USU 4-H Dinosaur Tote

BIG IDEA:
Fossils and geologic evidence provide understanding about life in ancient Earth.

UNDERSTANDINGS:
Earth events can occur quickly or slowly.
Fossils provide evidence of organisms and the environments in which they lived long ago.

ESSENTIAL QUESSTIONS:
How can we make inferences about ancient environments and animals based on modern environments?
Why is it important to understand fossils and geologic data?

THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:
See pg. 9-11

Supplies

- Paper*
- Pencils*

Fossil Molds p. 2
- Plaster and water*
- Plastic Bags
- Newspaper
- Fossil Molds
  - Trilobite Mold
  - Ammonite Mold
  - Cave Bear Mold
  - Megalodon Shark Tooth Mold
  - Deinoychus Claw Mold
  - Crinoid Mold
  - Leaf Mold
- Fossil Works Lesson Plan

Dinosaur Looks p. 4
- Dinosaur Models or Pictures*

How Old Is It? p.6
- Shells/pieces of shells, leaves, pine cones, small bones or sticks or plastic animals, etc.*
- Different types dirt (sand, soil, clay, etc.)*
- Water*
- Container*

*Not included in tote

Activity 1: Fossil Molds

Time: 20-30 min

Grade Level: 3-6

Materials:

- Plaster and water*
- Plastic Bags
- Newspaper (to cover working surface)
- Fossil Molds
    - Trilobite Mold
    - Ammonite Mold
    - Cave Bear Mold
    - Megalodon Shark Tooth Mold
    - Deinoychus Claw Mold
    - Crinoid Mold
    - Leaf Mold
- Fossil Works Lesson Plan

To Do:

1. Begin by asking and discussing how fossils form. Consider having students study and present different types of fossilization.
2. Divide the class into six groups. Have each group learn about one of the fossil mold animals (Trilobite, Ammonite, Cave Bear, Megalodon Shark, Deinoychus, and Crinoid). Information about these can be found in the Fossil Works Lesson Plan. Have students present what they learned to the class.
3. Spread Newspapers on work surface. Mix up 2 cups of plaster and 1 cup of water in a plastic bag. Pour into a fossil mold. Let the cast dry (about 1-6 hours). Casts can often be removed after an hour and then allowed to dry completely.
4. Remove the plaster from the molds and display proudly.

REFLECT:

- Do all bones eventually turn into fossils? Why do only some dinosaurs get fossilized?
- What conditions enable animals to become fossilized?
- How do we know what dinosaurs look like? How do their bones go together? How do they look on the outside?
- What do you think people thought of the fossils they found hundreds of years ago before people really knew about dinosaurs?

APPLY:

Very few dinosaurs and other types of ancient life actually fossilized. Most dinosaurs and other organisms simply decomposed. But sometimes the environment was just right for fossils to form. Some dinosaurs would die and become trapped in mud or at the bottom of a sea. They would get covered in sediment that eventually turned into rock and the organic material of the fossil would be replaced by minerals. There are a few other ways remnants of ancient life can be fossilized and preserved as well.

Paleontologists are able to identify and categorize fossils based on other fossils they have found. Finding complete dinosaurs is not very common. Scientists compare the fossils to known skeletons and can make inferences about what missing bones likely looked like. How dinosaurs look on the outside is harder to determine because there is little fossilized evidence of soft tissue, like skin. Scientists make educated guesses about what dinosaurs really looked like. As more and more evidence is gathered, scientists update their understanding of dinosaurs.

Looking at fossils, it is easy to imagine how people believed in things like dragons and creatures being turned into stone. There are fossils of ammonites that ancient people carved snake heads onto, attributing the fossils to a legend of St. Hilda turning snakes into coiled stone. In the 1700s, scientists discovered that the same types of fossils are found in rocks that are the same age. Scientists continue to use geology to date when fossils are likely from.

