## Contents

**The Savage Mountain**

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Literacy Overview

Reading Selections

• A Mountain Called K2 (science article)
• K2 1978 (personal narrative)
• K2 2011 (third-person narrative)
• Geared Up! (reference article)

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS

CC.5.RInfo.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

CC.5.RInfo.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

CC.5.RInfo.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

CC.5.RInfo.5 Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.

CC.5.RInfo.6 Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.

CC.5.RInfo.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

CC.5.RInfo.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

Writing Standards (page 17)

CONTENT GOAL

Students will read four selections in The Savage Mountain. They will learn about the challenges mountaineers face when climbing one of the world’s most treacherous peaks and the how these hazards are rooted in the science concepts of force, and gravity.

COMPREHENSION GOAL

Remind students that as thinking-intensive readers they must listen to their inner voice to monitor and repair comprehension as they read. Find opportunities to model and teach active thinking strategies to help students access content. You may want to focus on the following strategies for The Savage Mountain.

• Determine Importance: Readers need to sift out the most important information in a text. They must distinguish the important information from the interesting details to answer questions and arrive at main ideas.

• Ask Questions: Readers expand understanding when they ask themselves questions as they read and when they ask others questions as they discuss the content. Self-questioning propels readers to discover answers, ask more questions, and do further research.
ACTIVATE & BUILD BACKGROUND

Draw the graphic organizer shown above. Ask: What do you think a “savage” mountain is? What challenges might climbers face there? Write students’ responses in the graphic organizer.

Model for students by thinking aloud. You might say something similar to the following: I’ve hiked up small hills before, and all I needed were good boots and plenty of water. Then hold up the book cover and say: Hiking up this mountain would be completely different. It looks incredibly cold and steep. Climbers would probably need much more special equipment than I needed to hike up a hill.

Explain that the mountain on the cover is called K2 and it is located on the border of China and Pakistan in Asia. It is the second-tallest mountain in the world, after Mount Everest, but many people consider it even more difficult to climb. Tell students that climbers who wish to reach the top must face extreme winds, brutally cold temperatures, avalanches, and other natural hazards, and very low oxygen levels, which makes breathing difficult.

Ask students to Turn and Talk about other challenges mountaineers might face and what they think it would be like to climb to the top of K2.

Students can then Share what they already know or wonder about climbing extremely tall mountains.

You may want to return to the graphic organizer to add more information after students read each selection.

BUILD SCIENCE BACKGROUND

Pages 4–6 of this teacher’s guide address how certain science concepts relate to each selection in The Savage Mountain. This information will provide you with science background knowledge as you plan your teaching for this book.

Help students access background knowledge related to the science concepts. Support the concepts of force and gravity in ways that are familiar to your students.

• force: Tell students that a force is a push or pull. Explain through demonstration: toss a ball, push an object across a table, or blow on a sheet of paper. For each example, have students identify where the force is coming from and what object receives the force. Then invite students to test the effect of forces on other classroom objects and record their results.

• gravity: Tell students gravity is a force that is always acting to pull objects toward the center of the Earth. Drop a ball and ask students to describe what happened, based on what they just learned. Point to the ball on the ground and ask students whether gravity is still affecting the ball. (Yes, it’s keeping it on the ground)
Science Background

Science concepts are a critical part of each selection in *The Savage Mountain*. These pages will help you build content knowledge so that you may more effectively have discussions with students as they read each selection in the book.

The following big idea science concepts apply to several selections in the book.

- **A force** (student book, pp. 6, 12, 22, 30) is a push or pull. A force can be described by its strength and direction. A *contact force* is the most familiar, occurring when two objects touch. An example is the force a person exerts when pushing a shopping cart. A *noncontact force* occurs when one object exerts force on another without touching it. A magnet, for example, can pull and push another magnet and some metals without touching them.

- **Gravity** (student book, pp. 7, 12, 26) is a noncontact force. Gravity is best known as the force responsible for pulling all objects toward the center of Earth. In reality, gravitational force is present between any two objects in the universe. The gravitational attraction between those objects will be stronger when they have larger masses or when they are closer together. For example, a person exerts a gravitational pull on any nearby object, such as a desk. The desk also exerts a gravitational pull of equal strength on the person. But because the mass of the person and the desk are so small, (when compared with something like planet Earth), the gravitational attraction between them is far too small to notice.

