

Contour Mapping: Topography and Bathymetry

Lesson Summary: In this lesson, students will learn the use and importance of topographic mapping. They will be presented with activities that will help them to describe a topographic map, explain the different information a topographic map contains. They will also learn how to construct, read and interpret a topographic map.

Grade Level: 6th-8th Grade

Time Allotted: Approximately 2-3 days

Performance Objectives

References are to the Next Generation Sunshine State Standards (2007).

Science

- SC.6.N.1.4 Students will be able to discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.
- SC.6.N.1.5 Students will be able to recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.

Language Arts

- LA.6.2.2.3 The student will organize information to show understanding (e.g., representing main ideas within text through charting, mapping, paraphrasing, summarizing, or comparing/contrasting).

Social Studies

- SS.6.G.1.2 Analyze the purposes of map projections (political, physical, special purpose) and explain the applications of various types of maps.
- SS.6.G.1.4 Utilize tools geographers use to study the world.
- SS.7.G.5.1 Use a choropleth or other map to geographically represent current information about issues of conservation or ecology in the local community.

Prior Knowledge

No prior knowledge necessary.

Topic Overview

A topographic map is a two-dimensional representation of a three-dimensional land surface. Topographic maps are differentiated from other maps in that they show both the horizontal and vertical positions of the terrain. Through a combination of contour lines, colors, symbols, labels, and

Contour Mapping Lesson Plan

Students learn about topography and bathymetry by studying and making maps.

other graphical representations, topographic maps portray the shapes and locations of mountains, forests, rivers, lakes, cities, roads, bridges, and many other natural and man-made features (USGS).

The distinctive characteristic of a topographic map is that the shape of the Earth's surface is shown by contour lines. Contours are imaginary lines that join points of equal elevation on the surface of the land above or below a reference surface, such as mean sea level. Contours make it possible to measure the height of mountains, depths of the ocean bottom, and steepness of slopes.

In order to be useful, topographic maps must show sufficient information on a map size that is convenient to use. This is accomplished by selecting a map scale that is neither too large nor too small and by enhancing the map details through the use of symbols and colors.

In this lesson, students will learn how to describe a topographic map, explain the different information a topographic map contains, learn and be able to explain how to read and interpret a topographic map, and learn and explain how various earth scientists use topographic maps to study the Earth.

Key Vocabulary

Bathymetry

The topography of the bottom surface of a body of water (ocean, sea, pond or lake); or, the measurement of water depth at various places in a body of water

Contour or contour line

Line on a topographic map connecting points of equal elevation above or below mean sea level

Contour map

A map showing elevations and surface configuration by means of contour lines

Topography

The general configuration of part of the Earth's surface, including its relief and the position of its natural and man-made features

Materials

- Computer with Internet access
- Paper, ruler, pencil

References

The following documents are available in the [Orange County Water Atlas Digital Library](#):

[How to Make a Contour Map of Your School Playground](#)

Source: Mountain Environments Novice On-Line Lessons.

http://www.math.montana.edu/~nmp/materials/ess/mountain_environments/

Contour Mapping Lesson Plan

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[Bathymetry Systems: History & Methodology](#)

Source: Woods Hole Science Center, U.S. Geological Survey.

<http://woodshole.er.usgs.gov/operations/sfmapping/bathyhist.htm>

[How to Read a Topographic Map](#)

Source: U.S. Geological Survey Eastern Geographic Science Center.

<http://egsc.usgs.gov/isb/pubs/teach-pack/mapshow/lesson4.pdf>

[Creating Topographic Profiles](#)

Source: Idaho State University Geospatial Training and Analysis Cooperative

http://geology.isu.edu/geostac/Field_Exercise/topomaps/topo_profiles.htm

Procedure

Engage/Elicit

The teacher should encourage students to use the [Orange County Water Atlas Digital Library](#) and other references to help in answering the following questions:

1. What is a topographic map? What are some things that topographic maps are used for?
2. What is a bathymetric map? What are some things that bathymetric maps are used for?
3. What are contour lines?
4. How does one determine contour intervals?

Explore

1. Explain to students they will be working in small groups to further their understanding of topographic and bathymetric mapping.
2. Divide students into small groups and have each group examine a bathymetric map for one of the lakes on the [Orange County Water Atlas](#). To find maps:
 - a. From the Orange County Water Atlas, choose "Water Levels and Flows" from the "Topics" dropdown menu.
 - b. Click on the "Bathymetric Maps and Depth Information" link.
 - c. Click on the name of one of the lakes in the list. The Water Levels and Flows page for the chosen lake will be displayed.
 - d. Click on the "View Contour Map" link. The map will open in a new window.
3. Allow students to answer the following questions
 - a. What do the lines on the maps represent?
 - b. What does each number on the different lines represent?
 - c. What is your interpretation of the spaces between lines?
 - d. Using the instructions in Creating Topographic Profiles, can you draw a profile (cross-section) of your lake? What does your drawing help you to understand about its topography? What happens if you draw your line to transect the lake in a different place? Does its profile change? Why?
 - e. What else do you want to know about the lake's topography? How could you find out?

Contour Mapping Lesson Plan

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Explain

1. Is it possible for the bathymetry of your assigned lake to change? Why or why not?
2. Teacher should allow students to examine the 1998 and 2006 maps for Mary Jane Lake on the Orange County Water Atlas website. [1998 map](#) [2006 map](#)
3. Teacher should allow students to answer the following questions about Mary Jane Lake:
 - a. What are some of the differences and similarities that are observable between the two contour maps?
 - b. How did the overall size of the lake change in acres?
 - c. What might be some reasons for the changes observed?
 - d. What are some of the different actions that can be taken to preserve the topography of Mary Jane Lake?
 - e. It has been said that climate change is expected to produce more variable patterns of rainfall. In a very rainy year, how might the overall size of Mary Jane Lake change?
 - f. How would such a rainy year change the contour map of Mary Jane Lake?
 - g. How would the changes to the lake affect the people whose property is adjacent to the lake?
 - h. How might a year of extreme drought affect the overall size of the lake in acres?
 - i. How would such drought affect the contour map of the lake?

Extend

Tell students they will be using the directions from "Creating a Contour Map of Your School Playground" as a guide to construct their own contour map. (See reference above.)

Exchange/Evaluate

1. Clarity of directions
2. Quality of maps generated

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