

Groovy Geology!

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Geologists are Great!

Tell your students that they are going to be geologists today! Does anyone know what a geologist does? That is someone who studies the earth and finds out what the earth is made of. A geologist can study the earth to find oil (to make our cars run and to heat our home), precious metals like diamonds, water, or the remains of plants and animals called fossils.

Geologists tell people where it is safe to build roads and houses. They know about earthquakes and they know where plants will grow best. Let's learn how to be a geologist.

Sing this song: (to the tune of The Wheels on the Bus)
 When they sing "rocks," everyone throws their hands in the air and jumps!

Geology is the study of rocks
The study of rocks, the study of rocks.
Geology is the study of rocks,
And the earth, too!

Choose a child to be your model and dress him/her up to look like a geologist. Call on different children to help you dress the volunteer. Discuss why certain items are necessary for a geologist to have.

Need: (total): safari hat, toy shovel, hiking boots (if you have some to share), camping type vest, toy pick, canteen or water bottle, sunglasses, bucket for specimens, bug spray, a map

Earth Egg:

Discuss the three basic parts of the earth--core, mantle, and crust. Use a hard boiled egg (cut in half) to show its three parts. The earth is made like the egg. Using another hard-boiled egg, push a straw through the egg. This is called a "core sample." In the straw, there will be pieces of the eggshell, then pieces of the hardened egg white, and finally part of the egg yolk. Explain that the shell is like the earth's crust, the white is the mantle, and the yolk is the core.

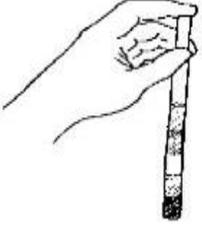


Teacher information:

shell: earth's **crust** (rigid, thin, relatively cool, made of rock and soil, 5 to 25 miles in depth)

white: earth's **mantle** (solid enough to split but fluid enough to flow, thicker and hotter than the crust, where earthquakes begin)

yolk: earth's **core** (liquid and very hot, outer core--1,400 miles thick and inner core--800 miles thick)



Option for older children: A core sample can be taken from different spots on the same egg, so you and the assistant teacher can each hold an egg and allow each child to take a core sample. Use discussion questions like this: Which is the thickest layer? Which is the thinnest? Does the earth's crust ever move? (YES, like in earthquakes) What can a core sample tell us about the earth?

****It is not always easy to take a core sample! Geologists must use huge pipes to do so, and it often takes many tries to get a good sample. The core samples are used to study the earth.**

Option for younger children: Buy or make orange, yellow, and green or blue, play dough. Each child can make a small earth ball with the three parts: orange for the core, yellow for the mantle, and blue/green for the crust. Use a plastic knife to cut it in half to show the three parts.



Need: a picture of the earth or a globe, hard boiled brown eggs, clear straws (cut in half); Option for younger campers: green, blue, orange, yellow play dough, plastic knives, plastic to cover tables

Rock Station:

Fill a water table partially with water. Children will enjoy scrubbing the rocks with toothbrushes and looking at them with magnifying glasses. They may want to clean the rocks they bring with them.

Sedimentary rocks are made from layers of earth being glued together. Examples include limestone, chalk, coal, clay, sandstone, and gypsum.

Metamorphic rocks are made when sedimentary rocks are changed by time, heat, and pressure. Marble, slate, and quartzite are examples.

Igneous rocks are made from hot liquid inside the earth. Lava is an igneous rock. Examples include obsidian, granite, and pumice.

Need: a water table, toothbrushes, scrub brushes, lots of rocks, magnifying glasses



Pebble Search Bottles: Use empty bottles (Gatorade works well) for this activity. Put several items in the bottle like toothpicks, coins, crayons, marbles, Legos, small toys, shells, acorns, small sticks, and more. Objects can be put in the bottle by cutting it down one side. Fill it about 3/4s full with pebbles, gravel, sand, or aquarium rock. Seal the slit with clear packaging tape. The children turn and shake the bottle to see what they can find in the sand. Great for observation skills!

