



Demos, Labs, & Science Stations Feature:

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

EARTH SCIENCE - 5E

EARTH'S HISTORY

NGSS · TEKS

Core Samples

EARTH'S HISTORY

Skills represent an organism that existed only briefly, and that was widespread. It occurred in many different areas. To date rock layers, geologists use core samples; then they can give the same age to those layers of rocks at other locations. An collect rock layer in a process called coring. Coring involves scientists to collect rock layer into the rock and withdraw the tube with the rock and fossils inside. Then be taken back to the laboratory to be studied.

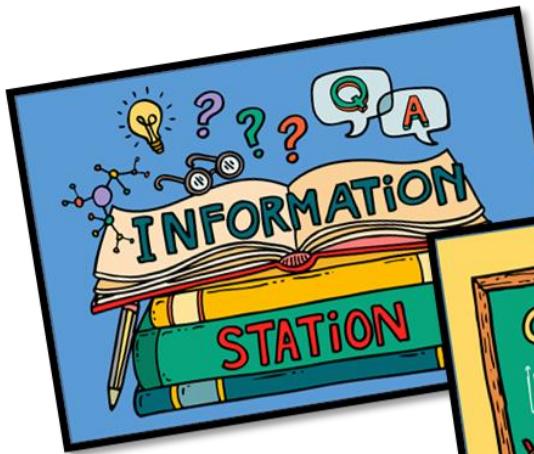
Materials needed:
 Milk cartons
 Bird seed mix
 Wooden skewer
 Ruler
 Paper
 Colored pencils
 Eye dropper
 Beaker
 Water
 Plastic bottle
 Mill

Procedure:
 Through the bird seed mix and determine which seed will be your "index fossil".
 Seeds chosen to represent index fossils from the rest of the bird seed mix.
 Mill of sediment (sand and potting soil) that will be placed in the mill.
 Mill will hold the index fossils your group has chosen. Record the order of sediment layers with "fossils".

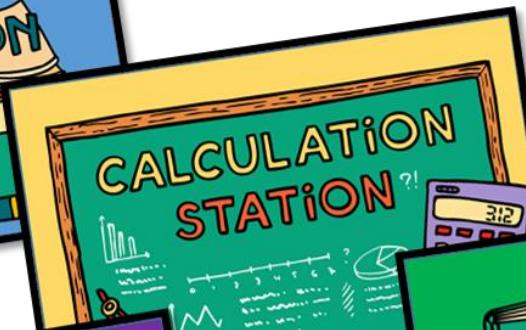
DEMONSTRATIONS, LABS, & SCIENCE STATIONS

HANDS-ON · STEM · CRITICAL THINKING

ENGAGING
READING!



GRAPHING,
WORD
PROBLEMS &
MEASUREMENT!



INQUIRY
SKILLS &
PROCESSES!



HANDS-ON
INVESTIGATIONS!



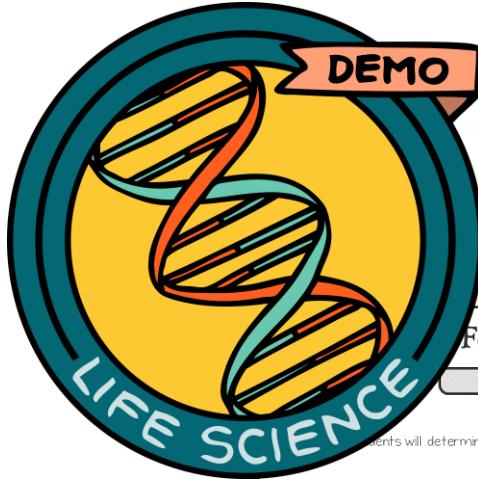
STEM CHALLENGES!

ALL Station Signage Included!!

Color & Black and White



NITTY GRITTY
SCIENCE



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:

- Spread items around the room and label each with a lettered index card.
- Have students examine the items on the table. Use a magnifying glass if provided.
- 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.
- Students should rotate and continue identifying each item until all have been placed in either category.
- 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.

