Exploring Geology at Grand Canyon National Park

Lesson Guide

**Lesson:** On-Demand Distance Learning Video

**Lesson Duration:** 45 minutes

**Materials:** Classroom Video and Worksheet Handout

**Grade Level:** 3-5

**Student Objectives**

## Essential Question

*What forces have shaped, and continue to shape, the Grand Canyon landscape?*

## Guiding Questions

*How do these forces continue to shape the Grand Canyon landscape?*

*Why is the Grand Canyon here and nowhere else?*

## Objectives

* Students will identify natural processes (river, weathering, and erosion) and human activities that contribute to changes at Grand Canyon.
* Students will apply cause and effect relationships to explain how and why the Grand Canyon's landscape is changing.
* Students will learn how the Colorado River has shaped the Grand Canyon over millions of years.

# Education Standards

This lesson plan fulfills the following educational standards:

## Common Core Standards

* W.4.8 ELA/Literacy: Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources. [(4-ESS2-1)](http://www.corestandards.org/ELA-Literacy/W/4)

**NGSS**

* 3-PS2-2: Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.
* 4-ES S2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
* 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

## Cross Cutting Concepts

* Cause and effect relationships are routinely identified, tested, and used to explain change.
* Patterns of change can be used to make predictions.

# Lesson Overview

The canyon is changing daily, forces like weathering and erosion are continuously shaping the Grand Canyon landscape. In this video you will go a bit deeper, to discover evidence of forces that are causing the canyon to change and widen over time. It’s important to note that the canyon is not growing but widening. We want to create the distinction that the canyon is not growing, up or down, but widening.

**Lesson Preview:** The video has a built-in preview section. *What I know, What I Want to Know*.

**Lesson Processing:** The video has a built-in processing section. *What I Learned*.

## Differentiating Instruction:

* Creating intentional learning groups/pairs based on interest, skill, performance, readiness.
* Allow students to demonstrate their learned knowledge through visual means.
* Divide classroom into groups. Each group is responsible for note taking a section. Students share notes with class.

## Vocabulary:

* Weathering: the breaking down or dissolving of rocks and minerals on the surface of Earth. Water, ice, acids, salts, plants, animals, and changes in temperature are all agents of weathering.
* Erosion: the geological process in which earthen materials are worn away and transported by natural forces such as wind or water.
* Cause: a reason for an action or condition. something that brings about an effect or a result.
* Evidence: something that is used to support or prove a claim or argument.

## Global Connections:

To emphasize why the Colorado River has carved a deep canyon and other rivers around the world have not carved such a canyon, compare and contrast the “power” of two distinct rivers, Mississippi River and Colorado River. Use aerial photos of both rivers spot differences/similarities, discuss, and come up with theories as to why one river carved a canyon and the other did not. Share the statistics below to continue to compare and contrast the differences.

|  |  |  |
| --- | --- | --- |
|  | Mississippi River | Colorado River |
| Length | 2,350 miles | 1,450 miles |
| Speed of water | 1.2 mph | 4 mph |
| Elevation drop | 1,425 feet | 9,000 feet |
| Width | 1 mile (average) | ~400 feet at Phantom Ranch |

To further demonstrate the power of water, use a washer and string to model how distance and slope affect the movement and erosive power of water. Place washer on string and have students on each end of the string. Begin with string being held parallel to the ground, make observations about how the washer may or may not be moving. Next, lift one end of the string higher, and make observations about how the washer is moving. Make connections to how one end of string is the Rocky Mountains, the other end is the Pacific Ocean (start/end points of Colorado River). Use this analogy for water moving over a landscape and its “carving” ability.

# Background Overview

The igneous and metamorphic basement rocks of the Grand Canyon formed around 2 billion years ago. Over hundreds of millions of years, many environments existed on this land and brought an array of sediment. Layers of mineral and rocks were deposited creating the rock layers you see today. However, those rock layers were only revealed after a major uplift occurred and created the Colorado Plateau. Six million years ago, the Colorado River began to carve the canyon and reveal the rock layers you see today.

Prior to western settlement and influence, artifacts have indicated habitation between 12,000-10,000 years ago. For many indigenous people this canyon continues to be home and a sacred place, offering us an opportunity to consider the powerful and spiritual ties between people and place.

The eleven associated tribes that still call this place home are:

Havasupai, Hopi, Hualapai, Kaibab Band of Paiute Indians, Moapa Band of Paiute Indians, Navajo Nation, Paiute Indian Tribe of Utah, San Juan Southern Paiute Tribe, Pueblo of Zuni, Yavapai-Apache Nation, and Las Vegas Band of Paiute.

Grand Canyon National Park was established in 1919. However, tourists flocked to the geologic wonder well before 1919. The Santa Fe Railroad, Fred Harvey Company, and U.S. Forest Service played roles in the development of tourism on the South Rim.

# Enhancing Learning

## Reflection Questions:

What are some of the main forces that have helped shape the Grand Canyon landscape?

* *Help them recall erosion, weathering, and the role of the Colorado River.*

How does the Colorado River contribute to shaping the Grand Canyon?

* *Encourage them to think about how water can carve through rock over time.*

How might the Grand Canyon look different if there were no rivers or water to shape it?

* *This will help them think about the importance of water in shaping landscapes.*

Can you draw or describe one way that the Grand Canyon might change in the future?

* *This encourages them to think about natural processes and changes over time.*

How do you think studying Grand Canyon can help us understand more about earth’s history?

* *Support them to think about the exposed rock layers and how they contain geologic history.*

# Additional Resources

## Associated Tribes - Grand Canyon National Park

<https://www.nps.gov/grca/learn/historyculture/associated-tribes.htm>

Learn more about the 11 associated tribes through this “We Are Grand Canyon” film, welcoming visitors to Grand Canyon National Park from those who have called it home since time immemorial.

## National Park Service Teachers’ Portal

<https://www.nps.gov/teachers/index.htm>

National parks are America’s largest classrooms. Find lesson plans about these great places.

## Grand Canyon National Park Youtube Channel

<https://www.youtube.com/user/grandcanyonnps>

Find other videos that explore culture, climate, plants, animals, and landscapes of Grand Canyon National Park

## Sean Willsey, Geology Professor

<https://www.youtube.com/playlist?list=PLOf4plee9UzDeaEYBHtkhGCiFbD4TcI0x>

Explore more of Grand Canyon through this collection of videos. Learn about the rock layers within the canyon, the environments that shaped this land, and more.