Lesson 1.4
Gary’s Sand Journal
Lesson Overview

Students read *Gary’s Sand Journal*—a book about a real geologist and how he studies sand—and gather more information about how geologists figure out how something changed when they can’t observe it changing. The teacher introduces and models how to use the reading strategy of visualizing. Partners read the book together and practice visualizing during reading to help them better understand ideas in the book. At the end of the lesson, students record observations of a mystery sand in their notebooks, based on information provided in the book. This lesson reinforces the idea that observations can be evidence to help explain how something got to be the way it is.

**Anchor Phenomenon:** The cliff where Oceanside Recreation Center is situated appears to be receding.  
**Investigative Phenomenon:** Different types of sand  
**Everyday Phenomenon:** There is sand at the beach.

**Students learn:**

- Scientists use different ways to study the world.
- Science knowledge helps us know about the world.
- Scientists start with questions and conduct investigations to find answers.
- Visualizing while reading helps readers better understand the ideas in a text.
- Scientists can make observations to help them visualize how something may have happened.
- Scientists look for patterns when they make observations about the world.
- Sand is formed when rock or other materials break into small pieces.
Introduce Gary’s Sand Journal and the reading strategy of visualizing.

Instructional Guide

1. Connect to prior learning.

In the previous lesson, you observed different sand samples to find out more about the sand. What are some observations you made about sand?
   [Sand can be different shapes, sizes, and colors.]

2. Introduce Gary’s Sand Journal. Hold up a copy of the book and read the title aloud. Invite students to share their observations of the front cover.

This book is about a geologist named Gary who uses his observations of sand to visualize how sand became the way it is.

Gary’s work is similar to our work as geologists. We were not able to observe the edge of the recreation center’s cliff getting closer to the flagpole so we need to visualize how this may have happened, based on what we can observe.

3. Introduce visualizing. Explain to students that visualizing is a strategy that readers use to help them understand what they’re reading.

The word visualize means to make a picture in your mind using information from different sources. When scientists can’t observe how something happens, they need to visualize it by creating a picture in their minds. Visualizing helps scientists answer questions.

Readers also visualize as they are reading to get a clearer picture of what is happening in the book.

4. Set a purpose for reading Gary’s Sand Journal.

As we read, we want to understand how Gary uses his observations of sand to visualize how sand got to be the way it is.
5. Designate partners and distribute books.

6. Discuss the table of contents on page 3. Point out the entries about sand size, shape, and color. Remind students that they made observations about the size, shape, and color of different types of sand in the previous lesson.

7. Read page 4 aloud. Have students turn to page 4 and follow along as you read. Ask them to use the image on the bottom of page 4 to make their own observations of the sand Gary has collected.

   Let’s use our observations of the sand to visualize where we think it comes from. Where do you think this sand comes from?

Accept all responses.

8. Read page 5 aloud and connect back to the reading purpose.

   Gary wants to learn more about sand—how each sand grain was made and how the sand grains got to the beach. These are changes that he cannot observe. How does he figure out the answers to his questions? [He makes observations. He gathers evidence. He visualizes how the process may have happened.]


   The text tells me that the size of sand grains is evidence of the size of the waves that carry the sand.

   I can visualize the size of sand grains, using the information and images in the book. I am creating a picture in my head of a big wave carrying big grains of sand and crashing against a beach. I can also picture small waves carrying small grains of sand to and from a beach.

   The pictures I create in my mind while reading help me better understand the ideas in the book. As you continue to read with your partner, create and share pictures in your head based on what you are reading.

Teacher Support

Instructional Suggestion

Providing More Experience: Today’s Daily Written Reflection

What is something you know about sand? What is something you would like to learn about sand? This prompt (on page 11 in the Investigation Notebook) asks students to reflect on the sand observations and comparisons they made in the previous lesson. The purpose of this prompt is to have students connect their observations of sand to Gary’s observations of sand in Gary’s Sand Journal.

Rationale

Literacy Note: Approach to Reading

Skillful readers use a variety of strategies to actively engage with informational text. The books in this unit are designed so that the responsibility of reading science text can be gradually released to students. This allows students to read...
more independently as the unit progresses and they become increasingly familiar with the concepts and vocabulary in
the unit. In this unit, the sense-making strategy of visualizing helps students make sense of what they are reading and
understand processes they can’t observe directly. Whenever possible, model how to use this strategy by thinking aloud
about how you visualize as you read. Students will have multiple opportunities to learn about and practice this strategy
through a gradual-release model; you initially provide a high level of direction and support, and this level of support
decreases over time in order to promote students’ independence.

