

Instructional Segment: Earth and Changes Over Time

This segment focuses on Earth’s processes associated with Providence Canyon State Park, Georgia and other North American landmarks.

Student Science Performance

Grade: 5th

Title:

Topic: Constructive and Destructive Processes

Earth’s Processes Discovered through Providence Canyon State Park

Performance Expectation for GSE:

S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.

- a. Construct an argument supported by scientific evidence to identify surface features (examples could include deltas, sand dunes, mountains, volcanoes) as being caused by constructive and/or destructive processes (examples could include deposition, weathering, erosion, and impact of organisms).
- b. Develop simple interactive models to collect data that illustrate how changes in surface features are/were caused by constructive and/or destructive processes.
- c. Ask questions to obtain information on how technology is used to limit and/or predict the impact of constructive and destructive processes. (Clarification statement: Examples could include seismological studies, flood forecasting (GIS maps), engineering/construction methods and materials, and infrared/satellite imagery.)

Performance Expectations for Instruction:

- 1. Develop an understanding of how Earth’s surface processes change land and features such as mountains, valleys, and islands as well as seafloor features such as trenches, ridges, and seamounts through the mechanisms of erosion, deposition, weathering, faults, and volcanism.
- 2. Develop an understanding for the natural processes that work together to continually shape the surface of Earth through constructive and destructive forces.
- 3. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- 4. Use data from models developed in the Getting Carried Away labs to construct a reasonable explanation of how weathering and erosion shape the surface of the Earth.
- 5. Communicate investigations and explanations to peers.
- 6. Understand that the surface of the Earth changes. Some changes are due to slow processes such as weathering and erosion.
- 7. Recognize that scientists monitor seismic activity using different methods of technology to help better understand the changes in the Earth’s surface.

Materials:

water, clay, sand, soil, pebbles, large baking pans, grass seeds or grassy plot, straws, sponge for moving water, plastic houses or small wooden blocks to simulate buildings, chalk, vinegar, paper towels, tongs or instrument to lift material out of water, clear plastic bottles with lids, coffee filters, foil, and cups

Engaging Learners

Phenomenon: [Providence Canyon State Park](#)

Do not show the entire 14 minute video. Use the segment between 5:00 and 7:30 minutes to show students the creek bed and walls of the canyon. (The world’s largest sand castle)

	<p>Obtaining: How do you think Providence Canyon formed? Why do you think it has gotten wider and deeper over time? How long did it take for Providence Canyon to form?</p> <p><i>Teacher hint: For background information on how Providence Canyon's formation was due to poor farming practices: Teacher Notes -Providence Canyon's History</i></p> <ul style="list-style-type: none"> ● <i>Questioning is one of the keys to conducting successful inquiry based learning activities. A KWL chart can help students raise questions as questions should come from the students whenever possible. Use the Obtaining questions to help guide students through the KWL chart.</i> ● <i>An anticipation guide is a series of statements that students must respond to individually after viewing the phenomenon. The teacher's role is to activate thought and background knowledge. Statements can be marked as likely or unlikely that the statement has scientific basis for how Providence Canyon formed:</i> <ol style="list-style-type: none"> 1. <i>Animals dug a hole first, then the hole just got bigger.</i> 2. <i>Rain and wind made a hole, then the hole just got bigger.</i> 3. <i>There was once a big lake, and suddenly all the water evaporated and left Providence Canyon.</i> 4. <i>An earthquake cracked the Earth.</i> <p>Evaluating: Students choose an explanation for how Providence Canyon formed by making inferences from the panoramic view.</p> <p><i>For the teacher</i></p> <ul style="list-style-type: none"> ● <i>Encourage students to create a narrative, an illustration with labels, a timeline, or a model to explain their reasoning.</i> ● <i>Encourage students to distinguish among facts, reasoned judgment, and speculation in an explanation.</i> <p>Communicating: Students share their explanations for the formation of Providence Canyon.</p> <p><i>For the teacher</i></p> <ul style="list-style-type: none"> ● <i>If possible, post or make available students' explanations. These can be referred to when clearing up misconceptions. They can also be used as teaching tools to further develop understanding of Earth's processes.</i> ● <i>If possible, keep the KWL chart or the anticipation guide, encouraging students to add to or change their thoughts based on evidence.</i>
<p>Exploring</p>	<p>Phenomenon: Same link to Providence Canyon State Park</p> <p>This is the link shown previously and is inserted here for an additional reference.</p> <p><i>Teacher hint: Refer to Providence Canyon's history link above for background information on how Providence Canyon's formation was due to poor farming practices:</i></p>

