

“Island Rotation”

Resource Summary: The lesson ideas that follow are designed to be utilized after viewing one of the fourteen tales entitled *Island Rotation* in the film **West of the West: Tales from California’s Channel Islands**. The segment is approximately 2 minutes in length and offers a unique opportunity to read the tale of the geologic history of the Channel Islands that is written in the rocks. In this lesson, students will learn about the geologic processes, which have shaped the landscape and oceanscape of Southern California over the last 18+ million years.

Subject Areas: English Language Arts & Literacy/Science

Grade Level Range: Grade 4 +

Standards:

CCSS.ELA-LITERACY.RI.4.3

Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

CCSS.SCI.4.2:

Analyze and interpret data from maps to describe patterns of Earth’s features.

Maps can include topographic maps of Earth’s land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.

CCSS.SCI.4.2B:

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.

Resource Provided By: Barbara LaCorte, Principal, Hope School, Hope School District

Resource Details:

Academic Language: Plate Tectonics, Continental Drift, Transverse Ranges, Subduction.

The teacher will introduce this lesson by stating that for most of us, geology can be a challenging subject to comprehend as the geologic forces that have shaped our planet have taken place over vast periods of time or under the surface of the earth where we cannot observe them occurring. Scientists have to look for clues to make sense of what we can see, to create theories, and build models to explain how things happen. One of the most important theories of geology is that of Plate Tectonics and one of the leading experts on Plate Tectonics lives in Santa Barbara and her name is Dr. Tanya Atwater.

The teacher will further explain that the students will be watching a segment of the film **West of the West: Tales from California's Channel Islands**, which tells some of the geologic story of the Channel Islands, and that after viewing this segment of the film and participating in the follow up activities, they will explain to others how the Channel Islands were formed, why our coastal mountain range is oriented east to west, and why when we stand on the coast in Santa Barbara to view the sunset we are actually looking south, and not west.

The teacher will direct students as they are viewing this segment of the film to think about how scientists might have discovered the evidence to support the explanations being advanced in the film. After viewing, the teacher will lead a discussion where the students will suggest their conclusions.

To simplify the theory of Plate Tectonics, the teacher will present the students with a model of the earth – a cracked hard boiled egg that has been dyed blue to easily show the cracks. The teacher will ask the students how the egg could be a model of the earth? The teacher will explain that the crust of the earth is made up of large and smaller plates like a cracked eggshell and that we are passengers on these plates that ride the surface of our planet. These plates are in constant (yet essentially undetectable) motion fueled by energy deep within the earth and the boundaries where the plates meet may differ and result in different actions.

To model the different types of plate boundaries, the teacher will have students stand up, pair up, and extend their hands, palms down toward each other. The teacher will instruct the students to move their hands closer so that they touch and push their fingers upward. The teacher will ask, "What is happening at these boundaries where the plates move toward each other, each pushing upward? This is where mountain building occurs. An example is the plate boundary in Asia where the Himalayas were formed and continue to rise.

The teacher will next instruct one student's hand to move underneath the other student's to model a boundary where one plate may be denser than the other. The teacher will ask what is happening here? Where one plate subducts or slides beneath another, the crust will heat up and melt, creating molten material that will rise as volcanoes. An example of this plate boundary is the coast of Asia known as the "Ring of Fire."

Finally, there are plates that slip and slide sideways past each other. The students will move their hands sideways back and forth. This sliding motion can cause earthquakes. An example of this plate boundary is where the Pacific and North American Plate meet creating the San Andreas Fault.

The teacher will further explain that the movement of the Pacific and North American plates is the reason for the Transverse Range, the east west orientation of our Santa Barbara Coast, and the location of the Channel Islands. To illustrate this movement,

the teacher will provide each student with the materials to create a Simulation of Plate Tectonic Deformations in Southern California and Northern Baja California downloaded from the Educational Multimedia Visualization Center of the Department of Earth Science at UCSB. http://emvc.geol.ucsb.edu/2_infopgs/IP4WNACal/hSoCalifPuzz.html. The students will need scissors, card stock, glue stick, and six brad fasteners to construct a model simulating 18 million years of tectonic activity between the North American and Pacific Plates. Once constructed the students will practice explaining the model to a partner.

The teacher will close the lesson by explaining that in nature there is constant change. Some of the changes we can see, most of these are manmade changes. Geologic changes are harder to see, so we have to make models to explain how the change happens. The students will be instructed to take their models home and explain to their parents how the Channel Islands were formed.

Additional Resources:

California and Baja California Plate Tectonic History, 20 Ma to Present, *animation*
http://emvc.geol.ucsb.edu/2_infopgs/IP4WNACal/cCalifornia.html

The Educational Multimedia Visualization Center of the Department of Earth Science,
U.C.S.B. downloadable resources:
http://emvc.geol.ucsb.edu/1_DownloadPage/Download_Page.html

Simulation of Plate Tectonic Deformations in Southern California and Northern Baja
California *physical model and accompanying teaching materials*.
http://emvc.geol.ucsb.edu/2_infopgs/IP4WNACal/hSoCalifPuzz.html