

LET'S EXPLORE THE GREAT BIG BLUE

Interpreting Maps to Determine Oceanic and Geological Features

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Let's Explore the Great Big Blue

A Lesson on Interpreting Maps to Determine Locations of Mountain Ranges, Deep Ocean Trenches, Volcanoes, Earthquakes and Natural Patterns

Lesson 4 of 6

Skill Level

Beginner (4th/5th Graders)

Educational Standards Supported

4ESS2.2, 4ESS2.4

Learner Outcomes

The learner will be able to:

- Interpret maps
- Demonstrate understanding of locations of deep ocean trenches and how they occur in patterns

Tag(s)

4-H Science

Time Needed

30-45 minutes

Materials Needed

- LCD Projector/Computer
- Random sized items (straws, cotton balls, magnetic letters, etc.)
- Fabric scraps
- Paper
- Pencil/ Markers/ Writing Utensil
- Pipe Cleaners
- Paper cups

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Introduction to Content

Maps are used on a daily basis and can be extremely valuable. This lesson will show youth maps in several forms and how they can be used in each form, including how to find natural patterns.

Introduction to Methodology

Students will discuss maps, explore them and read several. Then they will make a map.

Terminology/ Vocabulary/ Concept

Ocean trenches – steep depressions in the deepest part of the ocean

Tectonic Plates – large, irregularly shaped slabs of rock, or lithosphere, that make up earth's crust

Map key/ Legend – a set of symbols, colors and lines that explain what the different parts of a map represent

Subduction – a geophysical process in which two or more of earth's tectonic plates converge

Oceanic Crust - outermost layer of earth's lithosphere that is found under the ocean

Continental Crust - outermost layer of earth's lithosphere that is found under continents

Terminology/Vocabulary/Concept

Trenches, most commonly found in the Pacific Ocean, can be found all over the world. The deepest trench is the Mariana Trench and is 1,580 miles long and averages 43 miles wide.

Oceanic crust is composed of basaltic rock, making it denser than the continental crust, composed igneous, metamorphic and sedimentary rock. When tectonic plates converge, the older, denser plate is pushed beneath the lighter plate and deep into the mantle.

Setting the Stage/Opening Question

Open the lesson about maps. Show a school map/county map and talk about locations of schools and distances.

Then begin the full-class group activity “Let’s Make a Map.”

Pick two “landforms” (a bulletin board, pencil sharpener, teachers’ desk, class door, etc.)

Instruct the class on the steps to make a map between the two landforms. For example, the agent should pick a spot in the room to stand, and the youth must create a map between the agent and the object. Discuss which direction to go and what could potentially be the shortest distance.

As they make the map, students should remember obstacles in way.

Ask, “How many steps are there between the two locations?”

Include other distractions/hindrances/barriers that may be between the two.

Test the map to see how easy it is to follow.

Strategies to Increase Student Engagement

Compare the deepness of the trench to a real-life measurement to help youth understand how deep it is.

Experience

Show this video about ocean trenches (4 minutes in length):

youtube.com/watch?v=A98wPKiPMJw&t=239s

After the video, ask youth the following questions:

What are tectonic plates? **Answer** - In plate tectonics, Earth's outermost layer, or lithosphere—made up of the crust and upper mantle—is broken into large rocky plates. These plates lie on top of a partially molten layer of rock called the asthenosphere. Due to the convection of the asthenosphere and lithosphere, the plates move relative to each other at different rates, from two to 15 centimeters (one to six inches) per year. This interaction of tectonic plates is responsible for many different geological formations such as the Himalayas, a mountain range in Asia, the East African Rift and the San Andreas Fault in California.

What is the difference between oceanic and continental plates? **Answer** - **seafloor vs. continents**

Say, "When the denser oceanic plate moves under the less-denser oceanic plate we have created a trench."

Show seafloor diagram.

Say, "As the video stated at the end, if we were to drain all the water out of the ocean what would we find. Well, here are a few maps that have been created to give us a better visual."

- education.nationalgeographic.org/resource/ocean-trench/
- www.kids-fun-science.com/ocean-trenches.html

Hands-on activity with less time needed:

1. Sort youth in partners or groups of three
2. Give each pair a bag that contains two paper cups and a few pipe cleaners
3. Turn cups upside down and attach pipe cleaners to bottom of cup (Tape, staple, or puncture through bottom of cup)
4. One partner creates hills and valleys with the pipe cleaners
5. Grab a piece of paper and fold in half
6. Partner two will draw a horizontal map of the "trench" outline on top half of paper
7. Remove pipe cleaners and lay across bottom half of page and trace
8. Have groups discuss and compare
9. See how many groups had similar patterns to their horizontal maps

Hands-on activity with more time needed:

1. Sort youth into groups of 3-4
2. Disperse bags with all materials to each group
3. Have one student create a pattern with the different sized items, then cover with the fabric (all other students should have eyes closed)
4. Have the other student feel the ridges and valleys created by running their hands over the fabric
5. After feeling the landscape, have them try to draw a horizontal view of the "mountains" and "trenches"
6. Have the group discuss and compare
7. Walk groups through the steps and process of making a topographic map from the top of the "fabric" landscape
8. See how many groups had similar patterns to their horizontal maps

Share/Process

Say, "Ocean trenches are some of the most hostile habitats on Earth. Pressure is more than 1,000 times that of the surface, and the water temperature is just above freezing. Ocean trenches happen in natural patterns when the denser oceanic plates move under the less dense oceanic plate. In a subduction zone, some of the molten material—the former seafloor—can rise through volcanoes located near the trench. The volcanoes often build volcanic arcs—mountain ranges that lie parallel to the trench. Ocean trenches are found in every ocean basin on the planet, although the deepest ocean trenches ring the Pacific as part of the so-called 'Ring of Fire' that also includes active volcanoes and earthquake zones."

Say, "We explored creating our own maps in hopes to notice patterns that scientists have connected with ocean trenches to the location of volcanoes and earthquakes. If you enjoyed creating maps today, there are several careers you can consider which include the following:

- Surveyor
- GIS work
- Urban planning
- Geography
- Electrical grid planning and maintenance."

Ask, "What did you learn today?"

Ask, "What is something you will research further after today's lesson?"

Notes

Generalize

Ask, "Would you like to travel to one of the ocean trenches?"

Ask, "Did you like creating maps today? Why or why not?"

Apply

Ask, "What were similarities between your group map versus other groups?"

Ask, "If you were to tell someone what you learned today, what would you say?"

Supplemental Information

Educational Standards Met

Earth Systems

- 4ESS2.2 Interpret maps to determine that the locations of mountain ranges, deep ocean trenches, volcanoes and earthquakes occur in patterns.
- 4ESS2.4 Analyze and interpret data on the four layers of the Earth, including thickness, composition and physical states of these layers.

TIPPS *Life Skills*

4th Grade

Heart – Actively listening to what others are saying, be able to restate or summarize what has been said

5th Grade

Head – Communicate information learned from a specific project area

Heart – Understand one's ability, strengths, and limitations

Hands – Define issues of a given problem or situation

Hands – As part of a group, identify and agree on a common task or goal

References

education.nationalgeographic.org/resource/ocean-trench/

kids-fun-science.com/ocean-trenches.html

kids.britannica.com/students/article/Mariana-Trench/632233

data-tiptoncountygis.hub.arcgis.com/datasets/TiptonCountyGIS::schools/explore

personal.utdallas.edu/~rjstern/pdfs/TrenchProof.pdf



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