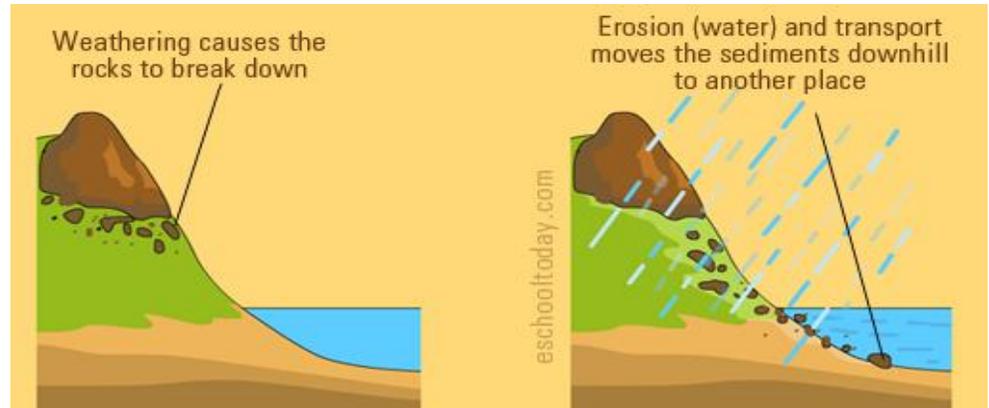
****Extension:** For older children, challenge them to find specific items. Ask detailed questions like: "Can you find the brown spotted shell? Can you find the nickel? Can you find the blue Lego?"

Need: empty plastic bottle, pebbles (or gravel or aquarium rock), scissors, clear packaging tape, items like: toothpicks, coins, crayons, marbles, Legos, small toys, acorns, sticks, etc.

Shakey Shake Jars: Collect small to medium plastic jars. Add sand, smooth rocks (polished rocks work), shells, and ¼ cup of water. Screw the lids on tightly. Use duct tape to seal the jars as necessary.

Ask the children thought questions like this, *“What is sand? What is it made of? What does it feel like? How does it become sand?”*

Brainstorm about how rocks break down to make sand. This is because of “weathering” which includes heat, pressure, cooling, and wind, etc. Sand is made of broken-up pieces of rocks and shells. Deserts have a lot of sand in them. We can make some sand in a jar.



Pass out the Shakey Shake jars. Demonstrate how to vigorously shake them so that the water moves the rocks and shells around. Explain that waves and currents in oceans, rivers, or lakes do the same thing to break up rocks. Over time, little tiny pieces of rock break off to form sand.

Need: small plastic jar, sand, smooth rocks, shells, water

Sing to the tune of “Jingle Bells.” Shake the jars as you sing!

**Shake our rocks,
Shake our shells,
This is how it sounds!**

Shake, shake, shake, shake, shake, shake, shake (7X to the beat) while teacher hums the tune.

That’s how sand is made, HEY!

Fossil Imprints in Sedimentary Rocks:

Rocks are constantly worn down into smaller pieces of rocks and minerals by wind and water. Streams and rivers wash these pieces into lakes and seas. They settle in layers as sediments that are buried and squashed together. Over time, the sediments harden into new rocks called sedimentary rocks. Examples include limestone, chalk, coal, clay, sandstone, and gypsum. Some sedimentary rocks contain the remains of shells and sea creatures called fossils.

As layers of earth press harder and harder down on shells or animal bones, fossils are formed. Fossils are remains of ancient living things or evidence of them, such as an impression.

Can you make an imprint of a fossil? Show the children how to flatten the play dough on the table. Place a shell or fossil on the play dough and press down to make an impression. Toy dinosaurs make good impressions, too.





Extension: The teacher mixes plaster of Paris into the consistency of thick pancake batter. Pour it into the molded play dough. Allow it to dry for up to ½ hour or more dependent on humidity. Peel off the play dough and you have a fossil!
Need: seashells and fossils, small toy dinosaurs, play dough, plastic for the table

Extension: plaster of Paris, plastic bowl, stirring spoon, water

Make a Fossil Sandwich demonstration: Layers of rock are squashed together under the earth’s surface and forced up to form mountains. Any fossils in the layers then come to the surface.

