Exploring the Geosphere

Topic: Elements of the Geosphere
Grade: 4th
Time: Approximately 6 to 7 days

Background Information: This series of lessons will take place after our unit on Earth's features. During this time, the students will get a general understanding of the four spheres and how they interact with each other. Before this, they will have general knowledge in regards to the layers of the Earth, weathering, and erosion. After this unit, students will have a more comprehensive understanding in regards to how the geosphere works, what is encompassed within the geosphere, and how the geosphere impacts the world around them.

NGSS:

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Developing and Using Models- modeling in 3-5 builds on K-2 experiences and progresses to build and revise simple models and using models to represent events and solutions ● Develop a model using an example to describe a scientific principle	ESS2.1- Earth Materials and Systems; Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Wind and clouds in the atmosphere interact with the landforms to determine patterns of weather.	Systems and System Models- A system can be described in terms of its components and their interactions

Day 1- What is the Geosphere?
Standards:
5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, atmosphere, and/or hydrosphere interact

5-ESS3-1 Combine information about ways individual communities use science ideas to protect the Earth's resources and environment

RI.4.1: Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text

RI.4.2: Determine the main idea of a text and explain how it is supported by key details; summarize the text

Objectives:
Students will be able to define the geosphere in their own words
Students will be able to describe the many elements of the Earth that make up the geosphere
Students will be able to explain the impact that the geosphere has on their lives

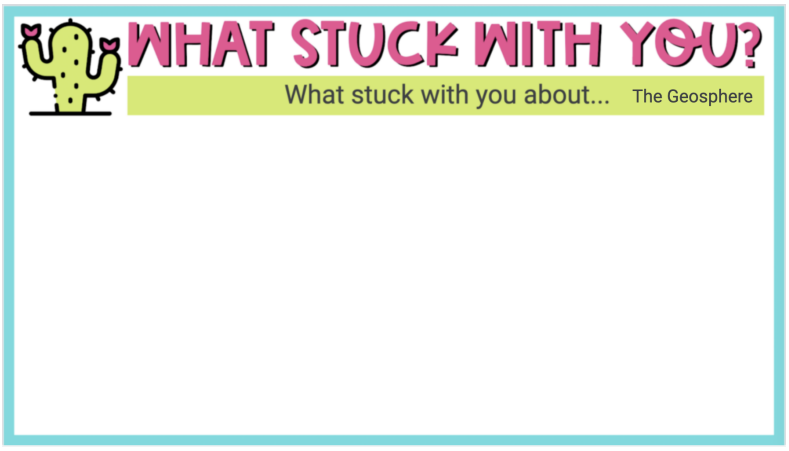
Materials:
- The Geosphere: Educational Video for Kids (link)
- "The Geosphere" article (link)
- "What's the Big Idea…About Earth" (link)
- Comprehension questions
- Chromebooks
- Access to Jamboard online

Procedure:
Engage:
- Turn and talk: What do you know about the word geosphere? What are you wondering?
    - Circulate room as students discuss, prompting with questions if necessary
    - Listen for prior understanding of the topic as well as any misconceptions students have
    - Share and discuss
- Introduce the term geosphere as the part of the Earth that is made up of rocks and minerals. This starts at the ground and goes all the way into the Earth's core. Discuss that this week we will be focusing on and learning all about different topics related to the geosphere including soil moisture, volcanic activity, and tectonic plates. Throughout the week, we will analyze data and identify patterns related to the geosphere to try to find solutions to this ongoing problem.

Explore:
- Watch video titled: The Geosphere (link)
    - Turn and talk: What did you learn about the geosphere from this video? What are you still wondering?
- Review that in the video, the narrator mentioned that the geosphere is made up of many moving parts including tectonic plates, the lithosphere, and the Earth's crust. Today

students will get a chance to explore more about the geosphere and how its ongoing changes impact our everyday lives.

- Split students into groups of 3-4
    - Each group is given copies of "The Geosphere" (link)
    - Students read the article together, focusing on what the geosphere is comprised of and how it impacts their lives
    - Individuals post one of the following on the class Jamboard: something you learned, something you are wondering, or an important idea from the text
    - Pull Jamboard up on Promethean board, give students opportunity to elaborate on their thinking



Jamboard where students will post their response to article

Explain:

- Discuss that the purpose of reading this article was to get a better understanding of what the geosphere is and how it has an impact on our daily lives
- Introduce that the article mentions terms such as erosion, tectonic plates, and fossilization. All of these terms will be further explained throughout the week

Elaborate:

- Students independently read the article "What's the Big Idea…About Earth" assigned via ReadWorks website. This can be differentiated to meet the needs of the different learners in the classroom. Students also have the option to have the article read aloud to them as they follow along (link)
- After reading, students complete corresponding comprehension questions to demonstrate understanding

What's the Big Idea...About Earth

by American Museum of Natural History

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

Our Earth Is Always Changing

The Earth formed over 4.5 billion years ago, and it has been changing ever since.

