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Dinosaurs Through Time and Place: A Paleontologist's Investigation

Thank you!

Thank you for using this Phoenix Zoo field resource! We hope it helps make your visit engaging, meaningful and memorable for your students. After your field trip, you'll recieve a follow-up email from our team with a short feedback survey. Your suggestions help us improve these resources and create even better experiences for future students and teachers.

Teacher Guide

Topics: Dinosaur diversity, geologic time, using fossil evidence, paleontology, scientific inquiry

Audience: Fourth through eighth grade. Younger grades with teacher or chaperone assistance.

Goals: The Dinosaurs Through Time and Place activity helps students explore when and where dinosaurs lived using fossil evidence. As students investigate the exhibit, they discover that dinosaurs lived over millions of years, that different species did not all live at the same time and that fossil discoveries provide clues about Earth's ancient environments and geologic past. Through data collection, pattern recognition and reflection, students practice thinking like paleontologists while correcting common misconceptions about prehistoric life.

Big Idea

Dinosaurs did not all live at the same time or in the same place. Fossils help scientists reconstruct Earth's ancient past and understand when and where different species lived.

Objectives: Students will be able to:

- Describe when major dinosaur groups lived using a geologic timeline.
- Identify where dinosaur fossils have been discovered around the world.
- Use fossil evidence to recognize patterns in the distribution of dinosaur species.
- Explain that not all prehistoric animals were dinosaurs.
- Use evidence to support explanations about Earth's ancient environments.
- Recognize that dinosaurs lived over millions of years rather than at the same time.

Arizona State Science Standards Alignment:

The standards listed below are examples of where strong alignment exists and are not intended to be comprehensive.

Grade Band	Standards	Connection
Upper Elementary	**4.E1U1.7** – Develop and/or revise a model using various rock types, fossil location, and landforms to show evidence that Earth's surface has changed over time.	Students construct a geologic timeline and analyze where fossils have been discovered to understand Earth's history. This is probably the strongest elementary alignment.
Middle School	**8.E1U1.6** – Analyze and interpret data about the Earth's geological column to communicate relative ages of rock layers and fossils.	The timeline activity asks students to organize dinosaurs by geologic time and compare when different organisms lived. Although they are not examining rock strata directly, they are interpreting fossil ages within the geologic time scale.
High School	**HS.L4U1.28** – Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.	Students evaluate evidence from fossils, compare organisms across time and place and recognize that fossils provide evidence for life's history and changing biodiversity. While evolution is not the primary focus, fossil evidence is a key component of the standard.

Science & Engineering Practices
Throughout the activity, students will: • Obtain, evaluate, and communicate information. • Analyze and interpret data. • Identify patterns. • Construct explanations from evidence. • Use models (timelines and maps) to represent scientific information.

Description

Students explore the Dinosaurs in the Desert exhibit by completing two investigations. In the first activity, students place dinosaurs on a geologic timeline. In the second, they map fossil discoveries around the world. Students then analyze the patterns they observe and use evidence to answer reflection questions about geologic time, fossil distribution and dinosaur diversity.

Each dinosaur has an accompanying sign with a fact page and QR code that links to more information. Dinosaur fact pages may also be accessed by clicking here. Depending on your school's technology policy, students, teachers or chaperones may scan the QR codes or use the link to learn more about each dinosaur. This information can be used to help students plot dinosaurs on the timeline and map.

Continue the Investigation

Looking for ways to extend learning before or after your field trip? These free resources for before and after your visit help students explore fossils, geologic time, and dinosaurs in greater depth.

Before Your Visit

Introduce students to dinosaurs, fossils, evolution, and geologic time with lessons, activities, videos, and interactives from the Chicago Field Museum.

Dinosaurs and Evolution Learning Resources

The Dinosaur Toolkit has several lessons that pair well with this activity, including:

- What Are Fossils? Primer (Grades 3 – 8)
- Rock Clocks Primer (Grades 3 – 8)
- Who Were Dinosaurs? Primer (Grades 3 – 8)
- Plate Motion: Past and Present (Grades 6 – 8)

After Your Visit

Create a collaborative classroom timeline to reinforce geologic time and review what students learned during their Phoenix Zoo investigation.

