



LESSON PLAN

COMPARATIVE ANATOMY GRADES 6-8

SUMMARY

Students observe similar structural and developmental characteristics of organisms in order to construct an explanation about the organisms' pattern of evolution.



MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

Science & Engineering Practices

Constructing Explanations and Designing Solutions
Analyzing and Interpreting Data

Connections to Classroom Activity

- Students observe structures in the upper extremity of several different organisms looking for similarities and differences among them. Then, students construct an explanation about the evolutionary relationships among those organisms.

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.

Connections to Classroom Activity

- LS4.A builds on disciplinary core ideas introduced in third grade—more specifically, that some plants and animals once living on Earth are no longer present. Also, students build on previous understanding that fossils provide evidence about organisms that lived long ago, and that evidence can be used to infer relationships among organisms that have similar patterns of development.

LS4.A: Evidence of Common Ancestry and Diversity

Anatomical similarities and differences between various organisms living today, and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.

Cross Cutting Concepts

Patterns

Connections to Classroom Activity

- Students observe similar structures in a variety of organisms looking for patterns in development that suggest organisms evolved similarly to possess characteristics that suited them best for survival.

DURATION

45 min.



ENGAGE

MATERIALS

- Three sets of animal images:
 - Set 1: Hawk, ostrich, and chicken
 - Set 2: Chicken, whale, and frog
 - Set 3: Frog, cat, and human
- Fossil image

Tell students you are going to show them some pictures of animals and you want them to notice similarities and differences as they observe the images. Also tell students to record questions they have as you show them three different series of pictures (nine pictures total). Show students three pictures at the same time and give them 2 minutes to add to their similarities/differences chart as well as their questions. Similarities and differences “look fors” are below for pre-assessment. As students notice similarities, encourage them to think about what functions those structures have and whether similar structures serve similar or different functions. The three sets of pictures are as follows:

Set 1: Hawk, ostrich, and chicken

Similarities students may notice: All the organisms are birds, and they share similar physical traits such as wings, legs, and beaks.

Differences students may notice: Ostriches don’t fly. Hawks are carnivores, ostriches are omnivores, and chickens are herbivores.

The goal of observing this set of animals is for students to notice that the birds have similar structures serving similar functions, even though ostriches don’t fly.

Set 2: Chicken, whale, and frog

Similarities students may notice: All the animals have limbs (i.e., appendages such as wings, fins, and legs).

Differences students may notice: One animal is an amphibian, one is a mammal, and one is a bird. These animals use their limbs for different things (e.g., swimming, walking, and hopping). Chickens and frogs lay eggs, whereas whales give live birth.

The goal of observing this set of animals is for students to notice more differences than similarities and to notice that similar structures sometimes have different functions.

Set 3: Frog, cat, and human

Similarities students may notice: All the animals have limbs, specifically legs that are used for walking.

Differences students may notice: One is an amphibian, and the other two are mammals. Humans are bipeds (walk on two legs), whereas cats and frogs are quadrupeds (walk on four legs).

The goal of observing this set of animals is for students to not only notice some similarities and differences but also focus more on the function of the structures than just the structures themselves.

Ask students to share with a shoulder partner the similarities and differences they noticed as well as questions that arose while making observations. Give each student 1 minute to share. Next, have students share the similarities and differences they observed with the class. Support students in noticing the patterns in the similarities and differences they share:

- Many organisms have similar structures that are used for both similar and different functions.
- If students were to look at the organisms without their skin, fur, or feathers, they would see similarities in the organisms' structures.

Invite students to share questions that arose while observing the three sets of animals. Record these questions publicly. (As you move through the lesson, refer to the questions and identify the questions that the class has answered.)



EXPLORE

Mystery Fossil (Archaeopteryx). Tell students a fossil of a previously unknown animal was found. Share the image of the unknown fossil with students. Ask students to make and record observations of the animal. Then ask them to make a claim, based on evidence from their observations (data), about the type of animal that is fossilized in the rock (a mammal, a fish, a reptile, a bird, etc.).

Ask students the following probing questions while looking for relevant evidence from their observations to make a claim. *How do you think this animal moved around? What do you think it ate? What kind of animal do you think it is?*

Also encourage the class to consider what they agree on and disagree on. This will be important and valuable when students revise their claims after watching the Generation Genius video and completing the Evaluate section.



EXPLAIN



WATCH THE GENERATION GENIUS COMPARATIVE ANATOMY VIDEO AS A GROUP





ELABORATE

Tell students to use comparative anatomy to help determine what type of animal is fossilized in the rock, or what type of animal it is most similar to, based on the fossil structures observed in the image. Ask students to create a table with four columns labeled as follows:

- *Structure I notice...*
- *Animal(s) that have that structure...*
- *Function I predict...*
- *Reasoning...*

See the data table provided for an example of what students might include in their own tables.



Structure I notice...	Animals(s) that have that structure	Function I predict...	Reasoning
Claws	Unknown Fossil Bird	Grabbing prey	The unknown fossil has claws like the bird, so it may have attacked prey like a predatory bird.

Ask students probing questions such as *What structures does the unknown fossil possess that would tell you what type of animal it is? What types of animals do you think it is closely related to? What similarities does it have to other animals you have observed? What do you think this animal ate? How do you think this animal traveled—by land or sky?*

Tell students the unknown fossil is a real fossil that was found for the first time in 1891, with 10 other fossils of the same kind being found since. It is called Archaeopteryx and scientists have long debated what it was—a bird or a reptile (a type of dinosaur).

Ask students to revise their initial claims based on evidence from observations (data) about the type of animal Archaeopteryx is—a bird or reptile. Encourage students to include specific evidence that connects similar structures (between Archaeopteryx and reptiles or Archaeopteryx and birds) to similar functions.



EVALUATE

There are multiple ways to assess your students' understanding of this topic. The exit ticket is an opportunity for students to use the science ideas they built in the lesson in a new context. Alternatively, you can use the Kahoot! quiz (which provides downloadable scores at the end of the game) and/or the paper quiz. All these resources are located right below the video in the assessment section.



EXTENSION

Have students observe pictures of fossilized remains of three prehistoric organisms—Rodhocetus, Ambulocetus, and Pakicetus. Then have students make a claim about the relationship among these organisms. Tell students to use comparative anatomy to identify evidence from their observations (data) to describe how these organisms are related as well as how they lived.



COMPARATIVE ANATOMY LESSON IMAGE SETS

Image Set 1



Image Set 2



Image Set 3

