



elephant trunk

☆ *6th-8th grade teacher's guide*

University of Nebraska State Museum

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Theodore F. and Claire M. Hubbard Family Foundation**

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UNIVERSITY OF
Nebraska
Lincoln



Dear Colleague,

Nebraska is well known for its fossil elephants. This kit is designed to bring these elephant treasures to your classroom. Thanks to the generous donation by the Theodore F. and Claire M. Hubbard Family Foundation this kit is now a reality.

There are two curriculum guides in the kit, one for grades **4th–5th (orange)** and the other for grades **6th–8th (green)**. The activities for both levels use some of the same materials with extensions for the older students. Materials used by both levels have been identified by the word 'all' or the color **dark brown**. Be sure to check for the appropriate grade level easily identified on the materials.

The kit contains five activities (supported by the Nebraska State Standards) that you can explore over the course of a week.

- Activity 1: Introduce paleontologists and the process of collecting fossils, through a table top dig site.
- Activity 2: Explore rock formations where ancient elephants were found and the time periods in which they lived, to understand Nebraska's past environments.
- Activity 3: Compare and contrast different types of elephant teeth and how they grow.
- Activity 4: Investigate modern elephant behavior to interpret prehistoric elephants found in the fossil record.
- Activity 5: Introduce modern elephants and discover the factors that threaten their survival today.

Your input is greatly valued. Please assist us by completing the enclosed Evaluation Form.

We hope that you and your students enjoy learning about Nebraska's diverse elephants. If you have any questions feel free to call (402) 472-6302.

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Additional Materials Required

ACTIVITY 1 – Additional Materials Required:

- Sand (50 lb. bag of play sand—approx. 13 cups per box.)
- Paper (1 sheet per partner)
- String
- Scissors
- Newspaper
- Tape
- Pencils
- 4 Containers to collect sand (one for each dig box)
- 12 Metric rulers

ACTIVITY 3 – Additional Materials Required:

- Apple slices or crackers
- Pink copier paper
- Pencils

ACTIVITY 4 – Additional Materials Required:

- Pencils
- TV
- DVD player

ACTIVITY 2 – Additional Materials Required:

- Pencils
- Colored pencils
- Blue, gold, yellow, and buff copier paper
- Scissors

ACTIVITY 5 – Additional Materials Required:

- Scissors
- Pencils
- Internet access

Activity One – Discovery!

Learning Objective:

To introduce the science of paleontology,
the scientist, and the process of collecting fossils.

Activity One - Discovery!

Group size:

Four groups (dig sites) - six students per group
Students work with a partner

Time:

Approximately 50 minutes

Materials Provided:

- Occlusal (chewing surface) tooth casts
(Four tusk, Mastodon, Stegomastodon and Mammoth)
- Small fossils (in 4 containers - 1 for each dig box)
- Medium fossils (in 4 containers - 1 for each dig box)
- 1 Fossil Identification Guide (template)
- 4 'Dig boxes'
- 1 *Discovery!* Story (p. 5) (Dig Directions p. 6 on back)
- 12 Strainers
- 12 Glasses
- 12 Spoons
- 12 Magnifiers
- Dig Site Report sheet (template) (p. 7)
- 4 Nebraska Fossil Elephant Teeth posters (oversized)
- 4 Modern Animal Guides
- Four tooth casts
(Four tusk, Mastodon, Stegomastodon and Mammoth)
- Fossil Check-In Guide

Additional Resources Provided:

- Museum Notes *Preserving Vertebrate Fossils: Notes from the Laboratory*
- Museum Notes *Fossil Elephant Teeth in Nebraska*

Additional Materials Required:

- Sand (50 lb. bag of play sand—approx. 13 cups per box.)
- Paper (1 sheet per partner)
- 4 Containers to collect sand (1 for each dig box)
- Newspaper
- String
- Tape
- Scissors
- Pencils
- 12 Metric rulers

Preparation:

 For each set of partners, make 1 copy of:

- *Discovery!* Story (p. 5)
- Dig Directions (p. 6)
- Dig Site Report sheet (p. 7)
- Fossil Identification Guide

For each dig box:

- Place occlusal tooth cast #1 in bottom of box #1
- Place #1 medium sized fossils in bottom of box #1
- Mix 1/4 of sand with small fossils #1
- Cover tooth and medium sized fossils with sand mixture
- Divide box into 3 sections using string and tape (diagram on p. 6)
- Label each section A, B, C
- Repeat for boxes #2, #3, and #4

Each Table Top Dig Site Needs:

- Newspapers to cover work surface
- One prepared dig box
- 6 Pieces of paper
- 3 *Discovery!* Stories
- 3 Pencils

Additional Supplies:

- 3 Glasses
- 3 Strainers
- 3 Spoons
- 3 Magnifiers
- 3 Metric rulers
- Container to collect sand from full glasses

Notes for the Teacher – Dig Boxes:

- Do not tell groups that there is a large fossil in the box or what it is – that is part of the discovery!
- The bottoms of the full elephant teeth casts are covered with colored felt for your easy identification.
- All the fossils in a dig box are of animals and plants that lived at the same time. (Each box corresponds with a different time period.)
- All fossils are real except for the moon rat jaw, hedgehog jaw, alligator teeth, beaver twigs, and elephant teeth.
- Before students clean up their table, they should turn their fossils in to the teacher so they can be counted. (There are 20 small and medium fossils, and 1 large fossil in each dig box.)
- Have a separate container at each table top dig site to collect the sieved sand. **DO NOT** discard sand until all fossils for that box have been turned in.

