

Skins and Skulls

Students will examine different animal pelts and use a dichotomous key to determine their previous owners. They will be introduced to the concepts of anatomy, evolution, and animal adaptation through a hands-on exploration of skulls and bones. Students will also explore similarities between our own skulls and those of a variety of animals.



Grade Level : K-6th

Objectives:

- Students will be able to define, identify and know the differences between the following: archeology and paleontology, carnivore and herbivore, guard hairs and papillae, summer pelts and winter pelts
- Students will become familiar with using dichotomous keys, skeletons, inductive reasoning and will be able to compare and contrast skulls.

Materials:

- Tubs containing skulls, bones, pelts, data sheets, diagrams and porcupine pelt making materials and paper and pencils for each child.

Time Considerations

One-two hours

Related Activities:

Animal Tracks, Mud Fossils

Nevada Department of Education Standards

- **Diversity of Life (Life Science Unifying Concept D):** Evidence suggests that living things change over periods of time which can be attributed to genetic and/or environmental influences. This process is called biological evolution. The diversity of life on Earth is classified using objective characteristics. Scientific classification uses a hierarchy of groups and subgroups based on similarities that reflect evolutionary relationships.
- **Scientific Inquiry (Nature of Science Unifying Concept A):** Scientific inquiry is the process by which humans systematically examine the natural world, is a human endeavor and involves observation, reasoning, insight, energy, skill, and creativity, is used to formulate and test explanations of nature through observation, experiments, and theoretical or mathematical models. Scientific explanations and evidence are constantly reviewed and examined by others. Questioning, response to criticism and open communication are integral to the process of science.

Excellence in Environmental Education Guidelines

- **Strand 1—Questioning, Analysis, and Interpretation Skills (A, B, C, G)** Learners are able to develop question, design investigations, collect information, and draw conclusions in order to learn about the environment.
- **Strand 2.2—The Living Environment (B):** Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited

Background

When teaching about skeletons, bones, skull and fur, it is most important to remember the hands-on touching experience that the children will have. It is not common for students to come into contact with these materials so really let them get into it. An endoskeleton (internal skeleton) is the mass of bone structure that the rest of the body is built around. It provides form for the species' function. The skeleton

acts as support and a surface for muscles to attach to, so movement can occur. An exoskeleton (an external skeleton), however, is on the outer covering (like a crustacean). Those types of skeletons provide protection to the soft tissues hidden inside. This lesson will concentrate on the endoskeleton. Endoskeletons are made up of various bones (see the human skeleton diagram). Most mammal skeletons and many other animals like reptiles, amphibians, birds and dino-

saurs have all the same bones. They just take on slightly different shapes with each species. Bones are formed when minerals mix with collagen and water. They “cement” together to form an extremely rigid material. Bones have internal structures (known as marrow) that produce red blood cells.

Skulls are fascinating bone structures that serve to protect the brain while also giving shape to our heads and faces. When studying a skull it is important to point out a few areas. The upper portion of the skull is covered with wavy lines that fit together like a zipper. These are growth lines. The skull is soft on the young animals until their brain has finished growing. When the brain reaches full size, the skull plates come together and calcify, leaving a kind of visual seam. The upper jaw is known as the Maxilla. It has a joint or hook that attaches to the lower jaw or Mandible. The Mandible is made of two opposite sides that come together at a fusion point in the chin. You can feel this fusion point by touching your own chin, right in



the center. The upper and lower jaw joint is not fused. Both the maxilla and mandible, as in other areas on the skull, have sets of small matching holes. These holes provide an opening for the arteries and nerves to make their way to the skin. Another important feature is the spinal cord opening. It leads out from the brain and down into the vertebra or spine. You can identify it as the large hole in the back bottom end of a skull.

Putting together real skeletons can be a very difficult job. Paleontologist (geologist who put together prehistoric fossils) can sometimes work for years to put together a dinosaur skeleton. Often time’s skeletons are damaged as they sit over time. This can make the bones difficult to recognize. In smaller skeletons, a bone or two may come up missing. Then those scientists must reconstruct a similar bone to complete their skeleton. It can be a difficult puzzle.

