

UbD and the Idaho State Science Standards Unit Planner

Grade level: Grades 4, 5 and 6

Unit topic: The History of our Changing Earth

1. Idaho State Science Standards (ISSS) and Idaho Core Standards

<p>ISSS Performance standards:</p> <ul style="list-style-type: none">● Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.● Analyze and interpret data from maps to describe patterns of Earth's features.● Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.● Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	<p>ISSS scientific practices:</p> <ul style="list-style-type: none">● Constructing explanations and designing solutions● Developing and Using Models● Analyzing and Interpreting Data● Engaging in an Argument from Evidence <p>ISSS crosscutting concepts:</p> <ul style="list-style-type: none">● Patterns● Systems and System Models● Cause and Effect● Scale Proportion and Quantity● Stability and Change
<p>ISSS supporting content:</p> <ul style="list-style-type: none">● Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches.● Maps of ancient land and water patterns, based on investigations of rocks and fossils, make it clear how Earth's plates have moved great distances, collided and spread apart.● There are three classifications of rocks produced within the rock cycle: sedimentary, metamorphic and igneous.● The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain ranges form in side continents or near their edges. Maps can help locate the different land and water feature areas of Earth.● 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.	
<p>Idaho Core Standards:</p> <ul style="list-style-type: none">●	

2. Threshold Knowledge:

- Geologic time is vast with very slow processes causing big changes over time--the differentiation of the layers of the earth, the movement of the tectonic plates--and low frequency, high impact events causing sudden change--volcanoes or earthquakes.
- Earth is a complex, complicated system--cause and effect is part of the basic understanding of Earth's processes.

- Thinking about and/or visualizing the spatial arrangement of things we can't see with our own eyes is central to the understanding of our Earth--layers of earth, movement of continents or Earth's plates.

3. Culminating outcomes:

- Project 1: Construct a model of the earth and its layers. Identify each of the parts of the earth and tell its story.
- Project 2: Construct an explanation based on evidence (from your research and the class created map) for how the Earth's crustal plates interact with each other and how do those interactions affect the people that live near plate boundaries.
- Project 3: Choose one type of rock (sedimentary, igneous, metamorphic) and tell the story of the rock, beginning as far back as you can. (Can you go all the way back to the beginning of the earth?)
- Project 4: Using what you have learned about the evolution of the Earth and its features, construct an explanation based on evidence for how geoscience processes have affected Idaho/the West Coast/the United States (poster? story? collage?--student choice)

3a. Essential question(s):

- What stories does the Earth tell us about its evolution?

3b. Guiding questions:

- How do we "read" the rocks?
- How do the rocks tell us the story of the Earth?
- Why are there ocean basins, continents and mountains?
- Why do Earth's Tectonic plates move?
- How does plate movement contribute to volcanic and earthquake activity?

4. Progression of learning:

- Week 1: Geosphere/Story of the Earth (What story does the Earth tell us?)
 - KWHL for story of the Earth (formation of the Earth) Include vocabulary they are already familiar with
 - Tell/read the story of the Earth...students take notes in their journals--write interesting /important facts, vocabulary (Use frayer model) they don't know and wonderings.
 - Complete whole class mind map after Story of the Earth--keep up for whole unit and add as we go.
 - Grapple with the question...How do Scientists know/learn about the layers of the earth if they can't cut the earth open? (Bring in a really unusual fruit that

students have not seen before--Jackfruit, dragonfruit, kiwano-horned fruit, rambutan are good options depending on your kiddos and what you can find at the grocery store. Have students try to determine what the inside of the fruit looks like without cutting it open...Brainstorm possible ways and test.)

- In small group centers, students will complete research to find more specific information about the layers/parts of the earth. (Teacher will provide appropriate sources. See Resources below) They will also complete layers/parts of the earth puzzle using what they remember from the Story of the earth.
- Complete Project 1: Model of Earth's layers and story of Earth's layers.