Background

Literacy Note: Visualizing
Visualizing is a sense-making strategy that is useful in both science and reading. Readers of science text often create
pictures in their minds to assist their comprehension. Being able to think visually is a critical strategy in science and is
particularly useful in this unit, as students learn to generate mental images to make meaning from science text. Visual
representations and models of erosion are prevalent throughout this unit, and visualizing gives students a way to
access these representations. Students will have many opportunities to learn about and practice visualizing throughout
the unit.

Background

Science Note: About Where Sand Comes From and How Sand Forms
Nearly all solid materials on Earth can eventually be eroded into sand. Rocks, shells, corals, bones, metals, and glass
can all be worn down over time by wind, waves, rivers, earthquakes, and other forces that break those materials into
smaller and smaller particles. (The majority of sand comes from rock, and this unit focuses on this type of sand in order
to demonstrate how rock can change.) Some sand is created as mountains and other landforms are worn down by
wind, rain, and streams—rock fragments are carried down streams and rivers to the shore. Thousands or millions of
years may pass as a rocky outcropping on a mountaintop is transformed into grains of sand on a beach. Some sand
forms right at the shore where waves crash against rocks, headlands, and reefs. The sand on many white sand beaches
is made of eroded coral reefs and/or shells of marine animals.

Background

Crosscutting Concepts: What Is Meant by Cause and Effect?
Cause and Effect is a crosscutting concept called out by the Next Generation Science Standards. It is one of seven
powerful ideas that are widely useful across scientific topics and subdisciplines. Making use of the crosscutting concept
of Cause and Effect involves identifying mechanisms and describing processes that lead to observable outcomes. It
often involves discovering how different conditions or inputs lead to different results. Discovering cause-and-effect
relationships is at the heart of the scientific endeavor and is applicable throughout science and engineering.

Background

Crosscutting Concepts: Cause and Effect Across This Unit
In this unit, students consider cause and effect as they construct explanations for observed changes to Earth materials
and landforms. In Chapter 1, they consider the causes that lead to different observable characteristics of sand. In
Chapters 2 and 3, they construct in-depth explanations of the process of erosion in which moving water causes slow
changes to landforms made of solid rock. By the end of the unit, students can contrast the causes of two effects: the
slow change to the recreation center’s cliff, and the fast change to the nearby cliff. This cause-and-effect lens helps
prepare students to explain many other processes that affect Earth, as well as processes in life science and physical
science.
Partner Reading

Pairs read *Gary’s Sand Journal*. After reading, students discuss how the word *visualize* was used in the text.

Instructional Guide

1. **Have partners read the rest of the book.** Encourage students to create pictures in their minds to better understand the ideas presented in the remainder of the book, and to discuss what they visualize with their partners.

2. **On-the-Fly Assessment: Students visualize while reading.** As you circulate, listen and make note of whether students are sharing what they visualize as they read with their partners. Prompt students to visualize while they read by asking, “What picture do you have in your mind as you read this page and examine the pictures on the page?”

3. **Discuss the word *visualize*.**
   - **Put the word in context.** Ask students to turn to page 12. Read the paragraph aloud and have students follow along. Point out that Gary used his observations to visualize where the sand came from and how it got to the beach.
   - **Prompt students to think about the meaning of the word.** Ask questions to help students think more deeply about the word, such as *What else did you visualize while reading the book? How did visualizing help you as you read the book? and How do you think visualizing helps scientists in their work?*
   - **Discuss other examples.** Have students give another example of visualizing, based on their own experiences.
   - **Remind students of the scientific meaning of the word.**

   To visualize means to make a picture in your mind using information from different sources.

4. **Post the *visualize* vocabulary card on the classroom wall.**
Embedded Formative Assessment

On-the-Fly Assessment 1: Visualizing

Look for: Throughout the unit, students will employ the strategy of visualizing as they read and as they engage in firsthand science investigations. Beginning with the reading in this lesson, students will have multiple opportunities to learn about and use the strategy of visualizing to support their reading comprehension. As you circulate, make note of whether or not students are using the strategy to guide their reading. Are they discussing with their partners what they are visualizing while they read?

