TARGET AUDIENCE
Kindergarten through Second grade

STANDARDS
VA Grades K-1: Scientific investigation, reasoning and logic; Matter; Life processes; Earth patterns, cycles and changes.
MD Grades K-2: Constructing knowledge; Applying evidence and reasoning; Communicating scientific information.

* See page 3 for an in-depth list of standards of learning covered in this program.

OVERARCHING GOAL
To observe, compare, contrast and analyze animal coverings.

STUDENT OBJECTIVES
1. Students will observe a variety of animals and what covers their bodies.
2. Students will compare and contrast the animals and their body coverings.
3. Students will utilize effective scientist skills.

STUDENT OUTCOMES
1. Students will use observation skills to describe animal body coverings.
2. Students will sort and/or classify the animals by their body coverings.

MATERIALS, RESOURCES, TIME, SPACE
Materials: 7 Animal coverings with corresponding images and example images of coverings. Animal Coverings Activity Sheet #1 and Post-visit Activity Sheet.
Time: 45 minutes
Space: Discovery Room

Denotes helpful suggestions!
PROCEDURE

Welcome: Scientist Discussion (2 minutes):
Teachers and students are welcomed. The lesson begins with the instructor referencing a scientist in the museum who studies and collects animals: Zoologists. Students will be told that they will practice being Zoologists in today’s lesson as they explore animals and their coverings. The role of a Zoologist and important scientist skills – using their sense of “sight” and “touch” will be discussed.

Brainstorming (Focus on Observation Skills) (5 minutes):
First: Students will be asked to think about what they already know about animals and their coverings (this will activate prior knowledge and help the students become more comfortable providing thoughts). To help students better understand the word COVERING, they will use their scientist skills – their “eyes” and “hands”, to explore what covers their own bodies (skin and hair).

Second: To generate further thinking students will be asked to explore the Biodiversity Wall to find other animal coverings. Mammals (Fur), Reptiles (Dry Scales), Birds (Feathers) and Arthropods (Exoskeleton) will be discussed. Students will hold images of the different animal coverings to help with reinforcement and visualization.

Activity #1 (Exploration and Discussion in Small Groups) (15 minutes):
The students will be divided into four groups and visit four stations, each displaying 2 animals and/or their covering. Each station will be managed by one chaperone/and or volunteer who will document the student’s ideas in order to not interfere with the flow of thinking. Students will be encouraged to work as a team, talk out loud and that there is often more than one right answer.

The instructor will discuss the small group’s activity and MODEL an example for the students by choosing an animal on the Biodiversity Wall. The instructor will describe what she/he “sees” (e.g. a fox with tan fur).

At each station, the students will be asked: What covers the animal? How would you describe these coverings? (Focus on Observation Skills) Students will examine the animal covering with their “eyes” and “hands”.

The instructor will explain how to touch the objects by asking the students to gently touch their arm using their pointer finger. This is how the students should touch the objects. The only person to pick up the object is the chaperone or teacher.

Helpful suggestion: Always as the student’s for their ideas first, however, you may need to model effective thinking and/or problem solving. If the students appear stumped, focus their attention on the specimen. Encourage them to reflect on what they “see” and “feel”. Remind them of the animal covering characteristics, vocabulary and basic needs discussed during the introductory brainstorm. Coverings: Skin, Fur, Dry Scales, Feathers, Exoskeletons, Claws. Basic Needs: Warm, Dry, Protect and Hide (an image card will be provided for visualization)
Reconvene (Introduction to Activity #2) (5 minutes):
Students reconvene as a group and the instructor will introduce the second activity. For this activity, the students will use the observations they made in the first activity to sort the animals into groups. They will work together with their group to compare and contrast the animal coverings and decide how to group the animals based on their covering. The instructor will emphasize that there is no one right way to group the animals, as long as they explain and justify their grouping.

Activity #2 (Classification According to Observations) (8 minutes):
Students will be given a pack of animal cards and a tray to sort the animals according to their observations in the first activity.

Closure (Post Lesson Thinking) (10 minutes):
Students will have the opportunity to share with the class how they sorted their animals. Once everyone has shared and discussed the different ways that they grouped the animals based on their coverings, the instructor will show them how scientists in the Museum would sort them: Mammals, Arthropods, Birds, and Reptiles.

Students will be asked to give themselves a round of applause for being such excellent scientists! They used their scientist tools of sight and touch to help them learn more about animals.