Skin, which protects and holds in all the important soft tissues around the bones, also has a



protection mechanism. That is hair or fur. Humans have adapted over the years to needing less hair. However, our climate still requires that we stay warm, thus, we have adapted again by providing ourselves with clothing. Often, our clothing reflects the protective pelts of animals. Fur provides great protection from cold and the dangers of everyday cuts and bruises. Fur is made up of two layers, papillae and guard hairs. The papillae hairs are short, warm, and fuzzy. They serve as insulators. The guard hairs are longer and oily. They are good for waterproofing. Together, these layers trap in heat while protecting the skin from damage. It is truly amazing how animals’ bodies are so well prepared for life. It is even more amazing how all species can continue to adapt to changes in their environments and further protect or benefit themselves from those changes.

*Before beginning this lesson, take notice of the materials and explain

to the students not to throw these things away as the materials will be reused!

Introduce the subject by asking the following questions:

- Why are skulls and skeletons important?
- What would life be without them?
- Why is our skin important? What would life be like without it?
- How do animals deal with the weather?
- What can you tell about an animal from its skull and its pelt?

Preparations

Tubs containing skulls, bones, pelts, data sheets, diagrams, and porcupine pelt making materials-also paper and pencils for every child.

1. Skeletons: all the skeletal bones (including skulls)
 - *six laminated sheets of each of the following skeletons: human, cat, rabbit, monkey, and dinosaur
 - *Five packs of paper skeleton puzzles
 - *Three sets of bagged and labeled real skeletons
2. Skulls: six larger skulls for hands on observation
 - *six laminated labeled skull sheets
 - *six “Gypsy skull reading sheets”
 - *paper, pencils and rulers for all the students



3. Pelts (hair or fur): box of pelts and furs
 - *six diagrams of hair
 - *six dichotomous fur keys
 - *Porcupine pelt making box-it contains:
 - 14 sponges
 - 140 "papillae hairs"/ toothpicks with fur on top
 - 200 "guard hairs"/oiled short toothpicks
 - 70 "quills"/ long toothpicks

PLEASE MAKE SURE KIDS RETURN ALL THE MATERIALS

Doing the Activity

Part 1 Skeletons

1. The facilitator may begin by becoming familiar with the kids and their names. You could do this by having them state their name AND a bone that they are familiar with. When they finish, begin a discussion of why and how bones serve humans. Ask the kids if they know how a bone is formed. Use the background info. to explain the contents to them.



This will prepare you to start in with the first section of the activity, skeletons.

2. Pass out the human skeleton sheets-(if there are not enough sheets have kids look onto a friends). Get the students on their feet and go over each bone. Have the kids verbally and physically identify each bone on their own bodies. For fun, it may be possible to do the Hokey Pokey with bone parts (Put your right tibia in, take your right tibia out...).
3. Separate the students into

groups of two or three. Hand out pictures of the different mammal skeletons (cat, rabbit, monkey, and dinosaur). Have students try to identify the similarities and differences between the skeletons. Try to lead them to see how all the major structures are alike.

4. Pass out the five laminated skeleton puzzles. Leave kids in their groups. Let them experiment with putting the bones together. When they've done this, ask them if they thought it was easy to do. Show them the vole skeleton put together from pieces of an owl pelt. Explain how difficult it is to put to-



gether a real skeleton (like paleontologists). When this discussion is complete, pass out the three real skeletons and let the children try to put them together. Before starting, remind them that the bones are fragile and they need to treat them with care and respect.

Wrap up this section with a view of bones and with the understanding that most mammal skeletons are similar with the same basic bones. Try to include the skull in your closing as it is the subject of the next lesson.

