Progression of Life

Grades 3-5
Fossil Dig

Summary: Students will extend the fossil dig activity that was introduced in the IDEA Place. They will explore the “where and why” of fossils. Fossils can be compared to one another and to living organisms according to their similarities and differences. Some organisms that lived long ago are similar to existing organisms, but some are quite different.

NCTM Standards: Not applicable

National Science Standards: Unifying concepts and processes
Evolution and equilibrium

Objectives:
To introduce the concept of the formation and location of fossils in our Earth.

Materials:
large to medium-sized sturdy box of wood or plastic modeling clay or play dough
building sand or soil
objects, leaves, shells, etc.
fossils (can be purchased or collected)
small items (bottle caps, broken bricks, etc.)
fossils made by students in the art portion of lesson

Procedures:
1. Exhibit example of fossils.
2. Display and discuss fossils from science text, reference books, or books selected.
3. Use a webbing or flow chart to show the process from the original object to the fossil stage.
4. Place art materials on work table. Demonstrate the steps to making a fossil. A large leaf, plastic fish or a shell work well.
5. Allow students to make a fossil. After two or three days, the students can add their fossils to the box.
6. Change objects often to extend interest. Bi-weekly works well.
Background Information:
Fossils are the remains or traces of ancient life. They tell paleontologists how organisms lived and grew. There are several types of fossils: petrifications, molds, casts, and trace fossils. Trace fossils consist of tracks, trails, burrows, and borings of ancient organisms. Petrifications, molds, and casts include preservation of soft and hard parts.

Assessment: Teacher observation

Resources: Original teacher idea

Submitted by Nancy Bryant & Judy A. Walker
Making a Good Impression

Summary: Students will extend the Progression of Life activities introduced in the IDEA Place to show how fossils have similarities and differences to present day existing organisms.

NCTM Standards: Standard 10—Measurement

National Science Standards: Unifying Concepts and Processes
Evolution and equilibrium

Objectives:
To formulate a model of one method of fossil preservation.
To communicate how the model differs from actual fossils.

Materials:
pie tin
spoon
mixed powdered clay
modeling clay
various items (sea shells, feathers, chicken bones)

Procedures:
1. The teacher should mix the powdered clay ahead of time.
2. Cover the bottom of the pie tin with a layer of modeling clay about 50 mm thick.
3. Firmly press the various items into the clay but don’t cover them with clay.
4. Carefully remove each item. Examine the imprints in the clay.
5. Scoop the mixed clay into the pie tin with modeling clay. Pat the clay until it is smooth.
6. Allow the clay to dry in the sun for two days.
7. Remove the clay “fossil” from the modeling clay and observe what you have. Draw a picture of both the impression and the clay fossil.
Background Information: An imprint or mold is one type of fossil. Any organic structure can leave an impression into a soft material. The various items used in this lab leave a mold bearing surface features of the original object opposite to those on the object itself. There are two types of molds: internal and external. Internal molds show features inside the objects while external molds show external features (growth lines, ornamentation).

Assessment: Teacher observation of students.


Submitted by Sue Garland
Body Saurus

Day One

Summary: Students will extend the prehistoric mural in the Progression of Life exhibit through a drawing activity in which they listen to a description of a dinosaur.

NCTM Standards: Standard 9--Geometry and Spatial Sense

National Science Standards: Life Science
Unifying concepts and processes

Objectives: To listen to a description of the Apatosaurus(formerly the Brontosaurus), etc. and draw accordingly. To compare their drawings with pictures of an Apatosaurus discussing the similarities and differences.

Materials:
one piece of plain white paper for each student
colored pencils, crayons
pictures of dinosaurs and descriptions

Procedures:
1. The students are given a plain piece of drawing paper.
2. The teacher explains that the students must listen very carefully to everything that is said. The teacher reads a brief description of the Apatosaurus, as outlined in the background information numbered 1-5.
3. As each description is given one at a time, the students are asked to draw accordingly. Once the information is given to the students, ample time is provided for the students to fill in the missing parts that were not detailed by the teacher.
4. After completing the drawing with pencil, the students should color their dinosaurs.
5. Encourage students to share their drawings with the other members of the class.
6. At this time, the teacher should provide study prints or pictures of a

Submitted by Teri Roberts
Grade level: 3-5

Apatosaurus and have students discuss their drawings and compare the similarities and differences.
7. Display drawings on a class bulletin board.

