

Who were dinosaurs?

3rd-5th Grade

NGSS:[3-LS4-1](#),[MS-LS4-1](#)



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MUSEUM

Read Pre-Lesson Preparation Before Class

Lesson Description

In this lesson students will explore what it means to define a group of animals and practice iterative analysis of data to uncover the truth. Students analyze and interpret data about various animals in order to determine whether or not these animals are dinosaurs. Students then work with a partner to articulate the criteria that they were using in their preliminary pass of the evidence. Finally, students use a given set of criteria to make a final evaluation of the animals.

Driving Phenomenon

While they lived on Earth, dinosaurs adapted to many different niches (roles) in their environment and spread across every land area on Earth. In terms of natural history, they were an amazingly successful group of animals. Still, many think of the term dinosaur as another way of saying old, outdated, or even a failure. **However dinosaurs were a diverse, active group of animals that thrived on the Earth for more than 150 million years** (by comparison the earliest humans were walking the Earth just 3 million years ago).

So how do we define this group of highly diverse and successful animals that all shared a common ancestor?

Driving Questions

- Who/what were the dinosaurs?

Learning Objectives

- Students will gain an understanding that not all prehistoric animals are dinosaurs by applying criteria to a set of unknown organisms.

Time Requirements

- Two 45-50 minute sessions

Prerequisite Knowledge

- Living things have needs for survival such as food, water, and air. The habitat where they live can meet their needs.
- Living things may possess features or practice behaviors that provide advantages for surviving and reproducing.
- Some animals that used to live on Earth no longer live or are extinct.

Teacher Resources

1. [A Prehistoric Riddle](#)
2. [Dinosaur Rules](#)
3. [Key to Dinosaurs and Dino-NOTS](#)

Student Resources

1. [Dinosaurs or Dino-NOTS?](#)
2. [Criteria Outlining Worksheet](#)
3. [Classify and Decide](#)

Who were the dinosaurs?

Full lesson procedures begin on page 4.

Engage 15 minutes	
Present students with the Prehistoric Riddle and allow them to wonder and make an educated guess about whether certain animals are dinosaurs.	Notes
Teacher Resources: 1 Student Resources:	
Explore 25 minutes	
Students will work with cards representing prehistoric animals and reason for themselves whether or not the animals are dinosaurs based on prior knowledge and the initial information from the Prehistoric Riddle.	Notes
Teacher Resources: Student Resources: 1	
Explain 20 minutes	
Students will work with a partner to outline their criteria for what a dinosaur is and is not based upon their previous evaluations.	Notes
Teacher Resources: Student Resources: 1 & 2	
Elaborate 10 minutes	
Present and review the four main criteria that can be used to determine if an animal is a dinosaur.	Notes
Teacher Resources: 2 Student Resources:	
Evaluate 15 minutes	
After reviewing accepted scientific criteria for what is considered a dinosaur, students, working in in pairs, will revisit their categorizations for Dinosaurs and Dino-NOTS.	Notes
Teacher Resources: 2 Student Resources: 1 & 3	

Pre-Lesson Preparation

Review the Teacher Resources and decide which ones you will project and which ones you will want to print and laminate. Each resource has suggested presentation guidelines.

- Print [Student Resource 1: Dinosaurs or Dino-NOTs?](#) (one copy per student)
- Two colors of Sticky Notes.

NOTES

Lesson Enrichment Ideas

DO

[Plan a trip](#) to explore the history of life on Earth in the [Griffin Halls of Evolving Planet](#), and see fossil specimens from all over the world up close at the Field Museum in Chicago.

Rent real specimens, and bring them to your classroom. If you live in the Chicago area, the [N. W. Harris Learning Collection](#) at the Field Museum offers numerous specimens that can be rented for study in the classroom.

- [Dinosaur Dinners](#)
- [Dinosaurs in the Jurassic](#)
- [Dinosaurs in the Cretaceous](#)
- [Paleontology Practices](#)

READ

Day of the Dinosaurs

by Dr. Steve Brusatte and Daniel Chestert

Admittedly, this book includes many Dino-NOTS! However, it full of examples explaining and illustrating dinosaurs' most essential body features in an way appropriate for 3rd through 5th grade students.

<http://worldcat.org/oclc/935196639>

Boy Were We Wrong About Dinosaurs

by Kathleen Kudlinski

An engaging introduction to the nature of science through the lens of dinosaur discoveries.

<http://worldcat.org/oclc/221152330>

WATCH

What Makes a Dinosaur a Dinosaur?

Field Museum Curator of Dinosaurs, Dr. Peter Mackovicky, outlines one of the most essential body features that defines whether or not an animal is considered a dinosaur or not.

<https://www.facebook.com/watch/?v=10154418996282273>

Brain Scoop Episode: Dimetrodon is not a Dinosaur

This video goes in depth into some of the traits and aspects of evolutionary history for why Dimetrodon is not a dinosaur.

<https://youtu.be/-tdVPiyVDsQ>

Engage

1 Project and/or read [Teacher Resource 1: Prehistoric Riddle](#)

The remains of this group of animals have been found on every continent on Earth. They lived on Earth for 165 million years. Various members of this group adapted to every possible environment filling every role of the ecosystem that an animal possibly can. Members of this group were as small as a turkey and also the largest animal ever discovered on land. While this group walked the land in the Mesozoic Era, their modern relatives fly in the air.

What is this group called?

- 2 Listen for students to recognize that you were referring to dinosaurs.
- 3 Once someone has claimed that you are talking about dinosaurs, ask them “what did I say that makes you think that?”
- 4 Find someone that has a different idea and ask them why they hold that opinion.
- 5 Have students share what they know about dinosaurs as well as some questions that they are unsure about. Compile what is known and what they are wondering about on a T-chart on the board.
- 6 Introduce the three animals on page 2 of [Teacher Resource 1](#), and ask the students: Are these animals dinosaurs? Allow students to vote their hypothesis by choosing one of two colors of sticky notes (e.g pink=NO yellow=YES). Ask the students to pick the colors for each animal based on their hypothesis and write a few words about why they think that on the sticky note, and then post their reasoning on the class chart.
- 7 Once the votes have been posted, ask people to share what they think about the disagreement/agreement among their peers. Also, explain that their answers here are just to get them to start thinking about strange animals that we don’t encounter very much. They will have the chance to revise or change their vote as we explore more about the question “ What are dinosaurs?”