Box 1 Four tusker (Green felt) (Lush jungle forests, warm water near by)

Small fossils: Total 14

6 Gar scales	1 Moon rat jaw (cast)
3 Alligator teeth (casts)	3 Mouse deer jaws
1 Hedgehog jaw (cast)	

Medium fossils: Total 6

2 Pieces of ivory
3 Pieces of petrified wood
1 Baby four tusker tusk (cast)

Box 2 Stegomastodon (Blue felt) (Savanna, frost free environment)

Small fossils: Total 14

3 Ground squirrel jaws	3 Muskrat tail vertebrae
2 Gopher molar teeth	3 Frog leg bones
3 Muskrat teeth	

Medium fossils: Total 6

2 Tortoise shell pieces
2 Pieces of ivory
2 Zebra teeth

Box 3 Mastodon (Yellow felt) (North woods, cool and wet)

Small fossils: Total 14

3 Catfish spines	3 Frog vertebrae
4 Catfish vertebrae	4 Lemming leg bones

Medium fossils: Total 6

3 Pond turtle shell pieces
1 Piece of ivory
2 Beaver chewed twigs (casts)

Box 4 Mammoth (Red felt) (Grasslands, wide open spaces, cool and dry)

Small fossils: Total 13

3 Ground squirrel teeth	6 Gopher incisor teeth
1 Gopher leg bone	3 Jackrabbit molar teeth

Medium fossils: Total 7

1 Baby mammoth tooth (cast)
2 Pieces of ivory
4 Pronghorn antelope molars

Teacher Activity Introduction:

Use the following for discussion

Where do paleontologists look for fossils? **Eroded areas, rock outcrops, road cuts, people call with finds**

What preparations do paleontologists make before they go into the field? **Research in museum collections and libraries**

What are things paleontologists do in the field? **Search for fossils, dig, draw, and take photos of fossils**

What can fossils tell us? **Age of rocks, earth history, past climates and habitats**

Action:

1. Students work with a partner, up to 6 students per 'dig box site'.
2. Introduce this activity by reading the **Discovery! Story** (p. 5) (located on the back of the Dig Directions sheet).
3. Read aloud #1 and #2 on the **Dig Directions** sheet (p. 6), which lists the items to be recorded on the data sheet.
4. Have students create their own data sheet. (Dig box should be on table without additional supplies.)
5. Read #3 on the Dig Directions sheet aloud with the students. Now the students can get their additional supplies.
6. Students will discover the large fossil quickly. Encourage them to remove all the sand before they take out the large fossil.
7. Distribute the **Fossil Identification Guide** and **Modern Animal Guide** after students have drawn their fossils.
8. Make a prediction; remind students to read #4 on the Dig Directions Sheet.
9. Collect the fossils. There are 20 small and medium fossils, and 1 large fossil for each dig box.
10. **AFTER** they have identified their fossils, distribute **Dig Site Report** sheets (p. 7). Give 1 report sheet to each team at the dig site (3 reports per dig box.)
11. Record group findings on Dig Site Report sheet (p. 7).

Students will:

- ~ Record the collected data of all three sections.
- ~ As a group predict the habitat and the climate by using the other species found at the dig site.
- ~ As a group predict what the large fossil at the bottom of the dig is.

12. Solve the Mystery:

After they have made their predictions:

- ~ Distribute the four elephant tooth posters.
- ~ Have four elephant teeth casts available to aid in the identification of the large fossil from each dig site.

Notes for the Teacher – Fossil Identification:

Identifying fossils is not always easy as no two fossils are exactly alike. In particular, the mastodon and the four tusk teeth are confusing. Two things to remember when looking at teeth: sometimes teeth are broken (the mastodon tooth for example has broken cusps) and all teeth wear down with use.

Mastodon: Look at the cast of the mastodon tooth. You will see fairly sharp cusps that form rows. When you look at the Mastodon tooth on the Nebraska Fossil Elephant Teeth Poster you can see how those cusps wear down with use. They tend to form narrow ovals, which get wider with wear. The occlusal (chewing surface) cast (from the dig box) of the mastodon shows both broken cusps and some wear, but not as much as in the poster.

Four tusk: Look at the cast of the four tusk tooth and you see cusps that are more rounded than the Mastodon. As the four tusk tooth wears down there are crinkles in the enamel; the crinkles eventually disappear and you have round ovals, which are the base of the cusps. The cast and the image on the poster show a tooth that is just beginning to wear. The occlusal tooth cast (from the dig box) shows a lot of wear, which makes it hard to identify.