Background Information:
It is important for the teacher to stress that this dinosaur is no longer called a Brontosaurus. Dinosaurs are named by their skull. When this dinosaur was originally extracted there was no head or skull with the rest of the bones. Scientists went to their "spare parts" room and tried several different skulls until they found one that fit. The skull used was that of the Brontosaurus. Many years later, a doctoral student was extracting and putting a dinosaur together, the Brontosaurus, for his thesis. When he extracted the bones, he found a skull on the spinal column. The skull he found was that of the Apatosaurus. Because he had pictures of the excavation process, he was able to prove that the wrong skull had been put on the Brontosaurus. It is actually an Apatosaurus.

Assessment: Journal writings. Students share their drawings. Make a chart comparing drawings with similarities and differences of pictures of the dinosaurs.


Submitted by Teri Roberts
1. The Apatosaurus had a long, thin neck and a tiny head.
2. Its legs were the size of thick tree trunks, and it had a very long tail.
3. It was amphibious, living both on land and water.
4. It had a very small brain.
5. It walked on all four feet, and ate plants.

The Mesozoic era began 200 million years ago, and it lasted for about 140 million years. This era was called the Age of Reptiles. Many land and water changes took place in this era. During this period the reptiles flourished and became highly specialized. The most well-known of these reptiles were the huge dinosaurs. The word dinosaur means "terrible lizard."

There were many kinds of reptiles that lived on land, in the oceans, and in the air. Some were very large, and others were quite small. Some ate only plants, and others ate flesh.

Apatosaurus: 23m (75 ft.) by 5m (15 ft.)
Anklyosaurus: 5.2m (17 ft.) by 1.5m (4 ft.)
Ornitholestes: 1.8m (6 ft.) by 1.6m (5 ft.)
Allosaurus: 10.7m (35 ft.) by 5m (15 ft.)
Styracosaurus: 5.5m (18 ft.) by 1.8m (6 ft.)
Tyrannosaurus: 14.4m (47 ft.) by 5.8m (18 1/2 ft.)

Submitted by Teri Roberts
Body Saurus
Day Two

Summary: Students will extend the prehistoric mural in the Progression of Life exhibit by participating in a measurement experiment of a dinosaur’s actual size.

NCTM Standards: Standard 10—Measurement

National Science Standards: Earth Science
Properties of earth’s surface

Objectives:
To estimate how many children lying “head-to-foot” it will take to make the length of a Apatosaurus.
To experiment to see the actual number of children it will take to make the length.
To estimate how many children lying “head-to-foot” it will take to make the height of a Apatosaurus.
To experiment to see the actual number of children it will take to make the height.

Materials:
20 to 30 students
chalk
playground
meter stick; yard stick
sheets 32 and 33 for each student

Procedures:
1. Beforehand, the teacher marks the length of twenty meters and height of five meters, chalking these reference points on the playground.
2. While still in the classroom, have students estimate how many children lying “head-to-foot” it will take to make the length of a Apatosaurus.
3. After the students record their predictions, they will go outside to the blacktop area and start lying down “head-to-toe,” one at a time.
4. The students should remain lying down until the twenty meters has been reached with their bodies. (If there are not enough students to complete this investigation, students from the front of the line can get up from their place to continue further on down the line, to complete twenty meters.)
5. The students will then orally count off how many student’s bodies make up the entire length of the Apatosaurus.
6. After students finish counting off, they stand and are given the opportunity to record the actual measurement.
7. The students then calculate the difference from their estimations and actual measurements.
8. This procedure will be repeated to find the height of the Apatosaurus.
9. Once both the length and height have been marked with student bodies, children may assist the teacher in drawing the shape of the dinosaur on the playground in chalk. It might be helpful to have four students stand on the chalk marks to provide reference points.

Assessment: Journal writing and illustration. Page 33—calculating the difference in estimation and actual measurement.

How Many Bodies Fit on Your Chalk Marks on Playground
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Tyrannosaurus Rex

Summary: This activity is an extension for the Progression of Life exhibit. Students will construct a Tyrannosaurus Rex using cutouts and brads.