Describe what is happening as you make the fossil sandwich. Roll the play dough into 3 flat pieces like a pancake. Sprinkle the first layer with shells. Add another layer of play dough and shells, then another layer on top with no shells.



Push the sides together to make an arch. This is what happens when rocks are squeezed together by pressure in or on the earth. Now slice the top off. The first layers are now in the middle. They are the oldest layers and contain the oldest fossils.

Need: seashells, small toy dinosaurs, play dough, strips of wax paper or sheet of plastic, 2 plastic knives, rolling pins



Practice Mining for Fossils

Compare the technique used in this experiment to how they will excavate the Treasure Rock in the next activity. If they want to dig like a real geologist (or use the word “paleontologist” with older children), this is a good way to do it!

Show the students a cookie. The chips represent fossils and the dough represents the rock. How does heat change the dough when it is cooked? This is similar to how heat and pressure change sedimentary

rock into metamorphic rock.

Now it’s time to mine for minerals! Give each student one cookie and a toothpick. The children mine for fossils by taking their toothpicks and excavating their rock. Show them how to gently use the toothpick to dig for the chocolate chips. Model a gentle forward stroking motion. This is important because we want them to use this technique when they excavate their treasure rock! Add math skills by asking them to predict and then count the number of “fossils” (chips) in their cookie.

Need: chewy chocolate chip cookies, toothpicks, napkins or wax paper

Sedimentary Treasure Rocks

This is a favorite among our campers! Treasure rocks tie in nicely with a unit about fossils. When scientists find old shells, bones, or rocks inside the earth, it is evidence that ocean or land animals once lived where the rock was found. They then carefully excavate the treasures!

At least 1-2 days before class, mix 2 parts sand, 1 part plaster of Paris, and water in an old bucket. Stir. Add water until it has the consistency of a sand castle at the beach! You do not want it too dry or too wet. The humidity outside plus the dampness of the sand will affect this.



Add treasures such as small seashells, aquarium rocks, dice, toy dinosaurs, polished rocks, etc. (If you want to use bones, save chicken bones. Clean them and soak them in bleach water.)

Once you add the treasures, stir the mixture. Fill small styrofoam cups about halfway with the mixture. At this point, you may want to add a small toy dinosaur or other treasure to each cup. Allow the treasure rocks to dry in a warm place. Aim a fan on them if needed. When dry, simply peel the styrofoam off. Children may use plastic knives, toothpicks, or small craft sticks to chisel away at the treasure rocks.

Remind them to use the mining technique they learned with their cookie.

Need: old bucket, sand, old wooden stirring spoon, plaster of Paris, water, small styrofoam cups, treasure ideas: small seashells, aquarium rocks, polished rocks, toy dinosaurs, dice, bones, etc., plastic knives, toothpicks, or small craft sticks for digging