The students may have to use the process of elimination in order to identify the four tusk occlusal tooth.

Activity Two – Zap to the Past

Learning Objective:

Identify rock formations in Nebraska where fossil elephants have been found.

Discover clues to past environments and geologic history in these rocks.

Identify adaptations and changes through time that allowed elephants to survive in different habitats. Explore the time periods when ancient elephants lived.

Activity Two – Zap to the Past

Group size:

Four students, each representing a different elephant

Time:

Part 1: What Rocks Beneath You?: 20 minutes

Part 2: Survival!: 15 minutes

Part 3: It's Time to Get in Line: 15 minutes

Activity Introduction

Materials Provided:

- 1 *Zap to the Past!* Story (p. 12-13) (template)
- Geologic Bed Rock Map of Nebraska
- Key to Four of Nebraska's Sedimentary Deposits (p. 15)

Part 1: What Rocks Beneath You

Materials Provided:

- 2 Cenozoic Posters (oversized)
- What Rocks Beneath You Direction Card (template) (p. 14)
- Set of Rock Formation Pieces
(4 rock layers and 1 map) (template)
- Activity 2 Data Sheet (template) (used for all 3 parts)
- 1 Set of Fossil Elephant Site Maps (template)
(4 maps - 1 for each elephant)

Additional Materials Required:

- Pencils
- Blue, gold, yellow, and buff copier paper
- Scissors (1 for each student)

Part 2: Survival!

Materials Provided:

- 4 Elephant skeletons (templates)
- 1 Set of Artist's Renditions (template) (3 pages with 6 images)

Additional Materials Required:

- Colored pencils
- Scissors

Part 3: It's Time to Get in Line:

Materials Provided:

- 12 Nebraska Elephant Timelines (oversized)
- 2 Elephant Mugshots Posters (oversized)

Preparation:

- Students need to know the name of the elephant they discovered in Activity 1, or assign an elephant to each student.
- Hang the Elephant Mugshot poster
- Hang the Nebraska Cenozoic posters

Activity Introduction Make copies of:

- The *Zap to the Past!* story (p. 12-13) (2 for each group)

Part 1: What Rocks Beneath You

Make copies of:

- Activity 2 Data Sheet (p. 16-17) (1 for each student)
- What Rocks Beneath You Direction Card (p. 14)
(2 for each group)
- Rock Formation Pieces on appropriate colored paper
(1 set for each group)
- Fossil Elephant Site Maps (1 set for each group)

Part 2: Survival! Make copies of:

- Elephant skeletons (1 set for each group)
- Artist's Renditions (1 set for each group)

Teacher Activity Introduction:

Use the following for discussion

What types of environments were in Nebraska a long time ago? **Jungles, savannas, forests, grasslands**

Where could you find rocks in Nebraska? **Give an example from your locality. Lincoln – near the Indian statue in Pioneer’s Park, Ashfall – pink cliffs of chalk near Niobrara State Park, Omaha – loess deposits cut into by the Missouri River, Trailside – Wildcat Hills**

What is an adaptation? **Physical characteristics or behaviors that a species developed in response to its environment.**

What adaptations help you survive?

Action:

1. Divide students into groups of four with each group having four different elephants.
2. Remind students of the elephant they discovered in Activity 1, or assign an elephant to each student.
3. Introduce the activity by reading the **Zap to the Past! Story** (p. 12-13).

Each group of four needs:

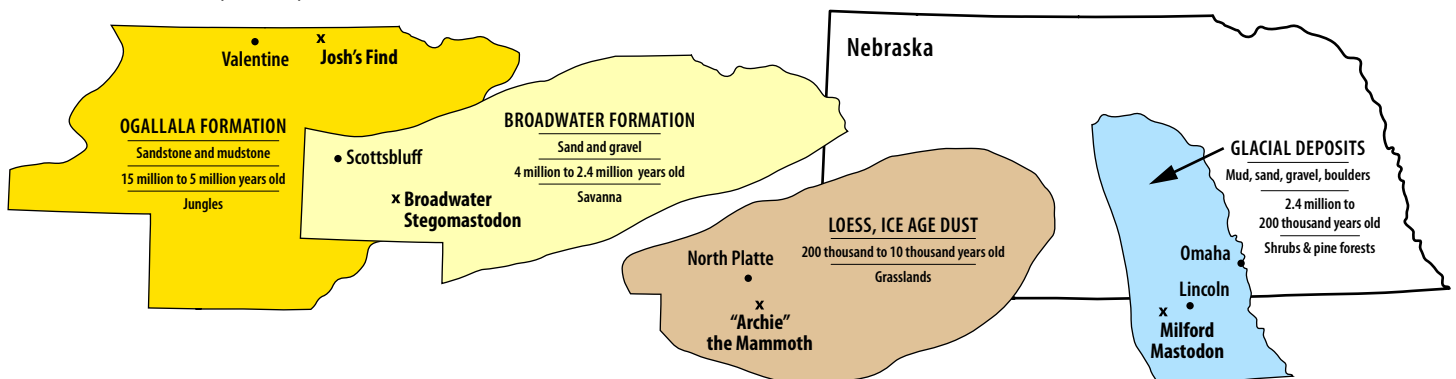
- 2 *What Rocks Beneath You?* Direction Cards
- 4 Pencils
- 4 Activity 2 Data Sheets (used for all 3 parts)
- 1 Set of Rock Formation Pieces (4 rock layers and 1 map)
- 1 Set of Fossil Elephant Site Maps (4 maps)
- 4 Pairs of scissors

