DINO BABIES

Self-Guided Tour
Grade 1

MUSEUM
OF TEXAS TECH
UNIVERSITY

Maiasaura eggs and babies
Photo courtesy of Bill Mueller

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Museum of Texas Tech University
P.O. Box 41491
Lubbock, Texas 79409-3191
http://www.depts.ttu.edu/museumttu

Painting by Luis Rey
www.peabody.yale.edu/exhibits/hatching

The Museum of Texas Tech University

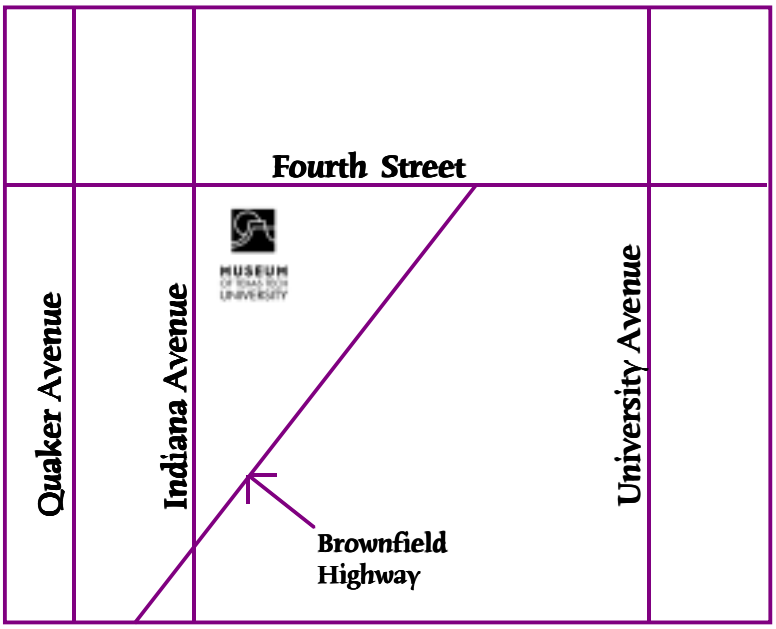
The Museum of Texas Tech University is an educational, scientific, cultural, and research element of Texas Tech University. It consists of several components: the main Museum building, the Moody Planetarium, the Natural Science Research Laboratory, the research and educational elements of the Lubbock Lake Landmark, and the Val Verde County research site.

Mission Statement

The mission of the Museum is to collect, preserve, interpret and disseminate knowledge about natural and cultural material from Texas, the Southwest, and other regions related by natural history, heritage, and climate. The Museum's collections, exhibitions, programming, and research complement the diverse interests of Texas Tech and its role in public and professional education in local, state, national, and international communities. Through classroom instruction, practicum, and field work, the Museum provides both theoretical and practical education. It is dedicated to acting as a responsible partner to Texas Tech and the community of museums.

Group Reservations

Reservations for touring the Museum are required, even for self-guided tours. Bookings must be made at least 2 weeks prior to your visit. At this time, you must reserve the Exploration Box, Story Book, Nest, and/or Video if you will be using them during your visit. Call (806) 742-2456 to reserve your tour time.



Dino Babies Introduction

Eggs, Nests, and Babies Case
Photo courtesy of Bill Mueller

Dino Babies is a multifaceted program designed to supplement the Grade 1 TEKS curriculum in science and language arts. *Dino Babies* packets incorporate lessons and activities which explore the life cycle of dinosaurs (with an emphasis on dinosaur eggs, nests, and babies). The program centers around the Museum's Dinosaur Hall through a teacher-led, self-guided tour. The Museum will provide a *Story Time* picture book or video (you may choose from three books or a story book on video, and an "Exploration Box" to help enhance your museum visit.

Background information, activities, and other supplemental materials are provided in this packet to help facilitate an informative and successful experience. It is strongly suggested that classes complete at least one of the pre-visit lesson plans and follow up with a post-visit activity after the Museum visit.

Grade 1 TEKS Standards Met

Dino Babies was designed to meet the Grade 1 TEKS curriculum. The following list identifies TEKS Standards this program meets:

In Science: § 123.3

(1.5) <u>Science Concepts:</u> The student knows that organisms, objects, and events have properties and patterns.
- (A) Sort objects and events based on properties and patterns.
- (B) Identify, predict, and create patterns including those seen in charts, graphs, and numbers.

(1.6) <u>Science Concepts:</u> The student knows that systems have parts and

are composed of organisms and objects.

(A) Sort organisms and objects according to their parts and characteristics.

(B) Observe and describe the parts of plants and animals.

(1.7) <u>Science Concepts:</u> The student knows that many types of changes occur.

(A) Observe, measure, and record changes in size, mass, color, position, quantity, sound, and movement.

(B) Observe and record changes in the life cycle of organisms.

(1.9) <u>Science Concepts:</u> The student knows that organisms have basic needs.

(A) Identify characteristics of living organisms that allow their basic needs to be met.

(B) Compare and give examples of the ways living organisms depend on each other for their basic needs.

In English Language Arts & Reading: § 110.3

(1.1) <u>Listening/speaking/purposes:</u> The student listens attentively and engages actively in a variety of oral language experiences.

(A) Determine the purpose(s) for listening such as to get information, to solve problems, and to enjoy and appreciate.

(B) Respond appropriately and courteously to directions and questions.

(C) Participate in rhymes, songs, conversations, and discussions.

(D) Listen critically to interpret and evaluate.

(E) Listen responsively to stories and other texts read aloud, including selections from classic and contemporary works.

(1.3) <u>Listening/speaking/purposes:</u> The student speaks appropriately to different audiences for different purposes and occasions.

(C) Ask and answer relevant questions and make contributions in small or large group discussions.

(D) Present dramatic interpretations of experiences, stories, poems, or plays.

(1.13) <u>Reading/literary response:</u> The student responds to various texts.

(A) Listen to stories read aloud.

(C) Respond through talk, movement, music, art, drama, and writing to a variety of stories and poems in ways that reflect understanding and interpretation.

(1.18) <u>Writing/Penmanship/Capitalization/Punctuation:</u> The student writes for a variety of audiences and purposes and in a variety of forms.

(C) Write to record ideas and reflections.

(D) Write to discover, develop, and refine ideas.

(E) Write to communicate with a variety of audiences.

(F) Write in different forms for different purposes such as lists to record, letters to invite or thank, and stories or poems to entertain.

Dino Babies

Teacher Discussion/Background Information

The following offers background information and topics for instruction and discussion. While some material may be too advanced for first grade, the more complex information is provided for the educator's benefit. Name pronunciations and definitions can be located in the included brochure: "A Changing World: Dinosaurs, Diversity, and Drifting Continents." Questions and text to promote your dialogue with students is written in italics.

What is a dinosaur?

- Emerging during the Late Triassic Period (228 million years ago), dinosaurs ruled the Earth for over **160 million years.**
- At the end of the Cretaceous Period (65 million years ago), dinosaurs vanish from the fossil record (with the exception of birds).
- Theories abound as to why dinosaurs became extinct, however, very solid evidence points to the consequences of an **asteroid impact** causing the mass extinction of the dinosaurs.
- Dinosaurs belong to a group of reptiles known as **archosaurs** in which there are two lineages: one leading to crocodiles and one leading to birds. Archosaur means **"ruling reptile."** Archosaurs are defined by their antorbital fenestra. The antorbital fenestra is merely an extra hole in the skull. This hole is located in front of the eye (ant=before; orbit=eye; fenestra=window).
- Crocodilians, pterosaurs, and their extinct relatives are also classified as archosaurs…however they are *not* dinosaurs.
- Dinosaurs are technically defined by their "perforated acetabulum," which simply means that they had a **hole in the middle of their pelvis.** No other animal on Earth has ever exhibited this feature.
- The evolution of a hole in the pelvis allowed dinosaurs to walk with their legs directly beneath them, as opposed to the sprawling condition of other reptiles.

"We are not dinosaurs!"

Commonly mistaken as dinosaurs, the following prehistoric animals are actually not dinosaurs at all:

1)**Pterosaurs**: These flying reptiles that lived during the Jurassic and Cretaceous were not dinosaurs…they *were* related archosaurs.