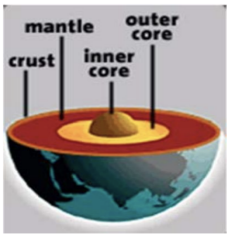
Sometimes these changes happen very fast. An earthquake can split the ground in a few seconds. Lava from a volcanic eruption can spread over the side of a volcano in minutes. A heavy rainstorm can flood a neighborhood in a day. These changes are easy to see.

But most changes happen so slowly we don't notice them at all. The continents slowly creep across the surface of the Earth at an average speed of eight centimeters a year. Over hundreds of millions of years, mountains form, and then slowly erode away.

How do Earth scientists know about these changes? They do a lot of detective work, and they look for clues all over the Earth!

Photo Credit: NPS

The Grand Canyon started to form about six million years ago.



Illustrations: Courtesy of AMNH

The Earth's Layers

The inner core is a solid ball made almost entirely of two metals, iron and nickel. It's hotter here than on the surface of the Sun!

Earth's Layers Work Together

Under your feet, the Earth's different layers are moving and interacting all the time. All the layers work together in a system, and each one plays an important role.

Here's just one way they all work together:

- Intense heat flowing out of the core and mantle makes the mantle flow in circles.
- The motion of the mantle causes the plates to move.
- The moving plates create volcanoes.
- The volcanoes release gases into the atmosphere.
- The atmosphere acts like a giant blanket, keeping the planet warm.

This makes life on Earth possible!

Illustrations: Courtesy of AMNH

Rocks Tell Stories About the Earth

Rocks hold important clues about our planet. They reveal secrets about remote places we can't go to and about distant times in the past.

Scientists might not be able to travel inside an erupting volcano, to the bottom of the ocean, or across the solar system. But they can learn about the conditions in these places from rocks they collect.

Rocks also give scientists a look back in time. We know about life long ago from the fossils held in sedimentary rocks. Fossils tell us when, where, and how ancient plants and animals once lived on the Earth.

Rocks can also tell us about the history of Earth itself. They hold clues to how the Earth formed and how it's changed over billions of years.

Photo Credit: USGS

Earthquakes change the landscape suddenly, but are caused by pressure built up over a long time.

A Peek Inside Our Planet

The Earth is made of different layers.

We live on the Earth's crust, a layer of rock about 30 kilometers (22 miles) thick. That might seem thick, but it's actually very thin, considering the size of the Earth. The Earth's crust and some of the mantle below is broken up into large pieces called tectonic plates.

The mantle is a thick layer just under the crust. It's as hard as rock, but it's actually flowing very slowly, about as slowly as your fingernails grow.

The outer core is a liquid layer, made mostly of iron and

nickel, that moves around the inner core. This motion causes the Earth to act like a giant magnet.

Photo Credit: USGS

Movement of the plates causes volcanoes and earthquakes and forms mountains and continents.

Photo Credit: NOAA

Early in the Earth's history, water vapor from volcanoes helped form our oceans.

Humans Are Just a Tiny Part of Earth's Long History

Our planet Earth formed 4.5 billion years ago. That's a really, really long time ago! Humans like us have only been around for 30,000 years. That's just a small part of the Earth's past.

It's hard to picture the Earth's long history. Here's one way to do it. Imagine the entire history of the Earth squeezed into just twelve hours, from noon to midnight.

When we think of time in this way, humans have only been around three seconds!

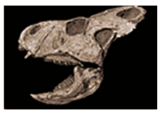


Photo Courtesy of AMNH

This is a fossil of Protoceratops, an animal that lived about 80 million years ago.

Photo Credit: NPS

This marine fossilrich rock was found high on the Guadalupe Mountains in west Texas.

All Rocks Are Made of Minerals

Whether it's a rock in your backyard or in a canyon wall, almost every rock you've ever seen is made of minerals.

Rocks are different because they have different types and amounts of minerals in them. One way scientists identify rocks is by looking closely at their minerals. For example, the rock sandstone is made of the mineral quartz. The rock granite contains quartz too, but it also has other minerals like mica and feldspar.

The kinds of minerals in a rock give clues to where the rocks formed. A rock with the mineral garnet probably formed deep in the Earth, like under a mountain. A rock with the mineral muscovite probably formed on land.

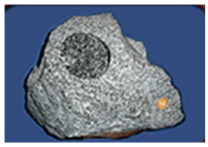


Photo Courtesy of AMNH

This is a rock called gabbro. It's made of the minerals plagioclase, clinopyroxene, and orthopyroxene.

Photo Courtesy of AMNH

A piece of gabbro was crushed. Its three main minerals were separated.

There Are Three Types of Rock

Rocks come in all sizes, shapes, colors, and textures.

Despite their differences, there are three basic types of rocks:

Igneous (IG-nee-us) rocks form from melted rock, or magma, that comes from inside the Earth. Sometimes the magma erupts from a volcano, and then cools and hardens at the Earth's surface. Magma can also cool slowly and form rocks underground. Igneous rocks are brand-new rocks. They don't form from other rocks.

