Lesson 3.3
Accumulation of Small Changes
Lesson Overview

This lesson helps students to incorporate time into their understanding of scale. Students use *Handbook of Land and Water* to gather evidence to support the idea that big changes happen to landforms and bodies of water as small changes accumulate. Pairs research and record how different landforms and bodies of water change. Then, each pair shares what they have learned with another pair that read about different landforms and bodies of water. Students reflect on what they have learned by writing about how erosion can cause a big change to happen. Next, students begin to explore the idea that scale can refer to how slow or fast events happen. Students work in groups to sort descriptions of changes caused by erosion—in order from the change that occurs over the shortest amount of time to the change that occurs over the longest amount of time. The purpose of this lesson is for students to learn that many small changes that are hard to notice can add up to a bigger change that is easy to notice.

**Anchor Phenomenon:** The cliff where Oceanside Recreation Center is situated appears to be receding.

**Investigative Phenomenon:** Landforms can change slowly over time.

**Students learn:**

- Many small changes that are hard to notice can add up to a bigger change that is easy to notice.

- Geologists can think about the scale of erosion in terms of size and time.
Students read about slow changes to landforms and bodies of water in the reference book. They record evidence in their notebooks.

Instructional Guide

1. Review the Mountain Model. Remind students that they investigated erosion with a Mountain Model in the previous lesson.

What did you learn through your investigation of the Mountain Model?
[Small changes that are hard to see can add up to a bigger change that is easy to notice.]

2. Hold up a copy of Handbook of Land and Water. Remind students that a reference book is used to locate specific information.

We are going to use Handbook of Land and Water to learn more about changes that happen in the real world.

3. Project notebook. Have students turn to page 51, Gathering Evidence of Change, in their notebooks. Read the directions aloud. Explain that pairs will gather and record evidence about two landforms to see if it supports the idea that small changes can add up to a big change that is easy to notice.

4. Discuss bodies of water. Let students know that bodies of water also go through small and big changes and that Handbook of Land and Water describes changes that happen to bodies of water, too. Explain that since the focus of the unit is mostly on landforms, students will read about those first; however, if students have time and finish reading about two landforms you would like for them to read about one of the bodies of water as well.

5. Distribute one copy of Handbook of Land and Water to each pair of students.

6. Have pairs select landforms to research. Let students know that they can use the table of contents or page 10 to help them decide.
7. Model gathering evidence about beaches.

- Ask students to turn to page 11. Point out that pages 11 and 12 are about beaches, but do not contain evidence about small changes adding up to a big change.

- Ask students to turn to page 13. Read the heading aloud: “How Beaches Change Slowly.” Point out that this page may contain ideas about small changes adding up to a big change.

- Ask students to turn to page 14. Read the heading aloud: “How Beaches Change Fast.” Point out that this page describes how a beach might change quickly, but that this information won’t help students understand small changes adding up to a big change, which is the topic they are researching today.

- Discuss similarities between sections in the reference book. Explain that all sections are set up this way: four pages each, with the first two pages having general information and the last page having information about fast changes that can happen.

- Ask students to turn back to page 13. Read both paragraphs aloud. Point out that the text states the diagram below will help explain the process of how a beach gets smaller, or erodes.

- Remind students of the diagrams they’ve created of the cliff and the importance of captions to help explain ideas.

Let’s examine the diagram and captions on page 13 to find evidence that supports the idea that small changes add up to a big change.

- The first caption on page 13 states that each wave carries away a little bit of sand. This supports the idea of a small change.

- The second caption discusses waves continuing to carry sand away, making the beach smaller.

- The last caption discusses how the small changes made by each wave add up to a big change.

- Remind students that they are seeking information that helps them to better understand how small changes can add up to bigger changes with landforms and bodies of water on Earth. As they read, they should use the headings on each page to help guide them toward finding this specific information.

8. Model how to record evidence about beaches.

- Project notebook page 51 again.

- On the projected notebook page, point out the table and write “beach” in the “Name of landform” column.

