An Introduction to Reading Topographic Maps

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Ohio Learning Standard:
Earth and Space Science:
Grade Eight: Earth Systems:
11. Use Models to analyze the size and shape of Earth, its surface and its interior
   (globes, topographic maps, satellite images)

Learning Objectives:
After this lesson, students should be able to:
1. Identify key features of a topographic map
2. Calculate the contour interval based on index contours
3. Create an accurate three-dimensional representation of a topographic map

Assessment:
Students will be able to evaluate their learning through:
1. Comparing their drawing of the contour lines to the one that is correctly drawn
2. Comparing their clay model to the three-dimensional picture of the topographic map

Materials Needed:
1. Colored pencils or crayons, 5 different colors for each student or pair of students
2. Modeling clay, about baseball sized, for each student or pair of students
3. Overheads or power point projection of all the Figures
4. Paper copies for each student or group of Figures 1 and 2
Lesson Outline

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35-40 total

Lesson

**Interest Approach - 2 minutes**

Ask the students what are some of the ways that they can describe where they are.

(possible answers include: house address, building, landscape features)

Ask the students what are some of the reasons that they want to know where they are.

(possible answers include: to get somewhere, go camping, hiking or hunting, get un-lost)

**Introduction - 3 minutes**

Features of topographic maps. On an overhead projection, show the students Figure 1. Say,

"Looks like a mess, doesn't it?" Pause. "Not if you know what you are looking at."

Highlight the features of a topographic map:

- Creek names (Goose creek)
- Creeks (blue lines)
- Lakes (blue circle above "Hiland High School" lower left)
- Roads (red and white lines, solid black parallel lines, dashed black parallel lines)
- Man-made features ("Hiland High School" and "Bethel Cemetery" in this map)
Contour lines (all those brown curvy lines)
Contour intervals (numbers on contour lines, 1200 and 1300, in this map)

Presentation - 10-15 minutes
Contour lines are the keys to understanding topographic maps. On an overhead projection, show the students Figure 2. Explain that the best way to understand topographic maps is understand how contour lines are drawn.

[Teacher information: When the map is complete, there will be contour lines drawn at 420, 440, 460, 480 and 500 feet. It is easiest to start with the 500 ft interval because it is a small circle. Do this contour interval as a class to demonstrate how to these intervals are drawn.]

Explain to the class that we are going to draw contour lines on the map of this island. The first one we are going to draw is at 500 feet. Each of the numbers represents an elevation at that spot. Ask the students how many they see at 500 feet? [there is one] Place a colored circle on that 'x.' [purple in the example] Ask the students if they see any other elevation marks at 500 feet. [there are none].

Explain that we need to use the pairs of elevation points to determine where the elevation is 500 feet. We need to use one point that is greater than 500 feet [508, for example] and one point that is less than 500 feet [497, for example]. We then place a point on the imaginary line between these two points where we estimate 500 feet would be [see below].

1. Find 2 points, one above your index contour and one below. For 500 ft:

   508 x
   x 497

2. Draw an imaginary line between the two elevation markers:

   508 x---x---x---x---x---x---x---x---x 497

3. Place a point on the line where the index contour value would be:

   508 x---x---x---x---x---x---x---x---x---x 497

4. Repeat until a clear circle-like shape emerges. It may be necessary to place more points in areas where the index contour line changes direction. [do this on the overhead for students to follow along]

Have the students repeat this process for index contour lines at 480, 460, 440 and 420 feet.
Important tips to remember when drawing index contour lines:

1. Contour lines (index or otherwise) never ever cross

2. The elevation numbers greater than the index contour value should be to the inside of the circle-like shape, all elevation numbers less than the index contour value should be to the outside of the shape.

3. Use one elevation number above and one below the index contour line value.

Walk around the classroom and assist the students in drawing the index contour lines. Once everyone is finished or nearly finished, bring the attention back to the front and have the students compare their drawings with the correct drawing, Figure 3. Ask them how theirs compares, where were there differences?

**Application - 5 minutes**

Explain: Contour lines are key because of the information they tell us about the landscape.

On the map, have the students identify:

1. The highest point (elevation point 508)
2. The steepest section (to the west of elevation point 508)
3. The second steepest section (northeast corner of the island)
4. The start of the river (near elevation point 488)
5. The end of the river (near elevation point 402)

**Comprehension - 5-10 minutes**

[Depending on the class, the instructor may want to hand out the clay after explaining the instructions rather than before]

On an overhead projection, show the students Figure 4.

Explain to them that one of the important aspects of reading topographic maps and understanding contour lines is being able to translate the two-dimensional map into a three-dimensional one. We are going to do that with clay here now, but, with practice, you will be able to do so in your heads.

Hand out the clay, if the instructor has not done so already.

The instructor can give the students some guidance as to thinking about how many peaks there are on the map, where the steep sections are and where the slope is not steep.
The instructor can either walk around the classroom, or work on a model of her own, the latter can help to illustrate that this process takes a bit of time.

Re-teach - 3 minutes
Once most of the students have completed their models, compare them to the map to see how well they did. Some key areas for comparison are:

- Are the two most northern peaks of equal height?
- Is the western side of these peaks steep and the eastern side more gently sloping?
- Is the southernmost peak shorter than the other two peaks and not broad?
- Is there a 'dip' in elevation in the middle of the island between the two sets of peaks?
- Overall, is the southern part of the island more gently sloping than the northern part?

Review and Closure - 2 minutes
On an overhead projection, re-show the students Figure 1. Ask them to tell you features of the landscape based on the lesson:

- Where are the steep section of the map? [around Goose Creek and south of Berlin]
- Where are the least steep sections? [north-central part of map]
- What are the elevations of the index contour lines? [1200 and 1300]
- What other features can the students identify?

Resources
Rivers book, Geography: Contour Lines (Student Activity 3.4)
Topographic Maps generated at www.digital-topo-maps.com
Island drawings generated by the author
Figure 1: free from www.digital-topo-maps.com
Figure 2: Island with elevation values
Figure 3: Island with elevations and index contour lines
Figure 4: Island with index contour lines for clay model