Part 1: What Rocks Beneath You?

Students will investigate Nebraska rock formations.

- ~ Introduce the **Nebraska Cenozoic Poster** to the students. The poster is a timeline of Nebraska during the Cenozoic Era (Age of Mammals). It includes animals, rock formations and present-day outcrops. In order for students to tie their rock piece (layer) to the poster they may use **time, their elephant, or the rock formation (piece)**.
- ~ Read the directions on **What Rocks Beneath You? Direction Card** (p. 14) aloud with the students.
- ~ Students will use the **Rock Formation Pieces** to build the geologic history of Nebraska.
- ~ Students will complete the **Activity 2 Data Sheet** (p. 16-17) using the **Rock Formation Pieces, Cenozoic poster, and the Fossil Site Maps**.

Rock Formation Pieces (reduced):



Notes for the Teacher – Nebraska Rock Layers:

The geologic and paleontological information for the students has been simplified. The four rock layers depicted in this activity contain 99% of Nebraska fossil elephants, however there are other fossil elephant bearing rock layers that are not depicted. One such layer includes sediments associated with existing streams. For example, in northwestern Nebraska, most of the exposed rock is too old to have elephants. As streams flowed across the state they deposited sands and gravels, which date back to the time of mammoths and mastodons. Elephant fossils, including the “locked mammoth” are quite common in these deposits, but these deposits are difficult to portray on paper; the rock formation piece would look like a doily.

Each group of four needs:

- 1 Skeleton of each type of elephant
- 1 Set of Artist's Renditions (six elephants - pass out later in activity)
- 4 Activity 2 Data Sheets (used for all 3 parts)
- Scissors

◀ **Part 2: Survival!**

Students will examine adaptations which allowed elephants to survive.

- ~ Distribute the four elephant skeletons.
(Students should use the skeleton of the elephant they discovered in Activity 1)
- ~ Read the directions out loud. Students create the elephant body.
- ~ Using the **Survival section of the Activity 2 Data Sheet** (p. 16-17), students share drawings, then discuss and list differences.
- ~ Hand out the sets of **Artist's Renditions** **AFTER** students discuss the differences between their elephants. Students should cut the Artist's Renditions in half then complete the Survival section of the data sheet.
- ~ **Solve the Mystery hint:** Would an elephant with short legs need a trunk?

Each group of four needs:

- 2 Nebraska Elephant Timelines
- 4 Activity 2 Data Sheets (used for all 3 parts)

◀ **Part 3: It's Time to Get in Line**

Looking at the rock record gives paleontologists an idea of when their fossils lived. Scientists can determine which fossil is older and which is younger. Generally older rocks are the deeper layers, younger rocks are on top.

- ~ Students can work together, but record separately.
- ~ Distribute the **Nebraska Elephant Timeline**.
- ~ Students will complete **It's Time to Get In Line** section of the **Activity 2 Data Sheet** (p. 16-17).
- ~ After students make an extinction prediction, direct them to the **Elephant Mugshots Posters** and have them answer #8 on their data sheet.

Notes for the Teacher – Elephant Evolution:

No matter what group of elephants or what continent elephants were on, the fossil record shows a general pattern of elephant evolution. The lower jaw first extended and then receded, which enabled the trunk to lengthen. The early Nebraska elephants were short, digging for roots and tubers in the jungle. As the climate changed, the food sources changed, which resulted in physical modifications in elephant height, lower jaws, trunks, and teeth.

Notes for the Teacher – Scientific Dating:

All rocks, minerals, and living things contain tiny amounts of radioactive elements. Radioactive elements are unstable and spontaneously decay until they become stable. This decay occurs at a constant rate, which is specific for each element. Carbon 14, for instance, has a relatively fast rate of decay – half of it decays every 5700 years. Uranium 238 in contrast, has a half-life of 4600 million years.

If we know the rate of decay and the amount of the stable material that has accumulated we can determine the age it first started to decay. Think of an hour-glass with sand in it. The sand flows at a steady rate. If we know the rate the sand is flowing and we know the amount of sand in the bottom of the glass we can calculate backwards and determine what time it was when the sand first started to flow.

Fossils up to about 50,000 years old have enough original radioactive carbon (Carbon 14) that they can be directly dated. Older fossils cannot be directly dated. But if they occur above one volcanic ash bed and below another ash layer, the radioactivity dates of the ash layers can set upper and lower limits for the age of the fossil.