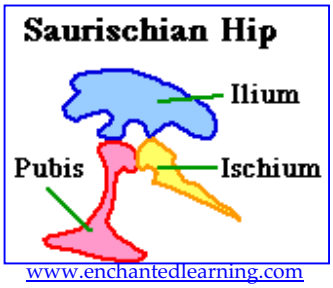
2) **Dimetrodon:** Commonly mistaken as a dinosaur, Dimetrodon (recognized by a large sail on its back) lived during the Permian Period and was actually a proto-mammal.

3) **Plesiosaurs:** Ancient marine reptiles such as plesiosaurs were not dinosaurs.

How Are Dinosaurs Classified?

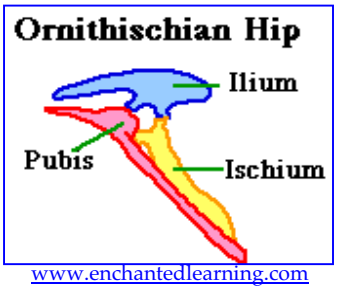
On the most basic level, dinosaurs are classified into two orders according to the general structure of their hip (notice the hole in the center of the pelvis):

1) The Saurischians **(lizard-hipped)**



www.enchantedlearning.com

2) The Ornithischians (**bird-hipped)**



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Within these two orders, the major dinosaur suborders exist. Listed below are the suborders and examples of dinosaurs belonging to that suborder. Dinosaurs in **bold** indicate animals that are found in the Museum's galleries (species names are added for further identification).

SAURISCHIANS (lizard-hipped)

Suborders:

1) *THEROPODS* (carnivorous, intelligent, bipedal) Examples: ***Tyrannosaurus rex, Coelophysis bauri , Deinonychus antirrhopus***
2) *SAUROPODS* (giant herbivores, quadrupedal, herders) Examples: ***Camarasaurus grandis,*** Apatosaurus, Diplodocus
3) *PROSAUROPODS* (early Sauropod relatives, herbivores, some bipedal) Examples: Plateosaurus, Massospondylus, ***Mussaurus patagonicus***

ORNITHISCHIANS (bird-hipped)

Suborders:

1) *ORNITHOPODS* (herbivores, some bipedal, included duckbills) Examples: Iguanodon, ***Maiasaura peeblesorum, Tenontosaurus tilletti***
2) *THYREOPHORA* (armored, quadrupedal, herbivores) Examples: Stegosaurus, Ankylosaurus, Minmi
3) MARGINOCEPHALIA (horned or thick skulled, quadrupedal, herbivores) Examples: ***Triceratops horridus***, Pachycephalosaurus, Styracosaurus

Are Birds Dinosaurs?

- Yes. Overwhelming evidence has led most scientists to agree that ***birds are the living descendents of dinosaurs.***
- Moreover, it should be noted when classifying birds within the animal kingdom, they should be classified as **reptiles.**
- Birds evolved from the Saurischian (lizard-hipped) line of dinosaurs. Despite the irony of not being classified with the Ornithischian (bird-hipped) dinosaurs, birds actually evolved from the theropod (Saurischian)

dinosaurs. The pelvis of the modern bird is an example of how **biological convergence** can occur, meaning, a similar physical characteristic can evolve independently within a different groups of animals that exhibit the same characteristic. Example: Birds, bats, and pterosaurs all developed wings for flight, but evolved wings independently from each other.

Dinosaur Eggs, Nests, and Babies

- Dinosaurs hatched from eggs that were laid by the females. Dinosaurs laid up to 22 eggs at a time. Groups **(clutches)** of eggs were laid in nests that were shallow holes scooped out of the ground. It is hypothesized that dinosaurs covered their nests with vegetation in order to keep the eggs warm.

Oviraptor Clutch
Photo courtesy of Bill Mueller

- Eggs were laid in many different formations: **spiral, concentric circles, rows, arcs, and irregular clusters.**
- Dinosaur nesting grounds (many nests found together) have been discovered, and conversely solitary dinosaur nests have also been found.
- The hard shelled dinosaur egg provided a protective and nurturing environment for the embryo inside. It allowed for the widespread distribution of dinosaurs on land, since dinosaurs did not have to return to water to reproduce like amphibians.
- Like bird eggs, dinosaur eggs were composed of a **shell**, **albumen** (egg white), **yolk** (food for embryo), **amniotic sac** (fluid filled sac protecting the embryo), **allantois** (stored metabolic waste of embryo), and the **embryo** itself.
- The porous structure of the eggshell aids paleontologists in distinguishing fossil eggs from egg-shaped rocks. Under a microscope, fossil dinosaur eggshells reveal two layers while modern birds have three layers.
- **Dinosaur eggs can only be positively identified to a specific type of dinosaur if an embryo or fetus is found inside (which is very rare).**
- Dinosaur eggs come in two different shapes: **elongated** (cucumber or oval shaped) and **spherical**. Size varies from very large eggs (basketball sized) to small eggs (ping-pong ball sized).
- ***Generally***, theropod dinosaurs laid elongated eggs, while sauropod dinosaurs laid spherical eggs.
- Duckbill dinosaurs laid oval shaped eggs similar to the shape of a chicken egg.
- Dinosaur eggs and nests have been found all around the world in concentrated areas including: **Western North America, South America (especially Argentina), Europe (especially France), India, Mongolia, and China.**
- Eggs have not yet been found in Australia or India.

Dinosaur Embryos, Fetuses, and Babies

- Dinosaur fossil embryos and fetuses are very rare.
- The most famous dinosaur fetus is **"Baby Louie."** Baby Louie is an ***Oviraptor philoceratops*** fetus that is preserved beautifully – still curled up in a fetal position. It is estimated that Baby Louie would have grown to be 30 feet long!

Juvenile *Oviraptor*
Photo courtesy of Bill Mueller

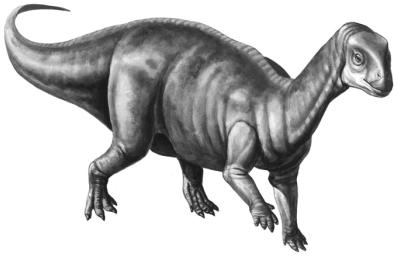
- *Oviraptors* were light, fast-moving theropod dinosaurs that lived during the Late Cretaceous Period. Several *Oviraptor* nests have been discovered in China. The name *"Oviraptor"* means **"egg thief,"** however this name was given under misconceptions. The interesting story of how *Oviraptor* got its name is located in your tour script. Note that the Museum has a cast of Baby Louie, a clutch of *Oviraptor* eggs, and a cast of a juvenile *Oviraptor* skull and neck (located in Case 17:Dino Hall).

- Fossil evidence reveals that many dinosaurs nurtured their babies after they hatched. A primary example of this evidence stems from the discoveries made with ***Maiasaura peeblesorum.*** *Maiasaura* are duckbill dinosaurs that grew up to 30 feet long. Nesting grounds (over 40 nests in one area) of *Maiasaura* have been found in Montana. The eggs, mud-rimmed nests, and adult skeletons of *Maiasaura* that have been found in Montana indicate that they nurtured their young. Fossilized remains of *Maiasaura* babies (only 1 foot long) also indicate that their joints were too weak to leave the nest and forage for food, suggesting that adult *Maiasaura* brought food to their babies.
  Maiasaura means **"good mother lizard."** The Story Time book, *Maia: A Dinosaur Grows Up*, tells the story of a *Maiasaur* baby. The Museum has casts of baby *Maiasaura* that are "hatching" out of their eggs (located in Case 17:Dino Hall).
- Dinosaur babies may have had an **"egg tooth"** to help them peck out of their shells when hatching. Birds and other reptiles today have an egg tooth, which is a hardened piece of cartilage that is reabsorbed into the body after the egg hatches.
- Fossil evidence indicates that *Oviraptors* nurtured their young as well. Adult *Oviraptor* bones have been found on top of *Oviraptor* nests. Paleontologists have hypothesized that parents were protecting their young from dust storms or predators.
- Babies of the giant sauropod dinosaur ***Camarasaurus*** have been found that are a little over three feet long!
- *Tyrannosaurus rex* babies have not been found yet.
- It is possible that some dinosaurs were twins or triplets.
- Dinosaur babies grew very fast compared to humans. For example, ***Allosaurus fragilis*** may have needed only 8 years to grow into a full adult. Some babies would double in size after only 6 weeks!