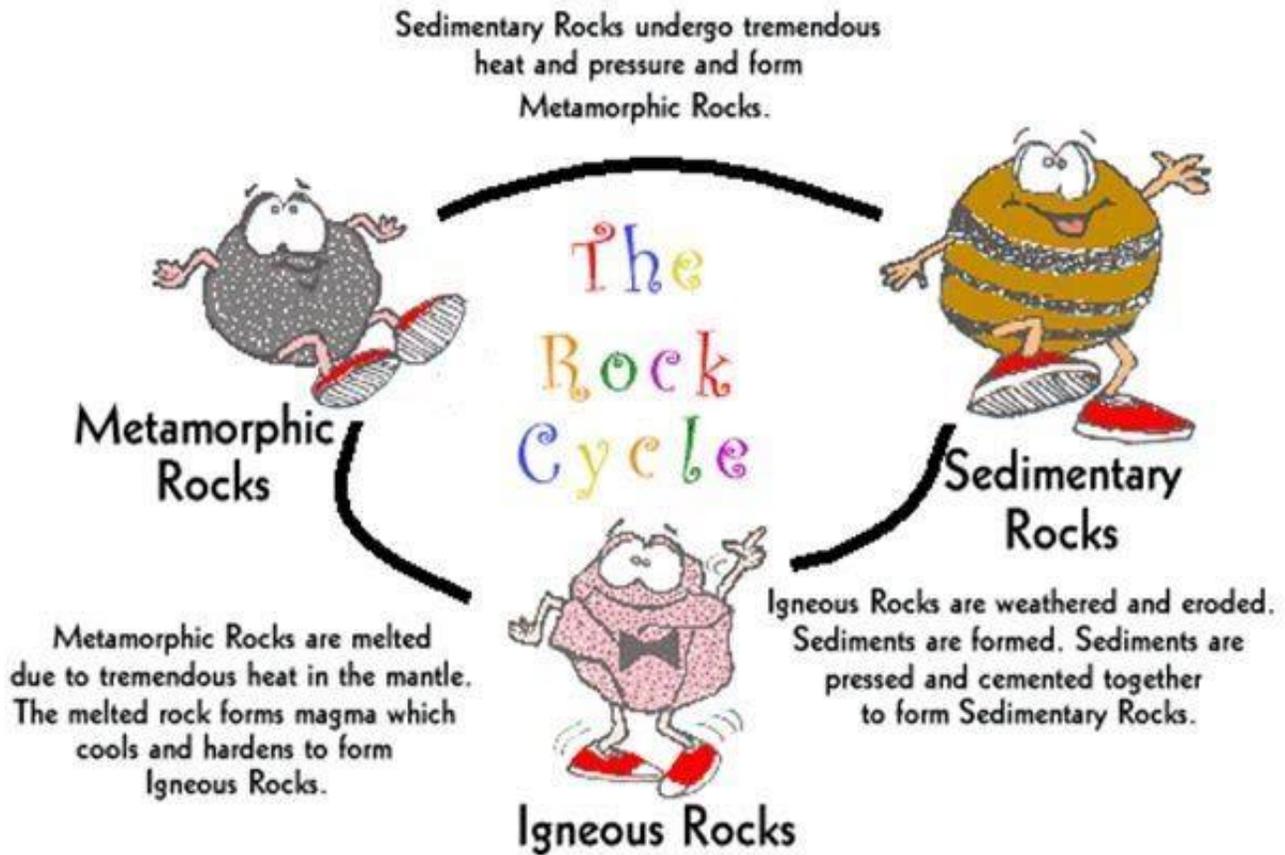
Edible Rocks: With enough time, heat, and pressure, sedimentary rocks turn into metamorphic rocks.

Cut the taffy candies in fourths. We want each child to have 2-3 small pieces of taffy, each piece a different color. Put the taffy on small pieces of wax paper for each child. Show them how to press and squeeze the taffy into one piece. Point out how the colors mix together. The more they are pressed together, the more they become a new, different looking taffy.



The pressing and squeezing, combined with the heat from their hand, simulates how metamorphic rocks are made within the earth. Metamorphic rocks are made when sedimentary rocks are changed by time, heat, and pressure. Metamorphic means “changed;” marble, slate, and quartzite are examples. Sedimentary rocks change into metamorphic rocks. (Show some samples.) The best part is that they get to eat this kind of rock!

Need: samples of metamorphic rocks, 2 different colors of taffy, small squares of wax paper, 2 plastic knives

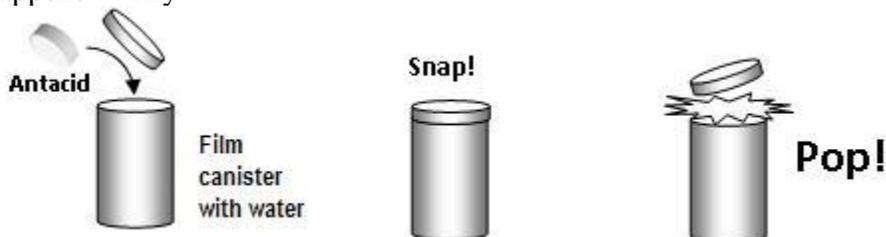
Pop**Rockets: the Power of a Gas:**

Eruptions from a volcano can be dramatic. Rising hot rock called magma can be trapped underground. Gases in the earth slowly start to swell in the rock until the pressure forces the magma to the surface. This is called an eruption.