Activity Three – What Big Teeth You Have

Learning Objective:

Compare and contrast the chewing surfaces of different types of elephant teeth and identify possible food sources. Discover how teeth and tusks grow throughout an elephant's life.

Activity Three - What Big Teeth You Have

Note:

This activity is designed for stations. Read each station for materials provided and preparation.

Group size:

Divide into four groups. Students will move from station to station.

Total Time: 50 minutes

Activity Introduction

Materials Provided:

- 1 *What Big Teeth You Have!* Story (template) (p. 22)
- Activity 3 Data Sheet (template) (p. 30-31)

Station 1: Teeth: Function and Anatomy

Materials Provided:

- Stegomastodon elephant tooth cast
- Nebraska Fossil Elephant Teeth poster (oversized)
- 3 Teeth: Function and Anatomy Direction Cards (p. 23)
- 1 Mirror

Additional Materials Required:

- Apple slices or crackers

Students will bite into a cracker or apple slice to get them thinking about the different types of teeth humans have and the function of those teeth. Students will identify the different parts of a human tooth and then compare it to an elephant tooth.

Station 2: Conveyor Belt

Materials Provided:

- Big Tooth (mammoth molar 6) and Big Tooth Label
- 1 Set of paper teeth (six teeth per set)
- Paper jaw (template)
- The Living Conveyor Belt graphic
- Years of Teeth graphic
- ELEPHANT Dorling Kindersley Eyewitness Books (p. 22)
- 2 Conveyor Belt Direction Cards (p. 24)
- Baby mammoth tooth

Additional Materials Required:

- Pink copier paper

Students will use a model of an elephant jaw to understand how new teeth come into an elephant's mouth. An elephant has six sets of teeth that come in over its lifetime. The first set consists of four very small teeth: two upper and two lower. As the elephant grows, the teeth move forward and drop out. A new set of slightly bigger teeth emerges from behind. Elephant teeth erupt from the back and move along the jaw toward the front, like a conveyor belt. Each tooth gets more and more worn as it moves forward. Slowly bits of the worn tooth break off as the new tooth from behind moves into position. The sixth and largest sets of teeth are the 'wisdom teeth'.

Station 3: What's for Lunch? (Teeth and Diet)

Materials Needed:

- Casts of three elephant teeth:
Four tusk, Mastodon, Mammoth
- Food: grass, fruits (2 pieces), and pine branch
- 3 Images of environments:
Warm jungles, north woods, and grassland
- 3 Styrofoam teeth sets: Four tusk, Mastodon, Mammoth
- 3 What's for Lunch? Direction Cards (p. 25-27)
Four tusk, Mastodon, Mammoth
- Nebraska Fossil Elephant Teeth Poster (oversized)

Students will look at different environments that once flourished in Nebraska and discover the food sources available to ancient elephants in those environments. By manipulating Styrofoam models, students will investigate the different ways ancient elephant teeth came together. Using this knowledge and examining the chewing surface of different fossil elephant teeth students will determine what each type of elephant ate.

Station 4: Tusks

Materials Needed:

- 7-year-old male tusk (cross-section)
- 40-year-old male tusk (cross-section)
- 40-year-old female tusk (cross-section)
- 24 Labeled pointers
- 2 Tusk Direction Cards (p. 28)

Students will examine cross-sections of mammoth tusks to discover a record of the elephant's life. Because a tusk never stops growing, students will be able to use the layers in the tusk to determine the age of the elephant and identify important times in an elephant's life (ex. weaning, giving birth, times of drought) The dark bands, which formed in the winter, are layers that are spaced closely together because food was not as plentiful and the new layers of dentine are very thin.

Activity Summary: Stegomastodon Mystery

Materials Provided:

- Nebraska Elephant Tooth poster (oversized)
- Nebraska Elephant Timeline (oversized)
- Tooth casts: Four tusk, Stegomastodon, Mammoth (can also use occlusal teeth)

Stegomastodon suddenly appears in the fossil record about 5 million years ago. Scientists wonder if it migrated from Asia or evolved from four tuskers here in North America. Students will use the tooth poster and the tooth casts to compare the four tusk and the stegomastodon teeth to see what conclusions they come to. They will also compare the mammoth tooth with the stegomastodon teeth to see if they can determine why the stegomastodon went extinct.

Preparation:

Introduction

Make copies of:

- What Big Teeth You Have! Story (1 for every 2 students)
- Activity 3 Data Sheet (p. 30-31) (1 for each student)

Station 2: Conveyor Belt

- Make 2 copies of elephant jaw on pink paper
- Construct 2 elephant jaws (directions on jaw template)
- Open Elephant Eyewitness book to p. 22

Station 3: What's for Lunch? (Teeth and Diet)

- Set up four groupings: food, teeth, photos, and What's For Lunch? Direction Cards

Station 4: Tusks

- Place two large tusks on floor. Place small tusk on table with Tusk Direction Cards and labeled pointers.