The mass of Earth, on the other hand, is so large that a person easily feels its gravitational pull. You notice this pull as you climb up stairs or a hill. With each step, you must pull your leg up against the gravitational force pulling it down. Falling is another way we feel Earth’s gravitational pull. If a person jumps up, Earth’s gravity will pull the person back down. As Earth pulls the person down, that person will exert an equally strong pull on Earth. However, because Earth’s mass is so large compared with the person’s mass, it is practically impossible to observe the effects of this pull.

Pages 5–6 in this teacher’s guide describe how the science concepts above relate to each selection. Additional science background information is given for each selection.
In this selection, students will learn about the many hazards mountaineers face when climbing K2, the second-tallest mountain in the world. They will also read how mountaineers must use forces (student book, p. 6) to fight the pull of gravity (student book, p. 7).

One of the dangers of climbing snow-capped mountains is the risk of an avalanche—a sudden rush of snow and ice down a steep slope. Avalanches can occur when loose, powdery snow is suddenly dislodged from a slope. The snow falls down the mountain, picking up speed because of gravity. The falling snow knocks loose even more snow, setting off a growing chain reaction. Avalanches can be even more devastating when a hard crust develops on the snow’s surface. When this crust fractures, the built-up snow is released all at once in a devastating “slab avalanche.” Mountaineers caught in the path of a slab can be crushed or buried under tons of snow.

The tremendous energy contained in an avalanche ultimately comes from the force of gravity. In general, as an object is raised above the surface of Earth, the amount of gravitational potential energy it contains increases. This means that when something causes an object to fall, it will strike the ground faster (and more forcefully) when dropped from a greater height.

Thus, avalanches that start from higher altitudes can reach higher speeds than is possible on lower mountains. Higher mountains also provide more time and space for avalanches to grow in size. Whenever the speed or the mass of snow making up an avalanche increases, its kinetic energy (energy of motion) also increases. By the time a large avalanche reaches the base of a mountain, it can contain millions of tons of snow and travel up to 300 kilometers per hour. If this avalanche encounters an object in its path, some of this kinetic energy is released and a force is exerted—demolishing whatever is in the way.

Among the greatest risks climbers face are the medical complications that can arise from oxygen deprivation. While the percentage of oxygen in the air is practically the same at these altitudes, the density is significantly less. This means that each lungful of air only contains about a third of the air a person can inhale at sea level.

Air is denser at sea level because the atmosphere overhead is much thicker. More air overhead means more mass is pulled down by gravity (student book, p. 12). It also means more force (student book, p. 12) is exerted on the ground. This force is called air pressure. At sea level, air pressure is great enough to compress air so it is easily breathable. At higher altitudes, however, the mass of the air overhead is significantly less, and air pressure is often too low to compress the air to tolerable concentrations. Breathing normally would result in suffocation. This explains why many mountaineers carry bottled oxygen and, incidentally, why commercial jets must maintain pressurized cabins at cruising altitude.

Prolonged exposure to low oxygen concentrations causes altitude sickness. Symptoms include headaches, hyperventilation, nausea, and disorientation. This interferes with mental concentration, which can lead to fatal accidents in treacherous conditions. Advanced symptoms include loss of coordination, increased blood pressure, and fluid buildup in the lungs and brain (which can lead to coma or even death). The body compensates for low oxygen concentrations by making more red blood cells to transport oxygen, but this takes time. High altitude climbers often must acclimate for many months before they push for the summit.
K2 2011

Student Book, pp. 20–29
Teacher’s Guide, pp. 11–12

In this selection, students will read an account of an expedition in 2011 to the summit of K2. They will learn about the dangers these climbers faced as they traveled along a route steeper and more treacherous than the one taken by the 1978 expedition.

Huge glaciers surround the base of K2. Glaciers are expanses of ice that form in highlands at high altitudes. They are often called “rivers of ice” because of the way they slowly slide down mountain valleys. Glaciers form over many years as repeated snowfalls build up without completely melting. The layers compact into ice. **Gravity** (student book, p. 26) pulls glaciers down mountains, but the ice usually creeps along at only a few centimeters (a couple of inches) per day. As a glacier moves, the **force** (student book, p. 22) of the moving ice breaks away rock from the valley floor and walls. The glacier carries this rock, which grinds against the sides of the valley. Over thousands of years, this grinding force noticeably erodes the valley deeper and wider.