Eruptions can happen on land or under the ocean. Some volcanoes erupt year after year but some are less active and rarely erupt. Some volcanoes don't erupt at all anymore.



Let's see how the power of a gas called carbon dioxide can cause an eruption. Fill a film canister halfway with water. Place it in a rubber tub. Add ½ of an Alka Seltzer and quickly put the lid on firmly. Stand back. Watch. What happens? Why?



Need: black film canisters with gray lids, Alka Seltzer, water



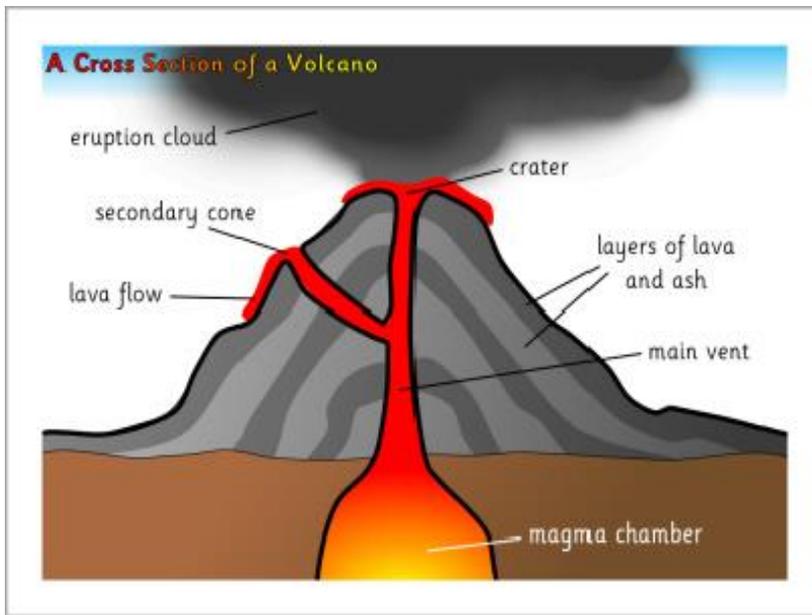
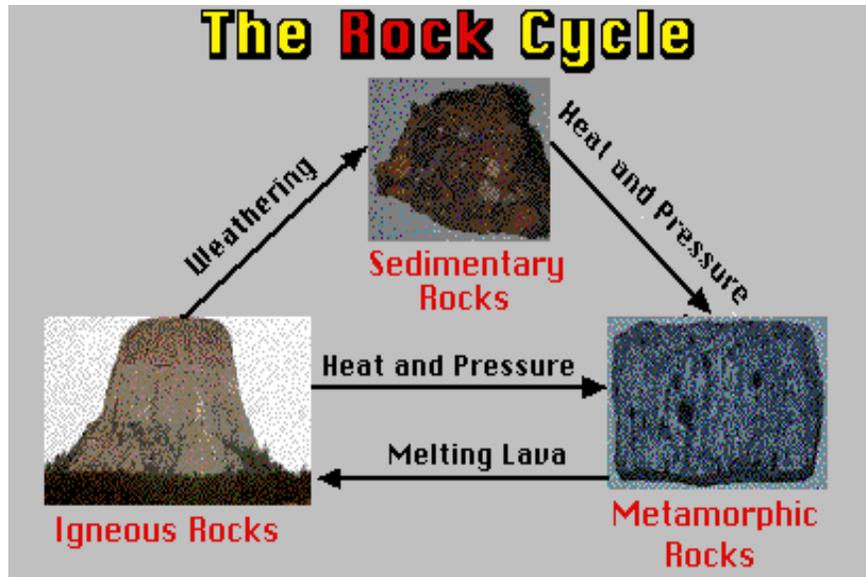
Make a Volcano:

