ARTICLE: TEACHER VERSION

About this Article

Lexile: 930

Wordcount: 634

Text Complexity: The Lexile level for this text falls towards the high end of the grades 4-5 CCSS text complexity band. This text is suitable as an interactive read-aloud for grade 3. Teachers should use their professional judgment and knowledge of students' independent reading levels regarding assigning this text for independent reading.

Note: Students should be sitting with elbow partners for this interactive read-aloud. Whenever the teacher notes suggest Think/Pair/Share, it is generally followed by instructions to "listen in" to student conversations. This enables the teacher to select students to share out thinking that would benefit the whole group to hear. Additionally, it allows the teacher to informally assess student thinking about the text. The teacher can follow up with a think aloud to help clarify parts of the text as needed. At times, the teacher may want to facilitate whole class discussion after Think/Pair/Share.

Key for Teacher Notes

- Green text
  specific strategies
- Regular text
  instructions for teachers
- *Italicized text*
  teacher's instructions to students
- Underlined text
  important domain-specific words

STUDENT READING

Piecing Together the Story of Dinosaurs from Fossils

You've probably seen pictures, models, or movies about dinosaurs that lived millions of years ago. But how do we know so much about these animals? How do we know what they looked like and how they lived? Since the early 1800s, scientists have been piecing together this mystery with fossils.

Think Aloud: *I notice the phrase "piecing together" is in the title and in the last sentence of the first paragraph. Why do you think the author meant by this phrase? What does it tell us about how scientists learn about dinosaurs with fossils?* Listen in and select student/s to share out. If needed, follow up with a think aloud: *Since dinosaurs lived millions of years ago, scientists rely on fossils to learn about how they lived and what they looked like.*

Fossils are the remains of ancient life. In order to become a fossil, the remains of a living thing must be buried quickly, usually in mud, sand, or volcanic ash. Over time, as the remains are buried deeper and deeper, the material around them hardens into rock. Minerals eventually replace the remains, turning them to rock too. Most fossils form from the hard parts of organisms such as teeth, shells, and bones. They also form from things a plant or animal leaves behind, like a footprint, a leaf print, and even eggs.

After reading this paragraph once, reread it aloud, stopping as follows:

Stop after the **first sentence** and underline the words "remains" and "ancient." Coach students to determine the meanings of these words, providing assistance as needed. Scribe definitions of these two words on chart paper. The definitions should ideally be constructed by students with your assistance. (E.g., remains = parts of a dead organism, ancient = from a very long time ago.) Paraphrase this first sentence for students using the new definitions. (Optional: scribe your paraphrase of the sentence on chart paper).

Tell students that the **second, third and fourth sentences** talk about how fossils are formed. *Let's read this very closely and then explain it to our partners in our own words*. Prompt students to think-pair-share after each sentence (partners can take turns paraphrasing). Listen in to students' conversations and invite selected students to share their paraphrase with the class. Allow for whole class discussion around the question, "How are fossils formed?" before finishing the rest of the paragraph.

After reading the **fifth and sixth sentences**, think-pair-share: What more have we learned about fossils from these last two sentences? Listen in to students' conversations and invite selected students to share out with the class.

Fossils show us what Earth was like long ago. They give us a picture of ancient environments. Scientists compare fossils from different time periods to investigate how life on Earth has changed over time.



From left to right: fossil skin impressions, fossil eggs, fossil theropod foot, fossil dinosaur trackway

Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like. And sometimes when you find and add new pieces, the picture looks very different from how you thought it would be.

Think-Pair-Share: *How do fossils help scientists? OR How do scientists use fossils? OR Why do scientists study fossils?* Listen in to students' conversations and invite selected students to share out with the class. Optional: Chart some of the key points of this section to start a record of the class's thinking about this text.

Think-Pair-Share: *What do you notice about these pictures?* Listen in and select one or two students to share out.

Think Aloud: Based on this last paragraph, *I think we are going to learn about how scientists learned new information after finding more fossils.* Talk through how the last sentence of the last paragraph in this section makes you think this. You may even preview the next subtitle and think aloud (or ask students to think-pair-share) about what the question "Egg Thief or Egg Protector?" makes you predict about what you will learn next from the text.