Explore

- 1 Inform students that they will look at several animals to try to determine if they are dinosaurs or dino-NOTs.
- 2 Pass out [Student Resource 1: Dinosaur or Dino-NOT?](#) to each student. Students will cut out the cards on the first two pages and then sort them into one of three areas on the placemat located on the third page:
(Yes! Dinosaur. | No. Dino-Not | Hmm? Unsure.)
- 3 Give the students about 5-7 minutes to sort their cards.
- 4 Check in with students after the time is up to see how confident they feel about their determinations. Did they have any animals left in the unsure pile? Did they have many left in the unsure pile? Thank students for their work, and encourage them by stating that simple questions are not always so easy to answer.
- 5 Ask for two or three students to share an animal that they were unsure about and why they could not make a determination.

Explain

- 1 Assign partners and pass out [Student Resource 2: Criteria Outlining Worksheet](#) to each pair.
- 2 Students will compare how they each categorized the dinosaurs.
- 3 Then, they will work together to write the common criteria or rules that they used for the “Yes” and the “No” categories.
- 4 Finally, encourage students to use the rules that they have written to sort the some or all the remaining animals in the “Unsure” category into the “Yes” or “No” categories.
- 5 Reassure students that might still have animals in the “Unsure” area and that sometimes we need outside help to solve a mystery.

Elaborate

- 1 Share with students that there are four facts that all dinosaurs have in common. We can use these known facts to test if an animal is a dinosaur or not. Print or project [Teacher Resource 2: Dinosaur Rules](#) and review them and the accompanying examples.

Evaluate

- 1 After reviewing the criteria allow students to again try to resort the animals still in their unsure column at their desk and change their vote at the board.
- 2 Pass out [Student Resource 3: Classify and Decide](#) and have the students reconvene with their partner from the criteria section. Students will share their thoughts on the discussion questions.
- 3 Follow up the pair-share time by allowing students to share their thoughts with the class, and come to a class consensus about whether or not each of the animals from the first activity are Dinosaurs or Dino-NOTS.

From Student Resource 3: Evaluate | Step 2

1. Did any of the criteria that you used to sort your animals initially match the Dinosaur Rules?
2. Was it more difficult to make decisions about where the animals belonged using your own criteria or after you had the Dinosaur Rules?
3. Why do you think body features or skeleton features are used to decide what group an animal belongs to?

Upper Level Differentiation

Students could work in groups to research and develop a scientific chart illustrating each of the nine skeletal features that distinguish dinosaurs from their ancestors and relatives. This will require additional research and anatomical support.

A Prehistoric Riddle

Teacher Resource 1.0

The remains of this group of animals have been found on every continent on Earth.

They thrived on Earth for 165 million years.

Members of this group adapted to every possible environment, filling every role of global ecosystems suitable for animals.

Some members of this group were as small as a turkey while others were the largest animal ever discovered on land.

In the Mesozoic Era, these animals all walked on land, however, their modern relatives fly in the air.

What is this group called?

Print and cut out these images. Use them as column headers on a three-column chart. See steps 6 & 7 of the [Engage](#) activity for additional details.



Woolly mammoths

Teacher Resource 1.0: A Prehistoric Riddle



Geosternbergia sternbergi



Dimetrodon grandis

Dinosaur Rules

Teacher Resource 2.0

1. Dinosaurs lived during the Mesozoic era. The earliest dinosaurs in the fossil record show up 230 million years ago during the Triassic period, and all non-avian dinosaurs died in the end of the Cretaceous period 66 million years ago. No dinosaur fossils have ever been found in rocks of other time periods.
2. Dinosaurs lived on land. They did not fly in the sky, nor did they live underwater like a fish or a whale.
3. Dinosaurs' legs were directly under their bodies which allowed them to stand upright and move forward (running or walking) swiftly.

For a modern comparison of what this means think of an example of how a horse runs with its legs directly underneath it compared to an alligator that crawls with its legs out to the side. Imagine how their speed differs because of these two different body features.

4. Dinosaurs all have special skeletal features that have been identified by paleontologists. Below are eight different features that can be used to "diagnose" an animal as belonging to the group, dinosaurs.
 1. There are three or more backbones (sacral vertebrae) that attach to the hips.
 2. The hip socket is an open hole rather than a cup-shaped indentation.
 3. There are distinct head and neck structures at the top of the upper leg bone (femur), and the neck is nearly perpendicular to the main shaft of the femur.
 4. The lower leg bones (tibia and fibula) are not equal in size; the fibula is much smaller.
 5. There is a special facet of bone on the lower leg bone (tibia) where the ankle bone connects.
 6. The shoulder bone (or scapula) is long and slender like a strap.
 7. The shoulder socket opens slightly backward toward the animal's tail, not just downward.
 8. There is a long ridge on the upper bone of the front leg or arm. Strong muscles attached to this ridge.