Sedimentary (sed-uh-MEN-tuh-ree) rocks form from tiny pieces of rock that are broken down by wind and water. Over time, these pieces settle in layers with sand, silt, dead plants, and

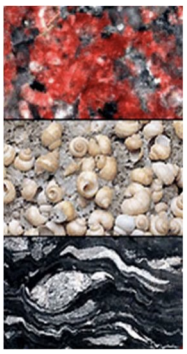


Photo Courtesy of AMNH

Top: Igneous Middle: Sedimentary Bottom: Metamorphic

Metamorphic (meh-tuh-MOR-fik) rocks form from igneous, sedimentary, and even other metamorphic rocks deep in the Earth's crust. When these rocks are heated and squeezed, they slowly change into new, metamorphic rocks.

Scientists Discover Things About Our Planet All The Time

In the 1960s, scientists discovered evidence that the Earth's crust and upper-most mantle are broken into plates that are always moving.

In the late 1970s, scientists found hot-water vents at the bottom of the ocean where plates are moving apart.

In 2004, scientists discovered that there once was liquid water on Mars. Other planets could

hold important clues to the history, or future, of our own planet Earth.

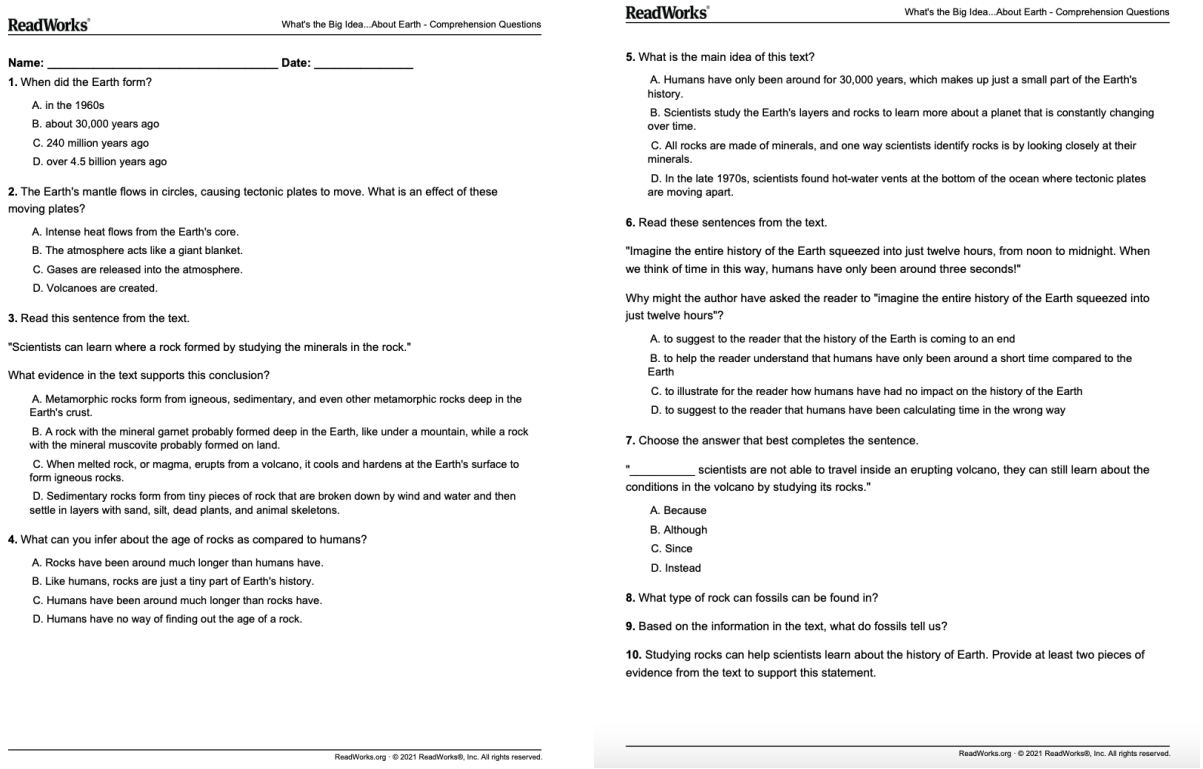
Scientists are always exploring new mysteries. Sometimes they do fieldwork, traveling to places like volcanoes or earthquake sites. Other times they do experiments in labs, recreating conditions deep inside the Earth where we can't go.

We have learned a lot about our Earth, but there is much more to learn. What will scientists discover tomorrow? Will that scientist be YOU?

Photo Credit: USGS

A scientist might gather rocks at a volcano to find out why it erupted.

What's the Big Idea…About Earth article (ReadWorks)



ReadWorks® What's the Big Idea...About Earth - Comprehension Questions

Name: _____ **Date:** _____

1. When did the Earth form?

A. in the 1960s
B. about 30,000 years ago
C. 240 million years ago
D. over 4.5 billion years ago

2. The Earth's mantle flows in circles, causing tectonic plates to move. What is an effect of these moving plates?

A. Intense heat flows from the Earth's core.
B. The atmosphere acts like a giant blanket.
C. Gases are released into the atmosphere.
D. Volcanoes are created.

3. Read this sentence from the text.

"Scientists can learn where a rock formed by studying the minerals in the rock."