East Lansing Public Library – Dinosaur Wall Timeline Activity

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Name: _____ Date: _____

Track Dinosaurs Through Time

Dimetrodon
295 mya

Ankylosaurus
66 mya

300 250 200 150 100 50

Permian 300-252 mya | Triassic 252-201 mya | Jurassic 201-145 mya | Cretaceous 145-65 mya

← Paleozoic Era | Mesozoic Era - The Age of Dinosaurs 252-66 mya

Most dinosaurs
go extinct 66 mya

Mission: Track dinosaurs through time! Scan each dinosaur's QR code and read the fact page to discover when it lived, then add it to the correct place on the timeline. Time is measured in *millions of years ago*, or *mya* for short. That's a long time ago! As you go, look for patterns and compare when different dinosaurs lived.

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Follow the Fossils

Mission: Follow the fossil evidence! Scan each dinosaur's QR code and read the fact page to discover where scientists have found fossils of that dinosaur. Record the dinosaur's number from the key on each continent where fossils have been discovered. Numbers 10 and 11 have been done for you. As your map fills in, look for patterns in where dinosaurs have been found.

Dinosaur Key

1. Allosaurus
2. Amargasaurus
3. Ankylosaurus
4. Apatosaurus
5. Archaeopteryx
6. Austroraptor
7. Brachiosaurus
8. Carnotaurus
9. Chindesaurus
10. Compsognathus
11. Deinonychus
12. Dilophosaurus
13. Dimetrodon
14. Dimorphodon
15. Edmontosaurus
16. Iguanodon
17. Irritator
18. Maiasaura
19. Mamenchisaurus
20. Mosasaurus
21. Omeisaurus
22. Pachycephalosaurus
23. Parasaurolophus
24. Psittacosaurus
25. Pteranodon
26. Pycnonemosaurus
27. Quetzalcoatlus
28. Sarahsaurus
29. Segisaurus
30. Sinoceratops
31. Sonorasaurus
32. Spinosaurus
33. Stegosaurus
34. Tapejara
35. Therizinosaurus
36. Triceratops
37. Tyrannosaurus rex
38. Velociraptor

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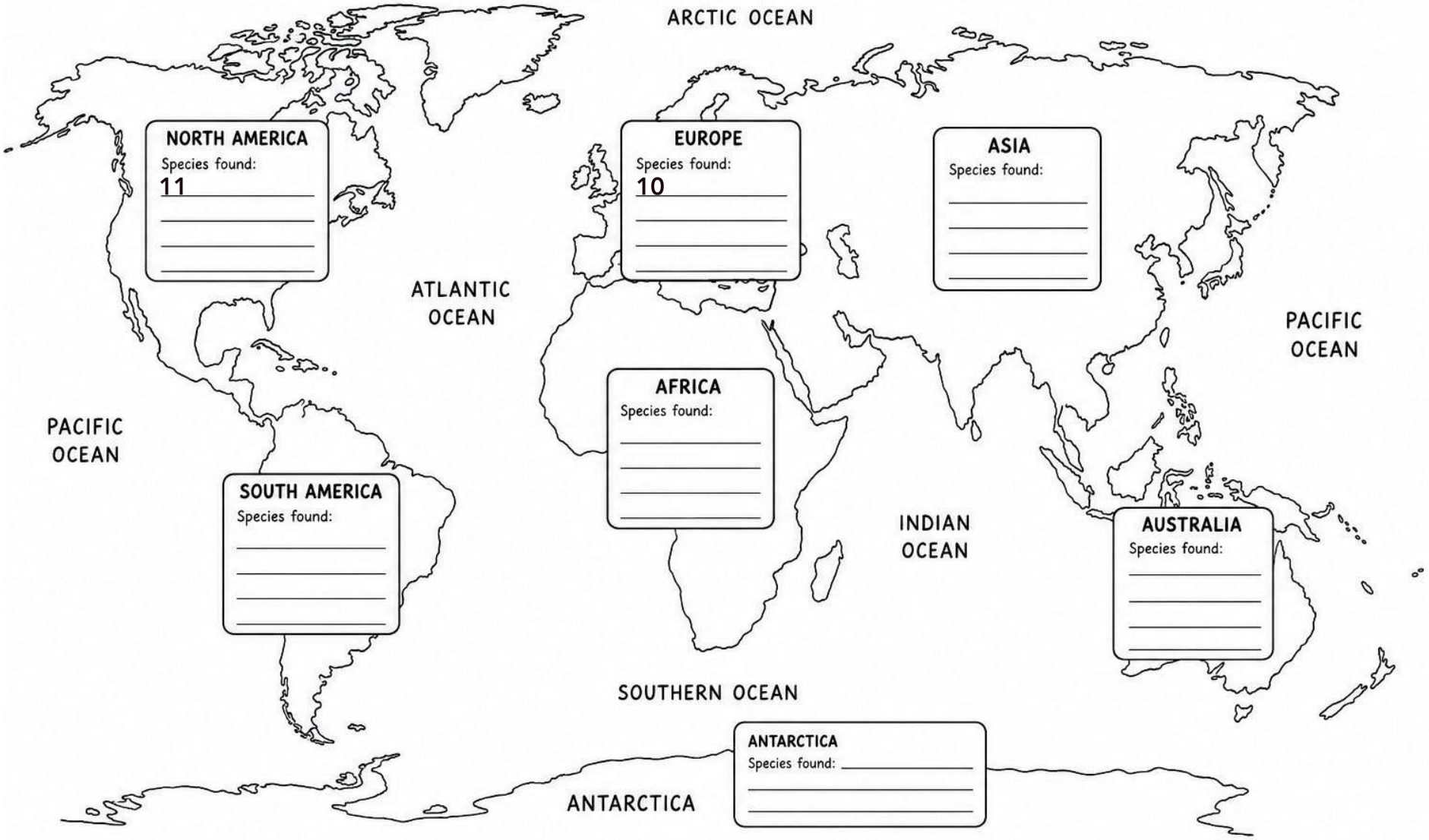
WHERE HAVE SCIENTISTS FOUND FOSSILS?