Teacher Resources: Dinosaur Rules

1. There are three or more backbones (sacral vertebrae) that attach to the hips.

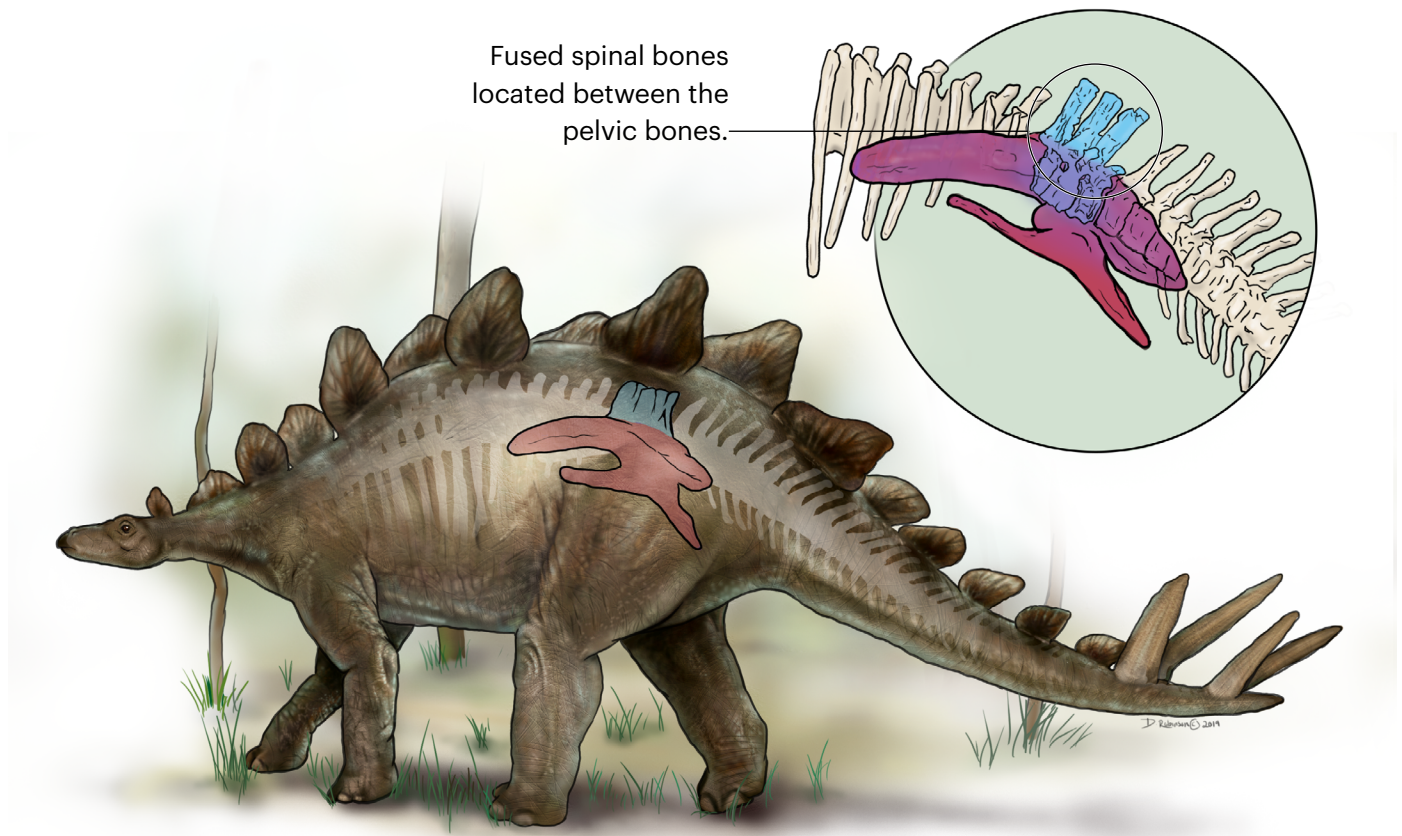


Illustration by Danielle Robinson

Teacher Resources: Dinosaur Rules

2. The hip socket is an open hole rather than a cup-shaped indentation.

