

Student Lab: California Geology (4-6)

Program Summary

In this laboratory activity, students learn about the structure and formation of rocks, the diverse geology of California, and the human uses of various rocks, sediments and minerals. They are also given the chance to investigate one rock in depth. Throughout the activity, students employ science process skills appropriate for grade levels 4 through 6, including making observations, classifying objects, formulating and justifying predictions and hypotheses, drawing conclusions from scientific evidence, and reading geological maps.

The program begins with an introduction to the terms "rock" and "mineral" and a brief discussion of the relationship between the two [rocks can be broken down to component minerals, but minerals cannot be further broken down; a rock is composed of at least two minerals]. Students are asked to record a definition of the two terms on their worksheet as a reminder, using words or drawings.

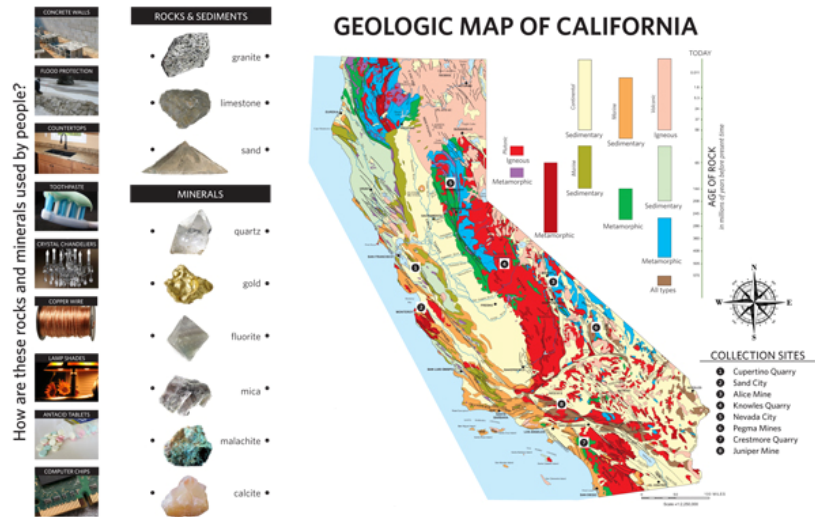
Then, as a class, the physical properties of rocks are discussed, including color, shape, texture, luster, pattern, grain shape, and grain size. With the help of student participation, the instructor models words that might be used for each property (e.g. pink, clear; round, flat; rough/bumpy/smooth; shiny/sparkly/dull; striped, layered, spotted; narrow; large/small).

It is then revealed that each of the three tables will investigate a different rock from California. Students at each table spend several minutes drawing and describing in words the physical properties of either hand-sized samples of the rock using a stereo microscope, or thin sections of the rock using a compound microscope. They then trade off, so that every student examines both kinds of samples and uses both kinds of microscopes.

This is followed by an introduction to the rock cycle, discussing the tectonic, volcanic, and environmental processes that create the three main categories of rocks: igneous (both extrusive and intrusive), sedimentary, and metamorphic.

The students are then tasked with using a) their newly gained knowledge of geologic processes, b) their own observations of the rock samples, and c) photographs of the collection site of their sample, to predict the category to which the rock on their table belongs. To find evidence to confirm or deny their predictions, the class is guided through reading and interpreting a color-coded geological map of California using a legend. After discovering whether their rock is igneous, sedimentary, or metamorphic, the names of the specific rocks are revealed, along with information about their formation, and a brief discussion of some pitfalls into which students may have fallen in predicting the category of their rock.

The lesson concludes with a matching game highlighting the practical uses of the mineral-based natural resources of our state. Students are given a few minutes to examine a collection of 9 rocks, sediments, and minerals mined in California. Using clues read by the instructor, a list of potential human uses, and a geological map, the students identify the samples, their usefulness to people, and the location of their origin. This game is available for teachers to take back to the school with them as a follow-up activity.



Grade 4

SCIENCE ES 4a, 5a, 5c; I&E 6a, 6c

Earth Sciences

4a. Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).

5a. Students know some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

5c. 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).

Investigation and Experimentation

- 6a. Differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- 6c. Formulate and justify predictions based on cause-and-effect relationships.

Grade 5

SCIENCE I&E 6a, 6h

Investigation and Experimentation

- 6a. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
- 6h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.

Grade 6

SCIENCE ES 1d, 1e, 1f, 6b, 6c; I&E 7a, 7e, 7f

Earth Sciences

1d. Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.

1e. Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.

1f. Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.

6b. Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.

6c. Students know the natural origin of the materials used to make common objects.

Investigation and Experimentation

- 7a. Develop a hypothesis.
- 7e. Recognize whether evidence is consistent with a proposed explanation.
- 7f. Read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.