The recipe for Treasure Rocks also works well to make a volcano. Place an old bowl on an aluminum pan or old cookie sheet. Mold the sand/plaster/water mixture around the bowl to form a volcano. Make a hole in the top of the volcano that a film canister will fit in. Add sticks and small rocks and toy dinosaurs to the sides of the volcano! Allow it to dry. Once dry, place the film canister in the hole at the top. This is where the “lava” will be added. **Note:** Volcanoes can also be made from modeling clay.

Lava recipe for a class: Add red and yellow food coloring to 3 cups vinegar. Add a squirt of dishwash liquid to make it goopy like lava. We put the lava in small squirt bottles. Children could also use medicine droppers to add the lava.

Rocks are made in different ways and that is why there are three types of rocks (sedimentary, metamorphic, and igneous). The third type of rock is called igneous. Guess where igneous rocks come from? They come from volcanoes! Samples of rock that have come from a volcano include obsidian, granite, and pumice.

Who knows what lava is? Lava is hot, melted rock that comes out of an active volcano. When that lava cools off, it gets hard again and makes igneous rock. Some of it cools off faster than others, so that is why the rocks are different.



For the eruption: Children will put a pinch of baking soda in the film canister. Squirt lava on top. WOW! There goes an eruption!

Repeat over and over. When the film canister gets full, dump its contents. The same holds true for the aluminum pan that the volcano is on. Dump the liquid and reuse the volcano. Children never tire of making the volcano erupt!

“There’s a volcano, quiet and still, (crouch down on floor)

Will it erupt?

Yes, it will! (Jump up!)

Need: old bucket, sand, old stirring spoon, plaster of Paris, water, a film canister, an old bowl, aluminum pan or cookie sheet with lips, optional: sticks, small rocks, toy dinosaurs. Also need red and yellow food coloring, vinegar, small amount dishwashing soap, small squirt bottles or medicine droppers, baking soda



Dino-cubes

Use small toy dinosaurs or polished rocks for this. Fill muffin tins with water. Add a toy dinosaur or polished rock to each cup. Freeze.

Take your class outside to a sidewalk or other area that has a rough surface. Get the ice chunks gritty in the dirt or sand or place them on a paper towel. That will help the children to hold them while cracking them open. Use small hammers or medium-sized flat rocks to crack open the dino-cubes! Big fun!

Need: 1-2 metal muffin tins (or ice cube trays) , small toy dinosaurs or polished rocks, water, small hammers or medium sized flat rocks (like landscaping rocks)

Where’s Your Stone? Game

One child is the “geologist” and sits on a chair facing away from the group. Place a rock under the chair.. The geologist closes his eyes while another child sneaks up, takes the rock, and returns to her seat. She hides the rock behind her back. The geologist has three guesses to identify who has the rock. Whoever took it becomes the next geologist!

Need: chair, rock

Dinosaur Song

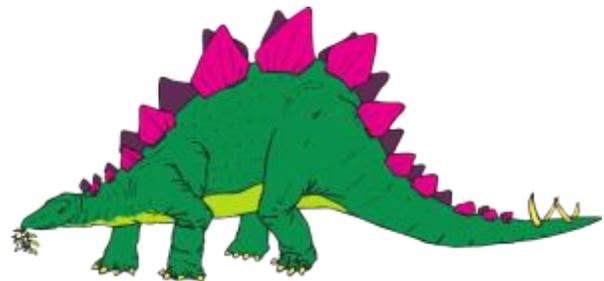
Sing to the tune of “I’m a Little Teapot.”

Dinosaur bones in the ground (point to ground)

Now they are fossils waiting to be found!

That is how geologists really know (finger tap on head)

That dinosaurs lived here long ago! (spread arms open wide)



Dinosaur Egg Hunt game:

Do this outside on a playground or lawn. Hide plastic eggs in the area, at least 2 per child.