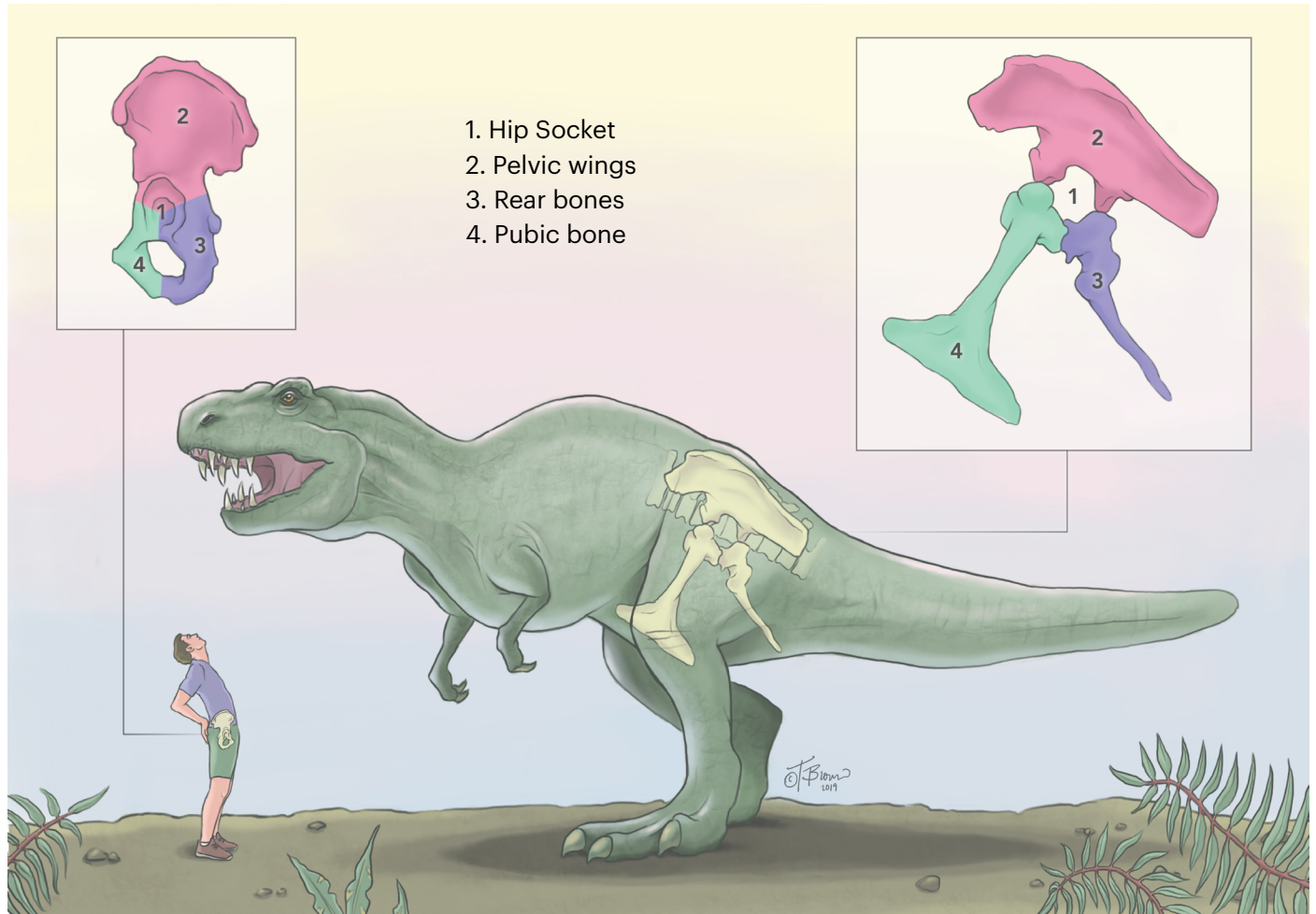
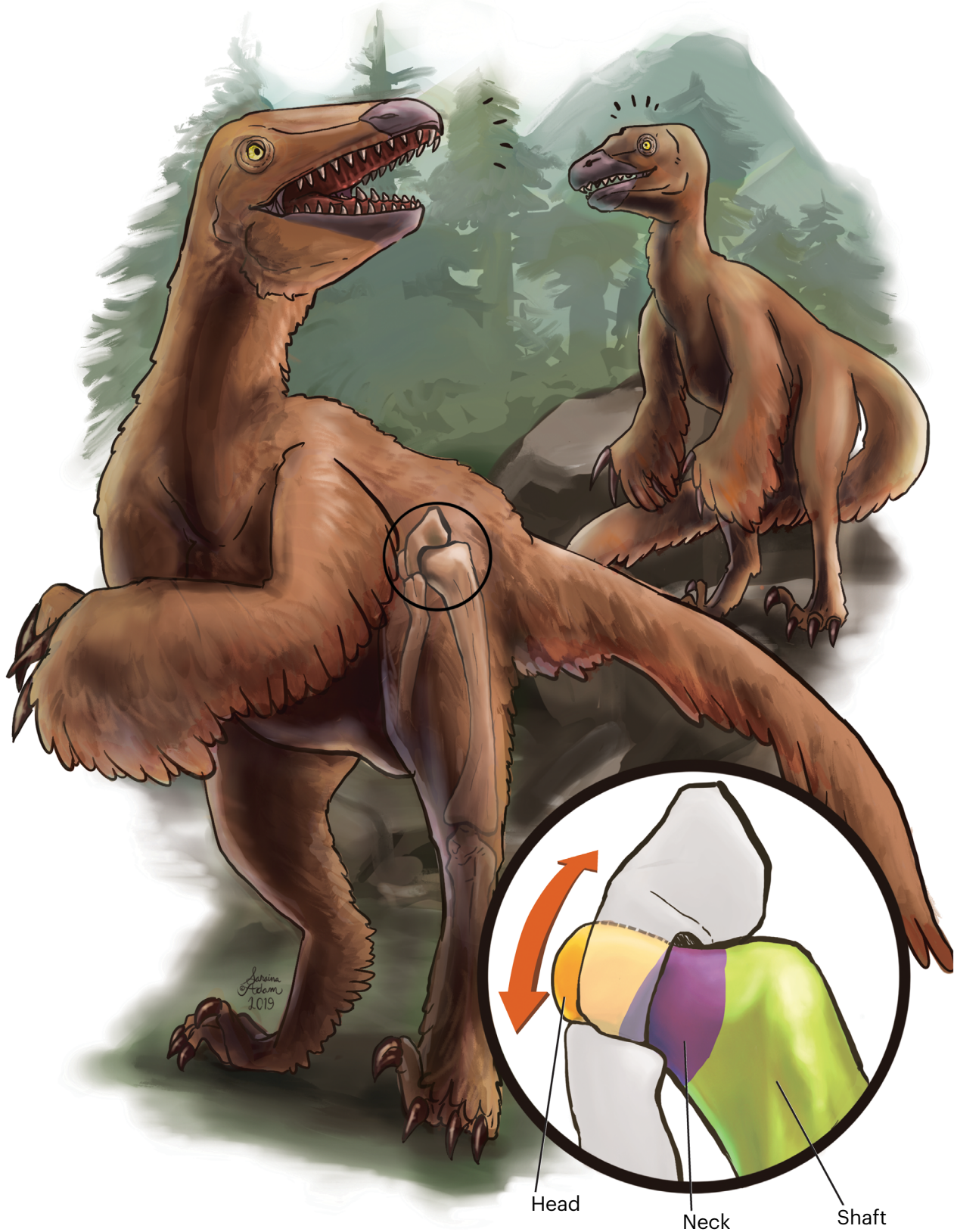


Illustration by Taylor Brown

Teacher Resources: Dinosaur Rules

3. There are distinct head and neck structures at the top of the upper leg bone (femur), and the neck is nearly perpendicular to the main shaft of the femur.



