Topography and Bathymetry

Grades K-4

Overview:

Students are introduced to the concepts of bathymetry and topography, and build a model to demonstrate an understanding of both.

Targeted Alaska Grade Level Expectations:

Science

[3-4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

[3] SA2.1 The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by answering "how do you know?" questions with reasonable answers.

[3] SD2.1 The student demonstrates an understanding of the forces that shape Earth by identifying and comparing a variety of Earth's land features (i.e., rivers, deltas, lakes, glaciers, mountains, valleys, and islands).

[4] SD2.2 The student demonstrates an understanding of the forces that shape Earth by identifying causes (i.e., earthquakes, tsunamis, volcanoes, landslides, and avalanches) of rapid changes on the surface.

Objectives:

The student will:

- work in a cooperative group;
- define bathymetry and topography;
- build a bathymetric and a topographic model;
- make bathymetric measurements and record them;
- make topographic measurements and record them; and
- identify tools used to make bathometric and topographic measurements.

Materials:

- Blue waterproof clay
- Green waterproof clay
- Metric rulers
- One paint tray per group of four kids
- Waterproof markers
- A variety of small "found items" to represent buildings, foliage, etc
- STUDENT WORKSHEET: "Making the Model"
- STUDENT WORKSHEET: "Bathymetry and Topography"

Whole Picture:

Bathymetry is the measurement of the depth of water. Bathymetric mapping is the process of mapping depths of oceans, seas or other large bodies of water. Sailors and fishermen use bathymetric maps to guide them and prevent shipwrecks. Two of the ways scientists use bathymetric maps are to understand currents and to predict where tsunamis may inundate the land. Bathymetric measurement began many years ago with sailors and fishermen using a *long rope* to measure water depth. This kept them safe from running aground in shallow water and wrecking their ships or boats. In modern times, fishermen and sailors use *echo sounders* to measure the water depth in areas where they

do not have maps. Scientists use satellites and other precise instruments to make their bathymetric measurements.

Topography is the measurement of natural land features such as mountains, hills, streams, rivers, plateaus, banks, crevasses, canyons, etc. Topographic measurements are important to many people. Farmers use the information to help determine where and when to plant crops. Hikers use topographic maps to help them determine their location. Builders decide where and how to build structures using topographic information. It is also important in planning the structure and locations of roads and bridges. Coastal communities need to consider topography for the sake of safety. Topographic information can help make communities aware of likely areas of flooding, earthquake danger, and tsunami hazard and escape routes to safe areas. Scientists, engineers and surveyors use satellite data and other instruments to create topographic maps to aid all these people.

Activity Preparation:

1. Write the words **Bathymetry** and **Topography** on the board or chart paper. Ask students if they have any idea what these words mean. Allow thinking time. If no one answers underline the letters *bath* and *topo*. Tell students this is a clue and that one word is related to the ocean, one to land. Allow think time, then, if still no answer tell them they can help remember by thinking *bath = water* and *topo = the land* (which is above the water). Next underline *metry* and tell students that this suffix refers to *measuring* (meters). The two parts of the word mean *measuring water*. Now look at the word topography. Establish that *topo* actually means place. Ask if they can figure out what *graphy* means. Allow think time. Confirm or explain that *graphy* means drawing. Define topography as the drawing and measurement of the land surfaces of the earth.
2. Proceed to the discussion of science basics.

Activity Procedure:

1. Have groups of four students work cooperatively to make a topographic and bathymetric model. Use a paint roller tray to simulate the ocean floor and land. Use blue waterproof clay to simulate underwater features and green waterproof clay to simulate land features. Tell students they must represent at least the following underwater (bathymetric) features: a ridge, a trench, small rises in the ocean floor, and an island. Their land (topographic) features should include, at the very least: hills, mountains, a lake, a river, and a cliff.
2. When the construction of the model is complete, have students add water to the tray to the depth at which the land and sea meet. Pass out the STUDENT WORKSHEET: “Making the Model.” Have students take turns using a metric rule to measure and record the depth of their ocean and the height of their land features on the worksheet.

Critical Thinking Questions: Why is it important for scientists to understand the shape of the ocean floor? Who do you think this information can help? Why is it important to know the shape of the land surfaces of the Earth?

Answers:

1. Student should write “B” on the satellite, depth finder, and submarine.
2. Student should circle the computer, satellite, and tripod with instrument.
3. Words should match definitions.
4. Student should underline the letters “topo” and “bath.”
5. All of the above
6. Answers vary, but could include farmers, hikers, builders, etc.
7. Answers should reflect understanding.