To make the nest: make a big pile of leaves, sticks, and grasses into a nest shape on the ground. If inside, use a box to build the nest.



Dinosaur Facts to teach:

The mother dinosaur, like this Saltasaurus, builds a nest out of grass, sticks, and leaves.

She lays about 25 eggs in the nest.

The mommy dinosaur has to protect her nest! The babies hatch after several weeks.

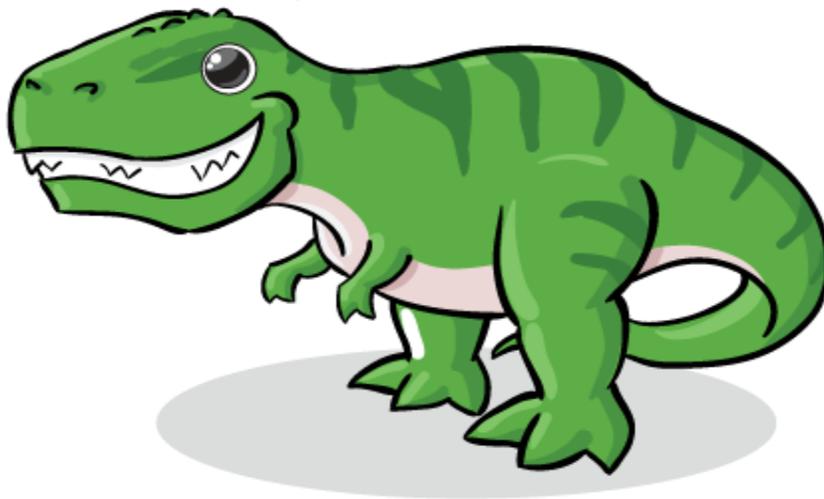
Where, oh where are those dinosaur eggs? For the game, tell the children that the mommy dinosaur is looking for her eggs. Use a toy dinosaur to be the mommy guarding her nest.

Some crafty animal like a T. Rex keeps taking the eggs and hiding them! The mommy dinosaur wants them back. Ask the children to find the eggs one at a time and put them back in her nest.

Make predator headbands by taping dinosaur pictures to headbands. (See the T. Rex below.) Or let children hold dinosaur toys or puppets to be the predators. Assign several children to be the crafty predators. While some children are returning the eggs to the nest, the children with the predator headbands on will “steal” eggs and hide them again. Let everyone be a predator!

Need: plastic eggs, leaves, sticks, grasses in a large cardboard box (if inside), puppet or toy dinosaur, predator headband or toy

For predators: Make copies of this dinosaur to tape to headbands.



I'm a Hungry Dinosaur song

Sing to "I'm a little Tea Pot." The teacher holds a dinosaur toy or puppet. If you have enough, let each child hold a dinosaur toy, too.

I'm a hungry dinosaur Make a hungry face.

Big and tall, Wave your hands big and tall.

Here is my tail, here are my claws. Point to your tail and hold your hands like claws.

Since I am so hungry, Rub your tummy.

I must "grooowwllll," Everyone make a loud grrroooowwllll.

Look out, I must eat right now! Tickle each child with the dinosaur puppet.

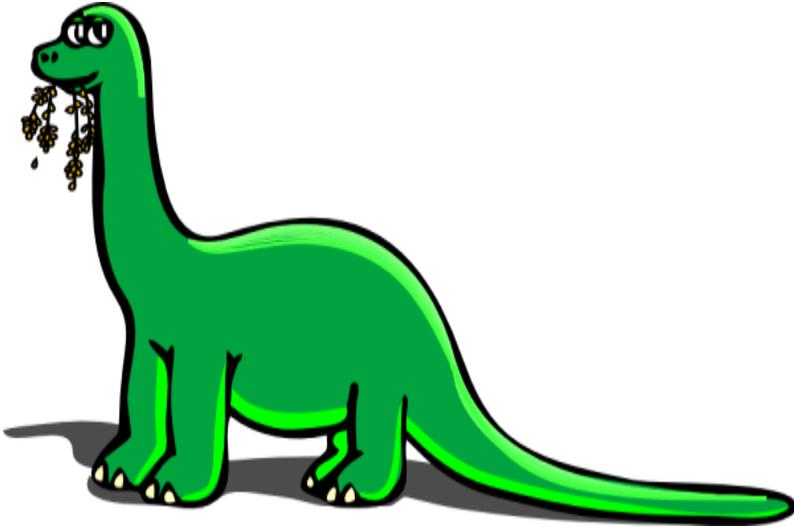
Feed the Dinosaurs!

