

Characteristics of Life

6-8 Pre-Activity

Lesson Summary

Students examine pictures and information of two animals to determine how closely grouped these animals might be classified taxonomically. Students are provided additional information to continue revising and developing their understanding.

Objectives

Students will be able to describe variations between different groups of animals

Students will be able to refer to text to make inferences

Students will be able to use accessible information to classify animals into taxonomic groups

Essential Question

How are living things similar or different from one another?

Materials

- Taxonomy information sheet (provided at the end of the lesson)
- Armadillo information sheet (provided at the end of the lesson)
- Scrap paper (or worksheet such as provided at the end of the lesson)
- Writing utensils

Prep

1. 1 Day before: Print out information sheets and worksheets as needed (1 for each student)

Key Terms

- **Classification:** the assignment of organisms to groups that share characteristics
- **Taxonomy:** the system of organisms to categorizations based on shared characteristics and relation
- **Vertebrate:** an animal with a backbone, including mammals, birds, reptiles, amphibians, and fish
- **Mammal:** any warm-blooded vertebrate having the body more or less covered with hair, nourishing the young with milk from the mammary glands, and giving birth to live young
- **Bird:** any warm-blooded vertebrate having a body covered with feathers, forelimbs modified into wings, scaly legs, a beak (no teeth), and bearing young in a hard-shelled egg
- **Reptile:** any cold-blooded vertebrate having a body covered with scales that shed, and bearing young in a typically soft-shelled egg
- **Amphibian:** any cold-blooded vertebrate in which the larvae being typically aquatic, breathing by gills, and the adults being typically semiterrestrial, breathing by lungs and through the moist, glandular skin

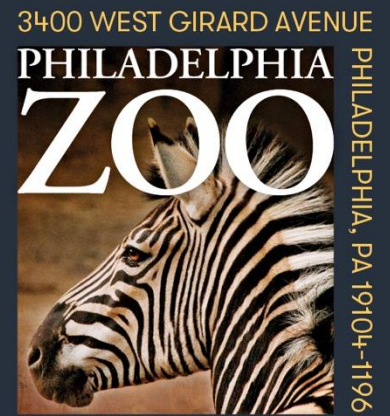
Background

There are many ways in which organisms (living things) can be classified. This process involves grouping organisms together based on shared characteristics. Some of these characteristics might include habitat, presence of a backbone, food source, diet, how they move, etc. By observing these organisms and sorting through their similarities and differences, we gain a better understanding of them and their needs, and are therefore able to better work toward protecting and preserving all living things!



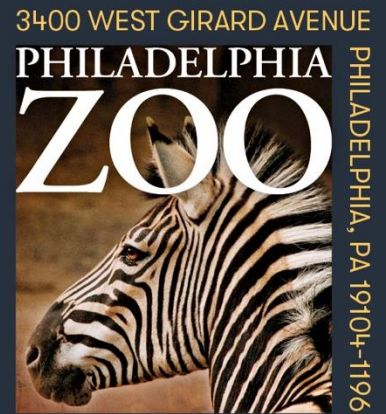
Implementation

1. Excite: Ask students to share their favorite animals aloud and keep a running list of all the animals shared.
2. Invite the students to get into groups to determine how those animals could be grouped together.
3. Bring the class back as a whole and ask groups to share some strategies they may have used to group the animals. Ask them specifically what similar or different features they might have used focused on to determine these different groups.
4. Share with students that they just worked to classify animals based off of similar features. Today, they will be diving deeper in categorizes animals based off of their taxonomy. Taxonomy looks at not only these shared features, but how the animals are related biologically as well.
5. Explore: Ask students now to consider two specific animals: a three-banded armadillo and a nine-banded armadillo. Provide students a picture of each.
6. Ask students first to take some time making observations and noting similarities and differences between the two animals. What are some features that the animals share? What are some features that look different between the two? Ask the students to record some of their findings.
7. After students have had time to make observations, discuss a class if they think these features would be an indicator of how closely related the animals were? Why or why not?
8. Explain: Share with the students that there are so many living things that scientists work to classify them into groups in order to understand them better. They have come up with a system to help them sort animals into groups called Taxonomy. There are 8 main levels of taxonomy, or taxonomic categories: Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species. The more taxonomic categories that two organisms share, the more closely related they are. Provide the students more information by supplying the Taxonomy Information Sheet, and give them time to review. Encourage students to highlight or take notes on some of the key elements that are considered to distinguish animals from one group to another.
9. Discuss with the students as a class if they think the information they've been provided is sufficient enough to determine how closely related the two animals are? Would we be able to identify if these animals were in similar or different taxonomic groups? Why or why not?
10. Elaborate: Share with students that the information provided might be able to start to determine if the two animals were in similar or different taxonomic categories, but we need more information about the animals themselves. Provide students with the Armadillo Information Sheet and allow them time to review. Invite students to add on their notes from before.