What evidence in the text supports this conclusion?

A. Metamorphic rocks form from igneous, sedimentary, and even other metamorphic rocks deep in the Earth's crust.
B. A rock with the mineral garnet probably formed deep in the Earth, like under a mountain, while a rock with the mineral muscovite probably formed on land.
C. When melted rock, or magma, erupts from a volcano, it cools and hardens at the Earth's surface to form igneous rocks.
D. Sedimentary rocks form from tiny pieces of rock that are broken down by wind and water and then settle in layers with sand, silt, dead plants, and animal skeletons.

4. What can you infer about the age of rocks as compared to humans?

A. Rocks have been around much longer than humans have.
B. Like humans, rocks are just a tiny part of Earth's history.
C. Humans have been around much longer than rocks have.
D. Humans have no way of finding out the age of a rock.

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ReadWorks® What's the Big Idea...About Earth - Comprehension Questions

5. What is the main idea of this text?

A. Humans have only been around for 30,000 years, which makes up just a small part of the Earth's history.
B. Scientists study the Earth's layers and rocks to learn more about a planet that is constantly changing over time.
C. All rocks are made of minerals, and one way scientists identify rocks is by looking closely at their minerals.
D. In the late 1970s, scientists found hot-water vents at the bottom of the ocean where tectonic plates are moving apart.

6. Read these sentences from the text.

"Imagine the entire history of the Earth squeezed into just twelve hours, from noon to midnight. When we think of time in this way, humans have only been around three seconds!"

Why might the author have asked the reader to "imagine the entire history of the Earth squeezed into just twelve hours"?

A. to suggest to the reader that the history of the Earth is coming to an end
B. to help the reader understand that humans have only been around a short time compared to the Earth
C. to illustrate for the reader how humans have had no impact on the history of the Earth
D. to suggest to the reader that humans have been calculating time in the wrong way

7. Choose the answer that best completes the sentence.

"_____ scientists are not able to travel inside an erupting volcano, they can still learn about the conditions in the volcano by studying its rocks."

A. Because
B. Although
C. Since
D. Instead

8. What type of rock can fossils can be found in?

9. Based on the information in the text, what do fossils tell us?

10. Studying rocks can help scientists learn about the history of Earth. Provide at least two pieces of evidence from the text to support this statement.

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Comprehension Questions via ReadWorks

Assessment:

Evaluate- To check for understanding, the teacher will assess students both formally and informally. In regards to the informal assessment, the turn and talk responses, and post-it note on the Jamboard will be taken into consideration (formative). In order to plan for future instruction and student understanding, learners will also be assessed according to their responses to the comprehension questions and evidence that they use to support their thinking on ReadWorks (summative).

Day 2: What is Soil Moisture? How does it Impact Us?

Standards:

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, atmosphere, and/or hydrosphere interact

Objectives:

Students will be able to define and explain soil moisture
Students will be able to explain how fluctuations in soil moisture impacts their daily lives
Students will be able to analyze and draw conclusions using authentic soil moisture data

Materials:

- Real World: What is Soil Moisture? Video (link)
- Soil Moisture data via My NASA Data (link)
- Graph Cubes via My NASA Data
- Graph Cube Questions via My NSA Data
- Soil Moisture Quiz (link)

Engage-

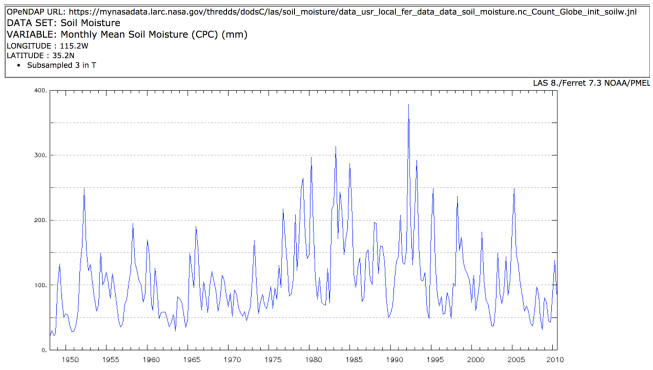
- Remind students that yesterday they were introduced to the geosphere, which is made up of all the rocks and minerals on the planet
- Review that the geosphere is made up of other elements on the Earth such as the tectonic plates, volcanoes, and soil moisture
- Today we will be focusing on soil and how the moisture of it has an impact on our planet

Explore-

- Turn and talk: What do you know about soil moisture? What are you wondering?
    - Circulate room as students are discussing, prompting whenever necessary
    - Listen for misconceptions and questions that students have regarding this topic
- Watch and discuss video- Read World: What is Soil Moisture? (link)
    - Students shared what they learned and are still wondering about soil moisture
- Introduce that today we will be using real data from the Mojave National Reserve in Nevada to discuss and formulate patterns in regards to soil moisture