Now what? When you hear students discussing what they visualize as they read, point out the process to other students. For example, you could say, "I heard a student describe a picture she created in her mind when she was reading about the shape of sand. This student remembered that visualizing during reading helps you better understand what you are reading." You can also ask students to share what they visualized after all students have read the book. Sharing with the class allows other students to hear examples of what it means to visualize during reading.

Teacher Support

Background

About the Book: Gary’s Sand Journal

Gary’s Sand Journal is a first-person account of how Gary Griggs, a geologist and oceanographer, investigates sand. In this book, Gary describes how he observes sand and uses his observations as evidence to support his ideas about the sand and its environment. The size, shape, and color of sand give him evidence about how old the sand is, what it’s made of, and how it got to where it is. The book includes entries from a “sand journal” in which Gary records his observations of three different sand samples that he collected from various locations. In each entry, he asks: “How did this sand get to be the way it is?” The final pages introduce a mystery sand, encouraging students to observe its color, shape, and size and think about what that tells them about the sand’s history. Gary’s Sand Journal provides an inspiring real-world example of a geologist at work and models how to make observations and use these as evidence to support answers to questions.

Crosscutting Concepts: Stability and Change Across Chapter 1

One of the crosscutting concepts emphasized in this unit is Stability and Change. Over the first two chapters, students learn that many scientists pay close attention to when and how change happens and when and how things stay mostly the same. In Chapter 1, students learn that landforms are made of rock and appear to be stable, but do in fact change. Evidence from Gary’s Sand Journal and from a physical model (introduced in Lesson 1.6) shows that rock does change and that geologists can use observations to learn about those changes even though they don’t observe them happening.
Rationale

Pedagogical Goals: Understanding the Nature of Science

One goal set forth by the Next Generation Science Standards (NGSS) is for students to understand the nature of science as a discipline and how scientific knowledge develops over time. The NGSS calls out eight understandings about the nature of science, which are woven throughout the Amplify Science curriculum. This unit gives students an opportunity to experience three understandings about the nature of science: that Scientific Investigations Use a Variety of Methods, that Scientific Knowledge Is Based on Empirical Evidence, and that Science Is a Way of Knowing. Specifically, Gary’s Sand Journal features a geologist who asks questions about how sand got to be the way it is. Students read about how scientists make observations to gather evidence and visualize using information from different sources when they can’t observe how something happens directly. They observe how the geologist featured in the text looks for patterns in the size, shape, and color of different types of sand to figure out answers to his questions. Collectively, this text illustrates the ideas that scientists use different ways to study the world, science knowledge helps us know about the world, scientists start with questions and conduct investigations to find answers, and scientists look for patterns when they make observations about the world.
Mystery Sand

Question: How did this sand get to be the way it is?

<table>
<thead>
<tr>
<th>Observations</th>
<th>Could be evidence of</th>
</tr>
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<tbody>
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<td></td>
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</table>

Size

Shape

Color
Mystery Sand (continued)

1. Did you observe the mystery sand change?

2. How were you able to figure out how the mystery sand changed even if you didn’t observe it changing?

3. What do you visualize about the mystery sand, based on your observations?
Setting a Purpose for Reading

Introduce *Gary’s Sand Journal* and the reading strategy of visualizing.

**Instructional Guide**

1. **Connect to prior learning.**

   - En la lección anterior, observaron diferentes muestras de arena para averiguar más sobre la arena. ¿Cuáles son algunas observaciones que hicieron sobre la arena?
   - [La arena puede tener formas, tamaños y colores diferentes].

2. **Introduce *Gary’s Sand Journal***. Hold up a copy of the book and read the title aloud. Invite students to share their observations of the front cover.

   - Este libro trata sobre un geólogo llamado Gary que usa sus observaciones de la arena para visualizar cómo la arena llegó a ser como es.

   - El trabajo de Gary es similar a nuestro trabajo como geólogos. No pudimos observar el borde del acantilado del centro de recreo acercándose más al palo de bandera, así que tenemos que visualizar cómo pudo haber sucedido esto, basándonos en lo que *si podemos* observar.

3. **Introduce visualizing**. Explain to students that visualizing is a strategy that readers use to help them understand what they’re reading.

   - La palabra *visualizar* significa hacer una imagen en la mente usando información de diferentes fuentes. Cuando los científicos no pueden observar cómo sucede algo, necesitan visualizarlo creando una imagen en sus mentes. Visualizar ayuda a los científicos a responder preguntas.

   - Los lectores también visualizan mientras están leyendo para obtener una imagen más clara de lo que está sucediendo en el libro.

