

Paleontologists

Grade Levels: 2-4

Paleontologists are scientists that specifically study forms of life from prehistoric times. In this lesson, you will practice the careful procedures that paleontologists use to categorize the fossils that they use study creatures from the past.

Objectives:

- Students will practice scientific procedures.
- Students will classify puzzle parts according to size, shape or color.

Standards Addressed:

- Sort/classify different living things using similar and different characteristics. S[LS1]-4-1.2
- Describe why organisms belong to each group or cite evidence about how they are alike or not alike. NH [LS1 [K-4] INQ+POC-1]

Materials:

Paper

Crayons

Scissors

Grocery Bags (one for every two students)

Procedures:

Begin by explaining to students that there are scientists that specialize or focus on certain things. Paleontologists are scientists that study the forms of life that lived in prehistoric times. They are able to study these life forms through plant and animal fossils. Paleontologists collect data from the earth that was left behind millions of years ago. However, the data they collect comes in parts or sections, so they need to organize and classify their collections to put the pieces of history together. Paleontologists need to be very careful when collecting this data and take their time in classifying their findings. Explain to the group that you are going to participate in an activity that will encourage them to think and react like Paleontologists!

First have students sit with a partner. Each student should have their own piece of paper, scissors and crayons. Make sure that no two colors are alike between partners. For example if John has red, blue and green, his partner Susan may not use those colors. Students may then draw a picture of anything they wish, the only guideline is that they need to completely fill their paper with color. Once they complete their drawing, they will use scissors to cut their picture out into "jigsaw style" pieces.

Once each group has finished cutting out their pieces, have them place both picture pieces in the same bag and carefully shake up the bag. Explain to the group that they will be completing another groups' puzzles by classifying the puzzle shapes as they pull them out of the bag.

Now, have each group switch bags with another group in the class. Ask a group to demonstrate to the class how the activity will be done by bringing their bag to the front or center of the room and working on their bag in front of the class.

Begin by explaining to the class that Paleontologists unearth data that can be millions of years old. This activity will be similar to Paleontologists unearthing data from the earth! They must be extremely careful when handling all of their findings and take their time in making predictions and classifications. Remind the group of the scientific fact they already know – each bag contains two puzzles and those two puzzles do not share the same color scheme. Taking turns, have each student (without looking) take a piece of paper out of the bag.

Have the group examine the piece and encourage descriptive phrases that include observations on the color, shape and size for each piece. As they continue to take turns picking puzzle pieces, they should be able to start categorizing the pieces into two separate piles that will eventually become two puzzles.

Have students continue to take turns picking pieces out of the bag and categorizing their pieces. Encourage them to communicate by explaining why each piece should be in the pile they place it. Explain to the students that at once all pieces are out of the bag, it is okay to then go back and relocate pieces into the opposite pile as they see fit. One of the many procedures that scientists must practice is restudying current data to make sure their classifications are accurate.

Students may choose to start to piece together the puzzles as they reveal pieces or they may choose to wait until all pieces have been pulled and they have their two separate piles. Once the bag is empty, they should begin to piece together the puzzles. This is another opportunity for them to examine, colors, shapes and sizes to determine how the puzzle fits together.

Adaptations:

For students with limited vision, try using two types of tactile manipulatives or small toys that are similar into the bag for them to categorize.

Extensions:

- Students can try creating puzzles using the same colors as their partner.
- Students may choose to place more than two puzzles in each bag.
- Students may draw or use pictures of dinosaurs.



Fossils

Grades 1-4

Paleontologists are able to study prehistoric creatures by examining fossils. Fossils are created when living things die and are buried by sediment, dirt and dust. Fossils are formed when the sediment hardens around bones, teeth and nails on these creatures that are buried in the earth. Fossils can be explained as imprints that were made on soft sediment that has hardened over time. Scientists examine fossils to make predictions and observations on what type of animals roamed the earth millions of years ago.

Objectives:

- Students will be able to understand how fossils are formed through imprints.
- Students will be able to make predictions based on collected data.

