Animal Classification (60 minute program)

**Purpose:** This lesson provides an overview of animal classification, with a specific emphasis on the identification of vertebrates and invertebrates and features that help to distinguish the five vertebrates classes.

**Audience:** 5th – 8th grade students

**Materials:** pencils, pens and markers (for classification example) vertebrate vs. invertebrate pictures (power point if available), animal specimens

- to obtain animal specimens, contact Dr. Steven Castleberry (scastle@warnell.uga.edu)
- to obtain live herps, contact Dr. John Maerz (jmaerz@warnell.uga.edu)

**Learning Objectives:** Following this lesson, students should be able to:
1. Explain why scientists classify things.
2. Recognize differences between vertebrates and invertebrates.
3. Determine major features unique to each of the five vertebrate classes (fish, amphibians, reptiles, birds, mammals).
4. Observe a mystery organism and, based on its characteristics, classify the animal into the appropriate vertebrate group.

**I. Introduction (5 minutes) – Learning to Classify**

What does it mean to classify something? Why would you want to group something into categories? Categories help us sort information, discover patterns, and learn about objects. What do we use to classify things? We observe characteristics.

If I asked you to classify this object (pencil), what do you notice that might help you? How is it similar or different to these other things (mechanical pencil colored pencil, pen, marker, etc.)? Which are most closely related to the pencil?

What if you had a bag of coins? How would you classify the coins? Why would you classify the coins (easier to count and figure out how many you have!)? Classifying living things works the same way. Today, we will focus on classifying animals. By the end of the lesson, you will have most of the skills to be an animal classification expert.

**II. Linnaean Taxonomy (10 minutes)**

Scientists use a system created by a Carl Linnaeus, a Swedish botanist, to classify living things. All organisms (living things) are placed into one of five kingdoms (animals, plants, fungi, monerans, protists).
***If appropriate and time allows, briefly describe the Linnaean taxonomy system:
Kingdom (Animalia, Plantae, Fungi, Monera, Protista)
Phylum — Animalia Phyla = Porifera (Sponges), Cnidaria (Jellyfish), Platyhelminthes (Flatworms), Nematoda, Rotifera, Mollusca, Annelida (Earthworms), Arthropoda (Insects, Crustaceans, Arachnids), Echinodermata (Urchins, Starfish), Chordata (Vertebrates)
Class — Chordata Classes = Fish, Amphibians, Reptiles, Birds, Mammals
Order
Family
Genus
Species

Mnemonic: King Philip Came Over For Great Spaghetti

Note: When scientists talk about a certain species, like a wolf, they use the genus and species name (Canis lupus). These words come from Latin – the language used by the ancient Romans. Although no one speaks Latin anymore, the Latin names works best because scientists from all over the world can recognize it.

Draw a diagram on the board. Circle “Animals.” Today we’re going to focus on the animal kingdom. Draw two arrows coming off of “Animals” and add “vertebrates” & “invertebrates.” Animals can be placed into two main groups: vertebrates (phylum Chordata) & invertebrates (everything else). What’s the difference? Vertebrates have bones, invertebrates don’t. What are we? Feel your spine. Show slides of various animals. Students will classify each as vertebrate or invertebrate.

Draw 5 arrows off of vertebrates. In the next 30 minutes or so, we’re going to meet some living (and non-living) vertebrates. You’re going to help classify them into one of the five vertebrate groups, or classes. What are they?

Mammals
Birds
Fish
Reptiles
Amphibians

At the end, we’ll test our classification skills on some mystery animals. Hopefully by then, you will recognize which vertebrate class each animal belongs to. It’s important that we remember some basic rules while we are classifying (stay quiet, stay seated, respect the live animals, etc.) Any questions? Let’s get started…
III. Classification Stations (25 minutes total, 12 minutes per station)

Split into two groups and visit the two classification stations.

Station 1 – Non-living specimens
Have students carefully sort the non-living specimens into groups, then have them explain how they made their choices. Students may carefully touch animal specimens. Discuss the characteristics each vertebrate class, identify each species (species may vary), and answer questions. Important things to cover:

**Mammals**: the basics = endothermic, hair, milk-secreting glands, different types of teeth, live birth
1. Mammals are **endothermic** vertebrates.
2. They have **hair**, which varies greatly among species.
3. Most have sudoriferus (sweat) glands.
4. They have **mammary (milk-secreting) glands**.
5. They have sebaceous (fat-secreting) glands.
6. They have heterodont dentition (different types of teeth).