Pre-Visit Preparation

Provided below are two suggested Pre-Visit lesson plans designed to introduce students to dinosaurs and their eggs, nests, and babies. You may choose to use one, both, or create your own. **Throughout this packet, questions and text to promote your dialogue with students is written in italics.**

Lesson Plan 1: Meet the Dinosaurs



Grade: 1st
Subject: Science and Language Arts
Topic: Dinosaurs
Time: 1 hour
Place: Classroom

You will need the following materials:

- Pictures of the two types of dinosaur hips (great pictures are located on www.enchantedlearning.com).
- Pictures of dinosaurs (suggestion: use four pictures, one of each "type" you will be discussing (such as *T. rex*, *Apatosaurus*, *Maiasaura*, and *Triceratops*).
- "Meet the Dinosaurs" coloring sheets and crayons (pp. 26).

Learning Objective: Students will learn dinosaur basics.

Behavioral Objectives:
Cognitive: Students will be able to answer the questions: What is a dinosaur? What is a paleontologist? When did dinosaurs live? Students will learn about the two groups of dinosaurs and two types of dinosaurs from each group.
Psychomotor: Students will express qualities of dinosaurs through interpretive acting/movements.
Affective: Students will want to pursue further studies of dinosaurs.

Skills: Communication, Critical and Creative Thinking, Natural Sciences, and Kinesthetic Learning

Program Procedure:
Preassessment (5 min): Sit in a circle on the floor. Go around in a circle and have each student name their favorite dinosaur. *Today we are going to learn all about dinosaurs. Make sure to pay close attention, because in the next week you will be studying dinosaurs and making a trip to the Dinosaur Hall at the Museum of Texas Tech University.*

Motivational Set (10 min): Remain in a circle. Pass around pictures of dinosaurs. Begin a dinosaur discussion: *What is a dinosaur? Who studies dinosaurs? When did dinosaurs live? Why did they become extinct?* Encourage students to discuss their answers. From the discussion, make sure that students

have the correct answers. Also, make sure that students learn about what defines a dinosaur (hole in the hip).

New Learning (25 min.): *Today you are going to be dinosaurs!*

1.Divide the class into two groups. *There are two different groups of dinosaurs. They are classified by their type of hip. The two groups of students will represent the two groups of dinosaurs: One group will be the* ***lizard-hipped (Group 1)*** *and the other will be* ***the bird-hipped (Group 2)****.* Show the class two pictures illustrating the two hip types.

2. Have Group 1 say their name out loud (lizard-hips), and do the same for the other group (bird-hips).

3. Many types of dinosaurs belong to these two groups, however we are only going to look at two different types of dinosaurs per group.

4. Divide Group 1 into two groups. Name the groups the **Theropods** and the **Sauropods**. Divide Group 2 into two groups. Name the groups the **Duckbills** and the **Horned** dinosaurs.

5. Have students in the **Theropod Group** say their name out loud: "We are the lizard-hipped theropods." *The theropods were among the smartest and fastest dinosaurs. They were carnivores (meat-eaters) and they walked on two legs. Theropods hunted all the other dinosaurs we will learn about today. Most theropods lived alone–not in herds. The theropods included Tyrannosaurus rex, Allosaurus, Velociraptor, and Oviraptor!* Have the students stand up (all other groups should be seated). Let the students act out what they think the meat-eating theropods acted like. *Ask: What did they sound like? What kind of facial expressions did they have? What did they walk like? How did they eat? What did they look like sleeping?* Show students a picture of *T. rex*, a theropod dinosaur.

6. Do the same for the next three groups. Have the students act out the same questions. Give the following information for the next three groups:

(A) **Sauropod Group:** Have the students say: "We are the lizard-hipped sauropods!" *Sauropods were the giant plant eating dinosaurs. They walked on four legs. Sauropods had very long necks and tails. They were not hunters, but some were hunted by theropods. Many sauropods lived in herds. Examples include: Apatosaurus (also known as Brontosaurus), Camarasaurus, and Diplodocus.* Show picture.

(B) **Duckbill Group:** Have the students say: "We are the bird-hipped duckbills!" *The duckbills also lived in herds. Some duckbills got to be over 30 feet long (about the length of a school bus)! Duckbills were plant eaters and probably had an average intelligence for a dinosaur. Theropods hunted duckbills. Duckbills like Maiasaura and Edmontosaurus were probably very good parents.* Show picture.

(C) **Horned Dinosaur Group:** Have the students say: "We are the bird-hipped horned dinosaurs*!" The horned dinosaurs included Triceratops and Protoceratops. Horned dinosaurs had horns on their head for protection and for competition among males. The horns were made of thick keratin – the same substance as your fingernails. Theropod dinosaurs sometimes hunted horned dinosaurs. Horned dinosaurs were plant eaters and walked on four legs. Show picture.*

7. Play a game of **"Duckbill, Duckbill, Theropod!"** This game is exactly like "Duck, Duck, Goose" except the student that is "it" is a duckbill dinosaur. You may call the circle the students form a "duckbill" nest. The student chosen as "it" must pick the "theropod intruder" among the other students in the circle that will chase him/her back around the circle to the safe, empty spot in the "nest." If the "duckbill" is caught by the theropod, he/she must try again. If the duckbill makes it back to the spot safely, the theropod must now become the hunted duckbill.

Summary (5 min): Ask students if there are any questions about what they learned today. Remind them about the two groups of dinosaurs, the bird-hipped and the lizard-hipped. Make sure the students remember that all dinosaurs have a hole in their hips and that is what makes them a dinosaur .

Application (15 min): Pass out the "Meet the Dinosaurs" coloring sheets. Have the students color the dinosaurs with crayons. Point out that the dinosaurs are divided by the two groups, just like they learned earlier.

Conclusion (2 min): Remind students that they will be going to the museum later this week to see some of the dinosaurs we have talked about today. Tell them tomorrow they will learn about dinosaur eggs, nests, and babies (see Pre-visit lesson plan #2).

Lesson Plan #2: SpEGGtacular Dinosaurs

Grade: 1st
Subject: Science and Language Arts
Topic: Lifecycles: Dinosaur Eggs and Babies
Time: 1 hour
Place: Classroom

http://mcclungmuseum.utk.edu/

You will need the following materials:
- Basketball, grapefruit, potato, cucumber, football, tennis ball, and ping -pong ball.
- Drawing paper or "Dinosaur Eggs" worksheet (p. 28 of this packet)
- Pencils
- Crayons
- Markers

Learning Objective: Students will learn about aspects of dinosaur reproduction including: eggs, babies, and parenting.

Behavioral Objectives:
Cognitive: Students will learn that dinosaurs hatched from eggs. Students will learn characteristics of dino eggs. Students will learn about two different types of dinosaur babies and how their parents cared for them
Psychomotor/Skills: Students will practice fine arts skills.
Affective: Students will appreciate the early life cycle of the dinosaurs.

Skills: Communication; Natural Sciences; Critical and Creative Thinking; Spatial/Visual Arts

Program Procedure:
Preassessment (5 min.): *Dinosaurs were what type of animal?* (answer: reptiles). Have the students brainstorm about other reptiles – make a list on the board. *How do reptiles give birth to their young? Reptiles lay eggs that eventually hatch babies. What other type of animal lays eggs that is a dinosaur and still lives today?…birds*! (Let students know that today they will be exploring dinosaur eggs and babies. Note that students should pay close attention because they will be going on a field trip to the Museum to learn about the life cycle of dinosaurs. They will even see some dinosaur eggs and babies while they are there!)

Motivational Set (5-10 min.): *What do you think dinosaur eggs look like? What shape are they? How big do you think they are?* Pass around the following objects: basketball, grapefruit, potato, cucumber, football, tennis ball, and ping-pong ball. *Dinosaur eggs varied in size and shape. Some were as big as a basketball. Some were as small as a ping pong ball. Two types of dinosaur eggs exist. Depending on the type of dinosaur, some eggs were spherical (round) while others were elongated, oval shapes.* Have the students identify which of the objects are elongated or oval, and which

are spherical. *What color do you think dinosaur eggshells were? Paleontologists do not know what color dinosaur eggshells were because color and patterns are not preserved in fossilized eggs.*

New Learning (20 min.) Play **"SpEGGtacular Dinosaurs,"** a True/False game and discussion. This is a guessing game, as the students should not know the answers yet. Remind them that it is okay to guess the wrong answer because no one should know the answer yet. This should not be a competitive game, but a tool for discussion. After a question is posed and answered, you will discuss why the answer is right or wrong. Use appropriate pictures/illustrations to add a visual element to the game. Let the students know you will be asking a series of true/false questions. Have the students raise their hands when they want to guess at the answer.

