

## Earth's Changing Surface

### Lesson 3b: Grand Canyon Explorers

<b>Grade 2</b>	<b>Length of lesson:</b> 30 minutes	<b>Placement of lesson in unit:</b> 3b of 6 two-part lessons on Earth's changing surface
<b>Unit central questions:</b> What does the surface of Earth look like? Does it ever change?		<b>Lesson focus questions:</b> Do landforms ever change? What evidence do we have?
<b>Main learning goal:</b> Landforms on Earth's surface change over time. These changes can happen very slowly.		
<b>Science content storyline:</b> The land hasn't always looked the way it does today. Landforms are changing all the time. Relief maps can help us identify and study landforms in different places. Measurements can help us determine whether landforms change over time.		
<b>Ideal student response to the focus questions:</b> We know that landforms change over time because the Grand Canyon is slowly getting deeper and deeper. We have evidence that these changes are happening because of the clues we gathered during our virtual tour of the canyon.		

#### Preparation

<p><b>Materials Needed</b></p> <ul style="list-style-type: none"> <li>• Science notebooks</li> <li>• Chart paper and markers</li> <li>• Google Earth Grand Canyon Tour from Pomona KMZ file or Grand Canyon Exploration KMZ file (from lesson 3a)</li> </ul> <p><b>Student Handouts and Teacher Masters</b></p> <ul style="list-style-type: none"> <li>• 3.2 Google Earth Tour Instructions (Teacher Master) (from lesson 3a)</li> <li>• 3.3 Grand Canyon Explorers, Part 2 (1 per student)</li> </ul>	<p><b>Ahead of Time</b></p> <ul style="list-style-type: none"> <li>• Review the content background document.</li> <li>• Review the Google Earth instructions in handout 3.2 (Google Earth Tour Instructions). Cue the Google Earth prerecorded video to begin after the second clue. If you feel comfortable using Google Earth, we recommend using the Grand Canyon Exploration KMZ file and navigating through the clues manually. However, you may just play and pause the prerecorded video if you prefer.</li> </ul>
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### Lesson 3b General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
3 min	<b>Link to previous lesson:</b> The teacher reviews the clues students gathered in the previous lesson that show the Grand Canyon could be changing.	<ul style="list-style-type: none"> <li>• Earth’s surface has many types of landforms. Landforms can change over time.</li> </ul>
2 min	<b>Lesson focus questions:</b> The teacher reviews the focus questions from the previous lesson: <i>Do landforms ever change? What evidence do we have?</i> Then students talk about their ideas so far.	
4 min	<b>Setup for activity:</b> Students share what they’ve learned about the Grand Canyon and prepare to finish their Google Earth virtual tour.	<ul style="list-style-type: none"> <li>• Relief maps can help us locate different places on Earth and study the landforms in those places. Technology and other sources of information provide evidence that can help us decide whether landforms are changing over time.</li> </ul>
8 min	<b>Activity:</b> Students continue their Google Earth exploration of the Grand Canyon and use a final informational clue to help them decide whether the canyon is changing.	<ul style="list-style-type: none"> <li>• Relief maps can help us locate different places on Earth and study the landforms in those places. Technology and other information, like measurements, provide evidence that can help us decide whether landforms are changing over time.</li> </ul>
7 min	<b>Follow-up to activity:</b> Using evidence from the Google Earth tour, students construct an explanation for whether they think the Grand Canyon is changing over time.	<ul style="list-style-type: none"> <li>• The land hasn’t always looked the way it does today. Landforms on Earth’s surface are changing all the time, and sometimes they change very slowly. We may not observe evidence of those changes unless we take measurements and gather other evidence.</li> </ul>
5 min	<b>Synthesize/summarize today’s lesson:</b> Students share their ideas and evidence for answering the focus question. Then the teacher summarizes key science ideas from the lesson.	<ul style="list-style-type: none"> <li>• The land hasn’t always looked the way it does today. Landforms on Earth’s surface are changing all the time, and sometimes they change very slowly.</li> </ul>
1 min	<b>Link to next lesson:</b> The teacher announces that in the next lesson, students will investigate what causes landforms to change over time.	