Standards Addressed:

- Identify the observable properties of different objects, such as color, size, shape, weight and texture. S(PS1)-2-2.1
- Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility) [PS1 (K-4) INQ – 1]

Materials:

A variety of different manipulatives or small objects collected from the classroom (ex. paper clip, marker cap, puzzle piece, blocks) or from nature (acorns, shells, leaves, pinecones).

Self-hardening clay

Display all items on the table for children to see. Allow each child to pick one object to use for this activity. Have them try to “hide” their object from the other students. Give each child a small ball of clay and have them

roll out the clay and flatten it a little. Then have the students carefully press their object into the clay to form an impression of their object. Make sure that the objects are removed from the clay carefully. Have the students “hide” their object from the other students so that they don’t see the object that each student used to form their fossil.

Once everyone has completed the first step, have students place their clay in a safe place to harden. Once the fossils are hard, students can begin examining each other’s fossils by investigating the shape and size of the fossil to make predictions on what object was used to form the fossil. You can either have all of the items that students chose keep hidden or put them on display for students to refer to in determining what object was used.

Have each student create his or her own Observation Log similar to the example given below:

This fossil was created by	Shape/Description	Prediction
Example: Katie	Square with 6 tiny dots	Lego

Encourage students to examine the fossil at a distance and close up because sometimes the angle at which you look at something changes your prediction.

Students can be asked to examine up to five fossils or more if time allows. Once students are finished, have students share the fossil they created with the class so that they can check with predictions. Explain to students that this isn’t a right or wrong activity but a chance for them to explore evidence from different angles and compare and contrast how fossils had many of the same and different features.

Adaptations:

For students that cannot see the impressions that the objects have left behind, have them feel them with their hands and give them a variety of the objects to choose from to match up which object go to which fossil.

Extension:

Choose a variety of larger object such as a variety of large plastic dinosaurs. Have a group of students use different parts of the dinosaur to make small impression from areas such as the teeth, toes, jaw bone, etc. on small pieces of clay. Have the students working on the same dinosaur mark the bottom of the clay with a similar letter so that you will be able to verify which fossils came from which dinosaurs at the end of the activity. For example, the fossils created from the stegosaurus have an “s” carved into the bottom. Also, have students mark the top of the clay with a different symbol or letter to use as a reference point when completing their Observation Log. For example, the fossil that Katie created of the Stegosaurus’s teeth has a k on the top. Once the fossils have hardened, have students complete their Observation Logs and make predictions on which fossil came from which dinosaur. Once students have had a chance to examine and record all fossils, ask them to make predictions on which fossils came from which dinosaurs and why. Have students gather to compare the fossils that came from each dinosaur, hold the fossil up to the area it came from for students to compare.



**How Large Were Dinosaurs?
Grades 4**

Some adult dinosaurs grew to be up to 66 feet high and 100 feet long however, some were as little as a pet dog. Using basic materials, children can plot out the dimensions of dinosaurs to experience first hand how large (or small) these magnificent creates once were!

Objectives:

- Students will use simple math to use their body as a measuring tool.
- Students will explore the shape and size of dinosaurs using visual markers.

Standards Addressed:

- Measures and uses units of measures appropriately and consistently, and makes conversions within systems when solving problems across the content strands. (M:G&M:3:7)
- Measures and uses units of measures appropriately and consistently, and makes conversions within systems when solving problems across the content strands. M:G&M:4:7

Materials:

Tape measures

Rulers

Paper

Pencils

Calculators

Markers – either construction/playground cones or something bright that would stick out in a field such as a bright colored Frisbees or extra t-shirts.

Procedures:

How long was a dinosaur? Measuring from its nose to its tail, could a dinosaur be as long as our whole class holding hands in a straight line across the baseball field? How small were some of the smallest dinosaur species? Children are going to use themselves as measuring tools to approximate the size of dinosaurs to gain a greater understanding of how large and small these creatures once were.