Egg Thief or Egg Protector?

In 1923, a team of paleontologists from the American Museum of Natural History made a surprising discovery in Mongolia's Gobi Desert. They found three large rocks that turned out to be fossilized dinosaur eggs. Then they discovered another fossil nearby: a toothless dinosaur. The leader of the expedition, Roy Chapman Andrews, guessed that the dinosaur had been stealing the eggs from the nest. He named it *Oviraptor* (OH-vee-rap-tor) or "egg thief."

Seventy years later, in 1993, another team from the Museum found very similar fossil eggs in the same desert. One of the eggs held a fossil embryo, or developing baby dinosaur. It turned out to be a baby *Citipati* (sit-uh-PAH-tee), a kind of dinosaur very similar to *Oviraptor*. Later, the team discovered a fossil of an adult *Citipati* over a nest. It was brooding, or sitting on the nest, the same way birds do: with its arms spread to protect the eggs. And if its arms were covered with feathers, as scientists suspected, these wings would have shielded the eggs from heat and cold. Paleontologists realized that these dinosaurs nested like birds living today.



This is one of the *Citipati* fossils. The feathered wings are spread over the nest to protect the eggs, the same way birds do today.

These dinosaurs didn't steal eggs. They were caring parents!

When the discovery was made, the group of dinosaurs that includes *Citipati* and *Oviraptor* had already been named "oviraptorids." Even though scientists no longer think these dinosaurs were "egg thieves," the name stuck.

Think-Pair-Share: *Partner A, tell your partner the story of what happened so far using these sentence frames…* (have on chart paper or smartboard)

> In 1923 AMNH scientists made a surprising discovery in the Gobi Desert. First, they found… Then, they discovered… Therefore, Roy Chapman Andrews came to the conclusion that…

Listen in and select one student to share out. For extra support, scribe the students' words in the "blanks" of the sentence frames so that the class can reference it later.

Think-Pair-Share: *Partner B, tell your partner the rest of the story using these sentence frames…* (have on chart paper or smartboard)

> Then, seventy years later in 1993, another team of AMNH scientists found… Later on, they also found… This led to a major discovery…

This second paragraph is more complicated, so you may opt to do this "story" as guided practice. Students can volunteer to "fill in the blanks" and you can coach them as needed.

Think-Pair-Share: *What does this fossil show? How is it related to what we just read about?* Listen in and select one student to share out.

Think-Pair-Share: *What is this paragraph telling us about the name "oviraptorids?"* Listen in and select one student to share out. *What is it telling us about how science works?* Listen in and select one student to share out. Allow students to add on and/or ask questions.

The Link Between Ancient Dinosaurs and Birds

Over 100 years ago, scientists started to notice similarities between birds and a group of dinosaurs called theropods (THERE-uh-pods). This group included *Tyrannosaurus rex*, *Velociraptor*, and *Citipati*. As new theropod fossils were discovered, the link with birds became even clearer. Scientists discovered that like birds, theropods laid eggs. And they walked on two feet with their legs directly underneath them. They also had three-toed feet with claws, an s-shaped neck, and hollow bones. Some even had sharp, bird-like beaks. And many theropods had feathers!



***Citipati* lived about 80 million years ago. These bird-like theropods grew to about nine feet long, with a toothless beak and feathered tail and front limbs.**

Because birds are so similar to these animals, scientists have placed them in the same group. Birds are theropods. This means birds are a kind of dinosaur! By piecing together fossils of extinct dinosaurs, we've learned that dinosaurs aren't extinct after all.

Underlining: *This paragraph tells us some of the similarities between modern birds and theropod dinosaurs. Let's make a list of the similarities. Go back and reread this paragraph, underlining ONLY parts that tell about a similarity between birds and theropod dinosaurs.* Look over students' shoulders and select students to share out. (Alternate option: do this as guided practice). Scribe the list on a chart. Sample chart: Theropod dinosaurs were actually birds (new idea): they laid eggs; they walked upright on two feet; they had three-toed feet with claws; they had an "S" shaped neck; they had hollow bones; some had beaks; many had feathers (evidence).