Record the dinosaur's number on each continent where fossils have been discovered.
Use the key on the previous page to match the numbers with the dinosaur names.



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Name: _____ Date: _____

A Paleontologist's Reflection:

Thinking About Time *Use your timeline to answer these questions.*

1. Which dinosaur lived the earliest? (Choose one) _____

2. Which dinosaur lived the latest? _____

3. About how many millions of years apart are the earliest and latest dinosaurs? _____

4. Movies and television often show Tyrannosaurus Rex fighting Stegosaurus, like in the image. Based on your timeline, could this really have happened? Explain your reasoning.

_____

_____

_____

Thinking About Place *Use your fossil map to answer these questions.*

5. Which continent has the most dinosaur species represented? _____

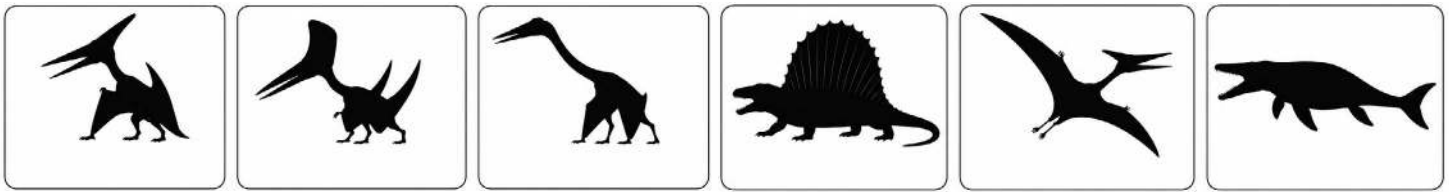
6. Which dinosaur has fossils that have been found on the most continents? _____

7. Find two dinosaurs that lived during the same geologic time period, but whose fossils were discovered on different continents.

_____ _____

To Notice or Wonder *Think about what you observed during your investigation.*

8. Six animals in the exhibit are not dinosaurs. Can you identify all six?



_____ _____ _____ _____ _____ _____

9. What surprised you most about when or where dinosaurs lived?

_____

_____

10. What is one new question you have about dinosaurs after exploring the exhibit?

_____

_____