

DINOSAURS AND FOSSILS

GRADES K–3

Dinosaurs and Fossils at the Science Museum

- Dino and fossil facts
- Classroom activities
- In-Museum activities
- Chaperone guide
- Connections to Minnesota Academic Standards

In this guide

Explore dinosaur skeletons and fossils of other ancient life in the Dinosaurs and Fossils Gallery on Level 3 by inviting students to think like scientists as they make observations, collect information, and make interpretations about ancient life.

Table of contents

How to use this guide and user tips	2
Dinosaur and fossil facts	3
Pre-visit and post-visit classroom activities	4
Minnesota Academic Standards	5
Additional resources	5
Chaperone guide: tips, notes, activities	6
Student activities	12

How to use this guide

- Give chaperones copies of the Dinosaur and Fossil Facts (page 3), the chaperone pages (pages 6–11), and student pages (pages 12–13) at least a week before the field trip.
- Add your own pages. Provide extensions of museum experiences back at school (see pre-visit and post-visit classroom activities).
- Activities in this guide can be done in any order.
- Questions in this guide are designed to encourage students to “think like scientists” by observing specific things. The questions are also meant to be starting points for discussions, with many possible answers and interpretations. Often one question will lead students to think of more questions. Encourage chaperones to record these questions for after-trip discussions or more research.



User tips

- Provide students with pencils and student sheets fastened to a stiff backing material such as cardboard. Teachers have packed easy-close plastic bags containing these materials for each chaperone.
- Provide tools to each chaperone for the measuring activity such as yarn or string that is marked off in feet, or tape measures. Encourage students to develop ways to use their bodies as measuring tools. Practice these methods in the classroom before the field trip.
- Prepare your students for the museum visit by introducing the schedule of the day, behavior expectations, and your expectations.



Dinosaur and fossil facts

Paleontologists are scientists who study all kinds of ancient life (not just dinosaurs) from millions and millions of years ago to 10,000 years ago. They learn about this ancient life mainly by studying fossils.

Fossils are the remains of living things that have been changed into rock. Fossils can also be impressions such as skin imprints, foot tracks, or a leaf impression. Fossils can also show traces of activity such as a nest of eggs, coprolite (feces), or bite marks.

Most ancient plants and animals did not fossilize. The tissues, bones, leaves, or wood rotted, were eaten or scattered, and are lost from the fossil record. Paleontologists estimate that only a fraction of the dinosaurs that have lived on Earth have been or will be found as some sort of fossil.

Under the right circumstances, animal and plant parts or impressions are mineralized, the process where minerals (the same things that make up rocks) replaces the organism. The organism must be buried quickly (sinks into mud, covered by blowing sand, buried under clay or mud in a body of water,) and be covered by more and more sediment. The chemicals from the living material must also be changed. As the original materials in bone, teeth, leaves or wood slowly decay, water that is rich in dissolved minerals seeps into the material and replaces the original chemicals. There usually is no original material left in a fossil—only minerals.

The majority of fossils are excavated from rock that formed from sediments such as sand, clay, mud, or gravel. When layers of sediment build up over time, the weight of the layers and the possible addition of chemicals dissolved in water cause the sediments to compress or cement into rock. The type of sedimentary rock in which fossils are found gives paleontologists clues they use to determine the age of fossils found in them.

The only evidence that dinosaurs once existed on Earth is from fossils. Paleontologists compare dinosaur teeth to give clues about their diet. They examine which fossils are found together, the way fossils are arranged, and how the fossils compare to structures of living organisms to develop ideas about the behavior and appearance of dinosaurs and other ancient forms of life.

Dinosaurs at the Science Museum Of Minnesota

The Dinosaurs and Fossils Gallery is on Level 3 of the Science Museum. Additional fossils can be explored in the Mississippi River Gallery (level 5) and in the museum Lobby.