SpEGGtacular Dinosaurs

See Teacher Discussion for explanation of answers

1. Dinosaurs laid only one egg at a time. **False.**
2. A group of eggs in a nest is called a "clutch." **True.**
3. Spherical shaped eggs were laid by theropod dinosaurs like *T. rex*. **False.**
4. Giant sauropod dinosaurs like *Apatosaurus* laid spherical eggs. **True.**
5. A dinosaur embryo is nourished inside the egg by the yolk. **True.**
6. Dinosaur eggs are found on all 7 continents. **False.**
7. Dinosaur eggs usually have preserved fetuses inside. **False.**
8. Dinosaurs did not take care of their babies. **False.**
9. *"Oviraptor"* is a dinosaur whose name means "egg thief." **True.**
10. *Oviraptor* eggs are elongated like a cucumber. **True.**
11. *Maiasaura* are dinosaurs whose name means "bad mother lizard." **False.**
12. An "egg tooth" may have helped baby dinosaurs peck out of their egg. **True.**

Summary (5 min.): *Are there any questions from the game. What do you find most interesting about dinosaur eggs? Of the two dinosaur babies we learned about which is your favorite? Why*?

Application (20 min.): Students will draw and decorate their own dinosaur eggs. Remind them that round eggs belonged to giant sauropods like *Camarasaurus*, while elongated eggs belonged to theropods like *Oviraptor*. Have the students draw the two different shaped eggs and label what type of dinosaur laid the egg. The eggs can be colored and decorated any way the student wishes. Alternative: Use the provided worksheet "Dino Eggs" for the students to color.

Conclusion (5 min.): Have the students share their dinosaur egg creations with the class. Decorate the room with the drawings. Remind students about the upcoming trip to the Museum. They will be learning about the life cycle of dinosaurs and especially about dinosaur babies. At the Museum, they will need to pay close attention because they will have to write and illustrate their own dinosaur baby story when they come back to school.

Museum Visit
Dino Babies Lesson Plan

Note: The following is a general lesson plan created for your visit to the Museum. Upon arrival, please sign in at the Guard's kiosk located in the Main Lobby. The story book, video, "Dinosaur Nest" and "Exploration Box" will be provided to you upon check-in if you reserved them when you booked the tour. You must check-in and check-out these supplies.

Title: Dino Babies
Grade: 1st
Place: Dino Hall, Museum of Texas Tech Univ.
Time: 1 hour
Group size: 1 class
Subject: Natural Science and Language Arts
Topic: Life cycle of dinosaurs

***Camarasaurus* and Juvenile**
Photo courtesy of Bill Mueller

You will need the following materials:
- Exploration Box
- Book: *Maia: A Dinosaur Grows Up Dinosaur Babies* (Penner) or *Dinosaur Babies* (Zoehfeld) or Video: *Maia: A Dinosaur Grows Up* (the same story read on video).
- "Dinosaur Nest"
- Tour Script (optional)

Learning Objective: Students will learn about the life cycle of dinosaurs with an emphasis on dinosaur eggs, nests, and babies.

Behavioral Objectives:
Cognitive: *In Natural Science*: Students will learn about the major phases of the life cycle through exploring the lives of dinosaurs. Students will learn about various characteristics of dinosaurs, and their eggs, nests, and babies. *In Language Arts*: Students will learn and practice listening and speaking skills.
Psychomotor/Skills: N/A
Affective: Students will appreciate the lives of dinosaurs and the cycle of life for all living animals.

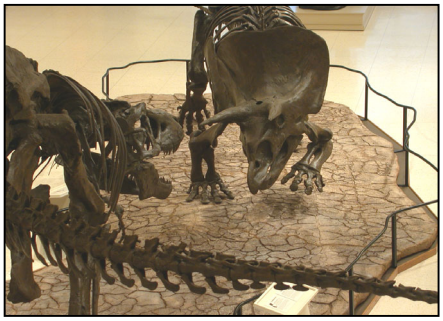
Skills: Critical and Creative Thinking, Natural Sciences, Communication

Program Procedure:
Pre-Visit Activities: Complete at least one of the two pre-visit lesson plans before your visit to the Museum.

Motivational Set (5 min.): You, the classroom teacher, will begin the museum experience in the Main Gallery in front of the *Tyrannosaurus rex* and *Triceratops horridus* display. *All of the dinosaurs and other prehistoric animals you will see today*

were once babies which grew up into adult dinosaurs and eventually died. Their remains, or bones are what we are going to look at today. The T. rex and Triceratops you see here were once much smaller. Compare the life cycle of dinosaurs to the life cycle of humans. *Do you remember when you were a baby? How tall were you? How much have you grown?* Encourage students to imagine what the dinosaurs looked like as babies. *We are going to the Dino Hall now where you will see all kinds of dinosaurs in different stages of their life.* Lead class to Dino Hall.

Note: Remind students what a fossil is. Tell them that they are going to be seeing casts of fossils in the Dinosaur Hall. Let the students know that most of the dinosaurs in the Dino Hall are **not** made of real bone. Exact casts (made of resin) are on display because dinosaur fossils are too fragile to exhibit. Real bones need to be kept in safe conditions where scientists can preserve and conduct research on them.



Tyrannosaurus rex and Triceratops horridus
Photo courtesy of Bill Mueller

New Learning (25 min.): Explore Dino Hall. Tour the cases and displays which relate to the life cycle of dinosaurs and dinosaur babies. Include discussion and object analysis within the tour in order to involve students. A tour script has been written specifically for this program and is provided within this packet. All italicized print is provided for you, the teacher, to say to your class.

Learning application is conducted during the tour as a "hands-on" activity. For most designated cases or displays, the Museum will provide one or two objects located in the Exploration Box. These objects reinforce concepts learned in discussion and can be handled by students. Some of the hands-on objects represent actual objects in the cases and displays, thus you may choose to make parts of this activity a "seek and find" game. At the end of each discussion, you can show the relevant object and pass it around the class. *Where do you see this in the case? What is this? Why is this object important? etc.* Each child should be able to touch and examine the artifact.

Story Time (25 min.): Read a story book provided by the Museum. You may choose from: Maia: A Dinosaur Grows Up, Dinosaur Babies (by Penner), or Dinosaur Babies (by Zoehfeld). You may also choose to watch the video version of Maia: A Dinosaur Grows Up (30 minutes long). Have the students sit on the benches or surrounding floor in the Dino Hall as you read the story. Place the "Dinosaur Nest" on the floor. Some students may sit in the nest. All three books discuss *Maiasaura*. Remind students about the baby *Maiasaura* in the display case. You may wish to read only chapters of your choice if time does not allow for the entire book to be read.

Conclusion (5 min): Summarize the major concepts of the lesson plan: the life cycle of dinosaurs, dinosaur eggs, nests, and babies. Ask if there are any questions. Return to school. Complete post –visit activities.

Museum Visit: *Suggested* Tour Script

The following is a script of a tour you can conduct that was designed specifically for this program. You are free to allow students to view all cases/displays, however, only some are pertinent to this program. The suggested tour below can be referenced by case number on the back of the enclosed brochure: "A Changing World: Dinosaurs, Diversity, and Drifting Continents." Name pronunciations and definitions can also be found in the same brochure. All tour activities are underlined (including activities using the Exploration Box).

Tour Script:

1) Begin your tour of the Dino Hall in the Triassic period at **Case 1: "The Dawn of an Age."** *Dinosaurs first emerged during the Late Triassic, about 228 million years ago. What is a dinosaur? Dinosaurs were ancient land dwelling reptiles that were unique because they had a hole in their hip bone (no other animal has ever exhibited this feature!).* Allow students to view the "Dinosaur Family Tree" and ask them to find the two different types of dinosaur hip bones. Let the students put their hands inside the "holes."