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3 min	<p><b>Link to Previous Lesson</b></p> <p><b>Synopsis:</b> The teacher reviews the clues students gathered in the previous lesson that show the Grand Canyon could be changing.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>• Earth’s surface has many types of landforms. Landforms can change over time.</li> </ul>	Ask questions to elicit student ideas and predictions.	<p><b>Show slide 1.</b></p> <p>Today we’ll continue our virtual tour of the Grand Canyon.</p> <p>What did we learn about the Grand Canyon last time?</p> <p><b>NOTE TO TEACHER:</b> <i>Record students’ observations on chart paper during this review.</i></p> <p><b>ELL support:</b> Encourage ELL students to listen and respond to one another’s ideas during this discussion.</p>	<p>We found out that the Grand Canyon is 2 centimeters deeper than it was 50 years ago.</p> <p>A clue told us about a scientist who visited the canyon as an adult, and he learned that it’s deeper now than when he visited the canyon as a kid.</p> <p>We also found out that the Colorado River carries loose soil and rocks with it as it flows through the canyon.</p> <p>From the second clue in the video and on our handout.</p>	<p>How did we learn that?</p> <p>How did we learn that?</p>

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			<p>Does anyone have some other observations and ideas to share about our tour last time?</p> <p><b>Show slide 2.</b></p> <p>So we already have two pieces of evidence to help us as we think about whether the Grand Canyon is changing:</p> <ol style="list-style-type: none"> <li>1. The Grand Canyon is 2 centimeters deeper than it was 50 years ago.</li> <li>2. The Colorado River carries loose soil and rocks with it as it flows through the canyon.</li> </ol> <p><b>ELL support:</b> Be explicit about what the two pieces of evidence are and why they count as evidence. This will help orient ELL students to what is being asked of them.</p>		
2 min	<p><b>Lesson Focus Questions</b></p> <p><b>Synopsis:</b> The teacher reviews the focus questions from the previous lesson: <i>Do landforms ever change? What evidence do we have?</i> Then students talk about their ideas so far.</p>	Set the purpose with a <u>focus question</u> or goal statement.	<p><b>Show slide 3.</b></p> <p>Let’s review our focus questions from last time: <i>Do landforms ever change? What evidence do we have?</i></p> <p>We’ll keep thinking about these questions today and gather more evidence to help us answer them.</p>		
			What do you think so far? Do landforms ever change? What evidence do we have?	I think landforms	

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				<p>might change because the Grand Canyon is 2 centimeters deeper than it was 50 years ago.</p> <p>Maybe the canyon is changing, but I think the top of the land is staying the same.</p>	<p>Does anyone disagree or have another idea to add?</p> <p>What makes you think that?</p> <p>Do you think the top of other landforms stay the same too?</p>
4 min	<p><b>Setup for Activity</b></p> <p><b>Synopsis:</b> Students share what they've learned about the Grand Canyon and prepare to finish their Google Earth virtual tour.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Relief maps can help us locate different places on Earth and study the landforms in those places.</li> </ul>		<p>Are you ready to finish our virtual tour of the Grand Canyon?</p> <p>Like last time, we'll use Google Earth to explore the Grand Canyon from right here in our classroom. We've already gathered two clues about whether the canyon is changing, and today we'll gather one more clue.</p> <p><b>Show slide 4.</b></p> <p>First, let's look again at this picture of the Grand Canyon.</p>		

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	<p>Technology and other sources of information provide evidence that can help us decide whether landforms are changing over time.</p>	<p>Ask questions to elicit student ideas and predictions.</p> <p>Summarize key science ideas.</p>	<p>Do you see anything new that you didn't notice last time?</p> <p><b>ELL support:</b> ELL students benefit from language consistency. Instead of asking whether they notice anything different, it's better to ask them whether they see anything new, since up until now, <i>different</i> has meant that something isn't the same as it was before or isn't the same as something else.</p> <p>Let's quickly review our evidence about whether the Grand Canyon looks different today than it did in the past. What do we know from our first clue?</p> <p><b>ELL support:</b> It can be helpful to point to the two pieces of evidence already highlighted.</p> <p>So we have one piece of evidence showing that the canyon is deeper. What other piece of evidence do we have?</p>	<p>The canyon is very tall and steep.</p> <p>It goes down very deep.</p> <p>The river is at the bottom.</p> <p>It's hard to tell that the canyon looks different, but we know that the canyon is 2 centimeters deeper than it was 50 years ago.</p> <p>I guess someone measured it.</p> <p>The Colorado River carries loose rock and soil with it as it</p>	<p>How do we know it's 2 centimeters deeper?</p> <p>Yes, scientists could have measured it.</p>