Teachers and students will be encouraged to visit other exhibits in the museum. How many more animals they can find? Students should use their scientist tools to describe what covers the animals. Notice how the halls are divided into Mammals, Reptiles, Insects, etc. How are the animals the same or different?

The students and teachers will be thanked for coming, and also the chaperones for their assistance. Students will be encouraged to visit again!
STANDARDS
VA grades K-1:
• K.1: a) Basic properties of objects observed.
  b) Observations made from multiple perspectives.
  c) Pictorial and verbal description of objects are made.
  e) Objects grouped by physical attributes.
  g) Questions are developed from observations.
  j) Unusual and unexpected results in activity recognized.
• K.2: a) Use senses to gather information.
• K.4: c) Textures and feel of objects can be described.
• 1.1: a) Differences in physical properties observed.
  c) Objects are arranged according to attributes.
  d) Observations are communicated orally and with pictures.
  f) Predictions are made based on patterns of observations.
  h) Inferences are made, conclusions are drawn.
• 1.5: b) Classification of animals based on physical characteristics.
• 1.7: b) Earth patterns affect animals’ body covering.

MD grades K-2:
• Standard 1.A.1.a) Describe what can be learned about things by observing.
  b) Seek information through observations, exploration and investigation.
• Standard 1.B.1.a) Provide reasons for accepting ideas.
  b) Develop reasonable explanations for observations made, share ideas and listen to other’s ideas.
• Standard 1.C.1.a) Describe things as accurate as possible and compare observations with others.
  b) Describe and compare things in terms of texture.
  c) Draw pictures to portray some features of objects.
  d) Work in a team, share findings with others, recognize that all should reach their own conclusions about findings.

DC grades K-2:
• K.SI.1. Describe objects by drawing pictures.
• K.SI.2. Learn that scientific inquiry can be used to learn about natural world.
• K.SI.3. Use senses to gather information.
• K.PS.2. Investigate and compare physical properties of objects.
• K.LS.2. Describe that animals are alike in some ways and different in others.
• 1.1.1. Observe and sort objects as a way of categorizing some properties.
• 1.1.2. Make observations to seek answers to questions.
• 1.1.7. Describe and compare objects by texture.
• 1.4. Different types of animals inhabit the earth.
• 2.1.1. Describe objects and compare observations with others.
• 2.1.3. Demonstrate ability to work with a team.
• 2.1.6. Draw pictures to portray key features of an object.
• 2.6.1. Observe and identify the visible external features of animals
Animal Coverings

Different kinds of animals have different body coverings. Animals with backbones (vertebrates) include 5 major groups based on observable features including body covering, among other characteristics:

- Fish have skin covered with wet scales
- Amphibians have bare skin that is usually moist or wet
- Reptiles have skin covered with dry scales
- Birds have skin covered with feathers
- Mammals have skin covered with hair (fur)

Animals without backbones (invertebrates) are extremely diverse in form, and have many different kinds of body coverings. Most arthropods, the group to which horseshoe crabs and insects belong, are covered by exoskeletons. An exoskeleton is a hard outer covering made of a hard, semi-transparent substance called chitin.

Why have body coverings?
The exoskeleton of arthropods and the skin and other coverings of vertebrates are very important to these animals. These body coverings provide protection and insulation, as well as a number of additional functions for individual animal groups.

1. Protection
Body coverings provide a protective layer against physical damage as well as acting as a barrier to disease-causing organisms like fungi and bacteria. Vertebrate structures formed from a protein called keratin may act as an additional barrier between the animals’ internal tissues and the environment, as well as providing the animal with a structure that can be used for defense, such as a horn or claw. Structures made of keratin include scales, horns, claws, nails, hooves, and hair. The hard outer covering, or exoskeleton, of arthropods acts as a defense against predators as well as environmental damage.

2. Insulation
Body coverings may help exothermic (cold-blooded) animals such as arthropods, fish, amphibians, and reptiles to retain or release heat from their environments. Body coverings may help endothermic (warm-blooded) animals such as birds and mammals to maintain and regulate their internal body temperatures.