4. **Set a purpose for reading *Gary’s Sand Journal***.
5. Designate partners and distribute books.

6. Discuss the table of contents on page 3. Point out the entries about sand size, shape, and color. Remind students that they made observations about the size, shape, and color of different types of sand in the previous lesson.

7. Read page 4 aloud. Have students turn to page 4 and follow along as you read. Ask them to use the image on the bottom of page 4 to make their own observations of the sand Gary has collected.

Usemos nuestras observaciones de la arena para visualizar de dónde pensamos que viene. ¿De dónde piensan que viene esta arena?

Accept all responses.

8. Read page 5 aloud and connect back to the reading purpose.

Gary quiere aprender más acerca de la arena, cómo fue hecho cada grano de arena y cómo llegaron los granos de arena a la playa. Estos son cambios que él no puede observar. ¿Cómo averigua las respuestas a sus preguntas? [Hace observaciones. Reúne evidencia. Visualiza cómo puede haber sucedido el proceso].


El texto me dice que el tamaño de los granos es evidencia del tamaño de las olas que transportan la arena.

Puedo visualizar el tamaño de los granos de arena, usando la información y las imágenes en el libro. Estoy creando una imagen en mi cabeza de una gran ola que transporta granos de arena grandes y choca contra una playa. También puedo visualizar olas que transportan granos de arena pequeños desde y hacia una playa.

Las imágenes que puedo crear en mi mente mientras leo me ayudan a entender mejor las ideas en el libro. Mientras continúan leyendo en parejas, creen y compartan imágenes en su cabeza basándose en lo que están leyendo.

Teacher Support

Instructional Suggestion

Providing More Experience: Today’s Daily Written Reflection
What is something you know about sand? What is something you would like to learn about sand? This prompt (on page 11 in the Investigation Notebook) asks students to reflect on the sand observations and comparisons they made in the previous lesson. The purpose of this prompt is to have students connect their observations of sand to Gary’s observations of sand in Gary’s Sand Journal.
Rationale

Literacy Note: Approach to Reading
Skillful readers use a variety of strategies to actively engage with informational text. The books in this unit are designed so that the responsibility of reading science text can be gradually released to students. This allows students to read more independently as the unit progresses and they become increasingly familiar with the concepts and vocabulary in the unit. In this unit, the sense-making strategy of visualizing helps students make sense of what they are reading and understand processes they can’t observe directly. Whenever possible, model how to use this strategy by thinking aloud about how you visualize as you read. Students will have multiple opportunities to learn about and practice this strategy through a gradual-release model; you initially provide a high level of direction and support, and this level of support decreases over time in order to promote students’ independence.

Background

Literacy Note: Visualizing
Visualizing is a sense-making strategy that is useful in both science and reading. Readers of science text often create pictures in their minds to assist their comprehension. Being able to think visually is a critical strategy in science and is particularly useful in this unit, as students learn to generate mental images to make meaning from science text. Visual representations and models of erosion are prevalent throughout this unit, and visualizing gives students a way to access these representations. Students will have many opportunities to learn about and practice visualizing throughout the unit.

Background

Science Note: About Where Sand Comes From and How Sand Forms
Nearly all solid materials on Earth can eventually be eroded into sand. Rocks, shells, corals, bones, metals, and glass can all be worn down over time by wind, waves, rivers, earthquakes, and other forces that break those materials into smaller and smaller particles. (The majority of sand comes from rock, and this unit focuses on this type of sand in order to demonstrate how rock can change.) Some sand is created as mountains and other landforms are worn down by wind, rain, and streams—rock fragments are carried down streams and rivers to the shore. Thousands or millions of years may pass as a rocky outcropping on a mountaintop is transformed into grains of sand on a beach. Some sand forms right at the shore where waves crash against rocks, headlands, and reefs. The sand on many white sand beaches is made of eroded coral reefs and/or shells of marine animals.

Background

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Background

Crosscutting Concepts: Cause and Effect Across This Unit
In this unit, students consider cause and effect as they construct explanations for observed changes to Earth materials and landforms. In Chapter 1, they consider the causes that lead to different observable characteristics of sand. In Chapters 2 and 3, they construct in-depth explanations of the process of erosion in which moving water causes slow
changes to landforms made of solid rock. By the end of the unit, students can contrast the causes of two effects: the slow change to the recreation center’s cliff, and the fast change to the nearby cliff. This cause-and-effect lens helps prepare students to explain many other processes that affect Earth, as well as processes in life science and physical science.
Partner Reading

Pairs read *Gary’s Sand Journal*. After reading, students discuss how the word *visualize* was used in the text.

Instructional Guide

1. **Have partners read the rest of the book.** Encourage students to create pictures in their minds to better understand the ideas presented in the remainder of the book, and to discuss what they visualize with their partners.

2. **On-the-Fly Assessment: Students visualize while reading.** As you circulate, listen and make note of whether students are sharing what they visualize as they read with their partners. Prompt students to visualize while they read by asking, “What picture do you have in your mind as you read this page and examine the pictures on the page?”

3. **Discuss the word *visualize*.**
   - **Put the word in context.** Ask students to turn to page 12. Read the paragraph aloud and have students follow along. Point out that Gary used his observations to visualize where the sand came from and how it got to the beach.
   - **Prompt students to think about the meaning of the word.** Ask questions to help students think more deeply about the word, such as *What else did you visualize while reading the book? How did visualizing help you as you read the book?* and *How do you think visualizing helps scientists in their work?*
   - **Discuss other examples.** Have students give another example of visualizing, based on their own experiences.
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Visualizar significa hacer una imagen en la mente usando información de diferentes fuentes.

4. **Post the *visualize* vocabulary card on the classroom wall.**
Embedded Formative Assessment

On-the-Fly Assessment 1: Visualizing

**Look for:** Throughout the unit, students will employ the strategy of visualizing as they read and as they engage in firsthand science investigations. Beginning with the reading in this lesson, students will have multiple opportunities to learn about and use the strategy of visualizing to support their reading comprehension. As you circulate, make note of whether or not students are using the strategy to guide their reading. Are they discussing with their partners what they are visualizing while they read?

**Now what?** When you hear students discussing what they visualize as they read, point out the process to other students. For example, you could say, “I heard a student describe a picture she created in her mind when she was reading about the shape of sand. This student remembered that visualizing during reading helps you better understand what you are reading.” You can also ask students to share what they visualized after all students have read the book. Sharing with the class allows other students to hear examples of what it means to visualize during reading.

Teacher Support

**Background**

**About the Book: Gary’s Sand Journal**

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**Crosscutting Concepts: Stability and Change Across Chapter 1**

One of the crosscutting concepts emphasized in this unit is Stability and Change. Over the first two chapters, students learn that many scientists pay close attention to when and how change happens and when and how things stay mostly the same. In Chapter 1, students learn that landforms are made of rock and appear to be stable, but do in fact change. Evidence from Gary’s Sand Journal and from a physical model (introduced in Lesson 1.6) shows that rock does change and that geologists can use observations to learn about those changes even though they don’t observe them happening.
Rationale

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Specifically, *Gary’s Sand Journal* features a geologist who asks questions about how sand got to be the way it is. Students read about how scientists make observations to gather evidence and visualize using information from different sources when they can’t observe how something happens directly. They observe how the geologist featured in the text looks for patterns in the size, shape, and color of different types of sand to figure out answers to his questions. Collectively, this text illustrates the ideas that scientists use different ways to study the world, science knowledge helps us know about the world, scientists start with questions and conduct investigations to find answers, and scientists look for patterns when they make observations about the world.
Instrucciones:
1. Pasa a la página 21 en El diario de arena de Gary.
2. Mira el dibujo de la arena misteriosa y apunta tus observaciones en la columna “Observaciones” en la tabla debajo.
3. Apunta de qué podrían ser evidencia tus observaciones en la última columna.
4. Cuando termines de apuntar tus observaciones, responde las preguntas en la página siguiente.

<table>
<thead>
<tr>
<th>Observación</th>
<th>Podría ser evidencia de</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamaño</td>
<td></td>
</tr>
<tr>
<td>Forma</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
</tr>
</tbody>
</table>

Pregunta: ¿Cómo llegó esta arena a ser como es?
Nombre: ____________________________________ Fecha: ________________

**Arena misteriosa (continuación)**

1. ¿Observaste la arena misteriosa cuando estaba cambiando?
   ____________________________________________

2. ¿De qué manera pudiste darte cuenta cómo cambió la arena misteriosa aunque no la hayas observado al cambiar?
   ____________________________________________
   ____________________________________________
   ____________________________________________

3. ¿Qué visualizas sobre la arena misteriosa, basándote en tus observaciones?
   ____________________________________________
   ____________________________________________
   ____________________________________________