In addition to the risks related to weather and the lack of water and oxygen, mountaineers face the obvious risks related to gravity. When a person stands on flat ground, gravity pulls him or her in the direction of the center of Earth, but in response to this force, the ground exerts a reaction force upward on the person. The person does not move up or down because the forces are balanced. When a person stands on a sloped surface, however, the reaction force of the ground points directly out from (perpendicular to) the sloped surface and does not fully balance the downward force of gravity. As long as the slope is not too steep, the force of friction between the person’s shoes and the ground can help balance the upward and downward forces and prevent the person from slipping. Icy slopes are especially dangerous for mountain climbers because there is so little friction.

GEARED UP!

Student Book, pp. 30–31
Teacher’s Guide, pp. 13–14

In this selection, students will learn about different types of equipment that mountaineers use that enable them to climb the steep slopes and survive the harsh conditions they encounter on K2.

A compass uses magnetic **force** (student book, p. 30) to indicate direction. A freely rotating pointer on the compass aligns toward the north, allowing hikers to determine the direction in which they are traveling. The pointer is actually a tiny bar magnet, and the north pole of the pointer aligns toward Earth’s magnetic south pole. Earth’s magnetic south pole is actually near the geographic North Pole.

Light usually travels in a straight line, but it can change direction when it strikes a surface. A black surface **absorbs** most of the light that strikes it, but a white surface, such as snow, **reflects** most of the light. Mountain climbers must wear goggles that protect their eyes from the intense reflection of the sun’s ultraviolet rays. At sea level, Earth’s atmosphere provides some protection from these harmful rays. At extreme altitudes, however, there is much less atmosphere to block the rays. Without proper protection, climbers can experience damage similar to sunburn at the back of their eyes, causing a temporary loss of vision called snow blindness.

Help students demonstrate how intense the reflection of sunlight from ice and snow can be. Darken the classroom and place a sheet of black construction paper and a sheet of white paper side by side. Have students observe the reflection that occurs as they shine a narrow-beam flashlight first toward the black paper and then toward the white paper. They will observe a much more intense reflection from the white paper.
A Mountain Called K2

Summary
“A Mountain Called K2” is a science article that provides an overview of K2, the world’s second-tallest mountain. It contains facts about the location and history of K2 and the extreme challenges and hazards mountaineers must overcome to reach its summit.

BUILD BACKGROUND FOR THE GENRE

Have students turn and talk about the kinds of things they might learn in a science article. Then have them share their ideas. Tell them that “A Mountain Called K2” is a science article with the following elements:

• It uses facts, details, examples, and evidence to convey information about forces involved in mountain climbing.
• The text is organized using headings and has specialized vocabulary.
• Facts and information are conveyed through photos, captions, a diagram, and other graphics.

BUILD VOCABULARY & CONCEPTS

forces
• gravity
• oxygen

Remind students that Using Context Clues is a strategy to infer the meaning of an unfamiliar word. They can “read around” the word, or read a few sentences before and after it, to make meaning from the context. Remind them to look at the photographs, too.

Another strategy to try is Sketching Words. Share the word forces in context and have students sketch a picture or diagram that they think demonstrates the meaning of the word. Allow a few minutes for them to complete their sketches, and then have them turn and share their sketches with a partner. Students should first explain their sketches, and then partners should compare and contrast them. Listen to students’ explanations and correct any misconceptions. Have students follow the same steps with the words gravity and oxygen.

Point out other important words in the selection, such as altitudes, frostbite, summit, and avalanches. Have pairs use sketches or context clues to determine their meaning. Some words lend themselves to sketching; others may not. You may start by giving sketching tips or by providing a sample sketch or diagram for one of the words.
READ

The content goal for The Savage Mountain is for students to learn about the challenges mountaineers face when climbing K2 and how these relate to the concepts of force and gravity. As students read “A Mountain Called K2,” they will learn about the energy and force climbers use to overcome gravity as they move up the steep slopes. Point out the Read to find out statement at the top of page 2 in the student book: Read to find out why climbing K2 holds many challenges.

Help students with the comprehension goal of accessing content by determining importance. Explain that by examining the text we can determine which details describe the main ideas and which details provide support. This can deepen our understanding. Model by reading the second and third paragraphs on page 3. Then say: When I read these paragraphs, words like difficult, daring, disaster, and uncertain stand out to me. I also read that snowstorms, thin air, and frostbite can all pose hazards to mountaineers. These details all relate to one important point: that mountaineers must face many extreme dangers when climbing K2.