The Science Museum has the following dinosaurs on display on level 3: *Stegosaurus**, *Diplodocus**, *Allosaurus**, *Camptosaurus**, *Triceratops**, *Apatosaurus*, *Camarasaurus*, *Thescelosaurus*, *Compsognathus**, *Stegoceras*, *Chasmosaurus*, *Dilophosaurus*, *Plateosaurus*, *Dilophosaurus*, *Bambiraptor*, *Anatosaurus*.

Dinosaurs on display on level 5 (in the lobby): *Tyrannosaurus**, *Edmontosaurus*.
(*are full skeleton reconstructions)



Pre-visit classroom activities

These activities allow students to practice skills they will use for activities during their field trip.

1) What's the difference?

Purpose: To compare and contrast similar classroom items.

Discussion: Look at the same part of two pieces of classroom furniture, such as chair or table legs, chair seats or backs. Discuss similarities and differences in shape, size and function.

Student activity: Draw the part from the two pieces of furniture. Label the drawings with the name of the furniture and the name of the part. Describe what is the same and what is different between these furniture parts.

2) Measuring how BIG? how Small?

Purpose: To practice using measuring tools and techniques students will use in the Dinosaurs and Fossils Gallery.

Student activity: Give small groups of students an 8–10 foot long piece of yarn or string, a ruler, and a marker. Have groups use the ruler and marker to mark off one-foot segments along the yarn/string. Have groups use the marked yarn/string to measure the length in feet of various items in the classroom and record their measurements.

3) Use your senses: Practice listening to nature and animal Sounds

Purpose: To use sense of hearing to observe nature and animal sounds.

Student activity: Listen to various nature and animal sounds on internet websites.

Suggested websites:

- Nature Sounds Society
www.naturesounds.org
Links to a variety of natural sound recording sites. Many have ambient sounds, and also sounds for purchase.
- The Cornell Lab of Ornithology Macaulay Library
www.macaulaylibrary.org/
Hundreds of sounds recorded from animals around the world. This site takes some time to explore and sample. Try donkey, American bullfrog, Great horned owl, American alligator.

Post-visit activities

- Graph the measurements from the **How BIG? How small?** activity.
- Use the measuring yarn/string to find out how the measured dinosaurs would fit into the classroom or other parts of the school.
- As a class brainstorm: What do we know about how scientists study dinosaurs?
- Investigate some of the questions the students raised during the field trip.
- Make clay models of the body parts students observed in the **What's the Difference** activity.

Minnesota Academic Standards

The Science Museum of Minnesota provides a field trip destination that allows teachers and students to reinforce Minnesota Academic Standards. Use of the materials in this Educator Guide will help you link learning experiences to the following content standards.

Science

Kindergarten

Nature of science and engineering

0.1.1.2.1 Use observations to develop an accurate description of a natural phenomenon and compare one's observations and descriptions with those of others.

Life science

0.4.1.1.1 Observe and compare plants and animals.

0.4.1.1.2 Identify the external parts of a variety of plants and animals including humans.

0.4.2.1.1 Observe a natural system or its model, and identify living and nonliving components in that system.

Grade 1

Nature of science and engineering

1.1.1.1.1 When asked "How do You Know?", students support their answer with observations.

1.1.1.1.2 Recognize that describing things as accurately as possible is important in science because it enables people to compare their observations with those of others.

1.1.3.12.1 Recognize that tools are used by people, including scientists and engineers, to gather information and solve problems.

Life science

1.4.1.1.1 Describe and sort animals into groups in many ways, according to their physical characteristics and behaviors.

Grade 2

Nature of science and engineering

2.1.1.2.1 Raise questions about the natural world and seek answers by making careful observations, noting what happens when you interact with an object, and sharing the answers with others.

Physical science

2.2.1.1.1 Describe objects in terms of color, size, shape, weight, texture, flexibility, strength and the types of materials in the object.

Grade 3

Nature of science and engineering

3.1.1.1.1: Provide evidence to support claims other than saying "Everyone knows that," or "I just know," and question such reasons when given by others.