ONnityGrittyScience

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:

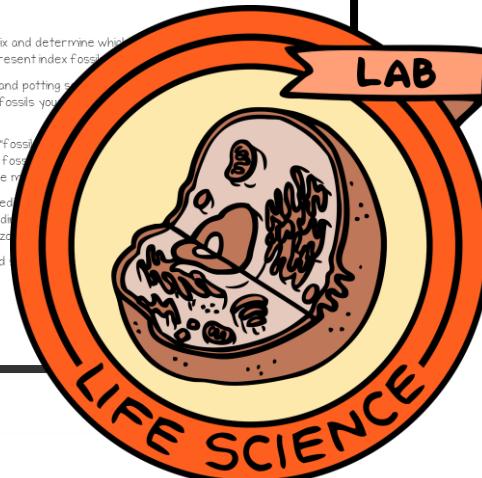
• small milk cartons	• ruler	• water
• sediment variety	• paper	• plastic bowl
• bird seed mix "fossils"	• colored pencils	
• plastic straws	• eye dropper	
• wooden skewer	• beaker	

Procedure:

Part A: Create a Model

- As a group, look through the bird seed mix and determine which seeds are the best to represent index fossils. Then, separate the seeds chosen to represent index fossils.
- Determine the order of sediment (sand and potting soil) and which layer will hold the index fossils. Place the index fossil layer on your answer sheet.
- Build the model of sediment layers with a "fossil" layer of sediment with a few pinches of fossil seeds. Place damp mixture at the bottom of the model.
- Continue building your model with other sediment layers like. Lightly pack the sediments after adding the correct layer and keep all layers horizontal.
- 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 a paleontologist from the University of Michigan confirmed the find. The bones are now on permanent display at the University of Michigan.

Another find in Michigan was in October 2015, with a backhoe when he uncovered a bone about 3 feet deep. The University of Michigan excavated. The farmer had discovered a 15,000-year-old woolly mammoth. Researchers uncovered the skull, pelvis, shoulder blades, multiple vertebrae, and a ribcage.

One of the youngest fossil hunters to make headlines was in Mansfield, Texas. He was on a fossil hunt with his father when he found a fossilized fish vertebrae. He discovered land-dwelling herbivores called *Nodesaurus*. *Nodesaurus* lived 100 million years ago.

One lucky amateur fossil hunter dug up bones in his backyard in Montana and discovered an entirely new species, including an almost complete half skull, backbone, legs, and tail. The bones were so well preserved, they were sent to a paleontologist to excavate. The bones were transferred to the Museum of Natural History for further identification. More than a year later, in May 2016, the results were published. The discovery was named *Sphenodus shipporum*. It was about 100 million years old.

Up until now, the only bones that have been found in Montana contain dinobirds. The most recent find is the greatest find ever made.

A. _____
 B. _____
 C. _____
 D. _____

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 Name _____ Date _____

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

A

OBSERVATION STATION

B

OBSERVATION STATION

C

OBSERVATION STATION

Timeline of Earth's history:

Period	Approximate Age (years ago)	Key Features
Hadrian	4,000 - 3,000	Brachiopods, Trilobites, Microfossils
Precambrian	4,600 - 2,800	Prokaryotes, Eukaryotes, Nematodes
Palaeozoic	541 - 252	Trilobites, Fossils, Fish, Insects, Vertebrates
Mesozoic	252 - 66	Dinosaurs, Plesiosaurs, Ichthyosaurs, Pterosaurs
Cenozoic	66 - Present	Mammals, Birds, Insects, Humans
Ordovician Silurian	445 - 419	Trilobites, Brachiopods, Microfossils
Devonian	419 - 358	Fish, Vertebrates, Trilobites, Microfossils
Carboniferous	358 - 252	Coal, Vertebrates, Trilobites, Microfossils

Name _____ Date _____

Three types of clues

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

2. How did Earth's continents move?

A1. _____
 A2. _____
 B1. _____
 B2. _____
 C1. _____
 C2. _____

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.

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

Materials:

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

Procedure:

- Wrap a piece of play dough around a piece of the sugar cube.
- Wrap a piece of play dough around the other half of the sugar cube.
- Place both wrapped cubes in a beaker of warm water.
- Stir the beaker of cubes completely.
- Use the spoon to remove the cubes and examine each cube.
- Answer the questions below.

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?

Name _____ Date _____

© Harry Gruyaert / Getty Images

A

Explain how most fossils form.

B

Distinguish between relative age and absolute age.

A

How long ago did Earth form and what physical features

B

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

B: 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 particles 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. For half of the radioactive atoms to decay is the time it takes for half of the radioactive atoms to decay.

