

## What Makes a Dinosaur a Dinosaur?

### Lesson Plan

Grade  
7-8

NGSS Standards  
MS-LS4-1, MS-LS4-2

21st Century Skills  
Critical thinking, problem  
solving

Materials  
Access to D&D Virtual  
Reality Exhibit, provided  
links, worksheet,  
powerpoint

Estimated time  
1-2 hours

Difficulty  
Advanced

Vocabulary  
Acetabulum, anatomy,  
deltopectoral crest,  
femur, humerus, sacrum,  
vertebrae

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### Objective

Learn about early dinosaur discoveries and what anatomical characteristics are used to define dinosaurs. This lesson focuses on concepts of anatomy.

### Activity

Students access the Darwin and Dinosaurs Virtual Reality Exhibit. They explore the online exhibit and interact with the touchscreen experience Darwin and Dinosaurs within the exhibit. Students answer the first eight questions in the Assessment.

In class, the teacher then runs through a Powerpoint that illustrates how dinosaur bones can be identified. After the presentation, students answer the remaining questions.

Through these activities students learn the skeletal features that define dinosaurs.

### Assessment

There are ten questions on the first page, each worth 2 points (20 points for this section). The answers to the first eight questions can be found in the exhibit. After the teacher reviews the Powerpoint with the class, students answer the remaining two questions on the first page and the four questions on the reverse (each worth 5 points), for a total of 40 points.

### Class Discussion

As the teacher runs through the Powerpoint presentation (a link to the Powerpoint is under Additional Resources), students ask questions and learn how to recognize certain bone features that collectively identify a dinosaur.

Lesson plan based on Darwin & Dinosaurs Virutal Reality Exhibit  
More lesson plans at [darwindinosaurs.com](http://darwindinosaurs.com)

## What Makes a Dinosaur a Dinosaur?

### Class Discussion

In addition to dinosaur discoveries, this lesson focuses on anatomical features of dinosaurs. Only skeletons fossilize, so the features described here all pertain to bones. Although there are additional features scientists look for and several of the features listed are found in other animals, dinosaurs have all four features.

**1. An open acetabulum.** The head of the femur meets the pelvis at the acetabulum forming the “hip joint.” It is the area of the pelvis bounded by the ischium, ilium and pubis bones. In dinosaurs the three bones come together to form an open space. (In humans the acetabulum is a deep, cup-shaped cavity in the pelvis, but it is not “open” as it is in dinosaurs.)

The position and orientation of the acetabulum in dinosaurs enabled them to walk with an upright posture, their legs underneath their bodies as opposed to sprawled out sideways like alligators and other reptiles.

**2. An elongate deltopectoral crest on the humerus.** In dinosaurs, the deltopectoral crest on the humerus (upper arm bone) extended about a third of the length of the bone.

**3. Three or more sacral vertebrae.** Sacral vertebrae fuse together to provide structural strength to the pelvis. The number of vertebrae that fuse varies by animal. Amphibians have only one sacral vertebra (which does not fuse with other vertebra), reptiles, two and horses five vertebrae (which all fuse together). In dinosaurs, three or more fuse and large fused sacral vertebrae are one anatomical feature that made it possible for some dinosaurs to get so big.

**4. Femur with a ball-shaped head.** Easily identified by a large ball shape where the femur meets the pelvis. It is this ball-and-socket (acetabulum) configuration that enabled a more upright posture in dinosaurs.

Using the provided PowerPoint, discuss with the class what each of these anatomical features are and why they are important. Show them the provided images and explain how to recognize them. Remind them that no single feature makes it a dinosaur—a dinosaur must have all four of these features.

At the end of the Powerpoint deck there are four examples (slides 13 - 16) for students to examine and identify as “possibly a dinosaur” or “not a dinosaur” in class. Show the slides but do not reveal the answers. Have them answer on their work sheets and then hand them in.