Now look back into Case 1. *Here two different animals are displayed.* ***Marasuchus*** *(the smaller animal) is an ancestor to all dinosaurs. Look at the hole in the* ***Eoraptor*** *hip bone. Eoraptor is one of the earliest known dinosaurs. These animals are relatively small. Do you think these are baby dinosaurs? How old do you think they were when they died? We will be seeing many dinosaurs today. Sometimes it can be confusing when we see smaller animals. They may look like babies, but they are not – they are just small. There are some dinosaurs in this gallery that are babies or are very young. As we tour the gallery keep your eyes open for them. The dinosaur you see here (Eoraptor) is small, but it is an adult. Imagine how small its babies were. Remember what we learned in class (pre-visit lesson). How did dinosaurs give birth to their young? They laid eggs…just like birds (living dinosaurs) or other reptiles. We will also be seeing dinosaur eggs today. Pay close attention!*

2) Walk over to the display in the center of the gallery, **"Display 7: *Camarasaurus* - Giant of the Jurassic."** ***Camarasaurus*** *is an example of a giant sauropod dinosaur that lived during the Jurassic period. Sauropods were very large dinosaurs that walked on four feet. Look at the two dinosaurs before you. What do you see? Do you see a baby dinosaur? Actually, the smaller dinosaur is a juvenile (very young). Why do you think it is walking with a larger dinosaur? Do you think it is a parent? How does a child depend on its parents? How old do*

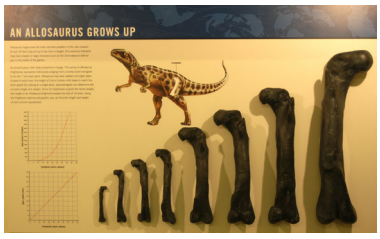
***Camarasaurus* embryo and egg reconstruction**

you think these dinosaurs are? What stage of life do these dinosaurs represent? Notice the footprints these dinosaurs left behind in the mud. How much bigger are the adult footprints compared to the juvenile footprints? Located in the Exploration Box are a set of footprints. Place the footprints on the ground and see how many students can stand inside each footprint. Note how much bigger the adult footprint is compared to the juvenile. Also in the Exploration Box is a cast of an adult *Camarasaurus* claw. Allow the students to examine the claw (size, shape, etc.) *From fossil footprint evidence, paleontologists know that sauropods like this animal traveled in herds. What are the benefits to traveling in a herd*? Bring the students around the display to the text on *Camarasaurus* (located in front of Case 6: "The Climb to Flight." Show students the picture of the *Camarasaurus* embryo in its egg. *Recently, scientists have found many sauropod eggs in India and Argentina. What shape is a sauropod egg?* (answer: spherical/round).

3) Walk back down the ramp a little to **Case 5: "Lords of the Triassic."** *Shown here are two animals:* ***Postosuchus*** *and an* ***Aetosaur****. These were not dinosaurs, but lived during the Triassic around the time of dinosaurs. Postosuchus was an ancestor to crocodiles that was a great hunter. Postosuchus was discovered nearby in Post, Texas (notice it was named after Post). Aetosaurs are armored reptiles that were plant eaters. They are also found in West Texas. What do you think happened here? Why? This is an example of how the food chain works. Postosuchus was hungry and ate the unfortunate Aetosaur. This is part of the cycle of life. What stage of life is represented here for the Aetosaur? All animals eventually die. Some animals are eaten, some have accidents or become sick, some just die of old age.* Pass around the *Postosuchus* teeth and *Aetosaur* armor located in the "Exploration Box." *Do you see these same objects in the display? Where? These are real fossils, not casts.* Remind them to be very careful. *Notice the serrations on the Postosuchus tooth. It is still sharp! This helped Postosuchus to be a successful hunter.*

4. Walk around the exhibit to the **Display 10: "Tooth and Claw."** *What is happening here? How is this display different from the last one? Here we see* ***Deinonychus*** *(a predator) leaping through the air. He is about to pounce on the plant-eating duckbill dinosaur* ***Tenontosaurus.*** *The Tenontosaurus hasn't been attacked yet. What stage of life does this display capture? Which animal is higher on the food chain? What physical characteristics help a meat-eating theropod dinosaur to accomplish such a task?* (Answers include: sharp claws, sharp teeth, quickness, powerful legs, etc.) *The name Deinonychus means "terrible claw." Note that the Tenontosaurus is not an adult, but a juvenile. Why do you think Deinonychus would choose to attack a juvenile, rather than an adult?* Take out the cast of a *Deinonychus* claw in the Exploration Box and pass it around the group. Have the students describe it.

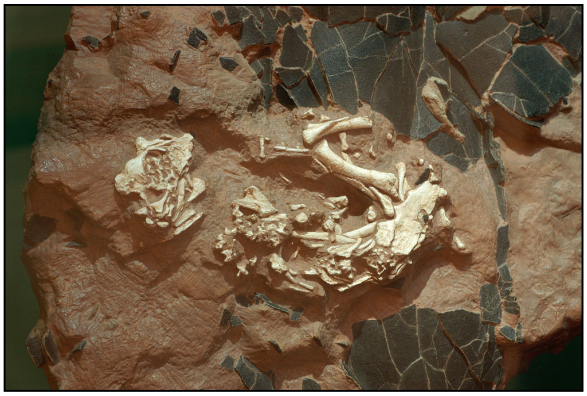
5. Lead your students over to **Display 16: "*Allosaurus* Grows Up."** *Here is an example of how a dinosaur gets bigger and bigger as it grows.* ***Allosaurus*** *was a theropod dinosaur. Remember, theropods were meat-eaters that walked on two feet. What is another type of theropod?* Have



Allosaurus Grows Up Display
Photo courtesy of Bill Mueller

students touch the growing femurs and discuss what they observe. *This is a femur (leg bone) of an Allosaurus. How big was the leg bone when the dinosaur was a baby? How big was the bone when the Allosaurus died? Allosaurus grew to be very large and only needed 8 years to grow to adult size. That is the length of time it would take you to reach 3rd grade!*

6. Step over now to **Case 17: "Eggs, Nests, and Babies."** Have the students sit in front of the display case. *What do you see here? Look over to the first object on your left. What do you think this is? Why? What part of the life cycle was this dinosaur in when he/she died? This is a section of a dinosaur nest found in Mongolia (near China). The bones that you see are the remains of a baby dinosaur. This is a very rare example of a fossilized embryo. Paleontologists have identified this fossil embryo as an* ***Oviraptor*** *dinosaur, and they named it* ***"Baby Louie."*** *Oviraptors were theropod dinosaurs like Tyrannosaurus rex, Allosaurus, and Deinonychus. Baby Louie would have grown to be 30 feet long (the length of a school bus)!*



Baby Louie
Photo courtesy of Bill Mueller

The name "Oviraptor" means ***"egg thief."*** *Actually, there is an interesting story about how Oviraptor got its name. In the 1920's, a nest of dinosaur eggs was found with the bones of a dinosaur on top of it. The dinosaur on top was some new kind of theropod dinosaur, but the paleontologists thought the eggs belonged to a different dinosaur – a horned dinosaur called* ***Protoceratops****. The scientists came to this conclusion because a Protoceratops was found very close to the nest. The scientists thought the dinosaur on top of the nest (the theropod) was in the process of stealing the eggs. Thus, paleontologists named the new dinosaur, Oviraptor, meaning egg thief. For many decades, people thought of Oviraptor as an egg thief. Yet not too long ago, paleontologists found another nest of similar eggs with Oviraptor bones stretched across them. This time, however, parts of a baby dinosaur skeleton were found in one of the eggs. Guess what kind of baby was in the egg? It was an Oviraptor, not a Protoceratops! In fact, Oviraptors were really misnamed…they were not stealing eggs, they were protecting their babies from some threat such as a sandstorm or predator. Now paleontologists have evidence that Oviraptors were extremely good parents.*

Look to the right of Baby Louie. This is an example of what a young Oviraptor looked like. Notice that only the head and neck are shown in this cast. Can you see any

similarities between this older Oviraptor and Baby Louie? Notice how much the head has grown when comparing it to the embryo.