NCTM Standards: Not applicable

National Science Standards: Unifying Concepts and Processes
Evolution and equilibrium: evidence, models, and explanations

Objectives:
To gain experience with constructing an object and observing the effects of the object moving (dinosaur).

Materials:
Tyrannosaurus Rex cutouts
paper fasteners
pencil

Procedures:
1. Cut out the two pages of patterns. Glue them to lightweight cardboard.
2. Cut out parts of Tyrannosaurus Rex.
3. Use the pencil to punch holes at the dots.
4. Use paper fasteners to put the pieces together as shown.
5. Make Tyrannosaurus move and roar.

Background Information: Dinosaurs lived in the Mesozoic Era. The Tyrannosaurus Rex was prominent in the Cretaceous toward the end of the era. T-Rex was a large carnivorous dinosaur, over 13 meters long and weighed in excess of 4 metric tons. T-Rex’s head was large and its mouth held teeth up to 6 inches long. Its limbs were equipped with great curved claws for feeding. The T-Rex was fast and smart.

Assessment: Teacher observation, completion of the model, and oral discussion.

Resources: Jurassic Park, 1993 U.C.S. and Amblin

Submitted by Carol Sinclair
Movable Dinosaur Pattern

Color and cut out the pieces of the dinosaur. Attach the pieces with brads by matching letters on the body parts.

Adapted from a publication by U.C.S. and Amblin.
Elbow Room

Summary: Students will extend the Progression of Life activities introduced in the IDEA Place. They will observe the effects of plant competition for space in an area.

NCTM Standards: Standard 10—Measurement

National Science Standards: Life Science
   Populations and ecosystems

Objectives:
   To compare four ecosystems—three with some competition for space and one with great competition.
   To observe and record the effects of competition for space in an ecosystem.
   To explain what happens when plants become crowded in an ecosystem.

Materials:
   four small milk cartons
   soil from a yard or garden
   measuring cup
   six bean seeds, six corn seeds, and six wheat seeds
   masking tape
   tape measure
   scissors
   four index cards

Procedures:
   1. Cut the tops from four milk cartons. Tape an index card to each carton. Label the cartons A to D. Carefully punch three drainage holes in the bottom of each carton.
   2. Fill each carton to the same level with soil.
   3. Place three bean seeds, three corn seeds, and three wheat seeds on top of the soil in carton A. Carefully sprinkle about 5 MM of soil over the seeds.
   4. In the same way, plant three bean seeds in Carton B, three corn seeds in carton C, and three wheat seeds in Carton D.
   5. Place the cartons in a well-lighted area. Predict what will happen by drawing what you think the plants will look like in 14 days.
   6. Water the seeds every two days. Keep the soil moist but don't over water. Use the same amount of water for each carton. Observe for two weeks.
   7. Fill in the chart to record your observations on your plants for two weeks.

Assessment: Observation sheets


Submitted by Sue Garland
Plant Observations

Fill in the chart to record your observations on your plants for two weeks.

WEEK ONE

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WEEK TWO

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WHAT HAPPENED?
1. After 14 days, how many plants were in each carton?

Submitted by Sue Garland
2. Did the plants in Carton A compare in height with the plants in the other cartons?

3. After 14 days, which type of plant seemed to be doing better?

4. How did the number of plants affect each plant getting what it needed?

5. How could you test how much space animals need?

Submitted by Sue Garland
Journey to the Center of the Earth

Summary: Students will extend the Progression of Life activities introduced in the IDEA Place by constructing a model of the Earth’s surface and its formation.

NCTM Standards: Standard 9—Geometry and Spatial Sense

National Science Standards: Earth and Space Science
Properties of earth materials

Objectives: To formulate a model of Earth’s surface.
To hypothesize about Earth’s formation.