**Birds**: the basics = endothermic, feathers, lightweight bones, wings, lay eggs
1. Birds are **endothermic** vertebrates.
2. Their skin is covered with **feathers**.
3. They have four-chambered hearts (like mammals).
4. Their bones are lightweight and usually hollow.
5. Their forelimbs are modified as **wings**.
6. They lay **eggs**.

**Fish**: the basics = ectothermic, aquatic, scales, fins (not limbs), gills, lay eggs in water
1. Fish are **ectothermic, aquatic** vertebrates.
2. Their skin is generally covered with **scales**.
3. Their limbs are modified into **fins** for swimming.
4. They breathe with **gills**.
5. They lay **eggs** that must be **in water**.

Station 2 – Living specimens
Have students carefully sort the living specimens into groups, then have them explain how they made their choices. Students may carefully touch live animals one at a time. Discuss the characteristics each vertebrate class, identify each species (species may vary), and answer questions. Important things to cover:

**Amphibians**: the basics = ectothermic, moist slimy skin, lay eggs in water, metamorphosis (land and water), no claws on toes
1. Amphibians are **ectothermic** vertebrates.
2. Their **skin** lacks scales, hair, and feathers, and is either smooth (like a frog) or rough (like a toad). They are dependent upon moisture and subject to desiccation; their skin **must remain moist to aid in breathing**.
3. They **lay eggs in water**, which hatch into an intermediate life form (tadpole or larva) that usually breathes with gills, and change into the adult form that **breathes air and can live outside water**.
4. They have three-chambered hearts.
5. They lack claws on their toes.
Reptiles: the basics = ectothermic, scales, claws, amniotic egg (lay eggs on land)
1. Reptiles are ectothermic vertebrates.
2. Their skin has scales, but no hair or feathers.
3. They have three-chambered hearts (except for alligators and crocodiles, which have four-chambered hearts).
4. They have claws on their toes (except those which do not have legs, such as legless lizards).
5. They are the first animals, in evolution, to develop the amniotic egg. This allows reptiles to lay eggs on land.

IV. Mystery Animals (15 minutes)

Come back together as one big group. Bring out a mystery animal, one at a time, and have the students use their classification knowledge to place the animal in the correct vertebrate class. Do not reveal the name of the species until they have guessed. Make sure each student has a chance to touch and silently observe the animal before guesses are made. When animal is classified, have students explain why – thinking back to what they learned in the classification stations.

Potential mystery animals:
- Salamander – looks like reptile, but slimy skin, no claws = amphibian
- Bat – wings look like bird, but hair/teeth = mammal
- Amphiuma – amphibian that looks like a snake or an eel, legs reduced for aquatic lifestyle
- Snake – no legs or claws, but scales = reptile

If time allows, include a dinosaur model. Classifying extinct animals like dinosaurs is tricky, because we can’t directly observe them. We have to rely on fossil evidence. The name “dinosaur” means terrible lizard. Dinosaurs appear to possess a lot of reptile-like features, but scientists now believe they are more closely related to birds.

V. Classifying Ourselves (if time allows)

Where do humans fit into this classification scheme? Using Linnaean taxonomy, here’s where we stand:

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primata (five fingers and toes, opposable thumb, collarbone)
Family: Hominidae (walk on two legs, S-shaped vertebrae, all apes)
Genus: Homo (Australopithecus/Homo erectus closely related, now extinct)
Species: Sapiens (homo = human, sapiens = wise or knowing)
VI. Conclusion (5 minutes)

There are millions of species of living things on Earth (1.5 million known, probably 20 million total, more are discovered everyday). We talked about vertebrates today. There are about 45,000 known species of vertebrates on the planet:

Mammals = 4,500 species (70% rodents and bats)
Birds = 9,900
Fish = 15,500 (many still undiscovered)
Reptiles = 8,240
Amphibians = about 6,000

However, vertebrates represent only 1/35 of all species on the planet. A single scoop of soil, for example, could contain 5,000 species of monerans (bacteria)! Every animal is important for different reasons. Classification helps! The more we know about each species, the better off we’ll be. Any questions???

Bonus: Animal Extremes

Largest animal = blue whale (over 100 feet, 190 tons – or five 18-wheeler trucks)
Largest land animal = African elephant (about 12 feet tall, 6-7 tons)
Largest invertebrate = giant squid (longest measured = 59 feet)
Strongest animal = rhinoceros beetle lifts 850 times its own weight
Fastest animal = cheetah on land (70 mph), sailfish in water (68 mph), peregrine falcon in air (200 mph)
Loudest animal = blue whale (low-frequency sounds heard 500 miles away), howler monkey is loudest on land (about 3 miles away)
Oldest animal = Galapagos tortoise (over 150 years old)
Smallest mammal = bumblebee bats of Thailand (2 grams – weight of penny)