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			<p>Now let's return to our Google Earth tour of the Grand Canyon and see what else we discover.</p>	<p>flows through the canyon.</p> <p>Maybe the water is making the canyon deeper by carrying away all that rock and soil.</p>	<p>How might this make the canyon look different today than it has looked in the past?</p>
8 min	<p><b>Activity</b></p> <p><b>Synopsis:</b> Students continue their Google Earth exploration of the Grand Canyon and use a final informational clue to help them decide whether the canyon is changing.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Relief maps can help us locate different places on Earth and study the landforms in those places. Technology and other information, like</li> </ul>	<p>Ask questions to elicit student ideas and predictions.</p>	<p><b>NOTE TO TEACHER:</b> <i>Distribute handout 3.3 (Grand Canyon Explorers, Part 2) and orient students to the tasks they'll be completing during the activity.</i></p> <p><b>Show slide 5.</b></p> <p>On our tour today, we'll follow the Colorado River the end of the Grand Canyon, where we'll explore Lake Mead.</p> <p>What kind of landform is Lake Mead? What does its name tell you?</p>	<p>It's a lake.</p> <p>Lakes are filled with</p>	<p>What do we already know about lakes as landforms?</p>

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	<p>measurements, provide evidence that can help us decide whether landforms are changing over time.</p>	<p>Select content representations and models matched to the learning goal and engage students in their use.</p> <p>Engage students in analyzing and interpreting data and observations.</p> <p>Engage students in constructing explanations and arguments.</p> <p>Engage students in communicating</p>	<p>Good answer! Now let’s start our tour. Remember to imagine that you’re a bird flying over the canyon and looking down at the land.</p> <p><b>NOTE TO TEACHER:</b> <i>Make sure the Google Earth Grand Canyon Tour from Pomona is cued to start immediately after the second clue. Play the video and then pause it after clue 3 pops up in the Google Earth bubble. Read the clue aloud.</i></p> <p>Let’s read our final clue and talk about what it tells us.</p> <p>Where are the rock and soil coming from that are filling up Lake Mead?</p> <p>Does anyone have some other ideas about where the rock and soil may be coming from?</p>	<p>water.</p> <p>Maybe from the Colorado River?</p> <p>They’re coming from the river.</p> <p>The clue tells us that the Colorado River is carrying soil and rocks to Lake Mead.</p> <p>Maybe they’re coming from the</p>	<p>Where do you think the water in the lake might be coming from?</p> <p>How do we know that?</p>



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		in scientific ways.	<p><b>NOTE TO TEACHER:</b> <i>Record students' ideas on chart paper during this discussion.</i></p> <p><b>ELL support:</b> Encourage ELL students to listen and respond to one another's ideas during this discussion. Note any surprising responses or confusion and ask questions to probe students' thinking. You could ask other students to explain what another student means. This can help them focus on what others are saying and holds them accountable to one another as learners.</p> <p>Take a moment now and write down your ideas for answering question 1 on the handout. Make sure to include evidence from our clue in your explanations.</p> <p><b>NOTE TO TEACHER:</b> <i>Give students a couple of minutes to process the third clue</i></p>	<p>canyon during floods.</p> <p>Maybe from the sides of the canyon when it floods.</p> <p>Dirt is being moved from inside the canyon to the lake.</p> <p>The dirt from the canyon has to go somewhere, and the water carries it to the lake.</p>	<p>What do you mean by "coming from the canyon"? Are they coming from anywhere along the river?</p> <p>So if soil and rocks are being carried out of the canyon to another place, what is happening to the canyon?</p>

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			<p><i>and write down their ideas for question 1 on the handout. Based on this clue, students should understand that the Colorado River is moving soil and rocks from the canyon to Lake Mead. Help them connect all three clues so they understand that water is slowly changing the canyon over time as it carries soil and rock out of the canyon and deposits them in the lake.</i></p> <p>What do you think the three clues mean?</p> <p>How does our third clue about Lake Mead help us decide whether the Grand Canyon is changing?</p> <p>Do you think Lake Mead is changing too?</p>	<p>The Grand Canyon is changing!</p> <p>Maybe the canyon is changing and getting deeper because the river is digging dirt and rocks out of the canyon and carrying them to the river.</p> <p>Yes, because it's filling up with soil and rocks. The rocks and soil are piling up in the lake, so it isn't as deep.</p> <p>It might totally fill</p>	<p>What do you think might happen to Lake Mead over many years?</p>