Explain-

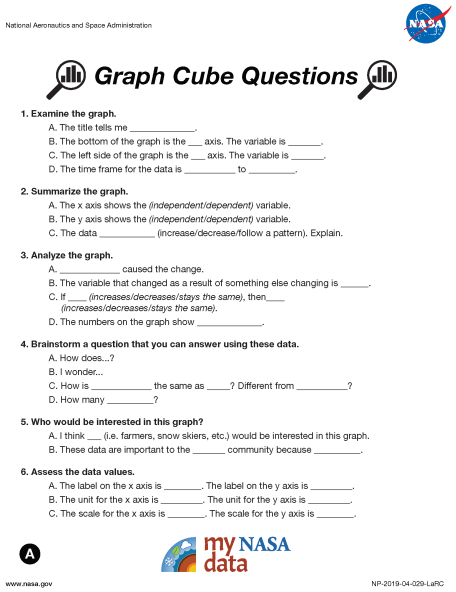
- Introduce data, highlighting key components including the title, x axis, y axis, etc.
- Students share what they notice and what they wonder about the data and what it tells us about soil moisture
- Split students up into groups of 4-5, each group receives a copy of the Graph Cube
- As a team, spin the cube and respond to the following question on each face. Group members choose a recorder to write down group responses
    - 1. Examine the graph- what do you notice?
    - 2. Summarize the graph
    - 3. Analyze the graph
    - 4. Brainstorm questions that you can answer using the data
    - 5. Who would be interested in this graph?
    - 6. Assess the data values
- After students are done working with their teams, share out and discuss as a class



My NASA Data on Soil Moisture in the Mojave National Preserve

Elaborate-

- After reviewing and discussing group responses using the Mojave data, students practice interpreting data independently using Graph Cube Questions
- Students are given individual copies of data as well as questions which they will respond to for teacher assessment
- Once students are done working, discuss responses as a class
- To wrap up, students complete Soil Moisture quiz (link)



National Aeronautics and Space Administration

Graph Cube Questions

1. Examine the graph.

A. The title tells me _____.
B. The bottom of the graph is the ___ axis. The variable is _____.
C. The left side of the graph is the ___ axis. The variable is _____.
D. The time frame for the data is _____ to _____.

2. Summarize the graph.

A. The x axis shows the *(independent/dependent)* variable.
B. The y axis shows the *(independent/dependent)* variable.
C. The data _____ (increase/decrease/follow a pattern). Explain.

3. Analyze the graph.

A. _____ caused the change.
B. The variable that changed as a result of something else changing is _____.
C. If ____ *(increases/decreases/stays the same)*, then____ *(increases/decreases/stays the same)*.
D. The numbers on the graph show _____.

4. Brainstorm a question that you can answer using these data.

A. How does...?
B. I wonder...
C. How is _____ the same as _____? Different from _____?
D. How many _____?

5. Who would be interested in this graph?

A. I think ___ (i.e. farmers, snow skiers, etc.) would be interested in this graph.
B. These data are important to the _____ community because _____.

6. Assess the data values.

A. The label on the x axis is _____. The label on the y axis is _____.
B. The unit for the x axis is _____. The unit for the y axis is _____.
C. The scale for the x axis is _____. The scale for the y axis is _____.

A

www.nasa.gov

my NASA data

NP-2019-04-029-LaRC

Graph Cube Questions which students will respond to independently using Mojave data

Assessment:

Evaluate- Students will be assessed for understanding in a number of ways throughout this lesson. First, students will be informally assessed based on their turn and talk discussions and cube work in their groups. To get a more comprehensive picture of each students' knowledge, they will also be assessed on their Graph Cube Questions and Soil Moisture quiz. The

information that I gain from these multiple assessments will help me to plan for and prepare future instruction.

Day 3: Soil Moisture Data
Standards:
5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact

4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation

4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features

Objectives:
Students will be able to analyze and describe a data set describing monthly soil moisture
Students will be able to propose a solution to the problem of increasing soil moisture levels

Materials:
- *Soil Moisture: Why Important, What Challenges, How to Measure & More* (link)
- Chart paper/markers
- Data from MyNASA Data (link)
- NASA's Minute: Dishing the Dirt (link)
- Chromebooks
- Access to Google Forms

Procedure:
Engage-
- Turn and talk: What do you remember about soil moisture? What are you still wondering about this topic?
    - Circulate room as students are sharing, listening to more information as to what they learned, are still curious about, and any further misconceptions that they have
    - Share and discuss responses as a class
- Watch and discuss video: "NASA's Earth Minute: Dishing the Dirt"
- Review and soil moisture is the amount of water in the soil. There are many ways that this impacts the Earth and the world around us.

