. **Coyote**: Omnivore. Mostly eats plants.

11. **Beaver**: Herbivore. Beaver specialize in eating the cambium layer found beneath tree and shrub bark.

12. **Black Bear**: Omnivore. Mostly eats plants.

13. **Black-Tailed Deer**: Herbivore. Antlers are grown and shed by males every year.

14. **Opossum**: Omnivore. A marsupial with an extremely high tolerance for many different foods and habitats.

Pelt Room

1. Have students take a walk around the table to look at the pelts. Then have them sit down.

2. Tell students that it is ok to touch the pelts but they must be careful. Some of these pelts are very rare and would be almost impossible to replace. Don't tug at the hair, be gentle, don't goof around, etc.

3. Open Discovery Guides to the corresponding "Pelts" page. Students should start with the pelt right in front of them. Encourage them to make careful observations, and try to figure out how the pelt might be adapted to a particular environment.

4. Some signs of adaptation/specialization to look for include:

- Overall size of the animal.
- Camouflage.
- The shape and size of the body parts (head, feet, legs).
- **Countershading**: A common form of camouflage marked by a light belly and darker back. This pattern reduces the appearance of shading when seen from the side. In the case of the skunk,

reverse countershading is used to make the animal *more* conspicuous. In the photo below, the 3 Ibexes demonstrate effective countershading: the less brightly lit white undersides are "canceled out" by shadowing from the rest of the animal.

- **Phases:** Animals can also change color depending on the time of year. Some weasels or rabbits turn white in winter to blend in with the snow.
- **Hair:** Long and/or very dense fur helps keep animals warm, and may indicate that they live in cold or wet environments.

5. Hand each student their pelt's corresponding picture/information page. Pelts are number with yellow tags.

6. Each student can share what their pelt was and one cool thing they read/learned about that animal with the class. Any surprises?

7. Repeat this process with a 2nd pelt if there is enough time.

Pelts Key

1. **Black Bear:** Hollow long hair: warmth; Color: camouflage; Feet/nails: digging.

2. **Coyote**: Countershading for camouflage; medium length fur suitable for hot or cold climates.

3. **River Otter**: Short and dense oiled fur for warmth and ease of movement through water.

4. **Red Fox**: Camouflage

5. **Black-Tailed Deer**: Hollow hair for warm, camouflage.

6. **Short-Tailed Weasel/Ermine**: Camouflage that changes with the season (brown in the summer).

7. **Cottontail:** Camouflage

8. **Beaver**: Short and dense oiled fur for warmth and ease of movement through water.

9. **Striped Skunk**: Warning coloration

10. **Canadian Lynx**: Dense long fur for warmth, camouflage, large feet for ease of travel through snow.

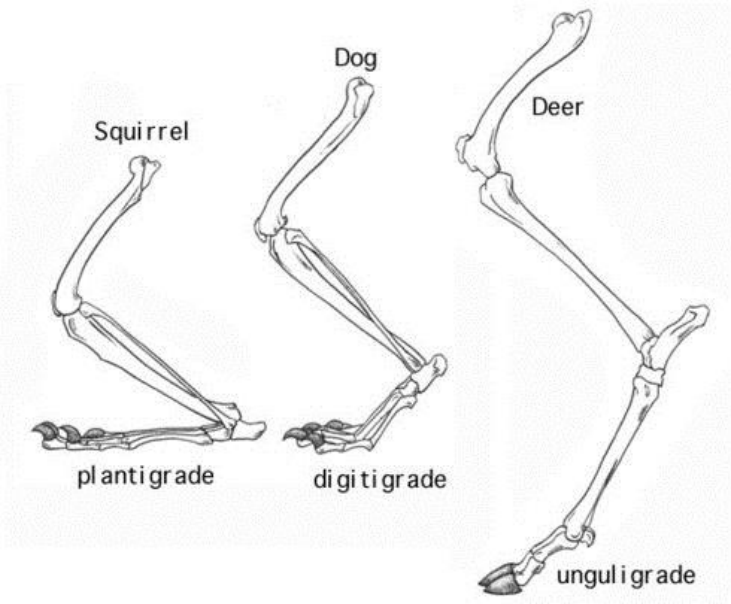
11. **Gray Wolf**: Dense fur for warmth, large feet for movement through snow, camouflage.

12. **Muskrat**: Short and dense oiled fur for warmth and ease of movement through water.

Track Room

1. Have students sit and open Discovery Guides to the corresponding "Animal Feet and Tracks" page.

2. Explain that all animal feet are adaptations that help them survive in many different ways. Think about all the ways a foot could help an animal find shelter, catch food, avoid predators, etc. Tell them that in a moment, you will be handing each of them a vinyl replica of the bottom of an animal's foot/feet. The replicas show realistic detail and size. They will examine the foot carefully and fill out the data table in their books. It may help the group to consider the 3 main types of walking in the animal kingdom. See the graphic below. Use the blank pages at the back of the journal for additional space if needed.



3. ***Tell students that it is ok to touch the feet but they must be gentle. Don't tug, rip, poke, or mark on any of them. Pass one foot/pair of feet to each student from the box.***

4. Encourage them to make careful observations to figure out all the things they can learn from the foot.

5. Hand each student a Lone Pine Animal Tracks Guide (raccoon on cover). Instruct them to find the track that matches the bottom of the foot they just investigated. Can they ID their animal based on the track? Help them navigate the books as needed and you can double check them with the key. Suggest they look on pages 150-154 in the guides to start, then use the index to turn to a certain page for more information about a specific animal. Once the animal is identified, encourage them to read about the animal and continue working to fill in their discovery guide page.

6. Share with the group which animals the feet really belong to, along with an interesting adaptation or observation.

7. Collect vinyl feet back in box and gather track field guides (depending on the next activity).

Tracks Key

1. **Bobcat:** Retractable claws that can be kept sharp for catching prey or climbing trees.
2. **Gray Wolf:** Claws can be used for digging up prey, or catching it on the run, or creating burrows.
3. **Deer:** These legs and feet have adapted to be as long as possible; it runs on its tip toes, which can also be used as defense.
4. **Black Bear:** Multi-purpose claws used for climbing trees and catching prey
5. **Beaver:** Webbed feet to aid in swimming.
6. **Cougar:** Retractable claws that can be kept sharp for catching prey or climbing trees.
7. **Coyote:** Claws can be used for digging up prey, or catching it on the run, or creating burrows.
8. **Raccoon:** Very dexterous and sensitive fingers can be used for catching a variety of prey including fish and amphibians, as well as climbing.
9. **Porcupine:** Claws for climbing. Flat feet that turn inwards; this animal has no need to run!
10. **Elk:** These legs and feet have adapted to be as long as possible; it runs on its tip toes, which can also be used as defense.
11. **Mink/Marten:** 5 toes, but sometimes only 4 are visible in tracks. Minks are aquatic while Marten are arboreal (tree climbing). Either way, the sharp claws are used to catch prey.

Conclusion/Extension: Reconvene the groups and have students hare some favorite/fascinating things discovered or learned about animal adaptations. Have students use their journals to create a VENN DIAGRAM for two different animals they learned about in the rooms. This activity could be preceded or extended using the following Outdoor School lessons: **Camouflage, Bat and Moth, Tracking**.

Notes: