

Ocean Topography

Participant Name:	Darlene Bissonette
District:	Brasher Falls Central
Grade Level:	Secondary
Subject/Course:	Earth Science
Cross-curricular Link:	
Approximate Time (IN MINUTES):	2 - 45 minute class periods

CONTENT AND SKILLS
Learning Objectives: Students will be able to identify the type of seafloor model by indirect means.
Essential Questions (optional): Besides visualizing the seafloor how can scientists measure the depth of the ocean?
Students' I can statements . . . - I can measure small increments using a metric ruler. - I can record data and use technology to create a 3D image of my results. - I can identify locations on a map and provide an image of what they look like.
How will you meet the needs of SWD and ELL/MLL students? - Students do not need to measure the depth at every hole in the box to obtain the desired results. - Students can work in small groups or work alone, depending on their comfort level. - Students can work with other mystery boxes to gain more comfort with the skill of measuring.
NYS COMPUTER SCIENCE AND DIGITAL FLUENCY STANDARDS List all standards that authentically align (e.g., K-1.CT.4)
7-8.CT.2 Collect and use digital data in a computational artifact. 9-12.CT.2 Collect and evaluate data from multiple sources for use in a computational artifact.
OTHER SPECIFIC STANDARDS (e.g., Content, SEL Benchmarks) List all standards that authentically align https://www.p12.nysed.gov/sss/documents/SELBenchmarks2022.pdf
- Earth Science Core Curriculum 2.1n Many of Earth's surface features such as mid-ocean ridges/rifts, trenches/subduction zones/island arcs, mountain ranges (folded, faulted, and volcanic), hot spots, and the magnetic and age patterns in surface bedrock are a consequence of forces associated with plate motion and interaction. - STANDARD 6—Interconnectedness: Common Themes Students will understand the relationships and common themes that connect mathematics, science, and technology and

apply the themes to these and other areas of learning. Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

INSTRUCTIONAL PLAN

List the steps of the lesson, including instructions for the students.
Add and highlight Standard Indicator next to activity that aligns

Before you begin this lesson you will have to 3d print the topographic boxes or make your own. The website is a subscription based program that came with the 3D printer the school purchased. The informative video is linked below. You could also design them yourself and then print or create. The students could also create these models. Standard 6

In this lesson students are given a box, with small holes in the top lid, which they should not open and look inside. Teachers are encouraged to tape or rubber band the lids to the box in order for the students not to peek at the landform in the box. There are different 3D printed ocean topography landscapes in the boxes. Please watch the video from MyStemKits.com on how they use these topographic boxes [Ocean Topography Mapping Kit](#).

The teacher will instruct students how ocean topography is determined by remote sensing. The students will model this remote measuring using toothpicks. The students will insert a toothpick into each hole and measure the depth until the surface of the landform is reached. Students will do this toothpick insertion and record the depth in millimeters. A tire tread gauge may also be used. If the gauge is too thick it can be filed down. Standard 6

The student will record their measurements in a data table that has the same grid as the box. Students will copy or type in their data into an Excel spreadsheet and create a 3D chart or surface chart of their data - the seafloor. At this time, I can not figure out how to create a surface chart or 3D chart in Google Sheets or any Google product so I will have to take the students to the computer lab to use EXCEL. Standard 6 and Standard 9-12.CT.2

Students will identify the seafloor landscape, draw and label the landscape, and locate the landscape on a map. Standard 2.1n

Student instructions - link is also below

Ocean Topography

Name _____ Date _____

Materials needed:

- Closed topography box (top and bottom) with the landform inside - DO NOT OPEN THE BOX
- Toothpicks and if available - one tire tread depth gauge
- Metric ruler
- Access to Excel, as Google Sheets does not support 3D Charts or Surface Charts

Procedure

1. Place the toothpick or tire tread depth gauge into each of the data points (A1, A2, A3, ..., A20; B1, B2, B3, ..., B20, etc.) and record the depth in millimeters (mm) on the Google Sheet attached below. If using the toothpick; place the toothpick all the way in the hole. Then grab the toothpick with two

fingernails as close to the top of the container as possible. Without removing your fingernails from the toothpick, measure the length of the toothpick that was in the container.

2. Google Sheet Data Table

[Topographic Depth Recording Chart](#) This is a Google Sheet

Students at my school have Chromebooks and have access to Google products. Students can enter their data here. At my school we will have to go to a computer lab to have students create their 3D model of the ocean floor using Excel.

You can enter data in the attached table above or initially write your data in the table below and then transfer the data to your Google Sheet.

[illegible]

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3. Transfer the data to an Excel spreadsheet.