Resources:

1. <http://volcano.oregonstate.edu/earths-layers-lesson-1>
2. <http://www.forbes.com/sites/trevornace/2016/01/16/layers-of-the-earth-lies-beneath-earth-s-crust/#7be8e67c58e6>
3. <http://www.scienceforkidsclub.com/earths-layers.html>
4. http://www.ducksters.com/science/composition_of_the_earth.php
5. <http://www.coolkidfacts.com/layers-of-the-earth-for-kids/>
6. <https://www.bighistoryproject.com/chapters/2#the-rock-we-call-home>

- Week 2: Plates and Continents (How has Earth evolved?)
 - Present a list of natural disasters from history.
 - Students choose natural feature/disaster to research. They should find the effects/results/damage of the event, the change in the Earth that resulted from the event and the location using GPS coordinates.
 - Students can collect the information from their research on a notecard.
 - As a group, plot the disasters on a classroom map--full size wall map--using the latitude and longitude where the disaster occurred. Use multi-colored dot stickers to mark the location of each disaster. (If multi-colored stickers are not available, use plain stickers and draw small symbols for each type of disaster. I used red dots for volcanoes, green dots for earthquakes and blue dots for tsunamis.)
 - While the class is plotting the dots together, each student has an individual map and all students are plotting the same disasters at their seats too.
 - Have students hypothesize about why the disasters are located in those specific places. Use chart paper to record and keep for later.

***Note with only 21 students, our disaster plotting did not result in the pattern I wanted--too few points. I decided to add more volcanoes using a Mystery Science website activity. (See link below.)

- Complete the Mystery Science (mysteryscience.com) activity called **Could a Volcano Pop Up in Your Backyard.**
- Revisit hypothesis list. Does new information give us any more insight into why the disasters happen where they do? Revise, edit and add to list.
- Present a map with tectonic plate boundaries and have students plot volcanoes and disasters on this new map too. (Each student gets their own map.)

- Revisit hypothesis list. Does new information give us any more insight into why the disasters happen where they do? Revise, edit and add to list.
- Present the three types of tectonic plate boundaries using active, hands on activities. (Some possibilities are in the resource section below, or choose your own activities.)
- Revisit hypothesis last one last time...What do they know now that they didn't know before? What is their new hypothesis about why the disasters happened where they did? What about the disaster they researched? Why did it happen?
- Return to the map...Students will use what they know about plate boundary movement to create a graphic organizer showing the common attributes of the events along different types of plate boundaries.
- Complete Project 2

Resources:

<http://www.learner.org/interactives/dynamicearth/>
<http://www.learner.org/courses/essential/earthspace/timeline/index.html>
<http://www.montessorimom.com/newsletter-plate-tectonics/>
<https://pubs.usgs.gov/gip/dynamic/understanding.html>
<https://mysteryscience.com/rocks/mystery-1/volcanoes-rock-cycle-earth-s-surface/53?r=7745534>
http://geology.com/nsta/pt_drawings.pdf
<http://geology.com/nsta/>

- Week 3: Types of rocks/rock cycle (What stories do rocks tell?)
 - Students will work in small groups to sort of large quantity of rocks of all different types according to attributes they choose and must provide explanations for each of their choices
 - Groups will compare attributes and observations and begin to narrow the number of attributes if necessary.
 - Groups will use the attributes/observations to “read the story” of each type of rock. (Where did it come from? how was it formed? how are they related?)
 - Using the story of each type of rock, (And possible further research/reading) students create their own diagram of the Rock cycle.
 - Complete Project 3

Resources:

<https://www.nasa.gov/sites/default/files/rockingtherockcycle.pdf>
<http://www.ducksters.com/science/rocks.php>
<http://www.rockcollector.co.uk/rocktype.htm>

- Week 4: Culminating Unit Project
 - Complete Project 4

Frontloading (ISSS crosscutting concepts, etc.):

- KWLH
- Mind Map
- Rock Sort

5. Ongoing formative assessment:

- Science journal checks
- Puzzles
- Discussions
- Group Check-ins
- Mind map completion
- Vocabulary (frayer model completion)