3. Other Functions
Other functions associated with some body coverings include:
- camouflage for protection against predators
- recognition signal to mates or members of the same population
- flight (contour feathers)
- sensory organs (whiskers)
- protection against harmful UV rays from the sun
- waterproofing and protection against desiccation (drying out)
- structure and rigidity (exoskeleton)

Animal Groups and their coverings

1. Arthropods
Arthropods have an exoskeleton that helps to support their bodies in the absence of an internal skeleton. The exoskeleton provides a place of attachment for the muscles, since there are no internal bones. Arthropods’ growth may be prevented by the rigidity of the exoskeleton. In order to grow, they must shed their exoskeletons, leaving them unprotected but able to grow rapidly before the new exoskeleton hardens (usually within a few hours). *Key characteristics: dry, hard.*

2. Fish
Fish are covered in a flexible layer of overlapping scales that are embedded in the inner layer of the skin. They are also protected by a layer of mucous slime that is secreted from glands in the skin. This slime layer is antiseptic and helps to lubricate the animal, making it more streamlined when swimming. Sharks and manta rays have a different type of skin scale from most fish. Their scales are small and tooth-like. The scales extend into their mouths where they serve as teeth. *Key characteristics: wet, scales.*

![Close-up of fish scales](http://thejavajive.com)

3. Amphibians
A majority of amphibians have “bare” skin that lacks scales, feathers or fur. The outer layer of the skin is usually smooth, except in some species of frogs and toads. Amphibians’ skin contains many mucous glands that secrete slime to lubricate the skin and prevent the animal from becoming waterlogged. Since the skin of many amphibians is also an organ of respiration, it must be kept moist at all times to help the animals breathe. *Key characteristics: smooth, wet.*

4. Reptiles
Reptile skin lacks feathers and fur, but they do have dry scales. Their skin does not contain sweat glands, so it may easily dry out in an exposed environment. Dry, horny scales act as a protective layer to help prevent water loss from their bodies. Most reptiles periodically renew their skin and shed the old, outer layer. *Key characteristics: dry, scales.*
5. Birds
Birds possess a covering of feathers on their body and scales over the exposed skin of their legs. Feathers are specialized structures made of keratin. There are three types of feathers: down feathers, which provide a protective insulation layer; filoplume feathers, which are hair-like feathers associated with down feathers; and contour feathers, which provide an ideal surface for flight. **Key characteristic: feathers.**

6. Mammals
Mammals are the only animals that possess hair, a structure that grows from the outer layer of the skin. A dense soft covering of hair may be called fur or wool. Hair forms an insulating cover. Glands in mammalian skin release oils which help to keep the fur waterproof and offer protection against rain and the cold.

Some mammals, however, do not need the protection of a furry coat. Such animals include elephants, rhinos and hippos. Animals such as elephants, rhinos, and hippos have only a sparse covering of hair over their thick, leathery skins. Other animals possess a layer of blubber under the skin, which serves to insulate their bodies. These animals do have some hair, but only a few sensory bristles found around their mouths for touch. Animals with blubber and sensory bristle hairs include whales and dolphins. **Key characteristic: hair/fur.**
<table>
<thead>
<tr>
<th>Glossary</th>
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<tbody>
<tr>
<td><strong>amphibian Noun.</strong> Any cold-blooded vertebrate of the class Amphibia, including frogs and toads, newts and salamanders, where the larvae is usually aquatic and breathes by using gills, while the adults are usually semi-terrestrial, and breathes by using lungs and through their moist skin.</td>
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<td><strong>antiseptic Adjective.</strong> Free from, or cleaned of, germs and other microorganisms.</td>
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<td><strong>arthropod Noun.</strong> An invertebrate having a segmented body, jointed limbs, and usually a chitinous shell that undergoes moltings, including the insects, spiders and other arachnids, and crustaceans.</td>
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<td><strong>bird Noun.</strong> Any warm-blooded vertebrate of the class Aves, having a body covered with feathers, forelimbs modified into wings, scaly legs, a beak, no teeth, and bearing young in a hard-shelled egg.</td>
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<td><strong>blubber Noun.</strong> The fat layer between the skin and muscle of whales and other animals, from which oil is made.</td>
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<td><strong>bristle Noun.</strong> One of the short, stiff, coarse hairs of certain animals.</td>
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<td><strong>camouflage Noun.</strong> Concealment by some means that alters or obscures the appearance.</td>
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<td><strong>chitin Noun.</strong> A substance that that forms a semitransparent, horny substance and is a principal constituent of the exoskeleton, or outer covering, of insects, crustaceans, and arachnids.</td>
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<td><strong>contour feather Noun.</strong> One of the three types of feathers possessed by birds that provides an ideal plane for flight.</td>
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<td><strong>desiccation Verb.</strong> To dry thoroughly.</td>
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<td><strong>down feather Noun.</strong> The soft under-plumage of birds.</td>
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<td><strong>ectotherm Noun.</strong> An organism that regulates its body temperature largely by exchanging heat with its surroundings.</td>
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<td><strong>endotherm Noun.</strong> An organism that generates heat to maintain its body temperature, typically above the temperature of its surroundings.</td>
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<td><strong>exoskeleton Noun.</strong> An external covering or a skeleton on the outside of an animal’s body.</td>
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<tr>
<td><strong>filoplume feather Noun.</strong> One of the three types of feathers possessed by birds that are hair-like and associated with down feathers.</td>
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<tr>
<td><strong>fish Noun.</strong> Any of various cold-blooded, aquatic vertebrates, having gills, usually fins, and typically an elongated body covered with scales.</td>
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<td><strong>insulation Noun.</strong> A material that covers, lines, or separates in order to prevent or reduce the passage, transfer, or leakage of heat.</td>
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<td><strong>invertebrate Noun.</strong> Not having a backbone or spinal column.</td>
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<td><strong>keratin Noun.</strong> A type of protein material found in the dead outer skin layer, and in horn, hair, feathers, hoofs, nails, claws, bills, etc.</td>
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<td><strong>mammal Noun.</strong> Any vertebrate having the body more or less covered with hair, nourishing the young with milk from the mammary glands, and, with the exception of the egg-laying monotremes, giving birth to live young.</td>
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<td><strong>mucous Noun.</strong> A viscous, slimy mixture of water and other substances that is secreted by glands lining certain body cavities which serves primarily to protect and lubricate surfaces.</td>
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<td><strong>respiration Noun.</strong> The inhalation and exhalation of air; breathing.</td>
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<tr>
<td><strong>reptile Noun.</strong> Any cold-blooded vertebrate, including groups such as the turtles, snakes, lizards, crocodilians and various extinct members including the dinosaurs.</td>
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</table>
**scale Noun.** One of the thin, flat, horny plates forming the covering of certain animals, as snakes and lizards.