Teacher Resources: Dinosaur Rules

4. The lower leg bones (tibia and fibula) are not equal in size; the fibula is much smaller.

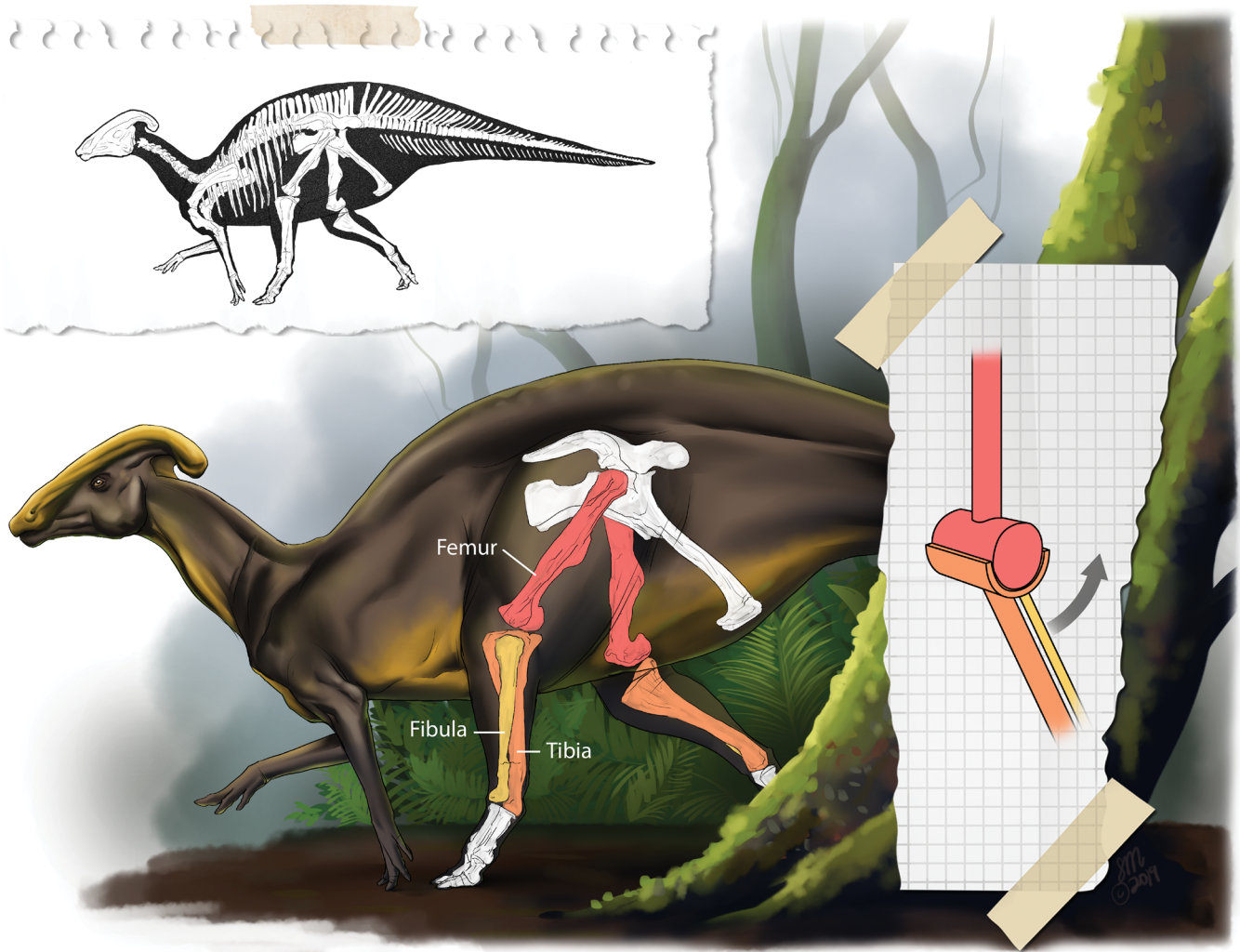


Illustration by Sarah McGuinness

Teacher Resources: Dinosaur Rules

5. There is a special facet of bone on the lower leg bone (tibia) where the ankle bone connects.

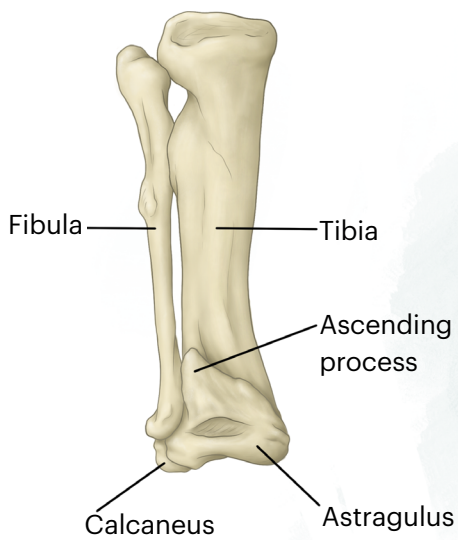


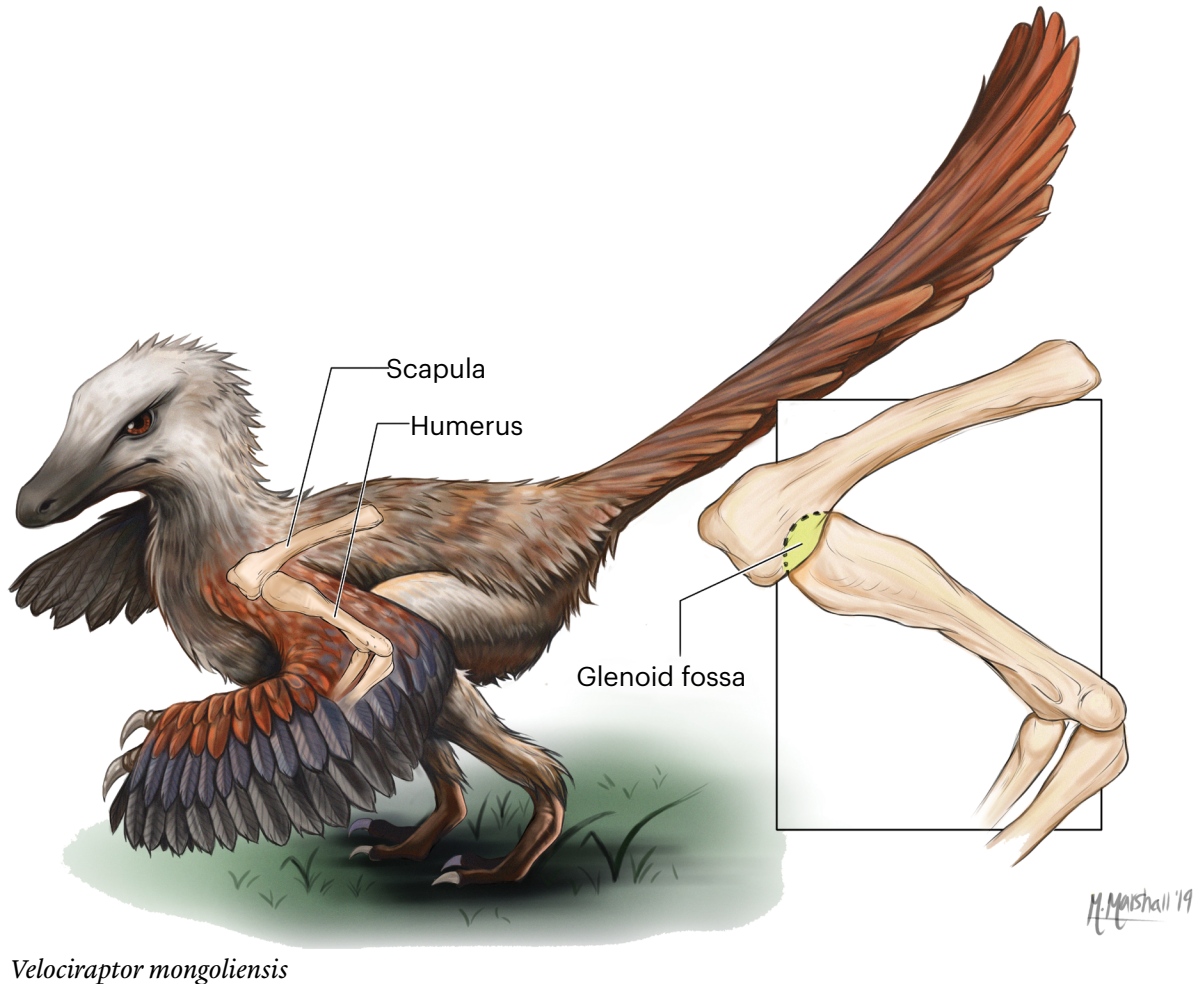
Illustration by Monica Wierzbicki

Teacher Resources: Dinosaur Rules

6. The shoulder bone (or scapula) is long and slender like a strap.



7. The shoulder socket opens slightly backward toward the animal's tail, not just downward.



Velociraptor mongoliensis