In this activity students will use their body as a measuring tool. Each student should have a piece of paper, pencil and ruler. Have students create two columns on their paper. Students may choose to include more than three body parts. The left side should be labeled “Body Part” at the top and at the top of the right side write “Measurement”

Have students write foot, body length (from top of head to floor) leg (from hip to foot), and arm span (from tip of middle finger on right arm to tip of middle finger on left arm holding arms out extended as far as they will reach). down the left column. Using the ruler, they will need to measure the lengths of each of these body parts to discover what each body part is equivalent to in inches. See example below.

Body Part	Measurement
Foot	9 inches
Arm Span	60 inches
Leg	30 inches

Now we need to work on some math skills! Remind students that since dinosaurs are extinct, the data that has been discovered through years of research are educated predictions. Knowing that all living things come in many different shapes and sizes, we know that the measurements that we are using are approximate numbers.

Next use either the website www.dinodatabase.com to download stats on dinosaurs dimensions or use the information that we have gathered below:

Brachiosaurus: Length – 1200 inches, Height – 600 inches

Tyrannosaurus: Length – 276 inches, Height – 600 inches

Velociraptor: Length – 24 inches, Height – 72 inches

Protoceratops: Length – 24 inches, Height – 72 inches

Stegosaurus: Length – 132 inches, Height – 360 inches

Print out this information for students to have their own copy to work on. Ask students figure out how many of each body part measurement it will take to come up with the length and / or height of each dinosaur. First use the example below

For example using the Body part measurements given above

Katie chose the Brachiosaurus. The Brachiosaurus length is 1200 inches, how many of Katie's feet would it take to equal 1200 inches? $1200/9 = 133.33$ of Katie's feet!

Now for the height of the Brachiosaurus, Katie is going to use her arm span:
 $600 \text{ inches} / 60 \text{ inches} = 10$ arm spans!

Now it's the students turn to use their own body part as a unit of measurement to determine how many of each part it would take to complete the length and height of certain dinosaurs.

Once the class has finished working on the math problems on paper, now its time to take them outside to a large field! Have students bring their papers with the dimensions and bring items to use as place markers (either construction/playground cones or something bright that would stick out in a field such as a bright colored Frisbees or extra t-shirts).

Students will now, use the body part measurements to physically display the dimensions they calculated for each dinosaur. Have students work in groups and make sure each group has plenty of space.

Place a marker at a starting point and using a student's work as an example, first map out a dinosaur together. Keep in mind that the student whose body part took the measurements must be the student that is physically plotting out the dimensions. For example if Darren chooses to use his arm span for the Brachiosaurus' length and his arm span is 50 inches. He will need to physically lay down on the grass and record his arm span 24 times. When he finished measuring the last span, he should put a marker so that students can see from marker to marker how long the Brachiosaurus was. This is where it will be helpful for students to work in groups. As Darren is lying down, someone in his group should use their finger to mark the spot where Darren will need to line up his next arm span measure as it would be difficult for him to do as he needs to stand up and move further away from the original marker.

Once the length of the dinosaur has been done, have students work on the height. Make sure that the students start from the center of the length or from the starting point for the length to measure the height. Once the dinosaur is complete have everyone stand back to observe the dimensions from a distance. Remind students that this is what the dinosaurs outline would look like if the dinosaur was lying down.

Have students work on many different dinosaurs so that they can walk around the field and compare the dimensions of the other dinosaurs that have been mapped out.

Extensions:

- Compare heights of school building with the height of dinosaurs. If you school is made out of brick, measure the height of one brick and count how many bricks you would need to reach the height of a dinosaur.
- This activity can be converted into a physical education and math lesson. Have the students measure their leaps or running strides and use those dimensions to "jog" out the dinosaur's length and width.
- Have students hold hands to see how many students it would take to measure up to the length of different dinosaurs.
- Use a spool of string to form a triangle, square or rectangle using the dimensions of different dinosaurs. Calculate how many Velociraptor will fit inside a Stegosaurus.