## What Makes a Dinosaur a Dinosaur?

### Additional Resources

[What makes a dinosaur a dinosaur?](#)

smithsonianmag.com/science-nature/ask-smithsonian-what-is-dinosaur-180967448

[Identify a Dinosaur Activity](#)

amnh.org/content/download/47011/721913/file/dino\_08\_dinosaur.pdf

[Dinosaur](#)

en.wikipedia.org/wiki/Dinosaur

[What is a dinosaur?](#)

australian.museum/learn/dinosaurs/fact-sheets/what-is-a-dinosaur

[The Dinosauria](#)

ucmp.berkeley.edu/diapsids/dinosaur.html

[Powerpoint: What Makes a Dinosaur?](#)

darwindinosaurs.files.wordpress.com/2021/06/first-dinosaur-discoveries-and-what-makes-a-dinosaur-1.pptx

### Virtual Exhibit

[Darwin & Dinosaurs Virtual Reality Exhibit](#)

my.matterport.com/show/?m=fv3NZ9XP6Zd

### Instructions for using the touchscreens in the VR exhibit

When “walking around” in the 3D model click on a touchscreen. A popup will display “Click here for more information.” Click on this link. This will open a new tab and let you engage with the interactive. The 3D model will still be open in the first tab.

The touchscreen experiences work on any device that has a browser.

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### Teacher Answer Key

No.	Question	Answer	Pts.
1	Who coined the term dinosaur?	Richard Owen	2
2	What does the term “dinosaur” mean?	Terrible (or wondrous/awe inspiring) lizard.	2
3	Who found the first Iguanodon tooth?	Mary Ann Mantell, wife of Gideon Mantell.	2
4	What were the names of the two dinosaurs first discovered?	Iguanodon and Megalosaurus	2
5	Where was the thumb spike put (incorrectly) on the first reconstruction of Iguanodon?	On the nose!	2
6	Who first described the jaw of the Megalosaurus?	William Buckland.	2
7	What fossil hunter did William Buckland persuade the British government to give a £25 annual pension to?	Mary Anning.	2
8	List two animals in the exhibit that are not dinosaurs.	Ichthyosaur, plesiosaur, pterosaur.	2
9	What are two skeletal features that can be used to help identify a dinosaur?	Open acetabulum, deltopectoral crest on the humerus, three or more sacral vertebrae, femur with a ball-shaped head	2
10	How many sacral vertebrae do dinosaurs have?	Three or more.	2

Question 11, Possibly a dinosaur; Question 12, Not a Dinosaur; Question 13, Not a Dinosaur; Question 14, Possibly a dinosaur.

## What Makes a Dinosaur a Dinosaur?

NAME

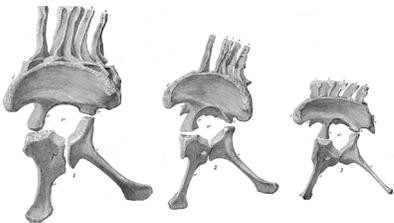
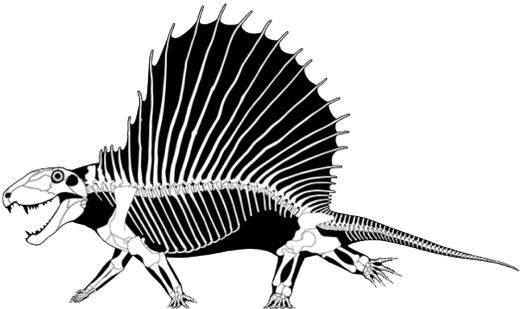
CLASS

URL [my.matterport.com/show/?m=fv3NZ9XP6Zd](http://my.matterport.com/show/?m=fv3NZ9XP6Zd)PASSWORD **Education001**

No.	Question	Answer	Pts.
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7	What fossil hunter did William Buckland persuade the British government to give a £25 annual pension to?		2
8	List two animals in the exhibit that are not dinosaurs.		2
9	What are two skeletal features that can be used to help identify a dinosaur?	Answer after class slide presentation.	2
10	How many sacral vertebrae do dinosaurs have?	Answer after class slide presentation.	2

## What Makes a Dinosaur a Dinosaur?

Based on the class discussion, indicate which of the following are dinosaurs. After the presentation, also answer questions 9 and 10 on the previous page.

 <p>11. Pelvises.</p>	<p><input type="radio"/> Possibly a dinosaur.</p> <p><input type="radio"/> Not a dinosaur.</p>	5
 <p>12. Humerus.</p>	<p><input type="radio"/> Possibly a dinosaur.</p> <p><input type="radio"/> Not a dinosaur.</p>	5
 <p>13. Three sacral vertebrae, short deltopectoral crest.</p>	<p><input type="radio"/> Possibly a dinosaur.</p> <p><input type="radio"/> Not a dinosaur.</p>	5
 <p>14. Femur.</p>	<p><input type="radio"/> Possibly a dinosaur.</p> <p><input type="radio"/> Not a dinosaur.</p>	5