- In the second column, next to “Small change,” write “Waves carry little bits of sand away from the beach.” Next to “Big change,” write “The small bits of sand add up and cause the beach to get smaller.”

- In the final column, circle “No”. Discuss the idea that small changes take a long time to add up to a noticeable change; therefore, a person would not be able to observe the beach changing by watching it.
9. Have pairs read about additional landforms and bodies of water and complete the notebook page. Circulate and provide support as necessary. Remind students to use the diagrams in the reference book as evidence to support the idea that small changes add up to a big change.

10. Prompt pairs to share with another pair. Explain that each pair of students should join another pair of students to discuss a landform or body of water they read about. Encourage pairs to share a landform or body of water the other pair did not read about.

11. Discuss evidence as a class. Have a few students share the evidence they recorded for different landforms. After students share about landforms, ask any students who read about a body of water to explain what they learned from their reading.

What evidence did the book provide to support the idea that small changes can add up to a big change that is easy to notice?

Highlight that the big changes are all the result of small changes occurring repeatedly over time.

12. Read a section about a body of water as a class. Explain that bodies of water change, too. Ask students to use the table of contents to choose a body of water they would like to read about. Read the section as a class and discuss how bodies of water also experience big and small changes. As needed, take notes on the board.

13. Collect all copies of *Handbook of Land and Water*.

Teacher Support

**Instructional Suggestion**

**Providing More Experience: Today’s Daily Written Reflection**

*Think about an elephant. What is something at a very small scale that you could observe about an elephant? What is something at a very large scale that you could observe about an elephant?* This prompt (on page 50 in the Investigation Notebook) asks students to reflect on scale as related to size before they incorporate time into their understanding of scale in this lesson. The purpose of this prompt is for students to consider scale at different perspectives, using a well-known animal, an elephant, to express their thinking.

**Rationale**

**Pedagogical Goals: Reading About Slow Changes in the Reference Book**

At this point, students should have a relatively clear understanding of how small changes can accumulate to create changes at a larger scale. Reading about small changes accumulating to create big changes in the real world helps solidify the observations students made when they investigated models and maps in previous lessons. Though the bulk of the unit is about changes to landforms, the reference book exposes students to how bodies of water can also change slowly, providing students with a broader view of how scale is related to stability and change in the world. The reference book does not provide, nor are students expected to gain, knowledge of the specific amounts of time over which landforms and bodies of water change. Instead, the reference book aims to impress upon students the more abstract idea of changes happening at a timescale far too long to observe directly. Students will continue to consider time in their investigations throughout the rest of the chapter.
Background

Literacy Note: About Text Features
Text features are the visual elements of a text that are used to organize information and highlight important ideas. Text features include headings, tables of contents, bold print, illustrations, captions, diagrams, etc. In this activity, students need to rely heavily on headings and diagrams to locate information about how a landform can change slowly. Learning to use text features is a strategy that students can employ to locate and make sense of content in informational texts.

Science Note: What Counts as a Big Change?
At this point, students should conclude that the changes caused by erosion can eventually add up to a big change. However, what is meant by “big” is relative. There is no exact measurement that we want students to consider as the benchmark for what counts as a big change. Some inexact measures that might be helpful for explaining what is meant by “big” change include: big enough to warrant inclusion on a map of an area and big enough for a person to notice. These measures are not exact because the scale and precision of a given map will affect which changes the map will reflect when it is updated, and the level of detail of a person’s observations will affect whether or not she notices a change. In the final activity of this lesson, students will compare several changes caused by erosion and may realize that some “big” changes are bigger than others.

Instructional Suggestion

Going Further: Reading About Changes to Bodies of Water
In order to focus on landforms, students are asked to read and then share their thinking about changes that happen slowly for two landforms from Handbook of Land and Water. The reference book contains similar information about various bodies of water. At the end of this activity, students work together as a class to think about the changes that happen to a body of water of their choice. If you have time, you may want to ask students to take this work a step further and independently record information about a different body of water on a separate sheet of paper. Ask students to create a table similar to the one on page 51, Gathering Evidence of Change, in their notebooks. They can then read about a body of water and record information about it in this new table. Alternatively, you can ask students to read about a body of water and orally share what they learned. Adding this experience will help students to gain more knowledge about how Earth’s surface changes.