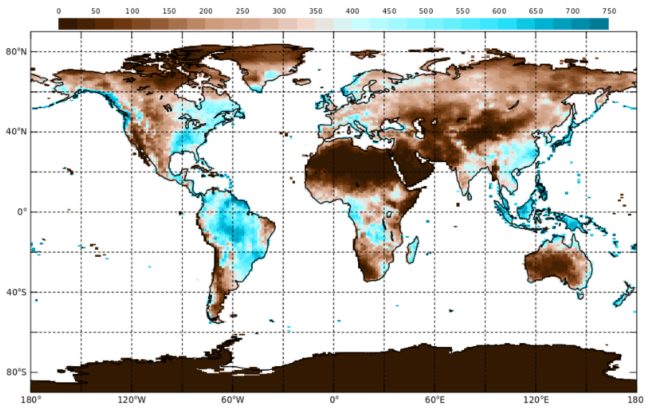
Explore-
- Discuss: What do you think are the challenges that are associated with changing soil moisture levels? How do you think this might impact our daily lives?
    - Share and discuss responses as a class

    - Complete “K” part of KWL chart, adding what students know about soil moisture
    - Use student wonderings to complete “W” part of the poster, adding what students want to know about soil moisture
- Read *Soil Moisture: Why Important, What Challenges, How to Measure & More* aloud, stopping at various points to clarify and discuss
    - After reading, complete “L” part of chart, adding what students learned about soil moisture

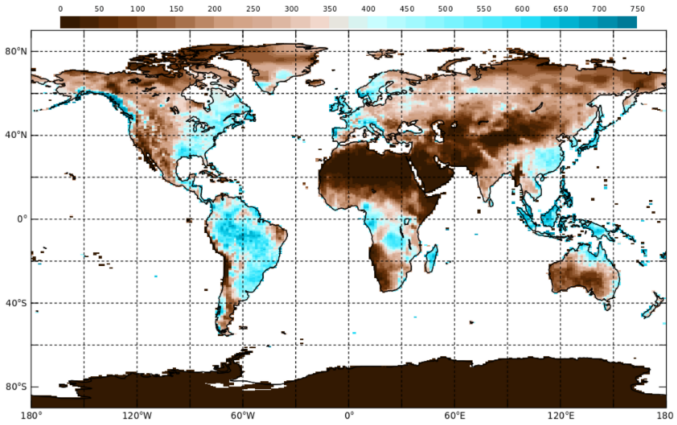
Example what soil moisture KWL chart may look like

Explain-

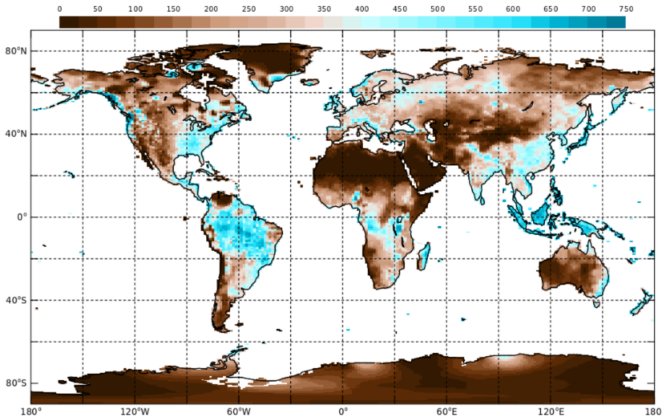
- Discuss that soil moisture contributes to a number of changes which impact their lives including: plant growth, water waste, and an increase in goods due to the measures which farmers need to keep track of and prevent a drastic change in soil moisture
- Introduce that today students will be observing and discussing real-data which represent the changes in which soil moisture has changed over the past few decades
    - Turn and talk: What do you think will happen to the soil moisture over time? Will it increase or decrease? Why do you think so?
    - Share and discuss as a whole class
- Students are split into groups and given a copy of each of the maps below. Working as a team, groups work together to record their observations, questions, and predictions
    - Present soil moisture data from January 1951, 2001, and 2022
    - Groups write down what they notice, wonder, patterns, questions, etc to share with the rest of the class. One group member records to share with the rest of the class.
    - As groups are working, circulate room to ensure of student success
- Once groups are done observing the data, share out findings as a class, discuss



January 1951 data



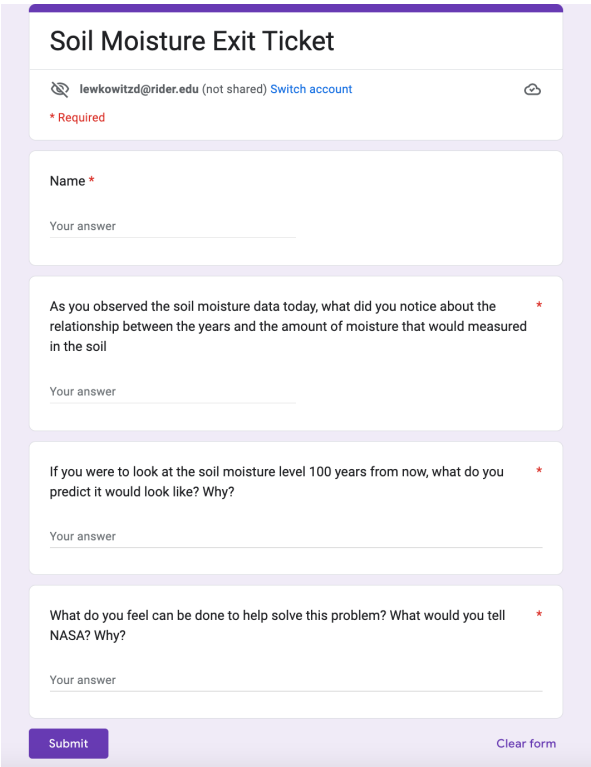
January 2001 data



January 2022 data

Elaborate:

- After groups share their findings, if time allows, students can share their individual observations and the patterns that they notice between the year the data was acquired, and the amount of moisture in the soil
- Google Form Response Exit Ticket
    - Students write the patterns that they analyzed in terms of the relationship between the years and the amount of soil moisture
    - Individuals come up with potential solutions to this problem, and ways that scientists can continue to monitor the moisture in the soil to predict future challenges



Exit Ticket that students will complete to demonstrate understanding

Assessment:

Evaluate- Students will be assessed for understanding in the following ways: turn and talk responses, group findings, and Exit Ticket answers. All of this information will be taken into consideration for planning out next steps for the rest of the week.

Days 4-6: What are Volcanoes?

Standards:

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact

4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features

Objectives:

Students will be able to define volcanoes
Students will be able to explain how volcanoes are formed
Students will be able to graph describe the relationship between tectonic plates and the Ring of Fire

Materials:

- All About Volcanoes: How They Form, Eruptions, & More! (link)
- BrainPop-Volcanoes (link)
- Volcano pictures from What is a Volcano? (link)
- Poster paper/markers
- Mystery Science lab (link)
- Chromebooks
- Access to Google Docs

Procedure:

Engage-

- Review and discuss that throughout the week we have worked on exploring aspects of the geosphere including soil moisture, and have analyzed examples of the ways that these elements have an impact on our lives
- Turn and talk: What do you know about volcanoes and how they are formed? What are you wondering?
    - Circulate room, listening for student responses and questions
    - Share out as a group
- Discuss that today we will analyze how volcanoes are formed and use our new knowledge to map out and predict whether we think a volcano could pop up in our backyard
- Watch video: All About Volcanoes: How They Form, Eruptions, & More!
    - Discuss key takeaways focusing on the introduction to tectonic plates and how they work together to form volcanoes

Explore-

- Introduce that today students will do a gallery walk where they will have an opportunity to analyze various pictures of volcanoes in order to demonstrate their prior understanding
- Split students into groups; these are the individuals that you will move from picture to picture with. When students come to a page they use their group color's marker to record observations, questions, etc. After approximately 3-5 minutes, switch to the next picture. Repeat until all groups have seen all pictures (below)

Lava fountain at Kīlauea Volcano, Hawai`i. Credit: J.D Griggs, USGS

This photograph shows an eruption of Mount St. Helens in Washington in July 1980. This eruption sent ash 6 to 11 miles (10-18 kilometers) into the air, and was visible in Seattle, Washington, 100 miles (160 kilometers) to the north. Credit: Mike Doukas, USGS

Lava bubbles up from Kīlauea Volcano in Hawai'i Volcanoes National Park. Credit: Scott Horvath, USGS.

Explain-

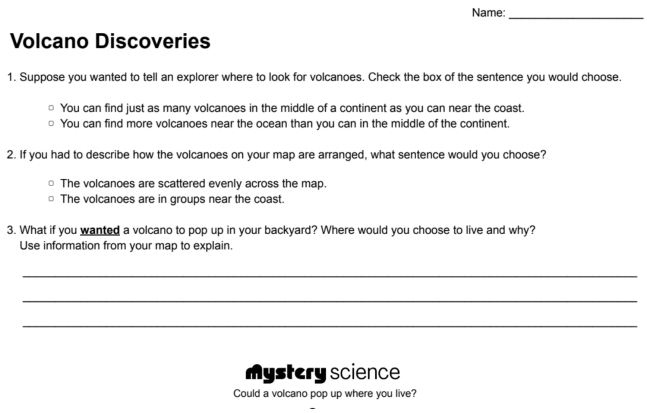
- Discuss that scientists have been working diligently to find new ways to track, predict, and reduce the impact of volcanoes on our planet. One way to do this is by analyzing and using what we know about tectonic plates to find patterns and make predictions
- Introduce tectonic plates as the shell of our planet. Like an egg, the shall can often break, but the pieces move around and fit together. This is similar to the way tectonic plates move. The plates can collide, slide, or move away from each other, resulting in various natural disasters such as earthquakes and tsunamis
- Watch Volcanoes BrainPop video, discuss
- Today we will be thinking like scientists to track locations where the most destructive volcanoes have formed, and use this information to answer the question: Could a volcano pop up in your backyard?
    - Take student predictions, using support to discuss

Elaborate-

Lesson modified from Mystery Science lab: Could a Volcano Pop Up Where You Live? (link)

- Students watch Mystery Science introductions video for a lab where they learn about a man in Mexico. One day a volcano began to form in the middle of the corn field in his backyard. We begin to learn more about where he lives and that his hometown of Paricutin is along a line of other volcanoes along the Ring of Fire
    - Turn and talk: What do you think? Could a volcano pop up where you live? Why or why not?