Stegomastodon Mystery

- Read the Stegomastodon Mystery information before the class discussion.

Teacher Activity Introduction:

Use the following for discussion

Why do animals have teeth?

Think about the following animals teeth and the food they eat:

Humans: newborn baby, 2-year-olds, 6 to 8-year-olds, kids with braces, adults

Dog or cat

Turtle or bird

Horse or cow

Is an elephant tusk a tooth?

Yes, tusks are an elephant's front teeth. They never stop growing. They get a tiny bit longer and bigger every day.

Does new ivory form at the tip of the tusk or at the root of the tusk?

The new tusk growth (newest ivory) is at the root of the tusk in the elephant's skull. Tusks grow similar to hair – new hair growth is at the root of the hair on your scalp. This is an important concept for students to grasp in order to understand the tusk activity. (Students often think the new growth is at the tip of the tusk – which is **not** correct.)

Action:

1. Read aloud the *What Big Teeth You Have! Story* (p. 22). (Students can read along with copies provided.)
2. Set up the 4 stations (p. 19-20). Divide the class into 4 groups. Working in groups, students will rotate through 4 different stations every 8 to 10 minutes.
3. Distribute the **Activity 3 Data Sheet** (p. 30-31), one for each student.

Activity Four – Clash of the Mammoths

Learning Objective:

Investigate modern elephant behavior to interpret prehistoric elephants found in the fossil record.

Activity Four – Clash of the Mammoths

Group size:

Students will work with a partner.

Time:

30 to 50 minutes

(Depending on how many video clips you watch.)

Materials Provided:

- 1 *Clash of the Mammoths!* Story (template) (p. 36)
- Activity 4 Data Sheet (template) (p. 41-42)
- Behaviors page (template) (p. 37)
- Clash of the Mammoths DVD
- Elephant Behavior Reference sheet (p. 40)
- Scientist's Interpretation of Elephant Behavior (p. 38-39)
- Nature: Echo of the Elephants DVD

Additional Materials Required:

- Pencils
- TV
- DVD player

Preparation:

Make copies of:

- *Clash of the Mammoths!* Story (p. 36)
(1 for every 2 students)
- Behaviors page (p. 37) (cut out 1 card for each student)
- Activity 4 Data Sheet (p. 41-42) (1 for each student)
- For your information, review the Elephant Behavior Reference and Scientist's Interpretation sheets before the activity.

Teacher Activity Introduction:

Use the following for discussion

To introduce behavior, students will “act out” behavior similar to charades. Students work with a partner. Give students a behavior card and have them try to communicate this behavior to their partner **without using words**. The focus is on non-verbal communication. Have students write down their guesses. A simple nod or shake of the head will let them know if they are correct. This should be a very quiet activity.

Discuss: What is behavior?

Were you able to communicate your behavior?

What body parts did you use to express your emotion?

How does a cat or dog express joy? fear?

What are ways elephants might express joy? fear?

Action:

1. Read the *Clash of the Mammoths! Story* (p. 36) out loud with the students.
2. In order to understand prehistoric elephants, paleontologists look to modern elephants and the observations of behavior recorded by biologists.
 - ~ The video clips are taped by real scientists observing elephants at bais (forest clearings) in the rainforests of Africa.
 - ~ The video clips were filmed at different times of the year. (During the wet season there is a lot of water and during the dry season there is very little.)
3. Pass out the Activity 4 Data Sheet (p. 41-42).
4. Students will record on their data sheet the behaviors observed in the video clips.
 - ~ Encourage students to focus on body parts
 - ~ Each clip is repeated on the DVD and labeled (ex. 1a and 1b).
 - ~ After students watch the first clip (1a), stop the DVD.
 - ~ Give students one minute to write down their observations and discuss it with their partner.
(Ex. Ear flapping, tail up, trumpeting)
 - ~ Show the same clip (1b) a second time.
 - ~ Give students another minute to add to their observations and make an interpretation of the behavior.
 - ~ Discuss as a class, then read the scientist’s interpretation for clip 1 listed on the Scientist’s Interpretation sheet.

NOTE: The DVD is divided into chapters or scenes. To advance quickly from one clip to another use the ►► **SKIP** button on your remote control.
5. Continue through the remaining clips. Read the Scientist’s Interpretations after each discussion. There are 23 clips. You can do as many clips as time allows.

Group Discussion: Could any of these behaviors be seen in the fossil record?

Activity Five - Cousins of Today

Learning Objective:

Introduce modern elephants and investigate their adaptations and habitats.

Discover the factors that threaten elephant survival today.

