

## OVERVIEW

**Grades:**

Grades 4–5; adaptable to all grade levels (see Adaption Suggestions)

**Subjects:**

Science, Ecology, Visual Art

**Duration:**

One hour-long session from start to completion

**Lesson synopsis:**

What would a topographical map look like in three dimensions? Work in teams to build three-dimensional topographical map models using sand and paper.

**Museum Connection:**

*Desert Derby*



This lesson can be explored solely in the classroom but it is best supported with an accompanying field trip to the New Children's Museum to view *Eureka!*, an exhibition about the state of California and the ideas that come from it. Among its installations, *Eureka!* includes the experience, *Car-a-oke* by artist Nick Rodrigues. In this installation, students can experience the feeling of being in a car and singing along to songs on the radio. Explore this space with students and have them consider what happens and how one behaves while in a car.

## LEARNING OBJECTIVES

**Students will:**

- o be able to identify the common features of a topographical map including contour lines, elevation points and color coding.
- o learn the difference between topographical maps using contour lines and those with added shaded relief.
- o transform a two-dimensional printed shaded relief topographical map into a three-dimensional map.
- o have the opportunity to work collaboratively within a team.
- o share their map models with the class and speak to their features.

# HOW-TO

## Materials Needed:

- o Sand (1 lb. per four students)
- o Popsicle sticks (one per student)
- o Tooth picks (three to four per four students)
- o Example of colored topographical map (one per class)
- o Printed examples of shaded relief topographical maps; consider using a different map for each team. Print out the maps in black and white to more clearly illustrate the differences in value in the images. See Resources for examples.
- o Scissors (one pair per student)
- o Blue construction paper (one, 9 x 12" sheet for every four students)
- o Pen or pencil (one per student)
- o Shallow, rectangular trays with lips such as those used for lunch trays (9" x 12" size or larger; one for every four students)

## Vocabulary:

**value** – the lightness or darkness of a color; in a black and white print out of a shaded relief topographical map, high elevation areas are darker (high value) and lower elevation areas are lighter (low value)

**topographical map** – is a type of map characterized by large-scale detail and quantitative representation of relief, usually now using contour lines, but historically using a variety of methods

**shaded relief topographical map** – topographical maps that are colored or shaded, so that the land surface looks three-dimensional.

**elevation** – refers to height in feet, or meters, above sea level

**contour lines** – lines drawn on a map connecting points of equal elevation; closely spaced contour lines represent steep slopes; contour lines that are spaced far apart represent gentle slopes

## STEPS

### Pre-Class Prep:

- o Arrange a visit to The New Children's Museum to view the new *Eureka!* exhibition, which includes *Desert Derby* by Roman De Salvo.
- o Locate examples of topographical maps to share with students, including a black and white printed version of the one to be used for the lesson exercise. Review the Resources of this lesson for suggested links to map examples.
- o Prior to implementing the lesson, create finished example of the project. Even if you choose not to share this work with students, it will help you to have a better understanding of the lesson.

### Motivation:

Ask students how they might travel to somewhere they have never been to before. Maps are designed to allow people to travel to a new location without a guide to show the way as they

tell us information about areas to which we may not have ever been.

The focus of this lesson is on how to read and use topographical maps. The most important feature of a topographical map is that it shows the elevation (or height) of the land using contour lines. Shaded relief topographical maps are topographical maps that are also colored or shaded so that the land surface looks three-dimensional.

As a class, look at topographical map examples (see Resources). Share the features listed below with students and have them locate them on the example maps:

- o Closely spaced contour lines represent steep slopes.
- o Contour lines that are spaced far apart represent gentle slopes.
- o Low elevation areas (e.g. valleys) are represented by widely-spaced or no lines.
- o Waterways (rivers, lakes, waterfalls) are colored blue.
- o Shaded relief added to a topographical map makes it more realistic.

Explain to students that, in teams of four, they will be transforming a two-dimensional printed topographical map into a three-dimensional map. They will share their completed map models with the class.

**Process:**



Place the two-dimensional map face up on tray.



Using their hands, have students pour sand onto the map, allowing it to pile up and spread from the highest to the lowest points to create peaks and valleys.



Students should then use Popsicle sticks to add contour lines to their maps in order to replicate the line patterns seen, and noting that closely spaced lines represent steep slopes and widely spaced lines represent gentle slopes.