Possible Responses

Investigation Notebook
Gathering Evidence of Change (page 51)

Answers will vary. Examples:
Name of landform: islands
How did the landform change?: Small change: waves carry sand away; Big change: lots of sand is carried away and island becomes smaller
Would you be able to see a big change in one day?: No

Name of landform: caves
How did the landform change?: Small change: water runs through cracks; Big change: cracks get bigger and a hole forms in the rock
Would you be able to see a big change in one day?: No
Gathering Evidence of Change

Directions:
1. Use *Handbook of Land and Water* to get evidence that many small changes can add up to a big change.
2. Choose two landforms to read about. Record those in the first column of the table below.
3. Record information from the book in the second column.
4. In the last column, circle Yes or No to answer the question.

**Idea:** Many small changes can add up to a big change.

<table>
<thead>
<tr>
<th>Name of landform</th>
<th>How did the landform change?</th>
<th>Would you be able to see a big change in one day?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small change:</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Big change:</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Small change:</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Big change:</td>
<td>No</td>
</tr>
</tbody>
</table>
Students read about slow changes to landforms and bodies of water in the reference book. They record evidence in their notebooks.

**Instructional Guide**

1. **Review the Mountain Model.** Remind students that they investigated erosion with a Mountain Model in the previous lesson.

   ¿Qué aprendieron a través de su investigación del Modelo de montaña? [Los cambios pequeños que son difíciles de notar pueden acumularse y dar como resultado un cambio más grande que es fácil notar].

2. **Hold up a copy of Handbook of Land and Water.** Remind students that a reference book is used to locate specific information.

   Vamos a usar el Manual de la tierra y el agua para aprender más acerca de los cambios que suceden en el mundo real.

3. **Project notebook.** Have students turn to page 51, Gathering Evidence of Change, in their notebooks. Read the directions aloud. Explain that pairs will gather and record evidence about two landforms to see if it supports the idea that small changes can add up to a big change that is easy to notice.

4. **Discuss bodies of water.** Let students know that bodies of water also go through small and big changes and that Handbook of Land and Water describes changes that happen to bodies of water, too. Explain that since the focus of the unit is mostly on landforms, students will read about those first; however, if students have time and finish reading about two landforms you would like for them to read about one of the bodies of water as well.

5. **Distribute one copy of Handbook of Land and Water to each pair of students.**
6. **Have pairs select landforms to research.** Let students know that they can use the table of contents or page 10 to help them decide.

7. **Model gathering evidence about beaches.**

   - Ask students to turn to page 11. Point out that pages 11 and 12 are about beaches, but do not contain evidence about small changes adding up to a big change.
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**How did the landform change?** Small change: water runs through cracks; Big change: cracks get bigger and a hole forms in the rock
**Would you be able to see a big change in one day?** No
Recolectar evidencia de cambio

Instrucciones:
1. Usa el *Manual de la tierra y el agua* para obtener evidencia de que muchos cambios pequeños se pueden acumular y resultar en un cambio grande.
2. Elige dos accidentes geográficos sobre los cuales quieres leer. Apúntalos en la primera columna de la tabla debajo.
3. Apunta información del libro en la segunda columna.
4. En la última columna, encierra en un círculo Sí o No para responder la pregunta.

**Idea:** Muchos cambios pequeños se pueden acumular y resultar en un cambio grande.

<table>
<thead>
<tr>
<th>Nombre del accidente geográfico</th>
<th>¿Cómo cambió el accidente geográfico?</th>
<th>¿Podrías ver un cambio grande en un día?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambio pequeño:</td>
<td></td>
<td>Sí</td>
</tr>
<tr>
<td>Cambio grande:</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Cambio pequeño:</td>
<td></td>
<td>Sí</td>
</tr>
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