3.1.1.2.3 Maintain a record of observations, procedures and explanations, being careful to distinguish between actual observations and ideas about what was observed.

3.1.3.4.1 Use tools, including rulers, thermometers, magnifiers and simple balance, to improve observations and keep a record of the observations made.

Mathematics

Kindergarten

Geometry and measurement

K.3.1.1 Recognize basic two- and three-dimensional shapes such as squares, circles, triangles, rectangles, trapezoids, hexagons, cubes, cones, cylinders and spheres.

K.3.2.1 Use words to compare objects according to length, size, weight and position.

K.3.2.2 Order 2 or 3 objects using measurable attributes, such as length and weight.

Grade 1

Geometry and measurement

1.3.2.1 Measure the length of an object in terms of multiple copies of another object.

Additional resources

Books

Smithsonian Handbooks: Fossils by Cyril Walker and David Ward, DK Publishing, 2002. ISBN 978-0-7894-898-5.

This book is visually appealing with its easy-to-read text, detailed photographs of fossils, and artists' reproductions of what the animals may have looked like.

The Dinosaur Book, DK Publishing 2018. Dramatic visuals, informative and accurate text, and explanations of new vocabulary give children age 5 and up an intriguing introduction to the world of dinosaurs.

Websites

Fossils and Paleontology: National Park Service
<https://www.nps.gov/subjects/fossils/index.htm>

Learn about fossils discovered in North America from all ages of the earth, including significant fossil finds. Meet paleontologists and other people working in related fields.

Chaperone guide

Tips

- Allow a few minutes of time for students to explore and investigate the exhibits when you and your group enter the different areas of the gallery.
- Share the excitement of the field trip by talking with your group about the exhibits and encouraging them to make observations such as those suggested in the activities. Don't worry about reading or understanding all the exhibit messages.
- Most of the questions in the Activities are open-ended and do not require specific answers. They are designed to get the students "thinking like scientists" by making observations, collecting information, and making interpretations based on the physical evidence. Please use the questions as starting points for discussions.
- Encourage students to ask their own questions and to work as a group to answer them. They may have questions that may require students to do more research back at school. Please record these questions under NOTES on this page.
- Museum staff and volunteers may be in the gallery. They enjoy talking with visitors and answering questions.

Good things to say to encourage discussions:

- Tell me more about that.
- What else do you notice/see/hear/feel?
- How do you know? What did you observe?


Notes

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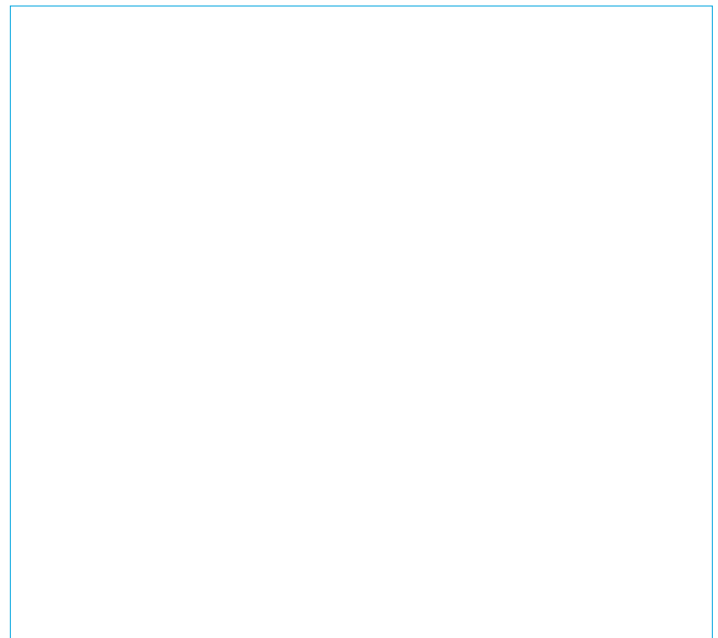
Chaperone guide

What's the difference?