The decay will continue at a steady rate, slowly changing the element to another element. Over time, the composition of the radioactive elements will go down as the amount of the radioactive element goes up.

Procedure

- Start with 1,000 grams of a certain radioactive element in 50,000 years.
- Complete the table on your worksheet to show the amount of radioactive material that has passed over time.

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.

Materials:

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

Procedure:

- As a group, choose a couple of animals to research.
- Create a narrative of what a footprint shape means. White side marked A.
- Create the scene to the best of your ability.
- Repeat steps 1–3, this time with a different animal.
- Copy one of the scenes and add a title.
- Hand your final draft to your teacher.

Testing:

Each narrative will be folded and given to another group. Each group will observe the other group's narrative and infer what they believe happened. Then, the groups will check for accuracy.

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

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

Directions: Use your imagination to answer the statement below.

Describe organ



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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!

Drip, Drop, Splat!

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

Materials:

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

Procedure:

1. Make a hypothesis of how density of a liquid will effect splatter size on your lab sheet.
2. Place the piece of paper down on the lab table in order to catch splatters.
3. 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.
4. Use the eye dropper to drop ONE drop of colored water and ONE drop of colored syrup. Make sure to drop on different places of paper.
5. Measure the size of the splatter in MILLIMETERS. Record in data table on answer sheet.
6. Repeat for each height.
7. Use the collected data to graph the splatter size versus drop height for each liquid.

Analyze and Conclude

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

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Hypothesis

Drop Height (cm)

	5	25	50	75	100
Colored Water					
Colored Syrup					

Height of Drop vs. Splatter Size

Legend

- Water
- Syrup

Height of Drop (cm)

Size of Splatter (mm)

Analyze and Conclude:

1. _____
2. _____

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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

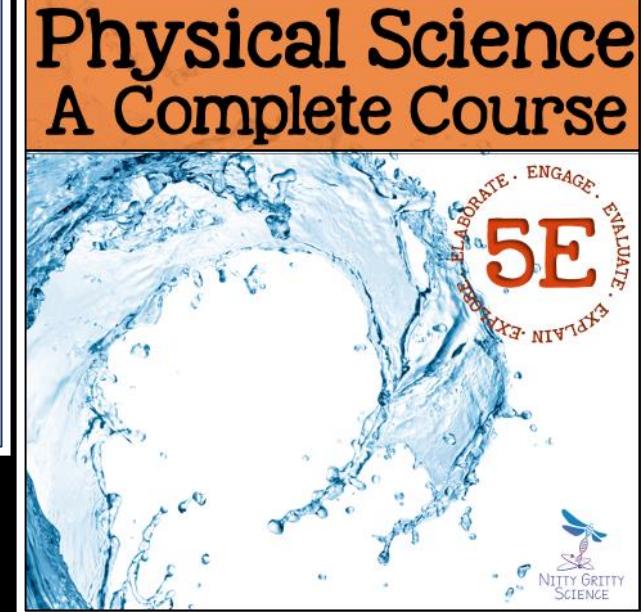
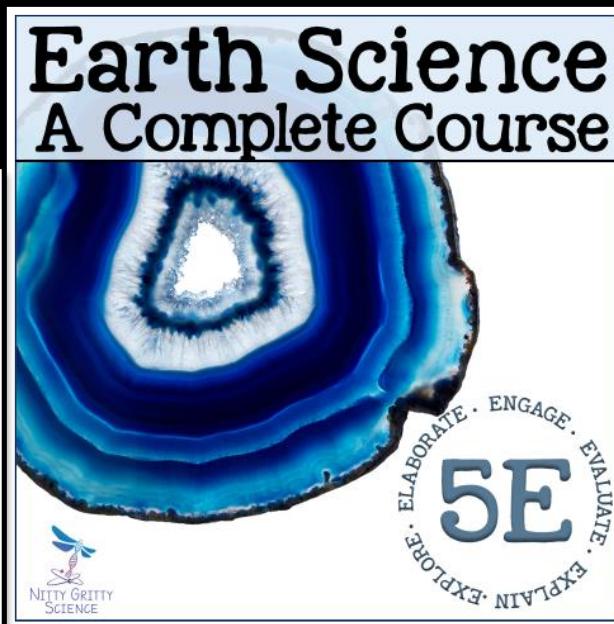
 Guided Inquiry Lab

 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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Contact Information:

Email: erica@nittygrittyscience.com

Website: www.nittygrittyscience.com

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