Unit Map

Why are rock samples from the Great Plains and from the Rocky mountains composed of such similar minerals, when they look so different and come from different areas?

Taking on the role of student geologists, students investigate a geologic puzzle: two rock samples, one from the Great Plains and one from the Rocky Mountains, look very different but are composed of a surprisingly similar mix of minerals. Did the rocks form together and somehow get split apart? Or did one rock form first, and then the other rock form from the materials of the first rock? To solve the mystery, students learn about how rock forms and transforms, driven by different energy sources.

Chapter 1: How did the rock of the Great Plains and the rock of the Rocky Mountains form?

Students figure out: The rock of the Great Plains is sedimentary rock and the rock of the Rocky Mountains is igneous rock. They formed in different ways so they must not have formed together. Rocks can form in different ways. This causes them to be different types. When sediment is compacted and cemented together, it forms sedimentary rock. When magma cools, it hardens to form igneous rock.

How they figure it out: They observe rock samples and explore the Simulation, finding different ways to make rock form. They model the formation of sedimentary rocks using hard candy, and view a video showing igneous rock formation as magma cools. They create a visual model showing two different ways rocks can form. They evaluate evidence based on how detailed observations are.

Chapter 2: Where did the magma and sediment that formed the rock of the Great Plains and the rock of the Rocky Mountains come from?

Students figure out: It is possible that the rock of the Great Plains formed from sediment that eroded off the Rocky Mountains. It might also be possible that the rock of the Rocky Mountains formed from the rock of the Great Plains if the Great Plains rock were somehow carried underground to where energy from Earth’s interior could melt it into magma. Matter gets transformed by energy, but the same matter is still present. Sediment forms when any type of rock is weathered, a process driven by energy from the sun. Magma forms when any type of rock is melted, a process driven by energy from Earth’s interior.

How they figure it out: They find ways to cause magma and sediment to form in the Sim, then observe which of these processes are driven by energy from the Sun and which are driven by energy from Earth’s interior. They watch a video that illustrates the processes of weathering and erosion. They read an article about the geologic history of Devils Tower. They model the formation of sediment using hard candy, and watch a video demonstration of a hard candy model of magma formation. They write about ways that different energy sources affect rock and create new visual models. They read and conduct Sim missions related to rocks in Hawaii in order to review chapter content.
Chapter 3: How could rock from one of the regions have transformed into a different type of rock in the other region?

Students figure out: The plate motion that occurred near the Great Plains and Rocky Mountains uplifted igneous rock that formed underground. This rock eventually eroded and its sediment formed sedimentary rock in the Great Plains. Plate motion moves rock formations. Subduction moves rock down, below Earth’s outer layer. Uplift moves rock upward, toward Earth’s surface. Uplift and subduction can expose rock formations to different energy sources, which can transform them. Any type of rock can transform into any type of rock because of plate motion.

How they figure it out: They read an article about the oldest rocks on Earth and how plate motion affects rock transformations. They conduct Sim missions attempting to transform certain types of rock to other types. They engage in a classroom model that illustrates the many possible transformations that rock material may undergo. They write about how rock material may come to be exposed to different types of energy, and therefore undergo different types of transformations, and they create their final visual model.

Chapter 4: Students apply what they learn to a new question—What rock transformation processes are happening on Venus?

Students consider whether rock transformations on Venus are producing mostly sedimentary rocks or mostly igneous rocks. They evaluate and analyze photographic and descriptive evidence, and also analyze evidence about energy sources on the planet. They engage in oral argumentation in a student-led discourse routine called a Science Seminar and then write final arguments.