Illustration by Morgan Marshall

Teacher Resources: Dinosaur Rules

8. There is a long ridge on the upper bone of the front leg or arm.
Strong muscles attached to this ridge.

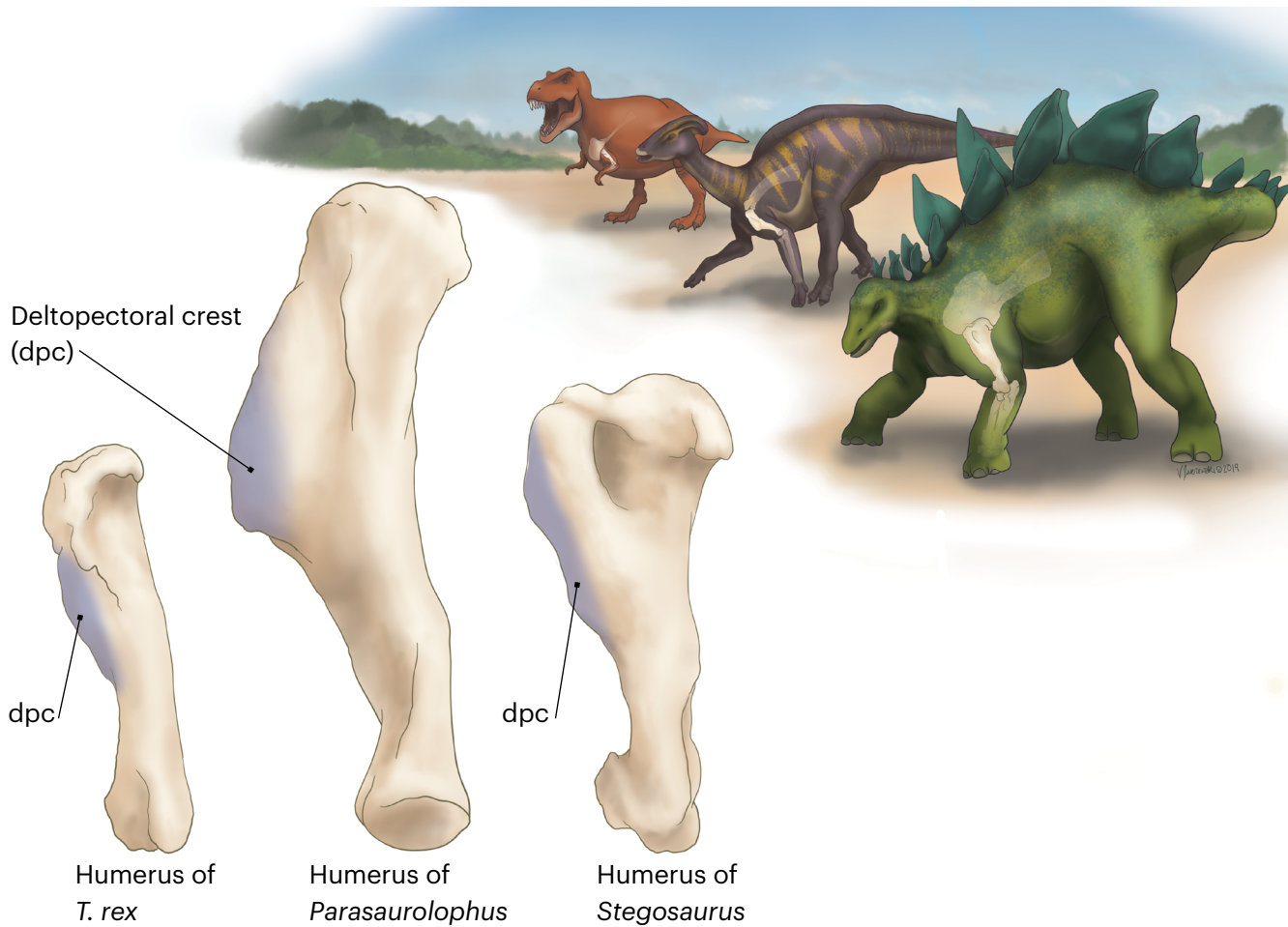


Illustration by Victoria Zakrzewski

Key to Dinosaurs and Dino-NOTS

Teacher Resource 3.0

Animal Name	Classification
<i>Archaeopteryx</i>	Dinosaur
<i>Dimetrodon</i>	NOT
Eryops	NOT
Hadrosaur	Dinosaur
<i>Herrerasaurus</i>	Dinosaur
Mammoth	NOT
<i>Megatherium</i>	NOT
Penguin	Dinosaur
<i>Protoceratops</i>	Dinosaur
<i>Repetosaurus</i>	Dinosaur
<i>Rhamphorhyncus</i>	NOT
<i>Smilodon</i>	NOT
<i>Stegosaurus</i>	Dinosaur
<i>Thalassomedon</i>	NOT
<i>Angistorhinus</i>	NOT
<i>Trionyx</i>	NOT