	<p>Activities</p> <ul style="list-style-type: none"> ● Getting Carried Away Labs <ul style="list-style-type: none"> ○ Slowing the Effects of Rain ○ Beachfront Property ○ Wind Erosion ○ Acid Rain ○ Weather or Not ○ Water and Rocks <p>Have students compare the similarities and differences between the formation of the Grand Canyon and Providence Canyon. <i>They are both formed by water erosion, but the Grand Canyon was formed by a river. Using a stream table, note how rivers impact Earth and note how deltas are formed.</i></p>
	<p>Obtaining: Students gather information about constructive and destructive processes.</p> <p><i>For the teacher</i></p> <ul style="list-style-type: none"> ● <i>Focus on S5E1b during this part of the lesson. Choose the above activities that help students develop models and gather data. Prepare in advance all of the materials necessary for the activities you choose to complete with your class. Material list: water, clay, sand, pebbles, large metal baking pans, straws, sponge for moving water, plastic houses or small wooden blocks to simulate buildings, chalk, vinegar, paper towels, tongs or instrument to lift material out of water, clear plastic bottles with lids, coffee filter, foil, and cups.</i> ● <i>Provide a chart or wall space for students to post other questions they have and suggestions on how they could find answers: research or investigation.</i> ● <i>Use the activities as small group stations or partner labs.</i> ● <i>You do not have to use all the activities, but ensure that students are inquiring and learning about several different processes.</i> ● <i>Have students complete activities at their own pace. Use formative assessment options as the students are working and interacting.</i> ● <i>Students may need to do some additional reading/research on Providence Canyon.</i> http://www.georgiaencyclopedia.org/articles/geography-environment/providence-canyon <i>Based on their experiences (relate back to labs) and their reading have them discuss the formation of Providence Canyon. Compare historical photos. How might it look in the future?</i> <p>Evaluating: Students describe the components of constructive and destructive forces.</p> <p><i>For the teacher</i></p> <ul style="list-style-type: none"> ● <i>Ask probing questions as students discover throughout the activities. Probing questions are open ended: How do you know? What is your evidence? What surprised you? What does this remind you of? Can you make any connections?</i> <p>Communicating: Students revise their previous understanding of the formation of Providence Canyon.</p>

	<p><i>For the teacher</i></p> <ul style="list-style-type: none"> ● <i>Students should revise, redraw, and rewrite their explanations from the Engage section to include their new information.</i> ● <i>At this point, teachers can add vocabulary that students have discovered to a word wall, to the KWL chart, or to student’s self-collection dictionary.</i>
<p>Evaluation</p>	<p><i>Evaluating and Communicating</i></p> <p>Questions and model to initiate class discussion: Discuss the different kinds of erosion you see in these images of the phenomenon or use the images and questions in this link: <u>Images of Evidence of Erosion</u></p> <p>Additional questions:</p> <ul style="list-style-type: none"> ● How do human activities contribute to erosion? ● Is erosion beneficial or harmful? ● What can you infer from the images about the geology of the area? ● What techniques can manage or prevent erosion? ● How are organisms impacted by the changing landscape? Can they adapt or change their behavior? <p><i>For the teacher</i></p> <ul style="list-style-type: none"> ● <i>Focus on S5E1 a and c during this part of the lesson. Students should connect their exploration of constructive and destructive processes to the formation of landforms, the technology used by humans that increase or slow the processes, and the impact that the processes and technology have on organisms. Teachers can offer prompts for writing and discussions such as: There is a mound of dirt in the school yard. How will it change over time? What forces will change it?</i> ● <i>All writing prompts and quizzes are an opportunity to enhance learning, adjust thinking, and clear up misconceptions.</i> ● <i>Have students brainstorm testable questions and make a quiz using these.</i>
	<p>Additional Activities for Assessment:</p> <ul style="list-style-type: none"> ● Go back to the original questions and have students write a micro-theme (mini-essay that limits the space to write by using an index card or a half sheet of paper), A Point of View Guide (students write narrative where the processes become the characters of the narrative), an Unsent Letter (students write to a friend or relative to explain what they have learned about Providence Canyon), or a double entry journal (where the teacher uses vocabulary, questions, or prompts on the left side of a paper and the student responds on the right side). ● Add to the KWL chart ● Have students conduct a webquest to find out more about Providence Canyon. ● Quiz to include questions about the cause and effect of erosion and resulting deposition.

Engaging and Explaining

Ask: Are all mountains and valleys made by erosion and deposition? Challenge them to explain their thinking about other processes that form mountains.

