



Demos, Labs, & Science Stations Feature:

- Hands-on Investigations
- STEM Challenge
- Scientific Literacy
- Inquiry Process Skills

EARTH SCIENCE - 5E**NGSS · TEKS**

The image shows a book titled 'EARTH'S HISTORY' with a teal cover. Below the title are several colorful circular icons representing different science stations: 'INVESTIGATION STATION' (test tubes), 'IMAGINATION STATION' (molecular structure), 'OBSERVATION STATION' (telescope), and 'CULATION STATION' (calculator). To the right of the book is a clipboard with a worksheet titled 'Core Samples' under the heading 'EARTH'S HISTORY'. The worksheet contains text about rock layers and a list of materials: wooden skewer, ruler, paper, colored pencils, eye dropper, beaker, water, and plastic bowl. Below the list is a section titled 'Model' with instructions about bird seed mix and sediment layers.

DEMOS, LABS, & SCIENCE STATIONS

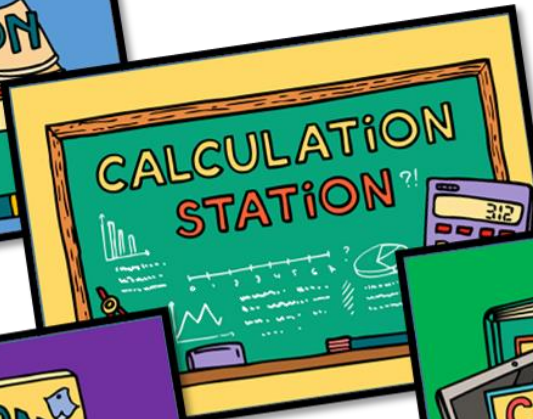
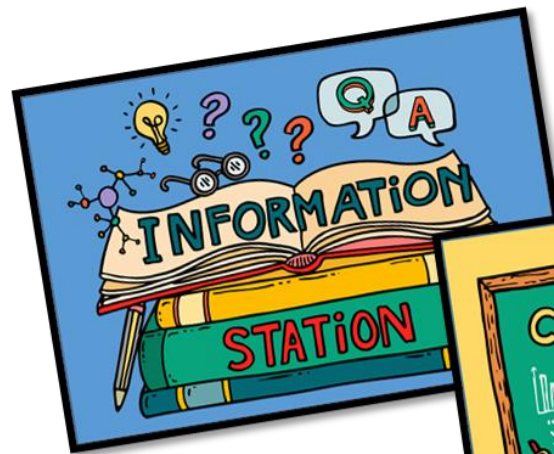
HANDS-ON · STEM · CRITICAL THINKING

**ENGAGING
READING!**

**GRAPHING,
WORD
PROBLEMS &
MEASUREMENT!**

**INQUIRY
SKILLS &
PROCESSES!**

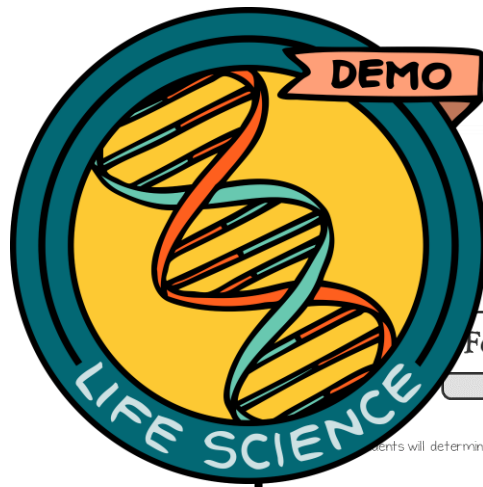
**HANDS-ON
INVESTIGATIONS!**



STEM CHALLENGES!

ALL Station Signage Included!!

Color & Black and White



Fossil Identification

EARTH'S HISTORY

Students will determine what is a fossil and try to understand how it formed.

Materials:

- actual fossils or photos (check with your local resource center or borrow from home or from those who may have samples to share)
- non-fossil items (may or may not include igneous rock, metamorphic rock, sedimentary rock, pressed flower, coin, shell, paper towel piece, bone, wood, metal washer, etc.)
- index cards labeled with letters that equal the number of fossil and non-fossil items
- magnifying glass (optional)

Procedure:

1. Spread items around the room and label each with a lettered index card.
2. Have students examine the items on the table. Use a magnifying glass if provided.
3. Students should determine if each object is a fossil or non-fossil. Have them place the letter of the index card either under the column labeled fossil or non-fossil. Have them identify the item if they can.
4. Students should rotate and continue identifying each item until all have been placed in either category.
5. When students are done, go over the answers with them and start a discussion on how they came to the conclusion that some items were fossils and others were not. You may also want to use this opportunity to introduce different types of fossils.