Activity Five - Cousins of Today

Group size:

Students will work with a partner

Total Time:

50 minutes

Activity Introduction

Materials Provided:

- 1 *Cousins of Today* Story (template)
(Elephant Distribution Maps on back)
- Zoobooks: Elephants

Part 1: Meet the Modern Elephants

Materials Provided:

- Meet the Elephants Playing Cards Sheets 1-5 (templates)
- Activity 5 Data Sheet (template) (used for all 3 parts)

Additional Materials Required:

- Scissors
- Pencils

Part 2: Doom & Gloom

Materials Provided:

- 2 Doom & Gloom Card templates (p. 52-53)
- 1 Elephant Herds template
- 12 Dice
- 1 Elephant Distribution Maps (on back of story)

Additional Materials Required:

- Scissors
- Pencils

Part 3: What Does the Future Hold?

Additional Materials Required:

- Internet Access
- Pencils

Preparation:

Activity Introduction:

Make copies of:

- Activity 5 Data Sheet (p. 56) (1 for each student)
- *Cousins of Today* story (p. 46) (1 per group)

Part 1 Meet the Modern Elephants

- Make copies of Meet the Elephants Playing Cards (p. 47-51)
(enough for partners to have a complete set of 20 text cards and 20 picture cards).

Part 2: Doom & Gloom

Make copies of:

- Doom & Gloom cards (1 set for each group)
- Elephant Herds sheet (1 per group)
- Elephant Distribution Maps (1 per group)

If you are short on time, you can have the Elephant Playing Cards, Doom & Gloom cards, and Elephant Herds cut and ready for the students ahead of time.

Teacher Activity Introduction:

Use the following for discussion

How many elephant species are alive today? **Scientists have traditionally said two species African, and Asian. Recent genetic testing indicates three species, African Bush, African Forest, and Asian.**

Where can you find elephants living today? **Africa and southern and southeastern Asia**

What are adaptations? **Physical characteristics or behaviors that a species developed in response to its environment**

What are some physical adaptations that help elephants survive today? **Trunks, big ears, tusks**

Are there any adaptations that might put them in jeopardy? **Tusks**

What does an elephant need to survive in its habitat? **Tusks**

Action:

1. Students will work with a partner.
2. Introduce the activity by reading aloud the **Cousins of Today Story** (p. 46) (on the front of the Elephant Distribution Maps).

Partners will need:

- 5 Meet the Elephants Playing Cards sheets (1-5)
- 2 Activity 5 Data Sheets
- Scissors

Part 1: Meet the Modern Elephants

Students will discover some of the differences between two elephant species (Asian and African)

- ~ Have students cut out the **playing cards** on the dashed lines.
- ~ Direct students to spread 20 picture cards face up on a table. The 20 text cards should be in a pile face down.
- ~ Have students take turns reading the text cards then match them to a picture.
- ~ When they are done, have the students answer questions **1 and 2 on the Activity 5 Data Sheet** (p. 56).

Partners will need:

- 1 Elephant Distribution Map
- 2 Activity 5 Data Sheets
- 2 Doom & Gloom sheets
- 1 Elephant Herds sheet
- 1 die
- Scissors

Part 2: Doom & Gloom

Students work with a partner looking at elephant distribution maps and playing the Doom & Gloom game to understand what happened to the elephants in the last 100 years and why.

- ~ Partners cut out **Doom & Gloom cards** and **Elephant Herds** (each elephant represents a herd of elephants).
- ~ Students count and record on their data sheet the number of elephant herds they have at the beginning of the game.
- ~ Direct students to place the cards face down in a pile. Students take turns drawing cards and reading them aloud. They roll the die to determine how many herds are lost or gained with each card.
- ~ At the end of the game, students record the number of remaining elephant herds on the data sheet.
- ~ Using the **Elephant Distribution Maps** (on back of the story), students complete **Part 2 on the Activity 5 Data Sheet**.
- ~ Students describe the terms habitat destruction, ivory trade, and money, and explain how they think it affects the elephants.

Partners will need:

- Internet access
- 2 Activity 5 Data Sheets

Part 3: What Does the Future Hold?

Students will explore elephant conservation websites.

- ~ Students explore one or more of the websites listed below.
- ~ Direct students to describe, on data sheet, two projects conservation groups are doing to protect elephants.

African Wildlife foundation: www.awf.org/section/wildlife/elephants

International Elephant foundation: www.elephantconservation.org/

Oregon Zoo: www.oregonzoo.org/Exhibits/elephant.htm

Save the elephants: www.save-the-elephants.org

Assn. of Zoos and Aquariums: www.aza.org

Notes for the Teacher – Conservation:

Scientists are studying wild elephants in the jungles and savannas of Africa and Asia. Zoo keepers are studying captive elephants. Conservationists protect wildlife and natural resources, raise money for research, and educate the public. There may be a time when wild populations become extinct. Sometimes the best way to help the elephants is to work with the local population who live near the elephants.

Nebraska Science Standards

Activity 1: Discovery!

Objectives: Introduce the science of paleontology, the scientist, and the process of collecting fossils.

Grades 6-8

SC K-12.1 Inquiry, the Nature of Science, and Technology

1. Abilities to do Scientific Inquiry

SC 8.1.1 Students will design and conduct investigations that will lead to descriptions of relationships between evidence and explanations.