- a. Student notes from observations and readings may look like the following:

Similarities:	Differences:
<ul style="list-style-type: none"> - Similar diets – similar dentition? - Both have hair (Class Mammalia) - Both have armor, carapace and bony plates (Order of Cingulata) 	<ul style="list-style-type: none"> - different ear shapes - different head shapes - 9-banded bigger (different in size, different number of bands)



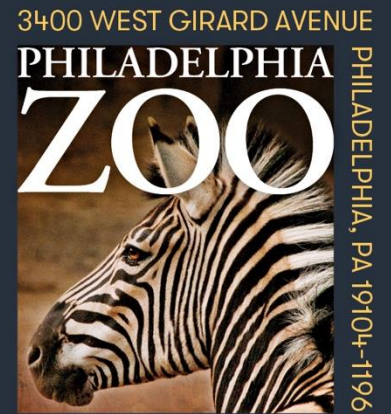
11. Discuss with the students as a class again if they think the information they've been provided is sufficient enough to determine how closely related the two animals are? Without using specific names, would we be able to identify if they were in similar or different taxonomic categories? Why or why not?
12. Ask the students to use their observations and the information from the readings to go rank by rank and determine if the two armadillos would be considered in the same or different groups at that specified taxonomic category.
- a. Based off student observations and the readings, students may have been able to record the following:

	Potential characteristics to consider:	3-banded and 9-banded armadillos are in:
Kingdom	Animal , Archaeobacteria, Eubacteria, Protists, Fungi and Plants	similar group
Phylum	notochord or not	similar group
Class	groups like different fish, amphibians, reptiles, birds, mammals	similar group
Order		similar group
Family	size, patterns, type of claw	different groups
Genus	skull shape, teeth, ear types	different groups
Species	distinct - only able to breed amongst species	different groups

13. Evaluate: Discuss with the students as a class one last time if they think the information they've been provided is sufficient enough to determine how closely related the two animals are? Without using specific names, would we be able to identify if they were in similar or different taxonomic categories? Why or why not?
14. Ask students to identify the taxonomic category at which the two armadillos start to differ from one another (they do not need to specify what that specific group is called, just at which level they separate from each other).
15. If accessible, invite students to confirm their findings by looking up the classification of each armadillo. The taxonomic classification of each animal is also supplied below. Ask students to record each animal's proper scientific name using the proper notation as described in the reading.

- a. Taxonomic classification of three-banded armadillos and nine-banded armadillos:

	Three-banded armadillo	Nine-banded armadillo
Kingdom	Animalia	Animalia
Phylum	Chordata	Chordata
Class	Mammalia	Mammalia
Order	Cingulata	Cingulata
Family	Chlamyphoridae	Dasypodidae
Genus	<i>Tolypeutes</i>	<i>Dasypus</i>
Species	<i>tricinatus</i>	<i>novemcinctus</i>



Expansion

Explore additional animals and work to determine how closely those animals are related to armadillos, each other, or other animals! Additional resources may be necessary.

Curriculum References

3.1.6.A1, 3.1.7.A1



Additional Resources



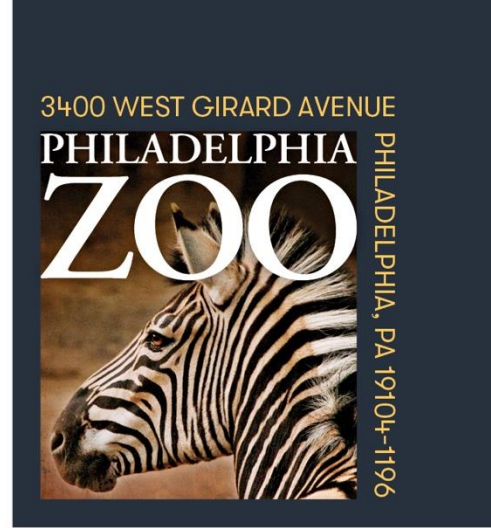
Three-banded Armadillo



Nine-banded Armadillo

Name: _____

Date: _____



Three-banded armadillo



Nine-banded armadillo

Observe the photos of armadillos and compare and contrast the two animals below.

Similarities:	Differences:

Is the information above enough to determine how closely the two armadillos are related? _____

While reviewing the taxonomy reading, use the space below to note important differentiations in the taxonomic levels mentioned. Based on this information and the observations above, then determine if the two armadillos would be considered in the same or different groups at that specified taxonomic category.

	Potential characteristics to consider	3-banded and 9-banded armadillos are in:
Kingdom		similar group / different groups
Phylum		similar group / different groups
Class		similar group / different groups
Order		similar group / different groups
Family		similar group / different groups
Genus		similar group / different groups
Species		similar group / different groups

*Once the chart is complete, mark which taxonomic category the two armadillos differ from each other.