- Groups are split into groups. Each group is given an area of the world: North America, South America, Asia, and Australia & Nearby Islands
    - Groups are given the coordinates for the most destructive volcanoes in that region. Students work together to map out the coordinates and respond to the lab questions (below)



Name: _____

Volcano Discoveries

1. Suppose you wanted to tell an explorer where to look for volcanoes. Check the box of the sentence you would choose.

    ▫ You can find just as many volcanoes in the middle of a continent as you can near the coast.
    ▫ You can find more volcanoes near the ocean than you can in the middle of the continent.

2. If you had to describe how the volcanoes on your map are arranged, what sentence would you choose?

    ▫ The volcanoes are scattered evenly across the map.
    ▫ The volcanoes are in groups near the coast.

3. What if you **wanted** a volcano to pop up in your backyard? Where would you choose to live and why? Use information from your map to explain.

_____
_____
_____

mystery science
Could a volcano pop up where you live?

- Share out and discuss what students noticed about their region
- Take each of the four areas and tape together. Prompt students to realize that when all these volcanoes are placed together in one big picture, a circle is formed
    - Introduce that this is where the Ring of Fire happens, and the majority of the most destructive volcanoes takes place within this ring
- Using the map, find where students live
    - Turn and talk: Using this information, do you think a volcano can pop up where you live? Why or why not?

Evaluate-

Students will be assessed for understanding in a number of ways throughout this lesson including: their turn and talk responses, answers to the Mystery Science lab, and their final reflection. This will be the main form of assessment for this assignment, as it will allow individual students to show what they have learned about tectonic places and the geosphere over the past few days.

Based on what you have learned about the geosphere and tectonic plates, do you think a volcano could pop up where you live? Why or why not? Use evidence from the Mystery Science, classroom discussions, and prior lessons to support your thinking

Google Document where students will respond to question via Google Classroom

Criterion	**4**	**3**	**2**	**1**	**0**
Student understand relationship between tectonic plate boundaries and landforms	Relationship is clear in group reflection, exceeds expectations	Relationship is clear in group reflection, meets expectations	Relationship is somewhat clear in group reflection, partially meets expectations	Relationship is not clear in group reflection, does not meet expectations	Relationship between tectonic plates and landforms is not mentioned in response
Student designs a clear and concise response to answer the question using evidence from classroom lessons, labs, and discussions	Response is clear and concise and uses an abundance of resources to support	Response is clear and concise and uses resources to support	Response is somewhat clear and concise and uses some resources to support	Response is not clear and uses few resources to support	Response is not given and/or does not use any resources to support
Final presentation includes 4th grade spelling, punctuation, capitalization, etc.	Presentation has 0-2 errors	Presentation has 3-5 errors	Presentation has more than 5 errors	Presentation has more than 10 errors	N/A

Criterion which students will be assessed upon for their tectonic plates reflection

References

BrainPOP. (2017, August 24). *Plate Tectonics* [Video]. YouTube. https://www.youtube.com/watch?v=RA2-Vc4PIOY

Could a Volcano Pop Up Where You Live? (n.d.). Mystery Science. Retrieved November 6, 2022, from https://mysteryscience.com/rocks/mystery-1/volcanoes-patterns-of-earth-s-features/53

Earth System Data Explorer. (n.d.). My NASA Data. Retrieved November 6, 2022, from https://mynasadata.larc.nasa.gov/EarthSystemLAS/UI.vm

Happy Learning English. (2022, February 2). *The Geosphere | Educational Videos for Kids* [Video]. YouTube. https://www.youtube.com/watch?v=CM18jdpXDOE

My NASA Data. (n.d.). Retrieved November 6, 2022, from https://mynasadata.larc.nasa.gov/lesson-plans/data-literacy-cube-graph-data-using-soil-moisture-data

My NASA Data. (n.d.-b). Retrieved November 6, 2022, from https://mynasadata.larc.nasa.gov/mini-lessonactivity/what-volcano

NASA Climate Change. (2015, January 22). *NASA's Earth Minute: Dishing the Dirt* [Video]. YouTube. https://www.youtube.com/watch?v=hgsIFyITvJE

NASAeClips. (2013, October 28). *Real World: What Is Soil Moisture?* [Video]. YouTube. https://www.youtube.com/watch?v=aJ3KaDJ9chM

Ouyang, A. (2022, August 23). *Soil Moisture: Why Important, What Challenges, How to Measure & More*. Latest Open Tech From Seeed. https://www.seeedstudio.com/blog/2022/07/22/soil-moisture-why-important-what-challenges-how-to-measure-more/

ReadWorks. (n.d.). Retrieved November 6, 2022, from https://www.readworks.org/article/Whats-the-Big-IdeaAbout-Earth/6abaa1fb-93bd-4f77-ab49-cda339037e08

SciShow Kids. (2015, April 22). *All About Volcanoes: How They Form, Eruptions & More!* [Video]. YouTube. https://www.youtube.com/watch?v=K7Oq9_DU1Mc

Soil Moisture. (n.d.). NASA. https://climate.nasa.gov/quizzes/soilmoisture-quiz/

The Geosphere | Center for Science Education. (n.d.). UCAR. Retrieved November 6, 2022, from https://scied.ucar.edu/learning-zone/earth-system/geosphere