

## Earth's Changing Surface: Scope and Sequence

Lesson Number	Focus Question(s)	Main Learning Goal	Science Content Storyline
1a	Does the surface of Earth look the same everywhere? In what ways does Earth's surface look different or the same in different places?	Earth's surface has a variety of landforms.	Earth's surface has a variety of landforms, or surface features, that can be described and categorized. The landforms of any one location can look different from those of other regions in the United States, even though specific landforms, such as mountains and river valleys, can be found in many locations.
1b	In what ways does Earth's surface look different or the same in different places? Do you think the surface of Earth changes? Why do you think that?	Earth's surface has a variety of landforms that are distributed in different patterns.	Landforms, or surface features, on Earth's surface aren't the same everywhere. The landforms of any single location can look different from those of other regions in the United States even though specific landforms, such as mountains and river valleys, can be found in a variety of locations. Describing and categorizing landforms can help us identify patterns in the locations of specific landforms on Earth's surface. Students have different ideas about whether Earth's landforms have always looked the same. In future lessons, we'll be investigating whether and how Earth's surface changes.
2a	What happens to Earth's surface that causes mountains to form?	Earth's thin outermost layer (crust) is made up of tectonic plates. Volcanic activity is one mechanism that builds up Earth's surface in some places over time.	Volcanic eruptions are one way mountains form. In some places on Earth, mountains are built as magma erupts from a volcano and then cools into rock. But are other processes involved in mountain building?  The outermost surface of Earth is a very thin layer of cold, rigid rock made up of interlocking crustal plates, like puzzle pieces that fit together. These crustal plates are called <i>tectonic plates</i> . Do tectonic plates contribute to mountain building? How would that happen?
2b	What happens to Earth's surface that causes mountains to form?	Earth's thin outermost layer (crust) is made up of tectonic plates that float or ride on a hot layer of rock moving beneath them. Volcanic activity is one mechanism that builds up Earth's	Volcanic eruptions are one way mountains form. In some places on Earth, mountains are built up as magma erupts and then cools into rock. But are other processes involved in mountain building?  Earth's outermost layer of cold, rigid rock is very thin and sits on a thick layer of hot, slowly moving rock beneath the surface. Earth's

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		surface in some places.	outer layer is made up of interlocking crustal plates—like puzzle pieces—that slowly move across Earth’s surface. These crustal plates, called <i>tectonic plates</i> , ride or float on the underlying layer of hot, slow-moving rock. How does this plate movement contribute to mountain building? How does it lead to volcanic eruptions?
3a	Are the moving plates of Earth’s crust involved in building up Earth’s surface and forming mountains? If so, how?	Earth’s tectonic plates move in different directions. They can move toward each other (collide), move away from each other, or move side to side.	Earth’s thin outer layer (crust) of cold, rigid rock is made up of interlocking plates, like puzzle pieces, that scientists call <i>tectonic plates</i> . These plates float on a thick layer of hot, slow-moving rock under the surface. Heat from Earth’s core softens this rock, causing it to rise. As this underlying layer rises toward the surface, it causes the rigid plates of Earth’s crust to move in different directions—toward each other (colliding), away from each other, or side to side.
3b	Are the moving plates of Earth’s crust involved in building up Earth’s surface and forming mountains? If so, how?	Earth’s tectonic plates move in different directions. They can move toward each other (collide), move away from each other, or move side to side. Plate collisions cause Earth’s surface to build up, forming mountains and other surface features. Mountains can also form as a result of repeated volcanic eruptions.	Earth’s thin outer layer (crust) of cold, rigid rock is made up of interlocking plates, like puzzle pieces, that scientists call <i>tectonic plates</i> . These plates float on a thick layer of hot, slowly moving rock underneath. Heat from Earth’s core softens this underlying layer of rock, causing it to rise toward the surface. This movement causes the rigid plates of Earth’s crust to move in different directions. When the plates move toward each other and collide, the crust crunches together and piles up. As this happens slowly over time, mountains are formed on Earth’s surface. Mountains can also form as a result of repeated volcanic eruptions that build up Earth’s surface layer by layer. The hot, slow-moving rock inside Earth causes both plate collision and volcanic mountain building.
4a	What evidence can we find to support the idea that mountains form when Earth’s crustal plates collide?	Mountains form when Earth’s crustal plates move toward each other and collide.	Earth’s thin outer layer (crust) of cold, rigid rock is made up of interlocking plates, like puzzle pieces, that scientists call <i>tectonic plates</i> . Heat from Earth’s core softens a thick layer of rock beneath the crust, causing the rock to heat up and rise very slowly toward the surface. Earth’s tectonic plates float, or ride, on top of this hot underlying layer of rock, which causes the plates to move in

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			different directions. Plates can move toward each other and collide, move away from each other, or move side to side, sliding past each other. Colliding plates result in the formation of mountain ranges.
4b	What evidence can we find to support the idea that mountains form when Earth's crustal plates collide?	Major mountain ranges on Earth are found at the boundaries of tectonic plates. This evidence supports the idea that mountains are formed when Earth's crustal plates collide. Mountain building occurs very slowly and can't always be felt or seen.	Earth's crustal plates move in different directions and sometimes collide or push into each other. These plates normally move very slowly over time. Colliding tectonic plates cause mountain ranges to form. Earthquakes can also occur where plates collide or slide past each other. When crustal plates beneath continents collide, they can crumple upward to form mountain ranges. Evidence of this is that major mountain ranges on Earth are found at the boundaries of tectonic plates. Mountain building also happens as a result of volcanic eruptions. Hot, slow-moving rock from Earth's interior causes plate collisions and volcanic mountain building.
5a/b	Can mountains grow so tall they reach outer space? Why or why not?	<i>Weathering</i> is a process that changes Earth's surface by causing rock to fragment, crack, and crumble into smaller pieces.	Mountains on Earth never grow so tall that they reach outer space, because the rock that makes up mountains is continually broken into smaller pieces through a process called <i>weathering</i> . Although plate collision can cause the continual uplift of mountains, the height of a mountain is limited, in part, by weathering.
6a/b	How does flowing water change Earth's surface?	The processes of erosion and deposition change the surface of Earth by carrying and depositing weathered earth materials, such as rocks and soil, from one place to another.	The movement of water in rivers and streams shapes and reshapes Earth's surface by transporting rocks and soil from higher elevations and depositing them at lower elevations. <i>Erosion</i> is the process by which weathered earth materials, such as rock fragments, sand, and soil, are transported from higher elevations to lower elevations. <i>Deposition</i> occurs when earth materials are dropped off or deposited in a new location. Erosion helps wear down higher places, while deposition helps build up lower places.
7a/b	How can we use what we've learned about Earth's changing surface to answer the unit central	Landforms, like mountains and valleys, can be explained using science ideas about plate movement, weathering, and erosion. At any given point in time, Earth's surface is being built up and	Earth's surface is continually being built up and worn down. Plate collisions and volcanic eruptions are building mountains on Earth's surface. At the same time, weathering and erosion are wearing them down. As plate collisions and volcanic eruptions lift earth materials (like rock) higher, weathering breaks them into smaller

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	questions?	worn down.	pieces, and erosion moves them to lower elevations. Mountain building is still occurring in the western United States, but weathering and erosion are also occurring. Older mountains in the eastern United States have mostly stopped growing, and erosion is wearing them down significantly.