4. Highlight all of the data, then click on “Chart” in the menu tabs.

5. Click on other and select “3D-Surface”.

6. Then click on “Chart Layout” and select from the 3D Rotation tile the angle that provides the best view of your seafloor model. Be sure to manipulate the X, Y, and perspective tabs so that you can explore the various views of your model to select the view that best matches your view of the model.

7. Once you have manipulated the image to best represent your model, save a screenshot of it and add it to the Google Classroom assignment and or upload your Excel sheet with this image to Google Classroom.

Students Assessment - link also below:
Ocean Topography Assessment

Name _____ Date _____

Directions:

Draw and correctly label important features of each of the following seafloor features. Besides each drawing, place the corresponding Matching Letter from the table below to identify your drawing.

On the map of Tectonic Plates from your Earth Science Reference Tables. Clearly place each letter, at least once, in the correct location of where you would find that feature on the map.

This map is attached.

Sea Floor Features and Matching Letter

Mid-ocean Ridge - A

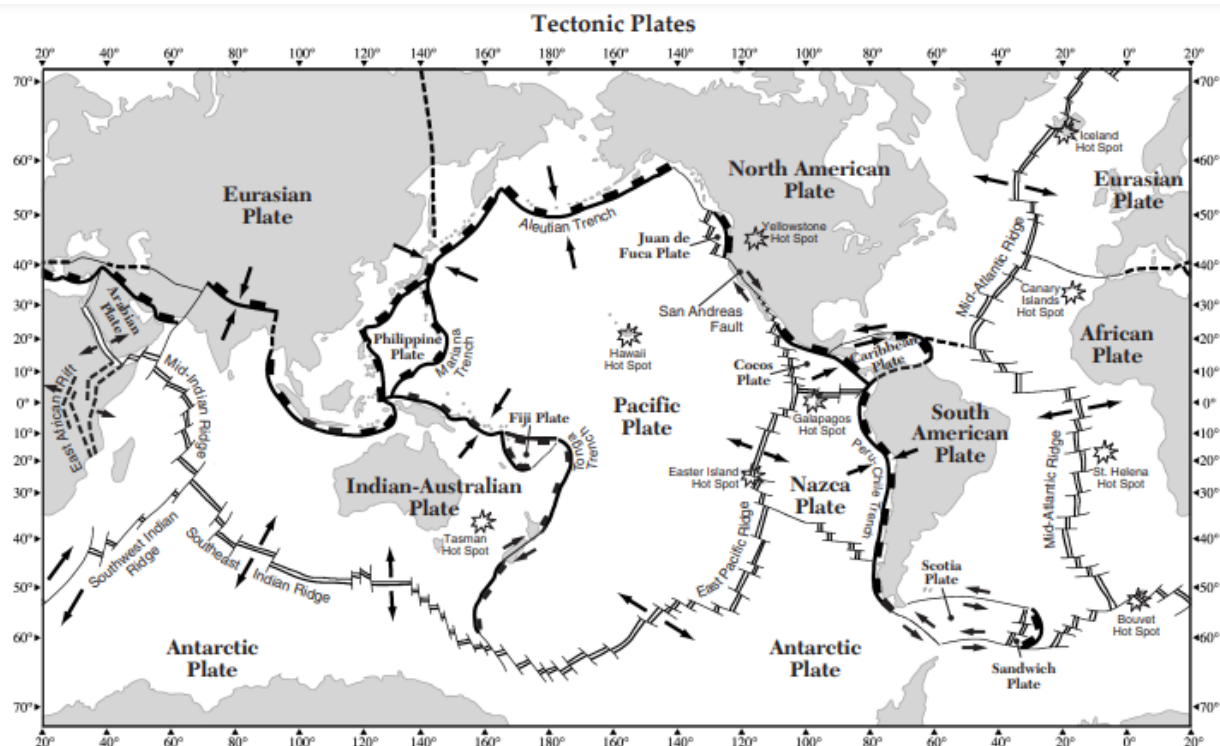
Seamount - B

Abyssal Plain - C

Deep Ocean Trench - D

Continental Shelf - E

Drawing(s):



SPECIFIC NEEDS: MATERIALS / RESOURCES / TECHNOLOGY

Add additional resources needed for this lesson such as instructional technology templates, images, videos, etc.

- Ocean Topography Mapping Kit from MyStemKits.com
*With access you can 3D print these kits for the class. These need to be printed ahead of time.
- MyStemKits.com informational video for the teacher - [▶ Ocean Topography Mapping Kit](#)
- Metric rulers
- Toothpicks and/or a thin tread depth tire gauge (from and automobile store)
- Student access to Microsoft Excel - for 3D or Surface Charts
- Student Handout [= Ocean Topography Student Instructions and Data Sheet](#)
- Student Assessment [= Ocean Topography Assesement](#)