SIEMENS STEM DAY | Science Technology Engineering Math

SIEMENS STEM DAY ACTIVITY

MAPPING IT OUT

REAL-WORLD SCIENCE TOPICS

- An exploration of maps to identify Earth's features
- An exploration to describe how maps allow us to observe processes that change Earth's features over time

ADDRESSES NGSS

LEVEL OF DIFFICULTY

3

GRADE RANGE

3–5

OVERVIEW

In this activity, students will use a topographic map of their school grounds to identify geologic features using a printed map. Students are asked to identify different features that are on the map by exploring their school grounds.

TOPIC

Plate Tectonics and Large-Scale System Interactions

OBJECTIVE

After completing this activity, students should be able to identify features on their school grounds.

NGSS THREE-DIMENSIONS

Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
Analyzing and Interpreting Data Analyze and interpret data make sense of phenomena using logical reasoning. (4-ESS2-2)	**ESS2.B: Plate Tectonics and Large-Scale System Interactions** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.(4-ESS2-2)	**Patterns** Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)

BACKGROUND INFORMATION

What is a method to describe patterns of Earth's features?
Maps are drawn to represent a variety of information. They are a visual representation of a larger area. Maps are scaled down into foldable maps or 3-D globes in order to be practically used by people. It is equally important that each object on the map is the same proportion as other objects.

In order to understand maps it helps to use them in context of a familiar area. For young children who may not have good spatial memory of their region, city, or even neighborhood, maps of the schoolyard can be the best way to approach teaching maps.

Maps are representations of an area as seen from above. They are a visual tool that helps us understand Earth. The location of mountains, volcanoes and earthquakes demonstrate patterns of tectonic activity.

KEY VOCABULARY

Map: a picture of Earth's surface
Map Scale: section of a map that tells you the distance
Scale: the ratio of the length in a drawing (or model) to the length of the real thing

MATERIALS NEEDED FOR ACTIVITY

- Maps of school grounds
- Compass or cell phone with compass feature
- Tape measurer
- Pencil

- Ruler
- Clipboard or something hard to write on

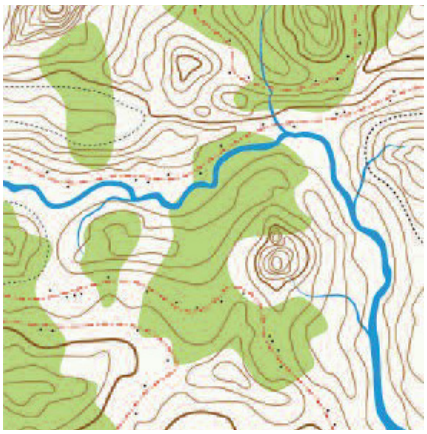
TEACHER PREPARATION

Before students arrive, prepare maps of the school grounds using the MapMaker Interactive site Google Maps, Google Earth, or Geology.com. Each includes features that allow you to mark school grounds with images and switch from topographic to satellite views. Identify the scale on each map so you are ready to point it out to your students.

Google Maps
http://www.google.com/gadgets/directory?synd=earth&id=11576246669

Google Earth
http://www.google.com/earth/

Geology Topographic Maps
http://geology.com/topo-maps/



Topographic Map

Satellite Map

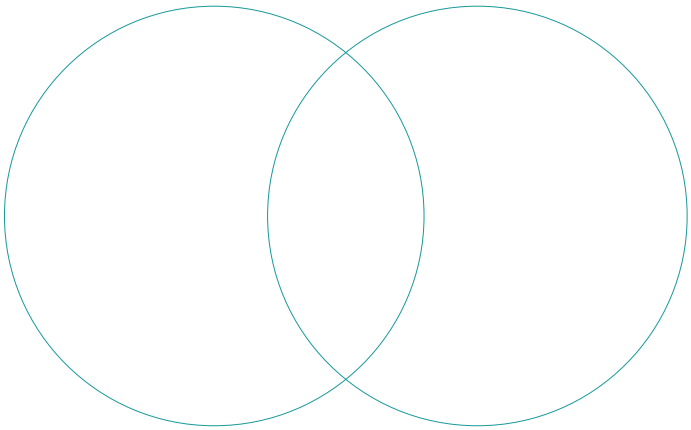
1. Warm-up Activity: Provide students with a topographic view of their school grounds. Explain to students that maps and satellite views show details of land features and how they change over time. How are land and erosional features depicted on topographic maps? How are changes in elevation shown on a topographic map?
2. Explain to students that map reading is an important skill. Maps are a tool that can shows details of an area and historical data over time. Students will go outside to survey their school grounds using the topographic map. Guide students to note features on their map such as grass playing fields, blacktops, buildings, surrounding roads, trees, bushes, parking lots. If there are hills or ditches on the property ask them to note those as well. Alternatively, the teacher can map out the groups for students and ask them to

walk around checking off the features they encounter. Hills can be labeled with contour lines and students will identify that illustration when they see the incline.

Students might need additional guidance to create keys. They also might not be familiar with a compass rose. Model an example of locating and drawing an object on their map. Ask students to use cardinal directions instead of left, right and straight.

3. Ask students to compare their drawing to the satellite image of their school property. Students will capture their observations in a Venn Diagram. How are the satellite image and the topographic map alike? How is the topographic map different from the satellite image? How is the satellite image different from the topographic map?

Venn Diagram
Comparing and Contrasting



4. Clarify with students that maps are a way to look at big areas. It is important that maps accurately depict an area.

Students at this level do not use the term ratio in math yet. It is appropriate for them to compare size and identify scale. Distribute enough scale cards for groups of 3 or 4 students to have a set. Direct students to observe the cards and identify if the images together would look like that in real life. For example, would a dog be larger than a flower?

- On your map, locate a feature in the schoolyard that will be easy to measure. For example, you can measure the basketball court, length of a goal post or garden plot.
- Go outside with your class and measure the length of that object with a tape measure. For the example the garden plot is 3.0 meters wide.
- Return to the classroom and measure the length of the feature on your map using a ruler. On the printed map the garden plot is 1.4 centimeters wide.

- To make the scale bar on your map, draw a rectangle the exact length as you measured with your ruler (1.4 centimeters)
- Every time you measure something measures 1.4 centimeters on the map it should measure 3.0 meters in real life. Students can check their calculation by going outside.

5. Wrap-up: Some county government sites include links to view local aerial images over time. Historical Imagery in Google Earth http://www.google.com/earth/explore/showcase/historical.html# is another database that includes pictures of familiar places for students to observe over time. Display a series of images showing a location over several decades. Ask students to observe the changes they see happening over time. What has increased? What has decreased?

   Students will identify changes that they observed. Ask students that if their school grounds (or another location) has changed over time, do they think other places on Earth have also changed? Ask them to brainstorm what types of changes they think are and have been occurring.

EXTENSION ACTIVITY

Students can consider short-term and long-term changes with maps. Crop cycles, leaves falling, weather, forest fires and precipitation are examples of short-term changes. Urban development, deforestation, melting glaciers and rivers changing are long-term changes. Students can compare these looking at local or global maps from usgs.gov.

The Landsat satellite image collection through usgs.gov shows change over time of Earth's land surfaces. Students can look at these images and find at least five things that have changed between a couple time periods.

SOURCES

http://htwins.net/scale2/?bordercolor=white
http://earthobservatory.nasa.gov/GlobalMaps/
http://www.usgs.gov/pubprod/
http://www.google.com/earth/explore/showcase/historical.html#'
http://www.google.com/earth/