Scientific Names

Three-banded: _____

Nine-banded: _____

Taxonomy Information Sheet

Taxonomy is the system of organisms into categorizations based on shared characteristics and relation. There are 8 main levels of taxonomy, or taxonomic categories: Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species. The more taxonomic categories that two organisms share, the more closely related they are.

Domain: At the highest rank, there are three domains including Archaea, Bacteria, and Eukarya. Eukaryotes are living things with cells that have a cell nucleus and membrane bound organelles. Animals, Plants, and Fungi are the most familiar eukaryotes.

Kingdom: Generally, scientists agree that there are 6 kingdoms: Animal, Archaeobacteria, Eubacteria, Protists, Fungi and Plants

Phylum: Within the animal kingdom there are more than 30 phyla. One of the biggest distinctive phyla in the animal kingdom is Chordata – the group of animals with a notochord (a stiff rod that provides structure and turns into a spine for some) and neural tube (which turns into the spinal cord for some) during development.

Class: This level of taxonomy breaks things down even further. For example, there are many animals for example with notochords, so they are further split up by shared features into groups like jawless fish, cartilaginous fish, bony fish, amphibians, reptiles, birds and mammals. Mammals are animals that feed their young milk.

Order: The next step, breaks down those classes into orders by looking at more specifics although there are no specific features focused on. Some examples of order under mammals include carnivores, rodents, carnivores, chiroptera (bats), etc.

Family: Here, orders are broken down into families based on past ancestors or physical traits such as size, pattern, or type of claw. There are lots of different carnivores in the world, but they aren't all the same. For example, the family Canidae (dogs and dog like animals including foxes) is not the same as the family Felidae (cats, both big and small). One of the biggest differences between Canidae and Felidae is skull size, number of teeth and coat pattern.

Genus: This is the second to last level, and here living things are more and more similar with only some differences. They can look relatively the same, but still be different! For example, the genus *Canis* includes dogs, wolves, coyotes, dingos and jackals. They all have similar dentition, ears, sized skulls, and sized bodies. Foxes are not included in this specified genus due to other physical differences, such as triangular face, smaller size, and semi- retractable claws.

Species: This is the most specific layer of taxonomy. Animals in the same species can breed together and create viable offspring (but cannot without other species, even in the same genus). Wolves are *Canis lupus*, while dogs are *Canis familiaris*. An animal's scientific name, includes the genus (capitalized) and species italicized.

Armadillo Information Sheet

Modern Armadillos are an amazing group of animals that originated in South America about 66 million years ago. Armadillos are a member of the Class Mammalia just like you and me!

Many believe that armadillos are in the Order rodents (animals with really long incisors, eat plant-based foods) or Order marsupials (animals that carry their young in a body pouch) which is false. Their closest living relatives are instead sloths and anteaters, which all belong in the Superorder Xenartha.

Armadillos are in an specified order of their own called Cingulata, that are distinct for their armor. That's where their name comes from, as "armadillo" means "little armored one" in Spanish. Armadillos have bony, armor-like plates covering their body and a shell called a carapace, which is made of true bone and cover their entire backside. Armadillos commonly have bony plates surrounding their tails as well.

9 banded armadillos: The nine-banded armadillos are the only type of armadillo found in the United States. Despite their name, nine-banded armadillos can have 7 to 11 bands on their armor. Nine-banded armadillos are about 2.5 feet (0.7 meters) long from the nose to the tip of the tail and weigh an average of 12 pounds (5 kilograms). They prefer warm, wet climates and live in forested or grassland habitats. Their abandoned burrows are utilized by other animals, such as pine snakes, rabbits, opossums, mink, cotton rats, striped skunks, burrowing owls, and eastern indigo snakes. These armadillos are generalist feeders and use their sense of smell to track down almost 500 different foods, most of which are invertebrates such as beetles, cockroaches, wasps, yellow jackets, fire ants, scorpions, spiders, snails, and white grubs. A lesser part of the diet is comprised of small reptiles and amphibians as well as eggs of mammals, reptiles, and birds, as well as some fruit, seeds, fungi, and other plant matter.

3 banded armadillos: Three-banded armadillos are found in South America, including Bolivia, Brazil, Paraguay, and Argentina. As their name suggests, they have three-bands across their back and they are the only armadillo that can curl itself into a ball completely. Three-banded armadillos usually weigh about 3 pounds (1.5 kilograms) and have 12-inch (30-centimeter) long bodies and 2.5-inch (6-centimeter) long tails. They live in open, grassy areas, open forests and marshes. They do not dig burrows like most armadillos, but use the abandoned burrows of anteaters when they can get them. They use their well-developed sense of hearing and smell to detect both predators and prey. In the wild they feed primarily on ants and termites, which they obtain using their powerful forelegs and claws.