***Oviraptor* feeding babies**

Now look at the nest of eggs to the right. Describe the eggs. What shape are they? What kind of texture do they have? How big are they? What type of dinosaur laid these eggs? Remember what we learned in class about dinosaur eggs. ***Elongated eggs were laid by theropod dinosaurs.*** *Do you know who laid these eggs? An Oviraptor laid this clutch of eggs. How many eggs do you see here?* Pass around the cast of an *Oviraptor* egg that is located in your Exploration Box. Ask students to describe the egg.

Finally look at the nest with the new baby hatchlings. Describe these baby dinosaurs. How tall are they? Describe their mouths. These are ***Maiasaura*** *eggs and babies. Maiasaura were duckbill dinosaurs that were plant eaters. They grew to be 30 feet long (the length of a school bus), but hatchlings were only 1 foot long. They laid their eggs in nests by scooping earth out of the ground. Maiasaura nests are about six feet across (as*

long as an adult man) and held up to 25 grapefruit sized eggs! Maiasaura had nesting grounds where they made their nests all in one place. In Montana, over 10,000 Maiasaura were found together suggesting that they traveled and lived in herds. What other animal have we seen today that travels in herds? (Camarasaurus).

What do you think "Maiasaura" means? We know "saur" means lizard. Maiasaura means ***"good mother lizard."*** *Maiasaura were the first type of dinosaurs found alongside their babies. Half-digested plants were also found with their babies whose teeth exhibited signs of wear from chewing. This suggests that Maiasaura nurtured and fed their young. How else do you think dinosaurs nurtured their young? They kept them warm, protected them from predators, etc. Why is this an important part of the life cycle?*

Maiasaura eggs and babies
Photo courtesy of Bill Mueller

Now we will read (or watch) a story about baby dinosaurs. Listen to see if there are any dinosaurs in the story that we learned about today. Pay close attention because later when we go back to school, we will write our own story about a baby dinosaur.

Summary: After the story summarize your tour: *I want you to think back to when we first came in the Dino Hall. Think about all the dinosaurs we have seen. Think about how they lived their lives, how they had their babies and took care of them, how they struggled to stay alive, and how they eventually died. This is the life cycle of the dinosaurs. How is this life cycle different from our own? We are not "hatched" from eggs, but it seems like we have more in common with dinosaurs than you might think! We are born to parents as small, helpless babies, and grow through our youth into adults. Just like Allosaurus, our bones grow bigger and bigger. We have to eat in order to survive – some of us eat plants like Maiasaura, and some of us eat meat like Oviraptors, and some of us eat both! If you think about it, we live in herds too like the sauropods and duckbills (different kinds of herds, but herds just the same). Someday, we might become parents and take care of our young, and someday our own life cycle will end as new ones begin.*

Note: After your tour, please complete the Exploration Box inventory located in the Exploration Box, and return the inventory to the Education Department. Thanks!

Post-Visit Activities

The following are suggested Post-Museum visit activities. It is recommended that your class complete at least one of the following to maximize the museum experience and the educational potential of the overall program.

#1 – Dino Stories

Students will compose and illustrate their own dino baby story. This story should be only one to two paragraphs long. Students may choose to write a story about any type of baby dinosaur they wish. Have students keep in mind the story that was read at the Museum. What story will they tell about their dino baby? You may want to provide a list of vocabulary words students could include in their story such as: egg, hatch, baby, mom, food, life, etc. If time allows, let the students share their stories with the class. *Alternate*: Compose a group story with the entire class using vocabulary words of your choice.

#2 – Dino Surfing

Depending on whether your class or library has internet access, have students research a dinosaur web-site. You can conduct this activity as a class or students may work individually (at school or at home). Four great websites for kids which all have information on dino babies are:
www.childrensmuseum.org/dinosphere/index.html
www.jpinstitute.com/index.jsp
www.nationalgeographic.com/features/96/dinoeggs
www.enchantedlearning.com

#3 – Baby Louie Coloring Page

Give students the opportunity to color the famous baby *Oviraptor* fetus: Baby Louie. This coloring page is taken from the popular 3-D reconstruction of Baby Louie which was commissioned by National Geographic (p. 29 of this packet).

#4 Just for Fun: A Dinosaur Egg Hunt

For a recess period, class party, or just for a fun activity on a Friday, conduct a Dinosaur Egg Hunt. Buy plastic dinosaurs and place them inside plastic eggs. Hide the eggs around the class, school, or playground. It is now the students' turn to be a paleontologist!

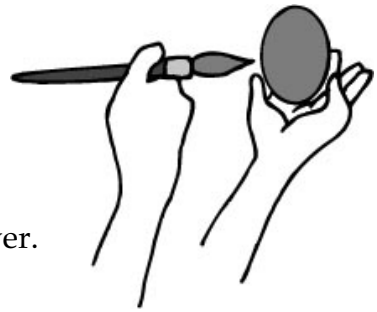
#5 Dino Babies Word Search – Reinforce new and old vocabulary words through this fun word search activity (p.30 of this packet).

#4 – Hatch Your Own Egg!
Students can create and decorate dinosaur eggs using everyday materials. Dinosaurs can be placed inside eggs and "hatched" once the project is finished. If students wish to keep the egg intact, just omit placing the "dinosaur" inside the egg.

Dino Eggs Recipe:

Materials:
- Balloons
- Newspaper or brown paper bags torn into strips
- Flour glue or paper maché paste (see recipes)
- Small plastic dinosaurs
- Paints, markers, glue, glitter, crayons

Method:
- Tear newspaper or brown paper bag into long strips, 2-3cm wide.
- (Optional) Place plastic dinosaur into balloon.
- Blow up balloon. Tie.
- Coat strips of paper with glue flour and spread over the balloon. Make sure that strips lay smooth against the balloon.
- Cover entire balloon with strips and let dry for 12 hours.
- Repeat this step, completely covering the balloon again with the strips of paper and let it dry.
- After second layer is dry the balloon is ready to decorate.
- Decorate your egg with paint, markers, glitter, or other mediums of your choice.
- Remind students that scientists still don't know what colors and patterns dinosaur eggshells were…let their imaginations take over.



Option:
- If you placed a small dinosaur into the balloon earlier, then you can "hatch" the egg. After the decorations have dried, break open the egg and let the baby dinosaur out!

Flour Glue Recipe:
- Bring 4 cups of water to a boil.
- Combine 1 cup of flour and 1 cup of water. Mix well. The mixture will be thin.
- Add flour mixture to boiling water.
- Stir well.
- Reduce heat and simmer for 3-4 minutes.
- Remove from heat. When cool, the glue is ready to use.
- Flour glue can be stored it in an airtight container. It will keep for several weeks. If the paste hardens, it can be softened by mixing in small amounts of warm water (as needed).

Resources on the World Wide Web

Children's Museum of Indianapolis – www.childrensmuseum.org/dinosphere/index.html
Dino Russ's Lair – http://www.isgs.uiuc.edu/dinos/dinos_home.html
Enchanted Learning – www.enchantedlearning.com
Jurassic Park Institute – www.jpinstitute.com/index.jsp
McClung Museum, U. of Tennessee – http://mcclungmuseum.utk.edu/
Museum of the Rockies – http://museum.montana.edu
Museum of Paleontology, U. of California, Berkeley – www.ucmp.berkeley.edu
Museum of Texas Tech University – http://www.depts.ttu.edu/museumttu/
National Geographic – www.nationalgeographic.com/features/96/dinoeggs
Nature – http://www.nature.com/nature
Peabody Museum, Yale U. – www.peabody.yale.edu
Royal BC Museum – http://rbcm1.rbcm.gov.bc.ca/programs/dinos/getcracking.html
Scientific American – http://www.sciam.com
Scholastic – www.teacher.scholastic.com/researchtools/articlearchives/dinos/dinobaby.htm
Society of Vertebrate Paleontology – http://vertpaleo.org
University of Bristol – http://palaeo.gly.bris.ac.uk/palaeofiles/eggs/default.html