Have students consider where waterways might be found. Students should draw shapes of waterways on the blue paper, cut them out, and place their waterways into their map models.



Students should continue working until the paper map is completely covered.



Instruct students to use toothpicks to mark off the highest elevations.

### **Sharing Session:**

Have each team present their finished work to the class. Allow teams to keep their works flat on their desks and invite the rest of the class to gather around. Students can also walk around freely in the classroom to view each other's creations. Provide students with the opportunity to speak about their works, explain each feature and the reason for it, and comment on the challenges and successes they experienced.

**Note:** This project is intended to be temporary (ephemeral), and the supplies can be gathered back together at the end of class time for the next group to use.

## **ADAPTATION SUGGESTIONS**

### **For younger students (Grades K – 3):**

Explore the creation of an elevation map using materials of varying textures and thicknesses such as beans, rice and sand. Have students represent different physical landforms based off a state map or other relevant map.

### **For middle and high school students (Grades 6 -12):**

Challenge students to work independently rather than in teams and to add scale to their maps using rulers and a mathematic conversion (i.e. 100 miles to 1 in). Begin from the highest elevation on the tooth pick and measure from there. Incorporate other features, such as cut out animals and plant life as another way to illustrate show scale.

### **For student with special needs:**

For students with tactile sensitivity, allow them to use a cup or other instrument to slowly pour the sand, as opposed to using their bare hands. Encourage students to work together as a team and divide tasks based on each person's skills. Help students keep track of the remaining time that they have to work on their project.

## **EXTENSION ACTIVITY**

### Map Models

Now that students have gained experience and understanding of topographical maps, have them create individual ones using more permanent materials such as papier-mâché, clay, layered cardboard or other building supplies. Try different terrains or recreate the one used for this project.

## **STANDARDS**

### **CALIFORNIA STATE STANDARDS**

#### **Visual and Performing Arts Standards**

##### **Grade 4**

2.3 Use additive and subtractive processes in making simple sculptural forms.

5.3 Construct diagrams, maps, graphs, timelines, and illustrations to communicate ideas or tell a story about a historical event.

##### **Grade 5**

2.4 Create an expressive abstract composition based on real objects.

4.4 Assess their own works of art, using specific criteria, and describe what changes they would make for improvement.

## Science Standards

### Grade 4

4.c. Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

### Grade 5

3.d. Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.

3.e. Students know the origin of the water used by their local communities.

## History and Social-Science Standards

4.1 Students demonstrate an understanding of the physical and human geographic features that define places and regions in California.

## COMMON CORE STANDARDS

RI 4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL 4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL 5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

## RESOURCES

### RESOURCES FROM THE SAN DIEGO PUBLIC LIBRARY

**Southern & Central California atlas & gazetteer (2005): detailed topographic maps (2005), by DeLorme Mapping Company**

912.794 DEL

This set includes topographic maps of Southern and Central California with relief shown by contours, shading, and spot heights.

**Rediscovering the Golden State: California geography (2000), by William A. Selby**

917.94 SEL

**California (2006), written by Ann Heinrichs; illustrated by Matt Kania**

J 979.4 HEI

## WEB RESOURCES

Historic topographic maps of California (Library Guides):  
<http://guides.lib.berkeley.edu/histopo>

How to Read Topographic and Geologic maps:  
<http://study.com/academy/lesson/how-to-read-topographic-and-geologic-maps.html>

Students learning about topographic maps video (You Tube video; total video is 5:28 minutes in length):  
[https://www.youtube.com/watch?v=hbk824\\_1PGs](https://www.youtube.com/watch?v=hbk824_1PGs)

Video tutorial about creating a topographic profile with cross sections (You Tube video; total video is 5:21 minutes in length):  
<https://www.youtube.com/watch?v=StDYPluk25M>

Information on Roman de Salvo's installation, Desert Derby, currently on view at The New Children's Museum:  
<http://www.thinkplaycreate.org/exhibition/eureka/desert-derby>

Information on the artist Roman de Salvo:  
<http://www.sandiegouniontribune.com/news/2015/oct/24/roman-de-salvo-knows-his-audience/>

<https://www.artsy.net/artist/roman-de-salvo>