Cut out pictures of dinosaurs. (Samples are provided on the next page.) Tape each picture to a plastic cup. Provide leaves, pieces of grass and several pieces of brown felt to represent meat.

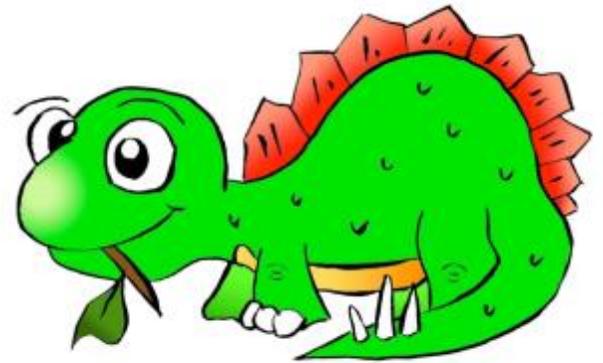
Tell the children to feed each dinosaur. Look at its mouth. If it has sharp teeth, it is a meat eater. If it doesn't, it is a plant eater. Feed the hungry dinosaurs!

(Of course some dinosaurs like Oviraptors ate both.)

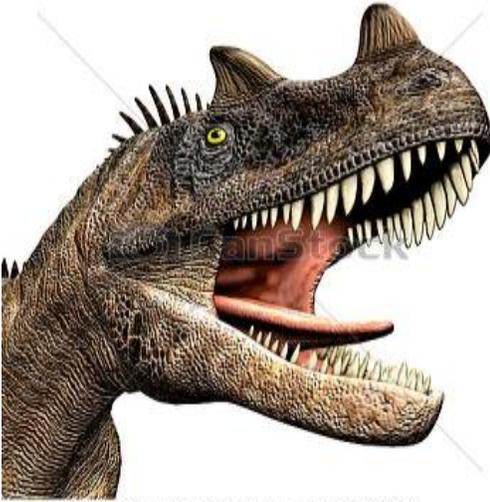
Need: 4-6 plastic cups, 4-6 pictures of dinosaurs, tape, scissors, pieces of grass, several leaves, a piece of brown felt cut into pieces



Stegasaurus

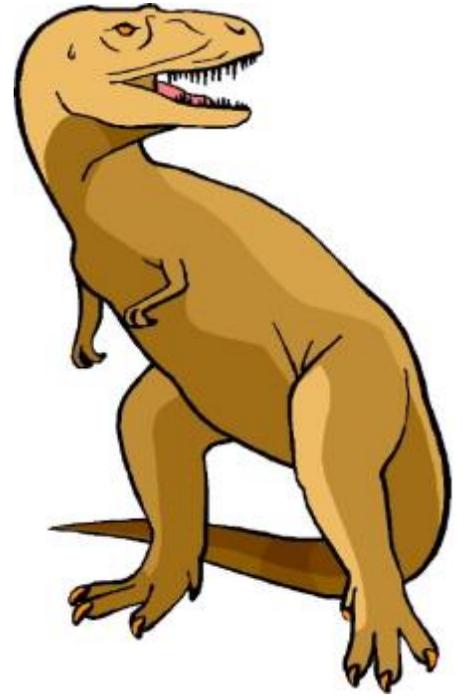


Baby Dinosaur



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Theropaud



T. Rex



Oviraptor