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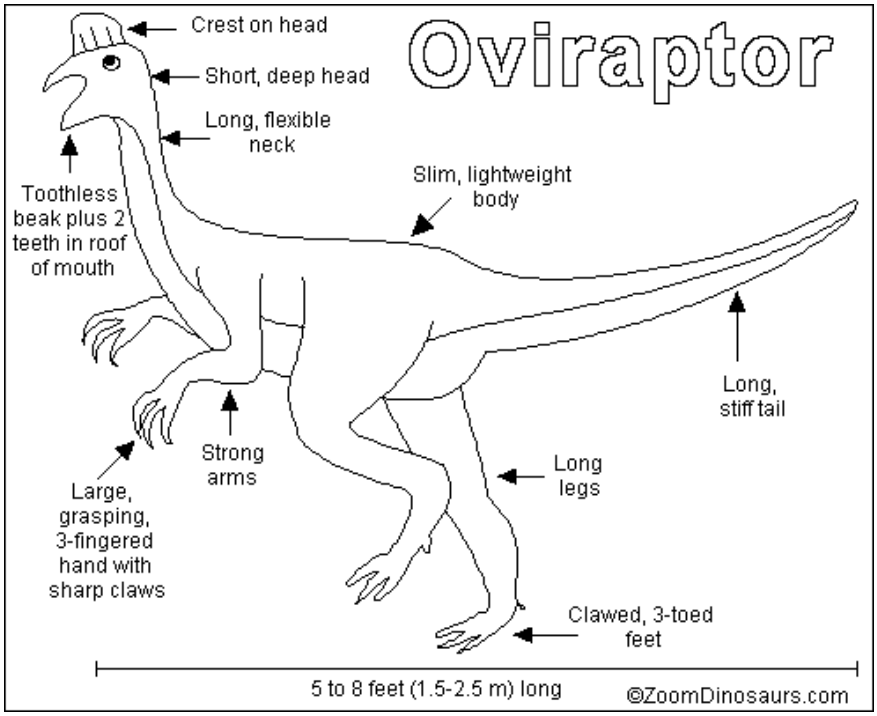
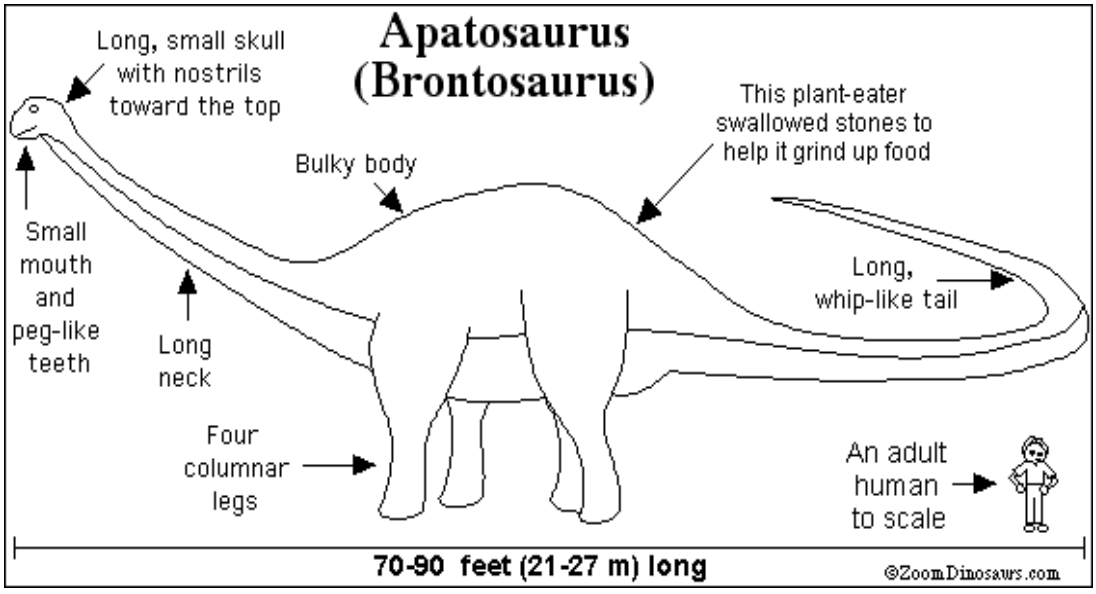
Supplemental Materials

Meet the Dinosaurs

Oviraptor: A lizard-hipped, theropod.

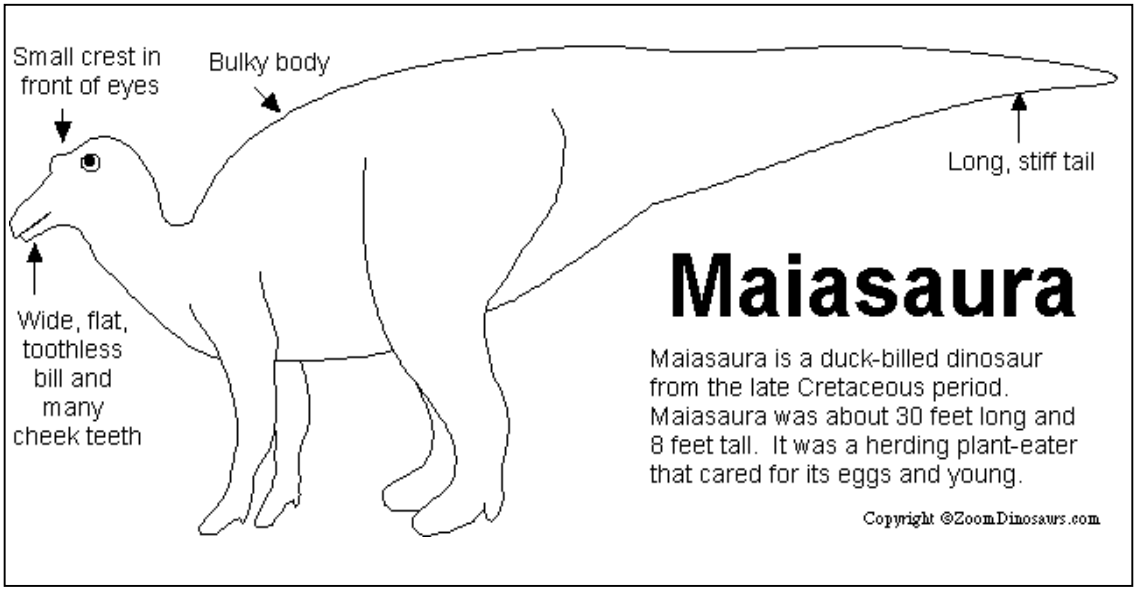


Apatosaurus: A lizard-hipped, sauropod.