Draw the same body part for two different dinosaurs.



Dinosaur _____
Body Part _____



Dinosaur _____
Body Part _____

Purpose:

To compare and contrast similar skeleton parts.

Where:

Many options—student-led choices. There are fossil skeletons on the walls, in cases, as well as overhead.

Discussion:

Look at the same body part on two different skeletons—teeth, toes, skull, femur (upper leg bone.)

- What is the same about that body part on the two skeletons?
- What is different?

Student activity:

Draw the same body part from two different skeletons. Label your drawings with the name of the animal and name of the body part you drew. Describe what is the same and what is different between these body parts in your drawing. (They don't need to be all dinosaurs.)

Chaperone guide

How BIG? How small?

Name of Dinosaur	How long is it?	Mark X if this is the biggest measured dinosaur	Mark O if this is the smallest measured dinosaur

Where:

Many options – student led choices. There are fossil skeletons on the walls in cases as well as overhead.

Purpose:

To measure the length of skeletons from three different organisms. (They don't need to be all dinosaurs.)

Discussion:

- Tell students, "Let's find three animals and their names."
- Ask, "What are some ways we could measure them?"

NOTE: Please do not go into the displays to measure the skeletons.

Measuring methods:

Teachers may give you a measuring tool (measuring tape, yarn or string with marks one foot apart.) OR have students stand with their arms stretched out to their sides. OR have students count the number of steps.

OR develop your own method for measuring!

Student activity:

Make the measurements and record them in the table on the student pages.

Chaperone guide

Feel a Fossil

Draw shapes of fossils you see or feel.

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Where:

There are a few fossils in the gallery that students may touch. Please do not climb over barriers to touch fossils. Ask a Museum staff person if they have any fossils they could share with your group.

Purpose:

To feel fossils and observe shapes.

Discussion:

Close your eyes and feel the fossil.

- What are some of the different shapes you feel?

Student activity:

Draw some of the shapes.

Chaperone guide

Use your senses

Circle the animals you saw in the **When the Dinosaurs Were Gone** forest scene. Put an **X** by the animals you thought made sounds.



Snake



Bird



Lizard



Butterfly



Fish

Where:

When the Dinosaurs Were Gone forest scene.

Purpose:

To use senses of hearing and sight to examine a model of a prehistoric forest.

Discussion:

Be very quiet and **LISTEN!**

- What do you hear?
- What do the sounds make you feel?

Look!

- Where do you see animals? Look very closely, and look up and down.
- Which animals could have made the sounds?

Imagine!

- Pretend you are one of these animals.
- What sound would you make?
- Why is the animal making that sound?

Look again!

- Which animals are harder to see? Why are they harder to see?

Imagine again!

- Pretend you are one of these animals.
- How would you make yourself harder to see?
- What do you think what you would **SMELL** in this forest?

Chaperone guide

My favorite fossil

Draw or write about your favorite fossil. Why is it your favorite?

Where:

Many options—student choice

Discussion:

Ask students what they like about the various fossils in one part of the gallery before they move to a different part of the gallery.

Student activity:

Draw or write something that helps you remember your favorite fossil and what it was about that fossil that you really liked.

Student activities

What’s the difference?

Draw the same body part for two different dinosaurs.

Dinosaur _____

Body Part _____

Dinosaur _____

Body Part _____

How BIG? How small?

Name of Dinosaur	How long is it?	Mark X if this is the biggest measured dinosaur	Mark O if this is the smallest measured dinosaur

Dinosaurs and Fossils

Your Name: _____

Feel a fossil

Draw shapes of fossils you see or feel.

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Use Your senses

Circle the animals you saw in the **When the Dinosaurs Were Gone** forest scene. Put an **X** by the animals you thought made sounds.



Snake



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My favorite fossil

Draw or write about your favorite fossil. Why is it your favorite?