Scientific Tools: SC 8.1.1.d Select and use equipment appropriate to the investigation, demonstrate correct techniques, and apply appropriate mathematical concepts.

Scientific Observations: SC 8.1.1.e Make qualitative and quantitative observations.

Scientific Data Collection: SC 8.1.1.f Record and represent data appropriately and review for quality accuracy, and relevancy.

Scientific Interpretations, Reflections, and Applications: SC 8.1.1.g Evaluate predictions, draw logical inferences based on observed patterns/relationships, and account for non-relevant information.

Scientific Communication: SC 8.1.1.h Share information, procedure, results, and conclusions with appropriate audiences.

2. Nature of Science

SC 8.1.2 Students will apply the nature of science to their own investigations.

Activity 2: Zap to the Past

Objectives: Identify rock formations in Nebraska where fossil elephants have been found. Discover clues to past environments and geologic history in these rocks. Identify adaptations and changes through time that allowed elephants to survive in different habitats. Explore the time periods when ancient elephants lived.

Grades 6-8

SC K-12.1 Inquiry, the Nature of Science, and Technology

1. Abilities to do Scientific Inquiry

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Scientific Communication: SC 8.1.1.h Share information, procedure, results, and conclusions with appropriate audiences.

2. Nature of Science

SC 8.1.2 Students will apply the nature of science to their own investigations.

Scientific Knowledge: SC 8.1.2.a Recognize science is an ongoing process and the scientific community accepts and uses explanations until they encounter new experimental evidence not matching existing explanations.

SC K-12.3 Life Science

4. Biodiversity

SC 8.3.4 Students will identify characteristics of organisms that help them survive.

Biological Adaptations: SC 8.3.4.a Describe how an inherited characteristic enables an organism to improve its survival rate.

Biological Evolution: SC 8.3.4.b Recognize the extinction of a species is caused by the inability to adapt to an environmental change.

Biological Evolution: SC 8.3.4.c Use anatomical features of an organism to infer similarities among other organisms.

SC K-12.4 Earth and Space Sciences

4. Earth's History

SC 8.4.4 Students will use evidence to draw conclusions about changes in Earth.

Past/Present Earth: SC 8.4.4.b Describe how environmental conditions have changed through use of the fossil record.

Activity 3: What Big Teeth You Have

Objectives: Compare and contrast the chewing surfaces of different types of elephant teeth and identify possible food sources. Discover how teeth and tusks grow throughout an elephant's life.

Grades 6-8

SC K-12.1 Inquiry, the Nature of Science, and Technology

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Scientific Observations: SC 8.1.1.e Make qualitative and quantitative observations.

SC K-12.3 **Life Science**

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SC K-12.4 **Earth and Space Sciences**

4. Earth's History

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Past/Present Earth: SC 8.4.4.b Describe how environmental conditions have changed through use of the fossil record.

Activity 4: Clash of the Mammoths

Objectives: Investigate modern elephant behavior to interpret prehistoric elephants found in the fossil record.

Grades 6-8

SC K-12.1 Inquiry, the Nature of Science, and Technology

1. Abilities to do Scientific Inquiry

SC 8.1.1 Students will design and conduct investigations that will lead to descriptions of relationships between evidence and explanations.

Scientific Observations: SC 8.1.1.e Make qualitative and quantitative observations.

Scientific Data Collection: SC 8.1.1.f Record and represent data appropriately and review for quality accuracy, and relevancy.

Scientific Interpretations, Reflections, and Applications: SC 8.1.1.g. Evaluate predictions, draw logical inferences based on observed patterns/relationships, and account for non-relevant information.

Scientific Communication: SC 8.1.1.h Share information, procedure, results, and conclusions with appropriate audiences.

2. Nature of Science

SC 8.1.2 Students will apply the nature of science to their own investigations.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 8.3.1 Students will investigate and describe the structure and function of living organisms.

Behavior: SC 8.3.1.e Describe how plants and animals respond to environmental stimuli.

4. Biodiversity

SC 8.3.4 Students will identify characteristics of organisms that help them survive.

Activity 5: Cousins of Today

Objectives: Introduce modern elephants and investigate their adaptations and habitats. Discover the factors that threaten elephant survival today.

Grades 6-8

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 8.3.1 Students will investigate and describe the structure and function of living organisms.

Behavior: SC 8.3.1.e Describe how plants and animals respond to environmental stimuli.

3. Flow of Matter and Energy in Ecosystems

SC 8.3.3 Students will describe populations and ecosystem.

Ecosystems: SC 8.3.3.d Determine the biotic and abiotic factors that impact the number of organisms an ecosystem can support.

Impact on Ecosystems: SC 8.3.3.g Identify positive and negative effects of natural and human activity on an ecosystem.

4. Biodiversity

SC 8.3.4 Students will identify characteristics of organisms that help them survive.

Biological Adaptations: SC 8.3.4.a Describe how an inherited characteristic enables an organism to improve its survival rate.

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