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Teacher guide and answer key
offered for every lab!

Easy-to-get materials!



Name _____ Date _____



Core Sampling

EARTH'S HISTORY

Index Fossils represent an organism that existed only briefly and that was widely distributed, meaning it occurred in many different areas. To date rock layers, geologists use index fossils to match rock layers; then, they can give the same age to those layers of rocks at other locations.

Scientists can collect rock layers in a process called coring. Coring involves scientists driving a hollow tube into the rock and withdrawing the tube with the rock and fossils inside. The core samples can then be taken back to the laboratory to be studied.

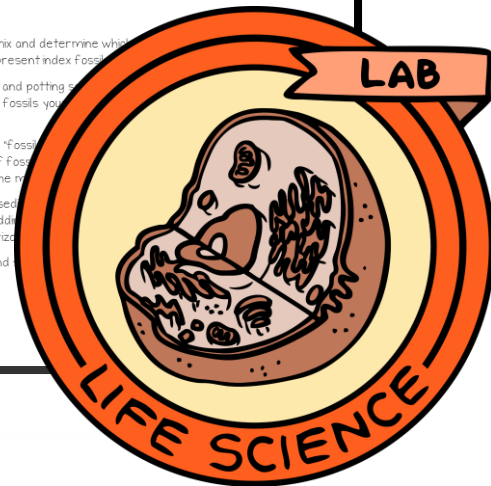
Materials:

• small milk cartons	• ruler	• water
• sediment variety	• paper	• plastic bowl
• bird seed mix "fossils"	• colored pencils	
• plastic straws	• eye dropper	
• wooden skewer	• beaker	

Procedure:

Part A: Create a Model

1. As a group, look through the bird seed mix and determine which seeds to use. Then, separate the seeds chosen to represent index fossils.
2. Determine the order of sediment (sand and potting soil) along with which layer will hold the index fossils you chose. Place damp mixture at the bottom of the milk carton.
3. Build the model of sediment layers with "fossil" seeds. Add a layer of sediment with a few pinches of fossil seeds. Place damp mixture at the bottom of the milk carton.
4. Continue building your model with other sediments. Lightly pack the sediments after adding the correct layer and keep all layers horizontal.
5. Label the model with the group name and teacher.



Discussion questions and
teacher set-up included!





Group members will read a passage and then complete a task to help increase science literacy and deepen their understanding of the science concept.



Backyard Dinosaurs

Have you ever imagined what it would be like to be a paleontologist? It must be exciting to uncover the bones of a gigantic dinosaur that roamed the Earth millions of years ago. Although these creatures have long been extinct, their bones are being unearthed to this day. You may believe that the only way to discover dinosaur bones is to be a paleontologist or to have special permits and tools to dig, but that is not the case. In fact, there are numerous stories of everyday people finding amazing discoveries in their own backyards.

One of these discoveries was made in Michigan by a contractor excavating in his backyard. He was surprised to discover a 4-foot-long rib bone sticking out from a pile of earth. With the help of a neighbor, the two men sifted through the soil and dug out the bone. The bone was then sent to a paleontologist from the University of Michigan for confirmation. From a mastodon. The bones are now on permanent display.

Another find in Michigan was in October 2015. A farmer was digging in his field when he uncovered a bone about 3 feet long. He contacted the University of Michigan to excavate. The farmer had been digging for 15,000-year-old woolly mammoth. Researchers uncovered the skull, pelvis, shoulder blades, multiple vertebrae, and a leg bone.

One of the youngest fossil hunters to make a discovery was in Mansfield, Texas. He was on a fossil hunt with his father when he discovered a fossilized fish vertebrae. He discovered the fossil while digging for land-dwelling herbivores called Nodosaurus. Nodosaurus lived about 100 million years ago.