Activity 2: Dinosaur Looks

Time: 20 min

Grade Level: 2-4

Materials:

- Paper and Pencil
- Markers/Crayons/Colored Pencils
- Plastic Dinosaur Models

To Do:

1. Begin by showing the different plastic dinosaur models. Have students write down observations and questions about what they see.
2. Explain to the students that scientists have to make educated guesses about the function of different dinosaur parts. Have students brainstorm ideas for what some of the features on their dinosaur models are for.
3. Talk about the fact that scientists do not really know what dinosaurs looked like on the outside. They are not necessarily green or brown. Like birds and lizards, there were likely many different types of patterns, some dull and some striking.
4. Have the students choose one of the dinosaurs to draw and color. Have them come up with their own idea of what the dinosaurs looked like on the outside. Encourage them to consider the environment, predators, attracting mates, and other factors to develop what colors and patterns a dinosaur may have had.

REFLECT:

- Why has the way dinosaurs are depicted changed over time?
- Why might it be important for a dinosaur to be colorful or to be dull colored?
- Why did you design your dinosaur the way you did? Does it help it blend in? Does it look intimidating to predators? Does it attract a mate?
- How do scientists try to determine what dinosaurs looked like or how they functioned?

APPLY:

Scientists work with what information they have and the backgrounds they come from. As scientists get new information and their backgrounds change, how dinosaurs are depicted change as well. It is not realistic to think that all dinosaurs were the same color. In modern times there are lots of variety, and lots of color in animals, like birds and lizards, which are believed

to be related to dinosaurs. Similarly, different types of dinosaurs likely had many different colors and patterns. Scientists use clues like environment and living animals that we know more about to try to determine what the likely look and functions of dinosaurs were.

Activity 3: How Old Is It?

Time: 30 min-1 hr

Grade Level: 2-6

Materials:

- Shells/pieces of shells, leaves, pine cones, small bones or sticks or plastic animals, etc.
- Different types dirt (sand, soil, clay, etc.)
- Water
- Container (plate, bowl, large yogurt container, ice cream bucket, etc.)

To Do:

1. Ask students how scientists are able figure out how old dinosaurs are. Let them discuss various ways they think or know scientist use. Come back to, or introduce the idea of using geology to date fossils of organisms.
2. Tell students they are going to simulate what happened over millions of years as organisms died and rock formed. Distribute containers to individuals or groups. You may choose to use one or many containers, shallow or deep containers, or a combination.
3. Use one type of dirt to cover the bottom of the containers. Be sure to add some water to the soil so that it can stick together. You can even mix it with water and glue so that it can harden. Have students drop pieces of shells on the top. Have the class cover the shells with the same dirt. Tell them this represents the Paleozoic Era 245-570 million years ago.
4. Select a new soil and layer that on top. Place some bones and plants on top of the dirt. Put more of the new soil on top. Pack it down so that the soil is tight. This layer represents the Mesozoic Era when there were dinosaurs 66-245 million years ago.
5. Have the class use a new type of soil and repeat what they did in the other eras. This last era represents the Cenozoic Era that includes the present to 66 million years ago. Finish by putting some animals, bones and vegetation on top that is not covered in soil.
6. Explain to the students that over the course of millions of years sediments are compressed and form rock. Igneous and metamorphic rocks also form and become part of the layer of rock. Discuss that erosion and earthquakes also affect layering. *You may want to make an extra model to demonstrate an earthquake and erosion.
7. Have the students carefully excavate their rock layers. If you used glue and let it

harden, you may be able to take your rock layers out of the container to excavate.

8. Have students note what they find in what layer. Have students share and compare what they excavated. Discuss that by matching things found to other discoveries and studying the geology, what layer of rock it was in, scientists can get an idea of how old a fossil is.

Variation: Include things like lava and erosion and other layers besides the main three. Learn more about specific rock formations and what events on earth caused those formations to come to be.

REFLECT:

- Are there only three layers of rock on earth? Why are there so many layers?
- What can you tell about fossils that are in older rocks verses younger rocks?
- How do fossils of seashells and fish end up on mountains?
- Why are some fossils found on the surface of the earth if they are so old?
- What similarities and differences were found among the different students' layers?

APPLY:

There are many different types of rocks and layers of rock on earth. All around the world there are different kinds of rocks but there are also patterns and similarities. Things like volcanic eruptions, sand storms, earthquakes, seas, continental drift, glaciers, rivers, and other things change the earth's surface. By studying the geology, scientists are able to learn about events that occurred millions of years ago and know the general age of different rocks. Knowing the age of rocks enables scientists to date the fossils that are found in them. Fossils in older rocks are older than fossils in younger rocks.