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			<p>So how many landforms are changing?</p>	<p>up with rocks and soil and not be a lake anymore!</p> <p>No, because it wouldn't have any water in it!</p> <p>Two.</p> <p>The Grand Canyon and Lake Mead.</p>	<p>If that happens, could we still call it Lake Mead?</p> <p>Which two landforms are changing?</p>
7 min	<p><b>Follow-Up to Activity</b></p> <p><b>Synopsis:</b> Using evidence from the Google Earth tour, students construct an explanation for whether they think the Grand Canyon is changing over time.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>The land hasn't always looked the way it does today. Landforms on Earth's surface are changing all the time, and sometimes they change very slowly.</li> </ul>	Engage students in constructing explanations and arguments.	<p><b>NOTE TO TEACHER:</b> <i>Have students pair up with an elbow partner and share their ideas about whether they think the Grand Canyon is changing based on the evidence they've gathered.</i></p> <p><b>Show slide 6.</b></p> <p><b>Turn and Talk:</b> So now that we've explored the Grand Canyon and gathered some clues, I'd like you to work with an elbow partner to answer the second question on your handout.</p> <p>Use the sentence starter to develop an explanation for whether you think the Grand Canyon is changing:</p> <p><i>We think the Grand Canyon [is/is not]</i></p>		

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	<p>We may not observe evidence of those changes unless we take measurements and gather other evidence.</p>	<p>Ask students questions to elicit student ideas and predictions.</p>	<p><i>changing because _____.</i></p> <p>Make sure to include evidence from our three clues in your explanations.</p> <p><b>Whole-class share-out:</b> Who would like to share your explanations with the class? Do you think the Grand Canyon is changing? Why or why not?</p> <p><b>NOTE TO TEACHER:</b> <i>As students share their ideas, record them on chart paper.</i></p> <p>Does anyone have another idea?</p>	<p>We think the Grand Canyon is changing because it's getting deeper.</p> <p>Clue 1 said the canyon is 2 centimeters deeper than 50 years ago.</p> <p>We think the canyon is changing too, but we also think that the dirt and rocks are filling up Lake Mead.</p> <p>Well, dirt and rocks are moving from the canyon to the lake, so the canyon is</p>	<p>How do you know it's getting deeper? What's your evidence?</p> <p>And how does this mean the Grand Canyon is changing?</p>



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					sand is building up the sides of the canyon?
5 min	<p><b>Synthesize/Summarize Today's Lesson</b></p> <p><b>Synopsis:</b> Students share their ideas and evidence for answering the focus question. Then the teacher summarizes key science ideas from the lesson.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>The land hasn't always looked the way it does today. Landforms on Earth's surface are changing all the time, and sometimes they change very slowly.</li> </ul>	Highlight key science ideas and focus questions throughout.	<p><b>Show slide 8.</b></p> <p>Let's revisit our focus questions, <i>Do landforms ever change? What evidence do we have?</i></p> <p>Based on the evidence we gathered during our virtual tour of the Grand Canyon, how would you answer the first focus question now? Write your answers in your science notebooks and make sure to include evidence from our investigation.</p> <p><b>Whole-group share-out:</b> Who would like to share your answers to the focus questions? Do you think landforms ever change?</p>	<p>I think landforms can change because the Grand Canyon is changing.</p> <p>Our first clue said that canyon is 2 centimeters deeper than it was 50 years ago.</p> <p>Our second and third clues said that</p>	<p>How do you know the Grand Canyon is changing? What is your evidence?</p>

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		Summarize keys science ideas.	<p><b>Show slide 9.</b></p> <p>Today we added another important clue to our evidence as we finished our tour of the Grand Canyon. Let's review what we learned:</p>	<p>the Colorado River is carrying rock and soil out of the canyon to Lake Mead.</p> <p>I still think that some landforms don't change. Like maybe flat ground is always flat.</p> <p>I don't know for sure, but I think maybe the land caves in sometimes.</p> <p>Like a hole is made in the land.</p> <p>Yes.</p>	<p>That's an interesting idea. Is flat ground always flat? What do others think?</p> <p>What do you mean by "the land caves in sometimes"?</p> <p>So if the land caves in, is it changing?</p>

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			<ol style="list-style-type: none"> <li>1. The Grand Canyon is 2 centimeters deeper than it was 50 years ago.</li> <li>2. The Colorado River carries loose soil and rock with it as it flows through the canyon.</li> <li>3. The soil and rock from the canyon are carried to Lake Mead and are slowly filling up the lake.</li> </ol> <p><b>Show slide 10.</b></p> <p>So based on our evidence, do we all agree with the conclusions on the slide?</p> <ul style="list-style-type: none"> <li>• Landforms like the Grand Canyon and Lake Mead can change over time.</li> <li>• These changes can happen very slowly.</li> </ul>		
1 min	<p><b>Link to Next Lesson</b></p> <p><b>Synopsis:</b> The teacher announces that in the next lesson, students will investigate what causes landforms to change over time.</p>	Link science ideas to other science ideas.	<p><b>Show slide 11.</b></p> <p>Now we know that landforms like the Grand Canyon can change over time, but we're still not sure what causes them to change.</p> <p>That's what we'll investigate next!</p>		