Part 2 Skulls

1. Pass out the six human skull pictures. Explain each section while having the kids point out the area on their bodies. Give every group of two children an animal skull, paper, pencil, ruler, and the skull reading activity sheet. Give the kids, at least, ten minutes to go over this sheet. After the majority have completed the activity, let the groups read their last paragraph aloud (*see

sheet)

Part 3 Pelts

1. Pass out the 'hair of fur' diagram. Discuss the needs and functions that fur and hair serve (see background info.).
2. Have the students try to pull out a few adaptations that particular species' fur assist in. for example:
 - Zebra Provides a confusing frenzy of stripes/defense
 - Snowshoe Rabbit. Turns white in the winter/camouflage
 - Mink Oil on fur repels water/warmth and waterproofing
 - Bear Thick hair growth/warmth during hibernation
 - Deer Winter coats have air space in each hair/trap in heat
3. Ask the students how humans have adapted to having very little fur. Try to lead the to see how we've emulated many of nature's survival tricks and turned them into synthetic products for our own use (i.e., fur coats, oil covered rain jackets, wool lined jackets, camouflage hunting suits and layers to trap in heat etc.) Pass out the pelts and the dichotomous pelt identification keys. Quickly explain how the key works and go through one example (like the elk). Leave plenty of time for the kids to hold, touch, and observe the specimens. This is a good time for the facilitator to set up the following porcupine pelt activity.



PORCUPINE PELT ACTIVITY

- Pass out one sponge to each child. Explain that it serves as the skin. Have the students put the papillae layer on first (pass out 10 furry toothpicks to each child). Make sure they understand how and why it serves as the warm insulating layer.
- Let the students place about 15 oily toothpicks or guard hairs onto their pelt. Lead them to see how the oil repels water from the warm insulating layer keeping it dry.
- Lastly, let them place the longer quills into their pelts. Ask the student if they can make their pelt shoot out a quill. They will try but inevitably, the answer will be no. Point out that the same is true for the porcupine. Porcupines cannot “shoot” out their quills. They must be rubbed out. Let them show off and compare their pelts before having them pack away their materials. Remember to let the students



take their time handling the specimens and have fun with the activity!!!

Ask the students “How do form and function relate in an animal’s skeleton? What can you tell from an animal’s life from its bones? How have humans adapted to life without a hairy coat?”

Evaluation—

To assess the student’s understanding of skeleton’s and the concepts learned in this lesson, give points for activity and discussion participation. If desired, give a short quiz on the initial questions (What can we tell about an animal by its skin, pelt, skeleton, and how do animals deal with the weather

Extension—

Have students discuss then draw what kind of pelts they would want themselves if they could choose. Have them discuss what might happen if a beetle had human skin instead of an exoskeleton, if a turtle had fur instead of a shell, if a rabbit had porcupine quills, etc.

Vocabulary

Adaptations: *Biology.* An alteration or adjustment in structure or habits, often hereditary, by which a species or individual improves its condition in relationship to its environment.

Anatomy: The bodily structure of a plant or an animal or of any of its parts.

Archeology: the scientific study of historic or prehistoric peoples and their cultures by analysis of their artifacts, inscriptions, monuments, and other such remains, esp. those that have been excavated.

Carnivore: A flesh-eating animal.

Endoskeleton: An internal supporting skeleton, derived from the mesoderm, that is characteristic of vertebrates and certain invertebrates.

Evolution: a biological process of change in a certain direction; working out or developing attrib-

utes to better adapt to a certain situation or location.

Exoskeleton: A hard outer structure, such as the shell of an insect or crustacean, that provides protection or support for an organism.

Guard Hair: longer, oily waterproofing hairs combining with papillae to insulate and protect the skin.

Herbivore: An animal that feeds chiefly on plants.

Omnivorous: Eating both animal and vegetable foods.

Paleontology: The study of the forms of life existing in prehistoric or geologic times, as represented by the fossils of plants, animals, and other organisms.

Pelage: the hair, fur, wool, or other soft covering of a mammal.

Pelt: a usually undressed skin with its hair, wool, or fur

Underfur: The soft, fine undercoat of certain mammals, such as otters, beavers, and seals.

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