Where fossils are found today are often very different that they were millions of years ago. Where a lush sea once was may now be a dry desert or a high mountain. Earthquakes and weathering affect where fossils are found. These same things can eventually expose fossils that used to be deep in the earth.

Though the earth's geology has lots of diversity, it also has patterns. By studying these patterns, we can learn and understand more about the earth around us.

Other Activities

- Play Dinosaur Bingo
- Play the Dinosaur Card Game
- Visit a Dinosaur Museum

Contents of Dinosaur Tote

- Fossil Molds (54 Total)
  - Trilobite Mold (12)
  - Ammonite Mold (7)
  - Cave Bear Mold (8)
  - Megalodon Shark Tooth Mold (6)
  - Deinoychus Claw (9)
  - Crinoid (12)
  - Leaf Mold (2)
- Fossil Works Lesson Plan
- Plastic Dinosaurs
- Dinosaur Bingo (7)
- Dinosaur Card Game (3)

Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

Note: These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for K-6 have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

THREE DIMENSIONS

2-LS4-1 Interdependent Relationships in Ecosystems (Activity 1: Fossil Molds, Activity 2: Dinosaur Looks)

Make observations of plants and animals to compare the diversity of life in different habitats.

Science and Engineering Practices:

- Make observations (firsthand or from media) to collect data which can be used to make comparisons.
- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas:

- There are many different kinds of living things in any area, and they exist in different places on land and in water.

2-ESS1-1 Earth's Systems: Processes that Shape the Earth (Activity 3: How Old Is It?)

Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Science and Engineering Practices:

- Make observations from several sources to construct an evidence-based account for natural phenomena.

Disciplinary Core Ideas:

- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

3-LS4-2 Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms (Activity 1: Fossil Molds, Activity 2: Dinosaur Looks, Activity 3: How Old Is It?)

Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

Science and Engineering Practices:

- Analyze and interpret data to make sense of phenomena using logical reasoning.

Disciplinary Core Ideas:

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere.
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.

Crosscutting Concepts:

- Observable phenomena exist from very short to very long time periods.
- Science assumes consistent patterns in natural systems.

3-LS4-2 Inheritance and Variation of Traits: Life Cycles and Traits (Activity 2: Dinosaur Looks)

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding, mates, and reproducing.

Science and Engineering Practices:

- Use evidence (e.g., observations, patterns) to construct an explanation.

Disciplinary Core Ideas:

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Crosscutting Concepts:

- Cause and effect relationships are routinely identified and used to explain change.

4-LS1-1 Structure, Function, and Information Processing (Activity 1: Fossil Molds, Activity 2: Dinosaur Looks)

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Science and Engineering Practices:

- Construct an argument with evidence, data, and/or a model.

Disciplinary Core Ideas:

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Crosscutting Concepts:

- A system can be described in terms of its components and their interactions.

4-ESS1-1 Earth's Systems: Processes that Shape the Earth (Activity 3: How Old Is It?)

Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.

Science and Engineering Practices:

- Identify the evidence that supports particular points in an explanation.

Disciplinary Core Ideas:

- Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.

Crosscutting Concepts:

- Patterns can be used as evidence to support an explanation.
- Science assumes consistent patterns in natural systems.

UTAH SCIENCE STANDARDS

K-Grade 2

Standard 1 (Activity 1: Fossil Molds, Activity 2: Dinosaur Looks, Activity 3: How Old Is It?):

- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

Standard 2 (Activity 3: How Old Is It?):

- Earth and Space Science. Students will gain an understanding of Earth and Space Science through the study of earth materials, celestial movement, and weather.

Standard 4 (Activity 1: Fossil Molds, Activity 2: Dinosaur Looks):

- Life Science. Students will gain an understanding of Life Science through the study of changes in organisms over time and the nature of living things.

Grade 4

Standard 4 (Activity 1: Fossil Molds, Activity 3: How Old Is It?):

- Students will understand how fossils are formed, where they may be found in Utah, and how they can be used to make inferences.

Grade 5

Standard 2 (Activity 3: How Old Is It?):

- Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.

INTENDED LEARNING OUTCOMES (ILO'S):

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.