Yellowstone National Park contains evidence of many different processes that change the Earth's surface.

[Erosion and Sedimentation Information](#)

Weathering, erosion and deposition are not the only processes that change the landscape in some areas.

Introduce the process of volcanoes and earthquakes as constructive and destructive processes.

Old Faithful Geyser gives evidence that there is something going on under the surface to heat the water that plumes into the air. This process is called hydrothermal activity.

[Old Faithful Geyser](#)

Yellowstone is also home to earthquakes and evidence of volcanic activity:

[Volcanic history of Yellowstone](#)

[Earthquakes in Yellowstone](#)

The destructive and constructive processes have changed and are changing the land in Yellowstone National Park.

Other changes have happened nearby in the state of Washington. Those mountains were formed by volcanic activity and five of those mountains are still active volcanoes!

Phenomenon Resources: [Mt. St. Helen's Web page](#)

Image of eruption of May 1980: [Image of Eruption of May 1980](#)

Ask students to discuss and explain: Why is a volcano considered a constructive force when it causes destruction of houses and other buildings? When is an earthquake or volcano a constructive process, and when is it a destructive process? Can it be both?

Have students research other active volcanoes, earthquakes, and how they are monitored. Here are possible website resources:

- [Michigan Tech Volcanoes Page](#)
- [United States Geologic Survey](#)
- [Earthquakes-- Incorporated Research Institutions for Seismology](#)
- [Current data on volcanoes in the United States](#)

Satellite images of areas before and after events etc. can be found at www.usgs.gov.

<p>Elaborating</p>	<p>Challenge groups of students to develop and design a model showing Earth’s processes involving changes in the surface of the Earth. Models are 2 dimensional or 3 dimensional and can include a booklet, a shoebox diorama, a poster, or a newsletter.</p> <p>Have them divide their model into three sections:</p> <ul style="list-style-type: none"> ● Constructive Force, ● Destructive Force, and ● Both Constructive and Destructive. <p>Share the models with others by displaying them in the hallway, media center or other central location.</p>
<p><i>Assessment of Student Learning</i></p>	
	<p><i>For the teacher</i></p> <p><i>Throughout the lesson, students receive feedback on the adequacy of their explanations and abilities.</i></p> <p><i>Informal, formative evaluations occur from the initial phase of the instructional sequence. At end of the lesson, information from assessment becomes more formal. In the evaluate phase, the teacher should involve students in experiences that are understandable and consistent with those of prior phases and congruent with the explanations from prior phases.</i></p> <p>Note that these descriptions of proficiency are referenced throughout the lesson as benchmarks for formative assessment.</p> <p>Clarify Intended Learning – Students explain the lesson phenomena using a model and written argument.</p> <p>Elicit Evidence – through model and written argument</p> <p>Interpret Evidence – look for evidence of student work below proficiency</p> <p>Act on Evidence – at this point in the lesson, determine how you will address student work that is below proficiency.</p>
<p><i>SEP, CCC, DCI</i></p>	<p>Science Essentials</p>
<p>Science and Engineering Practices</p>	<ul style="list-style-type: none"> ● Ask questions about the phenomena-- Providence Canyon, Yellowstone, and Mt. St. Helens. ● Develop and use models and simulations to construct explanations about the phenomena. ● Plan and carry out investigations that require identifying what is to be recorded, what are the dependent and independent variables, and how data will be collected in the Wind and Water Labs. ● Analyze data to identify significant patterns from IRIS (www.iris.edu) and USGS web sites that give current information about flooding, earthquakes and volcanoes. ● Construct an explanation to provide an account of features on the Earth’s surface

	<ul style="list-style-type: none"> ● Engage in argument from evidence to best explain the natural phenomena of Earth's changes.
Crosscutting Concepts	<ul style="list-style-type: none"> ● Observe patterns and look for relationships. ● Identify cause and effect relationships associated with constructive and destructive processes. ● Recognize scale, proportion and quantity in relation to size, time, and energy. ● Define the system of study by setting and identifying the boundaries of each system. ● Track the fluxes of energy and matter in and out of the established system. ● Identify structure and shape as part of the properties of the system or landform. ● Emphasize stability and change in the natural world as critical elements of each system.
Disciplinary Core Ideas	<ul style="list-style-type: none"> ● Earth's processes drive Earth's conditions, overall structure, composition, and change over time. ● Earth's processes are continuous and interrelated. ● Earth's internal mechanisms play a vital role. ● Water plays a vital role in both weathering and erosion. ● Human activity and interactions with the planet affect Earth's processes.