Skull Science

2nd Grade
Standard 2.2.1 and 2.2.2

Introduction:
All living things or organisms have basic needs: food, water, shelter, and space. These needs must be met for the organism to survive. These needs can be met through the resources of their environment, but organisms need a way to acquire these resources. They have features or parts of their bodies that help them survive in their environment. Today we are going to talk about features that animals have that help them survive. We are going to do this by looking at some different skulls. Skulls have clues about what an animal might see, hear, smell or eat.

Engage:
Imagine that you were walking around at the Discovery Center and you found a skull. How could you tell what animal it was? Do you think it would be helpful to know what animals live here? It might help narrow down the options. Do you think that we would find an elephant skull here? What about a monkey?

Show pictures of the common animals in the area: Bobcat, Mountain Lion, Mule Deer, Moose, Coyote, Fox, Skunk, Raccoon, Black Bear, Hawk, Owl, Woodpecker…

One of the first clues to help you identify a skull might be the size. Is it large? Is it small? A large skull like we have on the top shelf could not belong to an animal like a skunk, right?! We will also be looking at the eyes, nose, and mouth.

I am going to show you some skulls and we are going to look at them and make observations.
(Pull multiple skulls out of the display case including: hawk, woodpecker, moose, cougar, bear replica and raccoon)

First Skull: Hawk
What can you tell me about this animal from looking at this skull?
Observations may include the shape of the beak. Discuss the reason for the hook on the end of the beak and what kind of food the hawk may eat.
Point out the location and size of the orbits or eye sockets

1. Orbits/eye socket
    a. Size in relation to skull
    b. Large orbits indicate sharp eyesight, and perhaps the ability to see at night
2. Placement in the skull
    a. Forward vs side facing. This helps determine if the animal is a predator or prey
    b. Predator/Carnivore orbit placement is forward
        i. The overlapping field of view from both eyes gives the animals binocular vision, which provides excellent depth perception for hunting and catching prey
    c. Prey orbit placement is to the side
        i. The side placement gives animals a wider field of view to see predators coming from all directions
3. Demonstration of the difference between forward and side facing orbits
    a. How big is your field of view?
    b. Put thumbs up in front of you. Look forward and slowly move your thumbs to the side until you can't see them.

Optional Activity:
You need 3 volunteer students, 2 will be the prey and one will be the predator. Have the two prey volunteers stand back to back with each covering their right eye. Have the predator stand facing the prey (act like a predator) Tell the predator and the prey that they cannot turn their heads during the activity. Walk in a circle around the predator and the prey asking if they can still see you at different points of the circle.
Demonstrate how much larger the field of view is for prey animals with orbits on the side of their skull.

Ask: How important are forward facing eyes and depth perception for predators?
Have the predator face you. Take a crumpled piece of paper and have the predator try to catch it. Have the predator cover one eye and toss the crumpled paper again. It should be harder to catch the paper with only one eye.
Demonstrate how predators/hunters need both forward facing eyes to judge distance and depth perception.

Second Skull: Woodpecker
Here is another bird skull. What kind of bird do you think this belongs to?
Look at the shape of the beak. Why is this beak shape important for the survival of a woodpecker?

Third Skull: Moose
What can you tell me about this animal from looking at this skull?

Observations may include:
The placement and size of the orbits. What does this tell us about the moose? (They are prey)
The size of the nose.

1. Nasal Passages:
    a. Size in relation to skull
        i. Large nasal passages are generally indicative of a keen sense of smell.
    b. Inside the nasal passage look for bony, web-like structures called nasal turbinates. These provide the framework for the membranes that sense odor. (You can see the nasal turbinates very well in the black bear replica skull)
        i. Dogs generally have long nasal passages with a complex turbinate bone structure, giving them a keen sense of smell
        ii. Cats have shorter nasal passages and less complex turbinate bone structure

Size and shape of teeth
Before we talk about teeth, discuss the terms herbivore, carnivore and omnivore. Herbivores eat only plants, carnivores eat only meat and omnivores eat both.

1. Incisors
    a. Imagine biting into an apple. Which teeth do you use? Front teeth=incisors
    b. Herbivore: incisors are well developed and used for cutting plant material
        i. Some herbivores do not have upper incisors. Instead they have a hard palate on top that is used like a cutting board.
        ii. Moose, elk, deer and even goats have this feature. Show a picture of the moose with mouth open
2. Molars
    a. Imagine eating a piece of bread. What teeth do you use to chew the bread? Molars
    b. Herbivores: molars are usually flat and are used for grinding and chewing up plant material
        i. Flat molars do not overlap. The lower jaw moves side to side for chewing action
        ii. Result of chewing/grinding food on flat molars leaves teeth stained by food debris

Fourth Skull: Cougar
What can you tell me about this animal from looking at this skull?

Observations may include:
Placement and size of the orbits

Teeth
A Mountain Lion is a carnivore. It has small incisors, long canines and pointed molars

1. Incisors=front teeth
    a. Carnivore: incisors are usually less developed and used for grooming.
2. Canines
    a. Carnivores: canines are well developed. Long and pointed for piercing and holding prey.
    b. When a moose takes a bite of a leaf, the tree is not going anywhere. A Mountain Lion's favorite food is deer. How do you think a deer will act when a mountain lion tries to take a bite of it? It will run away. That is why the long and pointed canines are necessary!
3. Molars
    a. Carnivore: molars are pointed
        i. Usually top molars overlap lower molars creating a shearing action like scissors. The overlap prevents side to side movement of the lower jaw
        ii. Carnivores do not chew their food, they tear meat to shreds and swallow it whole
        iii. The bite-tear-gulp style of eating without chewing leaves their teeth clean and unstained by food debris

Fifth Skull: Black Bear
What can you tell me about this animal from looking at this skull?

Observations may include:
Placement and size of the orbits
Nasal cavity- Let the class look inside and see the nasal turbinates

Teeth
A black bear is an omnivore. It eats both plants and meat. The teeth look very different from a carnivore. The incisors are developed, long canines, and molars that are flat (very similar to our molars)

1. Incisors
    a. Omnivore: incisor development will depend on whether the animal prefers meat or plants
2. Canines
    a. Omnivore: canine development depends on whether the animal prefers meat or plants.
        i. Canines will be long and pointed in animals that hunt
3. Molars
    a. Omnivore: molar development depends on whether the animal prefers meat or plants
        i. Some animals that eat both meat and plants have some molars that have high crowns with sharp edges for shearing meat and some with wider crowns for crushing bone and plant material

Last Skull: Raccoon
What can you tell me about this animal from looking at this skull?
Hold up both the raccoon and the black bear skull and compare the two. They have many similarities.

Explore:
We want all of you to have a chance to be able to explore all of the things in this room. We want you to be able to touch everything! Many of the items in this room are fragile, so you need to be careful. You need to be gentle when touching the animals. If you are carrying something large, please use two hands. If you would like to see something that is up high, please ask for help from an adult. When you are done looking at something, please put it back where you found it.
After explaining the rules of the discovery room and explaining how to use the microscopes, let the class go and explore for the remaining time.