Topographic Maps

Partially adapted from Merrill Earth Science (1995)

Focus on Inquiry

The student will use systematic observations in describing spatial relationships by creating a topographic map from a landform model.

Lesson Overview

By working with a landform model to construct topographic lines, students will learn that topographic maps show land features as well as elevation.

Duration	Setting	Grouping	PTI Inquiry Subskills
50 minutes	Classroom	Cooperative groups of 3-4 students	3.1, 3.2, 3.4, 3.5, 3.6, 4.2, 4.4, 5.2, 5.8, 7.2, 7.3

Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
Engage	10 min	3.4	Internet (map images)	2	Students view different types of maps and discuss how they are used. Students begin to examine a topographic map for its unique features.
Explore	20 min	3.1, 3.2, 3.5, 3.6	None	3	Students use landform boxes to create topographic maps by marking the level of water at 2 cm water depth intervals on transparency sheets.
Explain	10 min	4.2, 5.2, 5.8, 7.2	None	3	Students examine their maps and identify three things they notice about their maps and their landform box. Students identify the contour interval and various elevations for their landform box.
Expand	10 min	4.2, 4.4, 7.3	Internet	3	Students visit locate their school on Topozone.com and identify contour interval, various elevations, and map symbols.
Evaluate	varies	7.3	None	n/a	Teacher developed rubric for topographic map.

Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

National Science Education Standards – Inquiry

Use appropriate tools and techniques to gather, analyze, and interpret data.
Develop descriptions, explanations, predictions, and models using evidence.
Think critically and logically to make the relationships between evidence and explanations.
Communicate scientific procedures and explanations.

National Science Education Standards – Earth Science

Landforms are the result of combinations of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, which destructive forces include weathering and erosion.

Some changes in the solid earth can be described as the "rock cycle." Old rocks at the earth's surface weather, forming sediments that are buried, then compacted, heated, and often recrystallized into new rock. Eventually, those new rocks may be brought to the surface by the forces that drive plate motions, and the rock cycle continues.

Louisiana Grade Level Expectations – Inquiry

Gr. 8, Inquiry GLE#6 - Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)

Gr. 8, Inquiry GLE#8 - Use consistency and precision in data collection, analysis, and reporting (SI-M-A3)

Gr. 8, Inquiry GLE#11 - Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4) Gr. 8, Inquiry GLE#12 - Use data and information gathered to develop an explanation of experimental results (SI-M-A4) Gr. 8, Inquiry GLE#13 - Identify patterns in data to explain natural events (SI-M-A4) Gr. 8, Inquiry GLE#14 - Develop models to illustrate or explain conclusions reached through investigation (SI-M-A5) Gr. 8, Inquiry GLE#16 - Use evidence to make inferences and predict trends (SI-M-A5) Gr. 8, Inquiry GLE#19 - Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7) Gr. 8, Inquiry GLE#22 - Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)
Louisiana Grade Level Expectations Earth Science Gr. 8, GLE#21 – Read and interpret topographic maps (ESS-M-A9)

Materials List

- examples of various types of maps. These can be actual maps, or images downloaded from the Internet.
- an assortment of small objects OR plastic model landforms that can be ordered from any science supply company. Clay may also be used to create features.
- one plastic storage box per group
- water tinted with food coloring
- beaker/or container for measuring the water
- metric ruler
- tape
- plastic transparency sheet
- water based marker or wax marker
- overhead projector (optional)
- computer

Advance Preparation

1. Download images of and/or collect various types of maps
2. Be prepared to go over vocabulary that students will need: contour lines, contour intervals, elevation, hachure, depressions, relief, sea level.
3. The teacher should have extra paper towels/mops/or cloth towel.
4. Spills will occur. Care should be taken when students empty the water from the box.
5. Tell students that contour lines never cross over each other.

Other Information

Prior Knowledge Needed by the Students

Students should know the reasons maps were created and different types of maps. The teacher might save the introduction of topographic maps for this activity.

Procedure

Engage

1. Show students an assortment of map projections that they are familiar with (Mercator, Robinson, street or city maps). Discuss how they are used. Allow all answers
2. Bring out a topographic map of their city/state or other area. Allow students time to discuss what they see on the map. How is this map different from the other maps?
3. Allow the students to discuss why this map was developed and how it can be useful.
4. Have students research using their text book or the Internet what the word “topographic” means.

Explore

1. Using the rulers and the transparency marker have students mark 2cm apart on the side of the container to the top.

2. Place the boxes or objects in the bottom of the container and tape them securely to the bottom. (Or if the plastic model landform is available, place the landform in the bottom of the container). Cover the box with the top.
3. Pour water into the container to a height of 2 cm.
4. Place the transparency sheet on top of the box and CAREFULLY trace where the water hits the objects that are taped to the bottom (or where the water meets the landform). These are called contour lines.
5. Remove the transparency sheet and add 2 more cm of water. (The depth is now 4 cm.)
6. Replace the transparency sheet and trace where the water hits the objects.
7. Continue this process until all objects are covered with water.
8. Get a white sheet of paper.
9. Carefully remove transparency sheet from the box.
10. Place the transparency on an overhead projector. Put the paper on top of the transparency sheet. Trace the lines from the transparency onto the paper. (If you do not have an overhead, use a window to trace the lines. Another method is to have students go over their transparency lines to make them dark enough so that when the paper is placed over it, the lines can be seen.

Explain

Have the students examine their topographic map of their box. As a group, ask them to come up with three things they notice about their map and their box. Responses should be recorded on Blackline Master #1.

1. What is happening when the contour lines get close together, and far apart?
2. How is elevation represented on a topographic map?

Tell the students that 1cm of water depth represents 10m of height.

1. What is the contour interval of this topographic map?
3. Compute the total elevation of the tallest feature on your map.
5. Where would 0 m elevation be? What is 0 elevation called?

Expand

1. Go to Topozone.com (http://www.topozone.com) and locate your school on a Topozone map. Have your students identify the following information:
    - Contour interval of their map
    - Elevation of the school
    - Highest and lowest elevation on the visible map
    - Buildings, schools, highways, streets, railroad tracks, church(es), cemeteries

Evaluate

Teacher developed rubric for topographic maps from the boxes.

Blackline Master

1. Topographic Maps.

Resources

US Geological Survey - Topographic Map

http://topomaps.usgs.gov/

Information about topographic maps, their uses, and topographic map symbols.

Topographic Map Lab

http://www.sir-ray.com/Topographic%20Map%20Lab.htm

Practical exercises with topographic maps. Answers not included.

Name_____Date_____Block_____Team_____

Topographic Maps

Analyze: Write your answers in complete sentences

1. What is the contour interval of your topographic map?

2. How are contour lines arranged for a **steep** slope and a **gentle** slope?

3. What is the **total elevation** of the **highest point** of your model?

4. How are elevations shown on any topographic map?

5. When would a topographic map not have a 0-elevation contour line?

6. How would an area of high relief compare with an area of low relief?

7. What tall feature could be found on an ocean floor?(Research this)

Answer the following using your local topographic map:

8. Draw the symbols found on the map of your city/town. Explain each symbol.

9. What was the elevation of your school?

10. What was the value of each contour line on this map?

11. What happened to elevation around a pond or stream?

Bonus: Research a location of interest. Find a topographic map of the area.