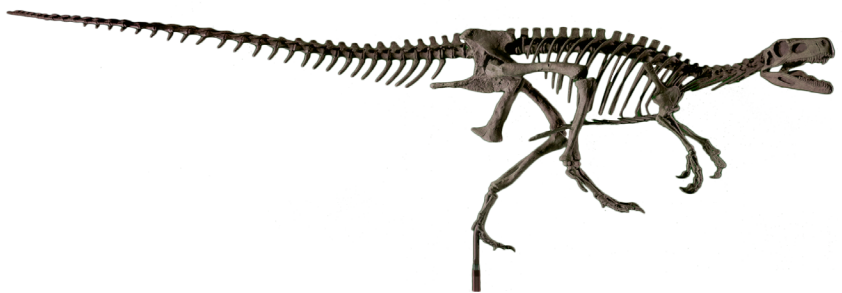
For teacher use only.

Dinosaurs or Dino-NOTS?

Student Resource 1.0

Herrerasaurus

Lived: 230 million years ago

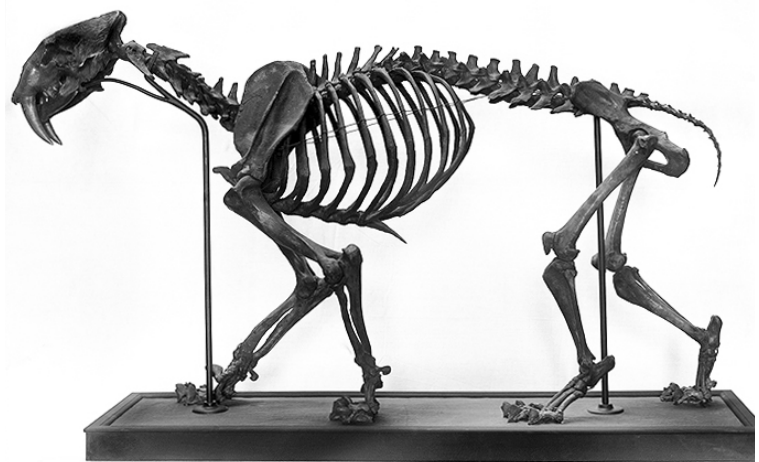


Left: © The Field Museum, Artist Karen Carr

Right: © The Field Museum, GEO85823c, Photographer John Weinstein

Smilodon

Lived: 2.5 million to 10,000 years ago



Left © The Field Museum, GEO86500_110d, Artist: Karen Carr

Right © The Field Museum, CSGEO39721_A, Photographer Charles Carpenter.

Student Resource 1.0: Dinosaurs or Dino-NOTS?

Rhamphorynchus

Lived: 150-148 million years ago



Left: © The Field Museum

Penguin

Lived: 62 million years ago to present



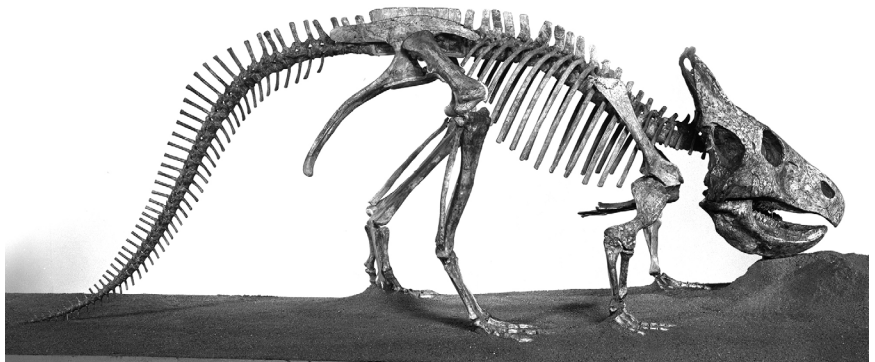
Penguin: Photographer Christopher Michel [CC BY 2.0]
Penguin Skeleton © The Field Museum

Dinosaurs or Dino-NOTS?

Student Resource 1.0

Protoceratops

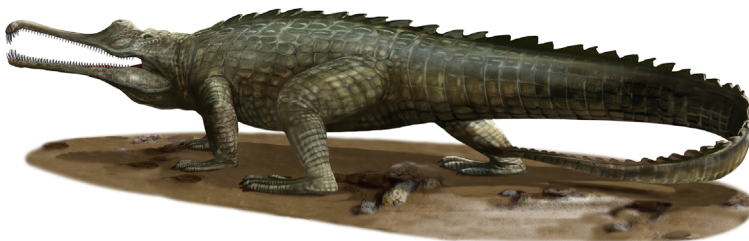
Lived: 84-70 million years ago



Left: © The Field Museum, GEO86500_090d, Artist: Karen Carr
Right: © The Field Museum, GEO81448

Angistorhinus

Lived: 230-210 million years ago



Left: © The Field Museum, GEO86500_174d, Artist: Karen Carr
Right: © The Field Museum

Dinosaurs or Dino-NOTS?