**vertebrate Noun.** Having a backbone or spinal column.
Resources

Suggested Web Sites:

World Almanac for Kids: Animal Facts
http://www.worldalmanacforkids.com/WAKI-Chapter.aspx?chapter_id=1

National Geographic Kids
http://kids.nationalgeographic.com

National Zoo
http://nationalzoo.si.edu/

North American Mammals by National Museum of Natural History
http://www.mnh.si.edu/mna/

NASA Infrared Zoo
http://coolcosmos.ipac.caltech.edu/image_galleries/ir_zoo/

Suggested Books:


References


ANIMAL COVERINGS
Activity Sheet

Student Names: __________________________________________________________

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<thead>
<tr>
<th>Name of Animal</th>
<th>What coverings do you “see” and “feel”?</th>
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ANIMAL COVERINGS
Post-visit Activity to do in the classroom

Animal Survey

Objectives: Listed in the beginning of the lesson plan

Time: Two 55 minute classes

Materials: Paper and writing instruments or digital cameras; poster board.

Discussion (10 min)
Students brainstorm the types of animals they saw in the Museum and list what covered their bodies. Students can also share the different groups of animals they saw in the Museum and what characteristics the animals had in common (or how they were different).

Application/Problem Solving (*about 90 minutes):
Introduce the “problem” students will solve. You are a scientist at the National Museum of Natural History and have been asked to take a survey of the animals in your school yard. You and other scientists in your group will need to create a method for collecting information about the animals you will see. You will also need to figure out a way to put the animals into groups. What other animal characteristics can you observe on the animals in your school yard? How would you group your animals?

1. Use the same student groups. Ask them to devise a method for collecting observations about animal characteristics (field notes). Students can also use digital cameras to take photos of the animals they see or draw pictures.
2. Students will observe in the school yard for animals and collect data on all the animals they see.
3. Students will use the data to develop a scheme for grouping the animals.
4. Students will display the groupings in list, picture or photo array.

*You can save time on this activity by providing field notes ahead of time; thus eliminating the need for step #1. This may also be necessary for younger students. See next page for field note example.

Post Activity Discussion (20 min):
Members from each group present their array and explain how they sorted the animals and why.
Field Notes

Draw the animal you see in this box.

Name of Animal: ________________________________________________________

What does the animal look like? __________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

What is the animal doing?  ______________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

What is the animal's habitat?  ____________________________________________
______________________________________________________________________
______________________________________________________________________