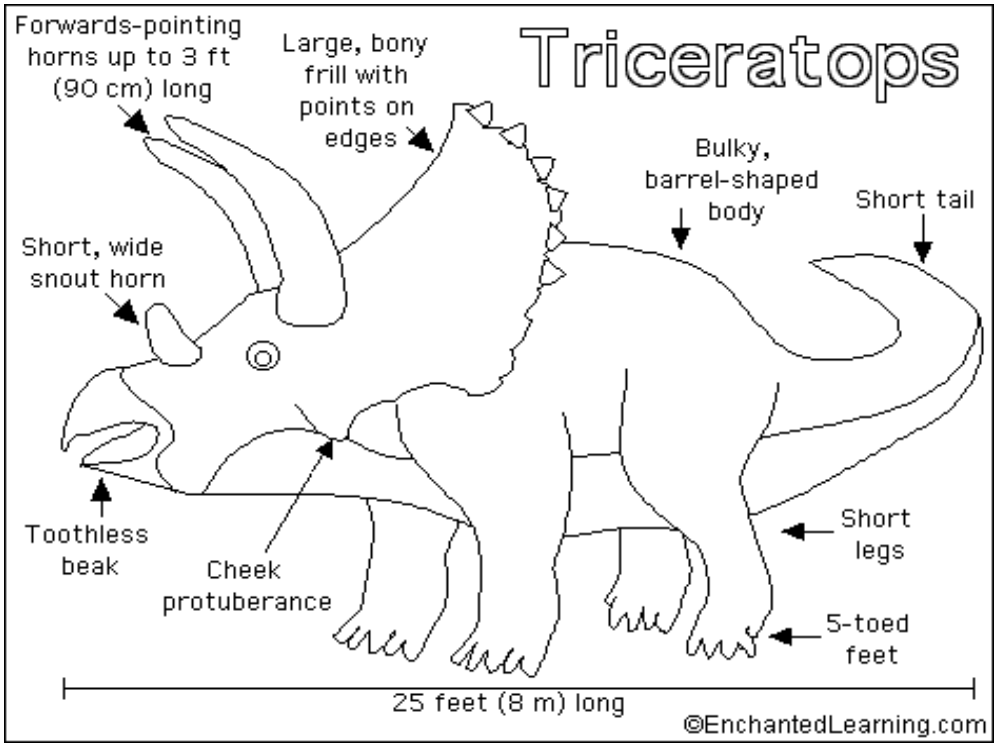


Meet the Dinosaurs

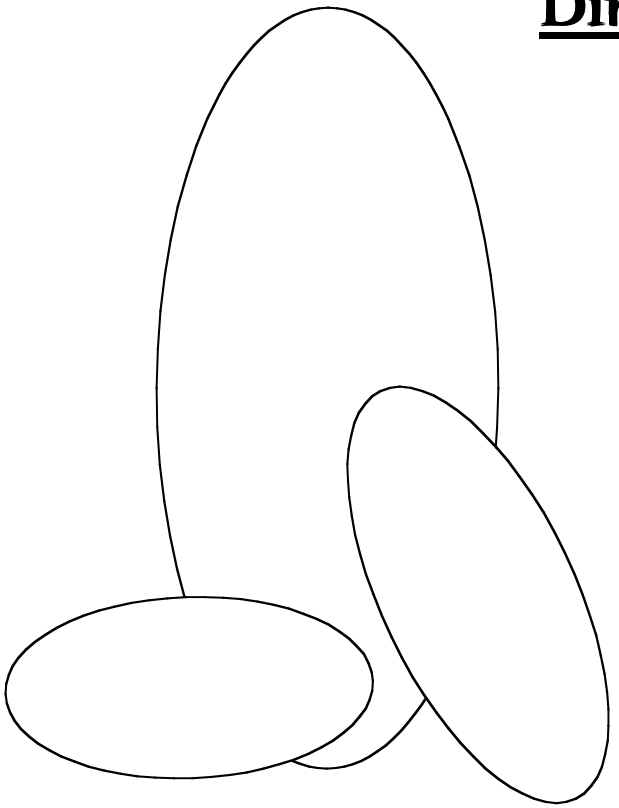
Maiasaura: A bird-hipped, duckbill.



Triceratops: A bird-hipped, horned dinosaur.

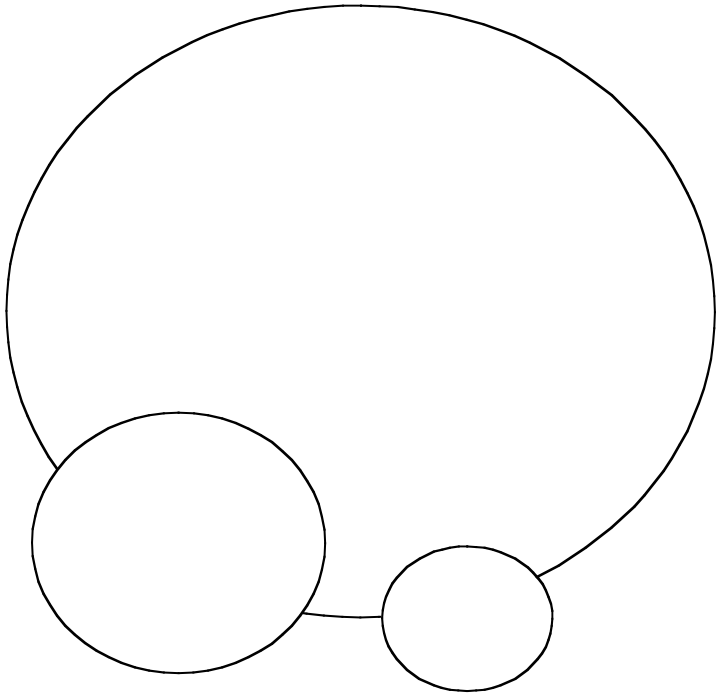


Dinosaur Eggs



Theropod Eggs – Elongated

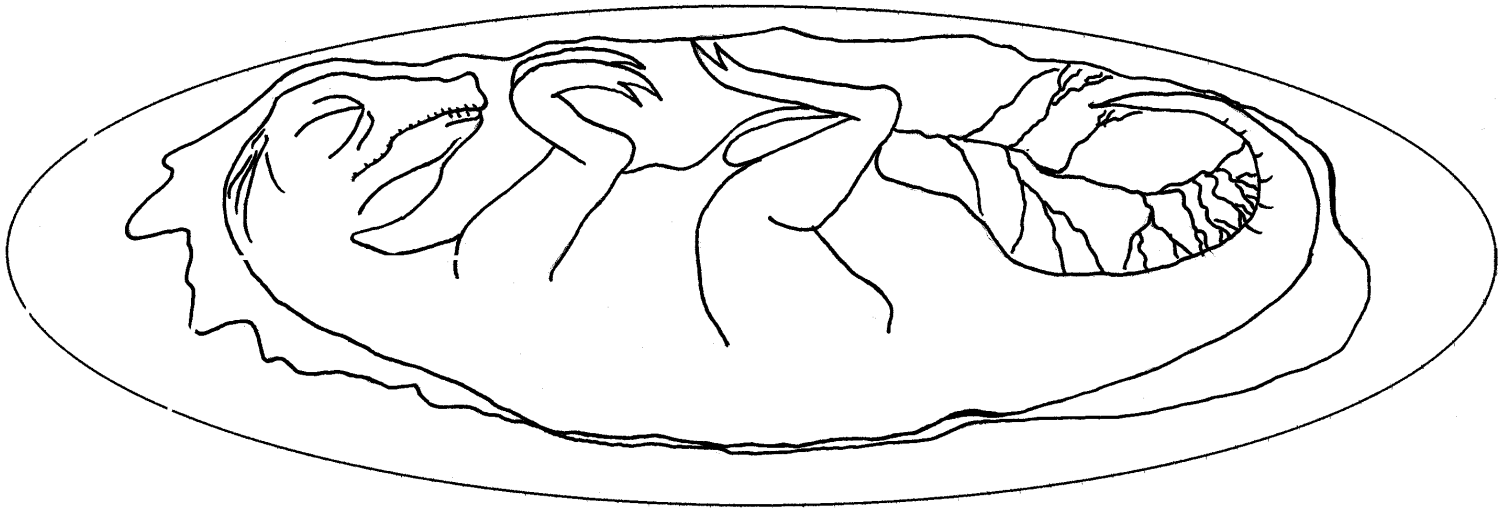
Theropods were meat-eating dinosaurs that walked on two legs. They are one type of lizard-hipped dinosaur. Oviraptor, T-Rex, and Velociraptor are all theropods.



Sauropod Eggs – Spherical

Sauropods were plant-eating dinosaurs that walked on four legs. They are another type of lizard-hipped dinosaur. Apatosaurus and Camarasaurus are sauropods.

"Baby Louie:" A Dinosaur Fetus and Egg



Paleontologists do not know what color Baby Louie was. Did he have patterns on his skin or on his egg? If this egg had hatched, "Baby Louie" would have grown into a giant *Oviraptor* dinosaur. What color/s do you think he was?

Drawing based off a model reconstruction by Brian Cooley.

A Dino Babies Word Search

Directions:
Search for the vocabulary words below. Once you find the word, circle it. You may find words diagonally, backwards, or forwards. Good Luck!!!

B J A F E T U S Y O Y D
J A B W O R G K T N P I
V R B L S E D U L Q U N
S U J Y C P C A E C H O
E G G F E T H A O L I S
Q S J M A I A S A U R A
T B I E W L S F V T X U
C A Y I R E N B F C Z R
I S T C M Z J D B H H U

BABY **CLUTCH** **DINOSAUR**

EAT **EGG** **FETUS**

GROW **REPTILE** **MAIASAURA**

A Dino Babies Word Search

(KEY)

Directions:
Search for the vocabulary words below. Once you find the word, circle it. You may find words diagonally, backwards, or forwards. Good Luck!!!

B J A F E T U S Y O Y D
J A B W O R G K T N P I
V R B L S E D U L Q U N
S U J Y C P C A E C H O
E G G F E T H A O L I S
Q S J M A I A S A U R A
T B I E W L S F V T X U
C A Y I R E N B F C Z R
I S T C M Z J D B H H U

BABY **CLUTCH** **DINOSAUR**

EAT **EGG** **FETUS**

GROW **REPTILE** **MAIASAURA**