Student Resource 1.0

Rapetosaurus

Lived: 70-66 million years ago



Left: © The Field Museum, Artist: Karen Carr

Right: © The Field Museum, GN90846_118d, Photographer: John Weinstein

Stegosaurus

Lived: 155-150 million years ago



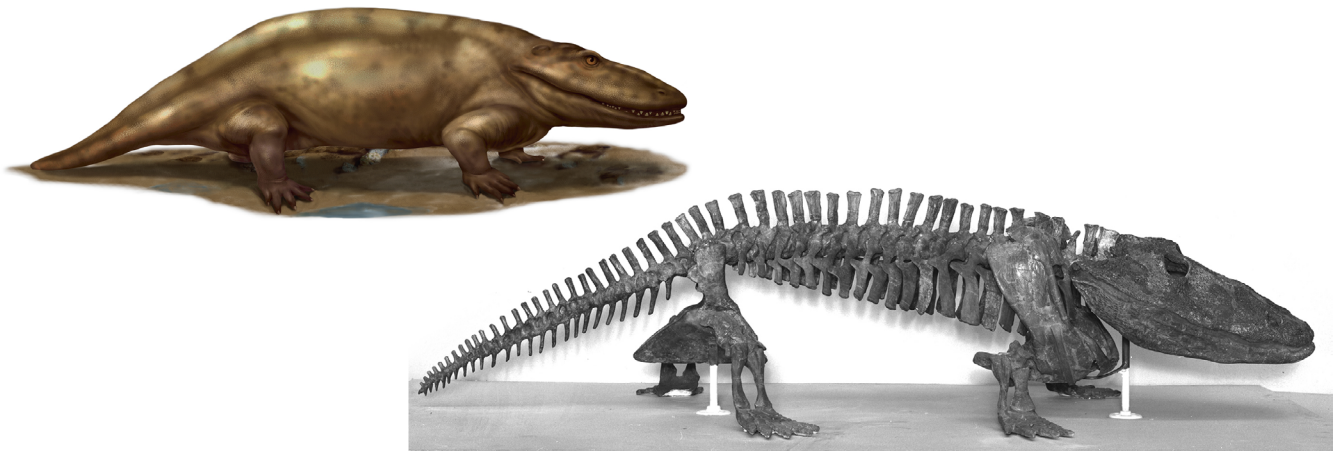
Left: © The Field Museum, Artist: Karen Carr

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Student Resource 1.0: Dinosaurs or Dino-NOTS?

Eryops

Lived: 299-278 million years ago



Left: © The Field Museum, Artista: Karen Carr
Right: © The Field Museum, GEO80774

Megatherium

Lived: 5 million to 10,000 years ago



Left: © The Field Museum, Artist: Charles Knight
Right: © The Field Museum



Student Resource 1.0: Dinosaurs or Dino-NOTS?

Trionyx

Lived: 125 million years ago to present



Left: © The Field Museum, Artist: Velizar Simeonovski
Right: © The Field Museum, GEO85893c, Photographer John Weinstein

Archaeopteryx

Lived: 150-148 million years ago

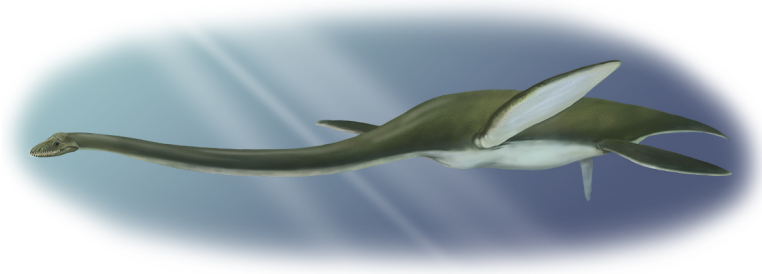


Left: © The Field Museum
Right: © The Field Museum

Student Resource 1.0: Dinosaurs or Dino-NOTS?

Thalassomedon

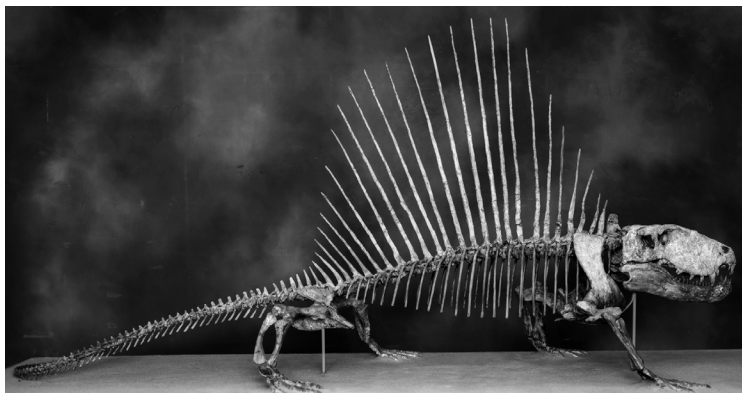
Lived: 95 million years ago



Left: © The Field Museum, Artist: Karen Carr
Right: © The Field Museum, PI2009

Dimetrodon

Lived: 295-272 million years ago



Left: © The Field Museum, GEO86500_008d, Artist: Karen Carr
Right: © The Field Museum, GEO81026

Student Resource 1.0: Dinosaurs or Dino-NOTS?

Edmontosaurus

Lived: 73-66 million years ago



Izquierda: © The Field Museum Produced by: Atlantic Productions
Derecha: © The Field Museum, PI5004

Woolly Mammoth

Lived: 150,000 to 4,000 years ago



Izquierda: © The Field Museum, Artista: Velizar Simeonovski
Derecha: © The Field Museum, CSGEO49819

Student Resource 1.0: Dinosaurs or Dino-NOTS?

Dino-NOTS	
Unsure	
Dinosaurs	

Criteria Outlining Worksheet

Student Resource 2.0

- 1 Look at all of the animals that both you and your partner put into the “Dinosaurs” group. Write down three (or more) traits that all of those animals have in common:

- 2 Next, review any animals that only one person had in the “Dinosaur” group. Based upon the criteria that you wrote above, do these animals still belong in the “Dinosaur” group? If not, move them to the unsure group.

- 3 Look at all of the animals that both you and your partner put into the “Dino-NOTS” group. Write down three (or more) traits that all of those animals have in common:

- 4 If there are any animals that only one person had in “Dino-NOTS,” decide whether to move them to another column based on the criteria you have written.

- 5 Evaluate the animals from the “Unsure” column once more to determine if you should move them into the “Dinosaurs” or “Dino-NOTS” categories based upon the criteria that you outlined above.

Classify and Decide

Student Resource 3.0

- 1** Did any of the criteria that you used to sort your animals initially match the Dinosaur Rules?

- 2** Was it more difficult to make decisions about where the animals belonged using your own criteria or after you had the Dinosaur Rules?

- 3** Why do you think body features or skeleton features are used to decide what group an animal belongs to?



**THE GRIFFIN
DINOSAUR EXPERIENCE**



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