One lucky amateur fossil hunter dug up bones in his backyard in Montana and discovered an entirely new dinosaur. The bones, including an almost complete half skull, backbone, and legs, were discovered in 2005. After paleontologists were called to excavate, the bones were transferred to the Museum of Nature for further identification. More than a year later, in May 2016, the results were published. The dinosaur was named *Spicospinus shipporum*. It was about 100 million years old.

Many of the bones discovered in backyards are not as large as the ones mentioned here. Some are just small fragments of bone. The bones are often found in the same place as the greatest discoveries.

A

How old do rocks need to be in order to find dinosaur fossils?

B

How old is the youngest fossil hunter and what did he discover?

C

Share when and where you've ever found, seen, or touched a dinosaur fossil.

D

Share when and where you've ever found, seen, or touched a dinosaur fossil.

A

B

C

1. The saber-toothed cat lived long ago was the

2. How did Earth's Paleozoic?

D

of the Grand layers?

three types of clues

Group members will have images, illustrations, or actual samples at this station that show applications or processes of the science topic.



Group members will work with one another to explore the concept through hands-on activities, so they may practice specific inquiry process skills as they learn.



Investigation Station

Preserved Remains

Problem: What can scientists learn from preserved remains?

Fossils are preserved remains or traces of living things. Most fossils form when living things die and are buried by sediments. Then, over millions of years, the sediments slowly harden into rock and preserve the shapes of the organisms. Fossils found in rock include molds and casts, carbon films, trace fossils, and petrified fossils. Organisms can also be preserved in amber.

Materials:

- play dough
- sugar cube
- warm water
- beaker
- spoon

Procedure:

1. Wrap a piece of a piece of the sugar cube in the play dough.
2. Wrap a piece of the other half in the play dough.
3. Place both wrapped cubes in the beaker. The beaker has not been covered.
4. Stir the beaker of water completely.
5. Use the spoon to lift and examine each cube.
6. Answer the questions.

Name _____ Date _____

Directions: Draw your sketches below - use labels when necessary.

1. Describe what happened to the sugar cubes in the space provided.

2. What did the playdough represent in this model?

3. Why is it such an important discovery when preserved remains are found?

Communication Station

A

Explain how most fossils form.

B

Distinguish between relative age and absolute age.

Name _____ Date _____

Communication Station

A

A: Most fossils form when living things die and are buried by sediments. The sediments slowly harden into rock and preserve the shape of organisms.

B

A: Relative age states whether a rock is older or younger than another rock, absolute age is a rock's age in years.

D

record of life forms, geological events in Earth's history, eras and periods.

There are three different options for this station: interviews, videos, or group essay. Depending on the option you choose, group members will communicate what they know by answering questions in creative ways.



Group members use their math skills to complete the station challenge. Skills may include graphing, analyzing data, using models, measurement, and calculating formulas or word problems.



Half-Life

Most elements are stable, but some exist in unstable forms, meaning they break down. When an element breaks down or decays, it releases energy and energy in a process called radioactive decay. These unstable elements are called radioactive. The rate of decay of each radioactive element is called its half-life. The time it takes for half of the radioactive atoms to decay is the half-life. The decay will continue at a steady rate, slowly changing the element into another element, changing the composition of the element and the amount of the radioactive element to go down as the element goes up.

Procedure:

1. Start with 1,000 grams of a certain original amount in 50,000 years.
2. Complete the table on your worksheet by calculating the amount of radioactive material and the years that have passed.

Directions: Complete the table below. Remember, when the radioactive material goes down, the new element goes up.

Years	Original Radioactive Material (grams)	New Non-radioactive Material (grams)
0	1,000	0
50,000		
100,000		
150,000		
200,000		
250,000		

Trace Fossils

Challenge: Provide clues about animals' behavior and size using trace fossils.

Trace Fossils provide evidence of the activities of ancient organisms. A fossilized footprint is one example of a trace fossil. From fossil footprints, scientists can determine an animal's size and behavior and, often, can infer what occurred when the footprints were left.

Materials:

- paper
- Footprint stamps
- ink pad
- playdough or clay (optional)

Procedure:

1. As a group, choose a couple of animals to study.
2. Create a narrative of what the animals did. Write the narrative on the side marked A.
3. Create the scene to the best of your ability.
4. Repeat steps 1-3, this time using the other animal.
5. Copy one of the scenes and create a new scene.
6. Hand your final draft to your group.

Testing:

Each narrative will be folded under the scene. The other group will observe the scene and infer what they believe happened and check for accuracy.