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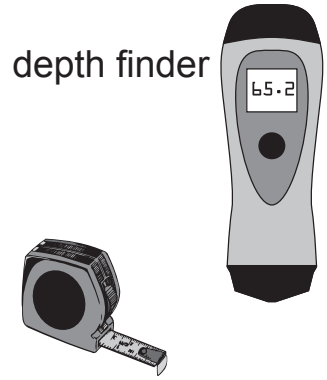
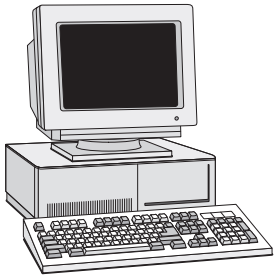
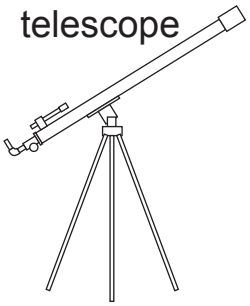
Topography and Bathymetry

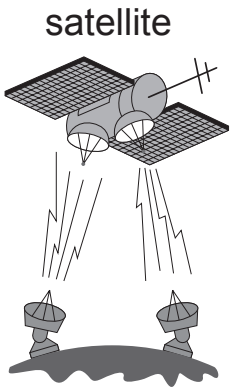
Student Worksheet (1 of 2)

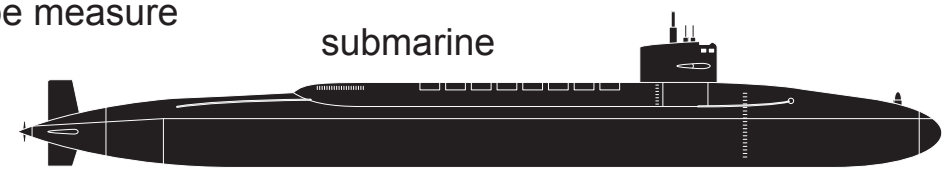
1. Write a B on the pictures of things that might be used in bathymetry.



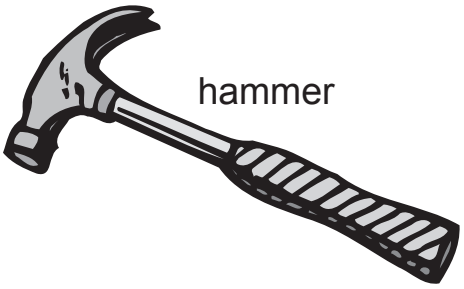


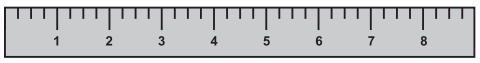


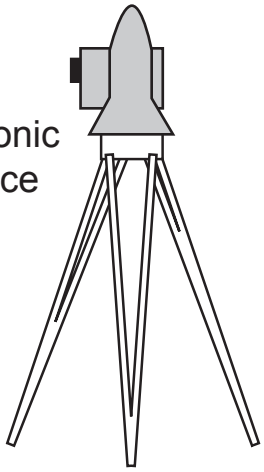


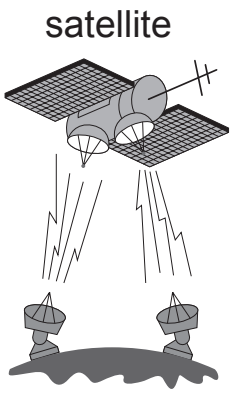


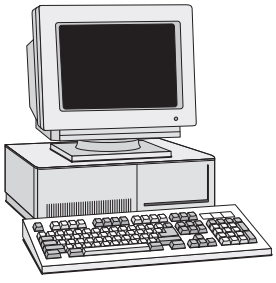
2. Circle the tools used to make a topographic map.











Name:_____

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Topography and Bathymetry

Student Worksheet (2 of 2)

3. Draw lines to match each word with its definition.

Bathymetry	measuring and drawing the surface features of Earth
Topography	measuring the depth of the ocean to understand its shape and features

4. Underline the letters in #3 that helped you remember which definition matched.

5. Put a check next to each group of people could be helped by understanding the bathymetry of the ocean.

____ Fishermen

____ People who live near the coast

____ Scientists

____ All of the above

6. Name a group of people who would find it important to understand the topography of the land. _____

7. Tell why this would be important to them. _____

_____

_____.

Name:_____

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Making the Model

Student Worksheet (1 of 2)

Measurement Record

Student group_____

Bathymetry

1. The deepest point of our ocean measured_____ centimeters.

2. The shallowest point in our ocean measured _____centimeters.

3. We made the following underwater features:

   _____

   _____

Topography

1. Use a ruler to measure the highest mountain you built. Record its height here.

   Our mountain is _____centimeters high.

2. Draw a side view of your mountain labeling the height.

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Making the Model

Student Worksheet (2 of 2)

3. For Extra Credit: Pick two other topographic features you built. Draw one from the side. Draw the other as it would look from the air. Label each to indicate the height.