SKELETONS: Museum of Osteology

Keys to Identification
Teacher Resource

Grade Levels: 6th - 8th Grade

6th-8th Grade Oklahoma Academic Standards (OAS):

MS-LS1-1 From Molecules to Organisms: Structure and Processes
MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-LS1-3 From Molecules to Organisms: Structure and Processes
MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics
MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS1-5 From Molecules to Organisms: Structure and Processes
MS-LS1-5: Construct a scientific explanation based on evidence for how environ- mental and genetic factors influence the growth of organisms.

MS-LS3-1 Heredity: Inheritance and Variation of Traits
MS-LS3-1: Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

MS-LS1-7 From Molecules to Organisms: Structure and Processes
MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

Program Overview:
In the *Keys to Identification* program, students will work in teams to locate and measure various skull features. Then using dichotomous keys and rulers, team members will identify various types of animals including but not limited to: mink, striped skunk, gray squirrel, bob cat, beaver, gray fox, opossum, rabbit, and raccoon. Emphasis will be placed on the student's ability to verbally communicate the identification process.

Learning Objectives:
- Participants will successfully measure various skulls, and locate features such as incisors, cheek teeth, canines, and post orbital crests.

- Participants will successfully use a dichotomous key to identify various mammals.
- Participants will successfully work in a team environment, and communicate their ideas with team members

Background:

When looking at skulls, the first question usually asked is "What kind of skull is that?" Skull identification can be determined by several methods. If you are unsure of a skull's identification, you can compare it with other known specimens. This, however, can be less than accurate and most will not have access to a large collection of known species. The most effective means of identifying a skull is with the use of a dichotomous key. A dichotomous key allows a person, through a series of questions, to identify an organism to species by process of elimination. Plants, fish and even skulls can be identified using this method.

Mammals, as well as some reptiles, amphibians and fish, have teeth. The teeth of an animal can tell you a lot about that animal's life. The type, shape and number of teeth an animal has can help determine its diet. If a mammal has long, sharp canines, it was most likely a predator. Canines are used for grabbing, holding and killing prey. Some meat eating mammals (carnivores) have sharp shearing cheek-teeth called carnassials. These teeth act like a scissor to cut through tough flesh and to break it into smaller pieces for swallowing and digestion. Examples of carnivores include cats, dogs and weasels.

Plant eating animals tend to have teeth specialized in chewing various parts of plants. Some plant eaters eat grasses (grazers), some eat twigs, leaves and berries (browsers) while others eat only specific plant parts (I.e. roots, fruit, etc.). In order to properly digest vegetation, an animal must chew its food to help break down the plant. Most herbivores have cheek teeth called molars. These molars help grind leaves, stems, grasses, fruit and even seeds before the animal swallows them. Examples of herbivores include deer, rabbits and cattle.

Some animals eat both plants and animals (omnivores) and have both types of teeth. Examples of omnivores include pigs, bears and humans.

What do the eye sockets, (orbits) of a skull tell you about an animal? A lot! Eye sockets that are large in relation to the size of an animal's skull may suggest an animal is active at night (nocturnal). In this case, a larger eye has evolved to allow the animal to see better at night.

Eyes that face forward on a skull suggest a predator. Forward facing eyes allow for binocular or stereoscopic vision, which allows an animal to see and judge depth. Predators need this depth perception to track and pursue prey. Cats and owls are excellent examples of predators that use forward facing eyes when hunting their prey. Monkeys also have forward facing eyes that give them depth perception needed to swing and leap in their tree top habitat. Humans have forward facing eyes as well.

Animals with eyes that are located on the side of its head would suggest a prey animal. Side eye placement allows for greater peripheral or side vision. This enables the animal to see predators approaching from the side as well as from behind. This vision is very important for protecting an animal when it is grazing or feeding.

Vocabulary:

Adaptation: Changes in behavior and/or physiology of an animal to better suit it to its environment

Binocular vision: Enables an animal to see and judge depth also stereoscopic vision

Browser: Herbivores that primarily eat twigs, leaves and berries

Carnassial: A carnivore's cheek teeth specialized for shearing meat

Canine teeth: Teeth that are pointed and conical, located between the incisors and premolars

Carnivore: Animals that primarily eat meat

Dentition: Animal's teeth used to acquire food, for defense, grooming and display

Dichotomous key: Through a series of questions, skulls can be identified by the process of elimination
Diurnal: Refers to animals that are more active during the day

Food Chain: The transfer of energy from one type of plant or animal to another

Grazer: Herbivores that primarily eat grasses

Habitat: The soil, water, climate, plants and animals of a particular ecosystem

Herbivore: Animals that primarily eat plants

Incisors: The front cutting teeth located anterior to the canine teeth

Molars: The rear grinding/shearing teeth located posterior to the premolars

Nocturnal: Refers to animals that are more active at night time

Omnivore: Animals that eat both plants and meat

Orbit: The bony socket in which the eye fits and serves as protection

Peripheral vision: enables the animal to see predators approaching from the side as well as from behind

Predator: Animals that attack and eat other animals

Premolars: Teeth located between the canines and molars used to hold prey, assist in cutting and/or grinding

Prey: Animals that are attacked and eaten by other animals

Reference: visit the SKELETONS: Museum of Osteology web page at:
http://skeletonmuseum.com/education

Recommended Reading:

Beisaw, April M.
2012   *Identifying and Interpreting Animal Bones: A Manual*. Texas A&M University Press, College Station, TX.

Elbroch, Mark
2006   *Animal Skulls: A Guide to North American Species.* Stackpole Books, Mechanicsburg, PA.

Gilbert, B. Miles
1990   *Mammalian Osteology*. Missouri Archaeological Society, Columbia, MO.

While at SKELETONS:

- Visit the exhibits and have your students discuss the processes that they would use to identify various types of skulls.
- Visit the Touch Table to identify mystery skulls from a number of different mammals.
- Look at the similarities on skull and skeletal structure within certain groups of animals such as Cats, Wild Dogs, Rodents, Primates, and Reptiles.