Think-Pair-Share: *What do you notice about the physical features of this dinosaur? What similarities does it have with the birds we see living today?* Listen in and select one or two pairs to share out a response to each question.

Think-Pair-Share: *Turn and talk to your partner about what you learned in this article.* Listen in and select one or two pairs to share out.

STUDENT READING

Piecing Together the Story of Dinosaurs from Fossils

You've probably seen pictures, models, or movies about dinosaurs that lived millions of years ago. But how do we know so much about these animals? How do we know what they looked like and how they lived? Since the early 1800s, scientists have been piecing together this mystery with fossils.

Fossils are the remains of ancient life. In order to become a fossil, the remains of a living thing must be buried quickly, usually in mud, sand, or volcanic ash. Over time, as the remains are buried deeper and deeper, the material around them hardens into rock. Minerals eventually replace the remains, turning them to rock too. Most fossils form from the hard parts of organisms such as teeth, shells, and bones. They also form from things a plant or animal leaves behind, like a footprint, a leaf print, and even eggs.

Fossils show us what Earth was like long ago. They give us a picture of ancient environments. Scientists compare fossils from different time periods to investigate how life on Earth has changed over time.



From left to right: fossil skin impressions, fossil eggs, fossil theropod foot, fossil dinosaur trackway

Think of fossils like puzzle pieces. The more pieces you have, the easier it is to put them together and tell what the whole picture looks like. And sometimes when you find and add new pieces, the picture looks very different from how you thought it would be.

Egg Thief or Egg Protector?

In 1923, a team of paleontologists from the American Museum of Natural History made a surprising discovery in Mongolia's Gobi Desert. They found three large rocks that turned out to be fossilized dinosaur eggs. Then they discovered another fossil nearby: a toothless dinosaur. The leader of the expedition, Roy Chapman Andrews, guessed that the dinosaur had been stealing the eggs from the nest. He named it *Oviraptor* (OH-vee-rap-tor) or "egg thief."

Seventy years later, in 1993, another team from the Museum found very similar fossil eggs in the same desert. One of the eggs held a fossil embryo, or developing baby dinosaur. It turned out to be a baby *Citipati* (sit-uh-PAH-tee), a kind of dinosaur very similar to *Oviraptor*. Later, the team discovered a fossil of an adult *Citipati* over a nest. It was brooding, or sitting on the nest, the same way birds do: with its arms spread to protect the eggs. And if its arms were covered with feathers, as scientists suspected, these wings would have shielded the eggs from heat and cold. Paleontologists realized that these dinosaurs nested like birds living today.



This is one of the *Citipati* fossils. The feathered wings are spread over the nest to protect the eggs, the same way birds do today.

These dinosaurs didn't steal eggs. They were caring parents!

When the discovery was made, the group of dinosaurs that includes *Citipati* and *Oviraptor* had already been named "oviraptorids." Even though scientists no longer think these dinosaurs were "egg thieves," the name stuck.

The Link Between Ancient Dinosaurs and Birds

Over 100 years ago, scientists started to notice similarities between birds and a group of dinosaurs called theropods (THERE-uh-pods). This group included *Tyrannosaurus rex*, *Velociraptor*, and *Citipati*. As new theropod fossils were discovered, the link with birds became even clearer. Scientists discovered that like birds, theropods laid eggs. And they walked on two feet with their legs directly underneath them. They also had three-toed feet with claws, an s-shaped neck, and hollow bones. Some even had sharp, bird-like beaks. And many theropods had feathers!



***Citipati* lived about 80 million years ago. These bird-like theropods grew to about nine feet long, with a toothless beak and feathered tail and front limbs.**

Because birds are so similar to these animals, scientists have placed them in the same group. Birds are theropods. This means birds are a kind of dinosaur! By piecing together fossils of extinct dinosaurs, we've learned that dinosaurs aren't extinct after all.

Image Credits

Fossil skin impression, theropod foot, dinosaur eggs, and trackway, © AMNH; *Citipati* fossil, © AMNH/ M. Ellison; *Citipati* illustration, Zhao Chuang, Courtesy of Peking Natural Science Organization.