Materials:
- four shelled round nuts (such as filberts or hazelnuts)
- peanut butter
- spoon
- large ripe banana
- two plastic bags
- freezer
- two graham crackers

Procedures:
Before you begin refrigerate the peanut butter to make it easier to use.
1. Take a spoonful of peanut butter and place a nut in the middle. Cover the nut with peanut butter. The thickness should be about as wide as the entire nut.
2. Place the peeled banana into a plastic bag and mash the banana until smooth. Place the covered nut into a bag and cover it with a layer of the mashed banana just a bit thicker than the peanut butter.
3. Put graham crackers into another bag to break them up into pieces. Arrange them so that the banana is completely covered with graham crackers.
4. Freeze your “Earth,” then bite into this model of Earth and draw a picture of its layers. You may want to cut the Earth in half so students can observe the layers.
**Background Information:** The earth is divided into three major divisions: the crust, the mantle, and the core. The crust is the thin (6-50 km), rocky layer that we see. There are two types of crust: continental and oceanic. The mantle is 2900 km and has a density of 4.5 g/cm³. It has a stony composition dominated by oxygen and silicon. The mantle is subdivided into three layers: the lithosphere, the asthenosphere, and the lower mantle. The core is 3400 km and has an average density of 10.7 g/cm³. It is divided into the outer and inner cores. The outer core is fluid-like viscous while the inner core is solid.

**Assessment:** Ask the students the following questions—

1. What does the graham cracker crust represent? (Earth's crust)
2. What does the banana represent? (Earth's mantle)
3. What do you think the peanut butter and nut represent? (two inner layers)


Submitted by Sue Garland
Peanut Butter and Jelly Geology

Summary: This lesson provides an extension for the Geoscopes: “What Do You See?” Idea Place activity. It helps the students understand different types of rocks: brown sandstone, limestone, shale, conglomerate, and white sandstone.

NCTM Standards: Standard 3—Mathematics as Reasoning

National Science Standards: Physical Science
Properties of objects and materials

Objectives: To list the steps in which brown sandstone, limestone, shale, conglomerate, and white sandstone are formed by using a model.

Materials:
white bread   wheat bread   raisins   chunky peanut butter   jelly   rye bread

Procedures:
1. Lay a slice of white bread down. Say “Here we have an area of igneous bedrock. A river flows swiftly along, carrying a load of white sand eroded from white rocks. The river becomes wider, so the river slows down. The slower the water moves, the less load it can carry, so it drops its load of white sand along the bottom. As years pass the sand becomes cemented together, forming a layer of white sandstone.”
2. Spread chunky peanut butter and raisins on the white bread. Say, “A major flood occurs. Tons of mud, rocks and debris come pouring through this area and cover the white sand.”
3. Lay a slice of wheat bread on top of the white bread. Say, “In time, a slower, more gentle river flows across the area. Even though it’s a calmer river, it still carries a load. It has traveled through clay and carries a large amount of fine clay particles called silt. As the river slows down and becomes shallower, the silt drops to the bottom, forming another layer. In time, the silt will become sedimentary rock called shale.”
4. Spread jelly on the wheat bread. Say “The earth is warming and glaciers are melting. The ocean rises and covers the area we are observing. The saltwater brings marine or sea life. Their shells line the ocean floor, forming a new layer. In time, the ocean will recede and leave a calcium-rich layer that becomes limestone.”
5. Lay a slice of rye bread on top of the wheat bread. Say “It is time for a severe drought. Winds pick up eroded bits of brown rocks, sandblasting the other rocks, until a layer of brown sand covers the observed area. This layer will become brown sandstone.”

Assessment: Teacher observation

Submitted by Tracy Moncrief
Under the Sea

Summary: Students will extend the Progression of Life exhibits. After a brief study of oceans, the students will coordinate an art activity to simulate sea life.

NCTM Standards: Not applicable

National Science Standards: Unifying Concepts and Processes
Evidence, models, and explanations

Objectives:
To determine student’s understanding of sea life
To follow simple directions for constructing a manipulative mural

Materials:
9 inch paper plates (one per student)
Saran Wrap or lamination material
crayons
dry peat moss/sea weed material
tagboard for fish (2 inches long)
small seashells or shell macaroni
rubber cement
small magnet strips
craft sticks
10 inches of yarn (per student)

Procedures:
1. Color plates light blue.
2. Glue on sea weed, shells, etc.
3. Cut and color fish shapes.
4. Add magnets to back of fish.
5. Place a fish on the plate—do not glue.
6. Cover plate with Saran Wrap or lamination material and trim edges.
7. Glue edges well.
8. Add a magnet strip to a craft stick.
9. Attach yarn to back of plate and end of stick.
10. Allow to dry overnight.
11. Move the craft stick around on the back of the plate to make the fish swim.


Resources: Original teacher idea

Submitted by Nancy Byrant & Judy A. Walker