B


Narrative:

Trace Fossils:

Group members will work together to solve a STEM (Science, Technology, Engineering, Math) challenge by creating models or designs that demonstrate their understanding of the science topic being taught.




This station makes science concepts relevant for students by asking them to imagine scenarios that will bring about discussion and critical thinking.



A Tour of the Eras


Directions: Use your imagination to answer the statement below.

IMAGINE you are going on a tour of Earth during one era of geological time.



Describe the organism.

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Drip, Drop, Splat!

Problem: How does the density of a liquid and drop height effect the size and shape of liquid splatters?

Materials:

- colored water (graduated cylinder A)
- colored syrup (graduated cylinder B)
- eye dropper
- paper
- metric rule
- meter stick

Procedure:


- Make a hypothesis of how density of a liquid will effect splatter size on your lab sheet.
- Place the piece of paper down on the lab table in order to catch splatters.
- Measure the heights listed in the data table using a meter stick. Place meter stick with end starting at zero on paper and move up stick when increasing height of drop.
- Use the eye dropper to drop ONE drop of colored water and ONE drop of colored syrup. Make sure to drop on different places on paper.
- Measure the size of the splatter in MILLIMETERS. Record in data table on answer sheet.
- Repeat for each height.
- Use the collected data to graph the splatter size versus drop height for each liquid.

Analyze and Conclude

- Was your hypothesis correct? Explain.
- What were two controls in your experiment that helped you collect the most accurate data possible?

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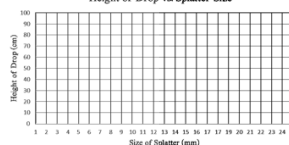
Date _____



Hypothesis _____

	Drop Height (cm)			
	5	25	50	100
Colored Water				
Colored Syrup				

Height of Drop vs. Splatter Size



Legend

☐ Water

☐ Syrup

Analyze and Conclude:

- _____
- _____

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USER-FRIENDLY PAGES:
Students easily recognize which answer sheet to use at each station by matching station icons located on each page!

TEACHERS SAVE TIME:
Laminate station pages and reuse for each class and for years to follow!

Inquiry and Process Skills

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 Demo

 Guided Inquiry Lab

 Science Stations

Inquiry-Based Science Unit: Earth's History	Classifying	Communicating	Compare & Contrast	Creating Models	Gather/Organize Data	Generalizing	Identifying Variables	Inferring	Interpreting Data and Graphs	Making Decisions	Manipulating Materials	Measuring / Calculating	Observing	Predicting
Fossil Identification	X	X	X			X		X		X	X		X	
Core Sampling		X	X	X	X		X		X		X	X		X
Information Station: Backyard Dinosaurs					X	X		X						
Observation Station: Images & Questions	X		X		X	X		X					X	
Investigation Station: Preserved Remains	X		X		X				X		X		X	
Calculation Station: Half-life			X		X		X		X	X		X		
Communication Station: Questions	X	X				X				X				
Creation Station: Trace Fossils		X		X	X				X	X	X	X	X	X
Imagination Station: A Tour of the Eras		X		X						X				X

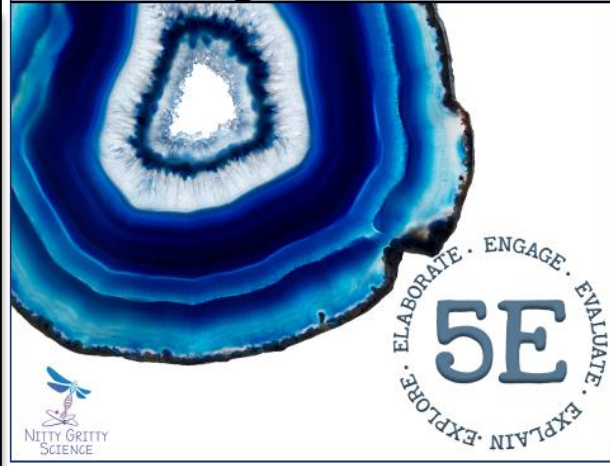
NGS promotes scientific inquiry throughout the curriculum. Students become more confident and effective learners while developing problem-solving and critical thinking skills. Process skills, such as planning, organizing and evaluating, help students to complete projects and assignments. These skills allow students to independently gather information, analyze it, and draw their own conclusions.

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