Before students begin reading, say: As you read, pay attention to the details and notice which ones relate to a bigger, more important idea. If you can’t decide, try reading the paragraph again and reflect on the facts and information. Pause at the end of each page to think about the important points on the page.

TURN & TALK

Revisit the Read to find out statement. Have students turn and talk about why climbing K2 is challenging. (Possible response: The mountain is extremely tall and steep, and the air is so thin and cold that climbers can have difficulty breathing and staying warm.) Have students turn and talk about the Check In question, thinking about the meaning of the word savage as they talk: Why is K2 called the Savage Mountain? (Possible response: K2 is called the Savage Mountain because it is so difficult and dangerous to climb.)

Determine Word Meaning Activate students’ prior knowledge by having them turn and talk about what they think they know about the word expedition. Next, have them read the first paragraph on page 3. After reading, ask a few students to share their definition of the word. Ask how this word is different from similar words like trip, adventure, or hike. Have student pairs locate several other unfamiliar words in the selection and work together to figure out the meaning of these words, as well as possible synonyms.

Explain Relationships Point out to students that a good way to increase their understanding of a selection is to look for relationships between concepts. Model by reading the paragraph about force on page 6. Say: Steep slopes require climbers to use greater force to climb K2 than to climb a mountain with shallower slopes. Then have students turn and talk to discuss relationships between additional concepts in the selection. Ask: What is the relationship between gravity and dangers that climbers face on K2? (Possible response: Gravity pulls everything down, including snow and climbers on mountains. The risks from snow falling in the form of an avalanche or of injury from a fall are magnified on extremely high, treacherous mountains such as K2.) Additional relationships to discuss include those between altitude and oxygen, between altitude and water, and between the number of people who have climbed K2 and Mount Everest.

WRITE & ASSESS

You may want to have students do a “quick write” to assess understanding. It’s always helpful to have students reflect on both the content and their thinking process.

• What are three challenges mountaineers must face when climbing K2?
• What other questions do you have about high altitude mountaineering?
K2 1978
Personal Narrative

Summary  "K2 1978" includes two personal narratives written by Jim Whittaker and Jim Wickwire about their expedition to the summit of K2 in 1978. The narratives describe the dangers the climbers faced and the ways they overcame those challenges.

BUILD BACKGROUND FOR THE GENRE

Ask students to turn and talk about the kinds of information they might expect to read in a personal narrative. Have pairs share their ideas with the class. Then tell students that “K2 1978” is a personal narrative with the following elements:

• It provides two firsthand accounts of an event—the climbing of K2.
• The writers describe events in chronological order. The descriptions include dates, times, places, and people involved.
• It includes photos with captions, as well as other graphics.

BUILD VOCABULARY & CONCEPTS

• gravity  • energy
• force  • oxygen

Remind students that Using Context Clues is a strategy to infer the meaning of an unfamiliar word. They can “read around” the word, or read a few sentences before and after it, to make meaning from the context. Remind them to look at the photographs, too.

Another strategy to try is Becoming Wordkeepers. Explain that a wordkeeper is responsible for knowing the meaning, part of speech, and spelling of a certain word. But remind students that the meaning of the word is the most important thing to remember. Write the word gravity and its part of speech on a card and ask if anyone knows its meaning. If a student gives the correct definition, write it on the back of the card and give it to the student. If no one knows the word, ask a volunteer to learn it and be the wordkeeper. Other students can ask the wordkeeper if they forget the word’s meaning or spelling. Follow the same steps with the words force, energy, and oxygen.

You may want to point out other important words or terms in this selection, such as prologue, epilogue, trudged, parka, and mishaps. Designate a wordkeeper for each of these words and any words that might be unfamiliar to students.
READ

The **content goal** for *The Savage Mountain* is for students to learn about the challenges mountaineers face when climbing K2 and how these relate to the concepts of force and gravity. Explain that “K2 1978” describes an exciting but harrowing expedition to the summit of K2 in 1978. Point out the **Read to find out** statement at the top of page 10 in the student book: *Read to find out if climbers reached the top of K2.*

Help students with the **comprehension goal** of accessing content by asking questions as they read. Model by reading the prologue on page 10 aloud. Then say: *Mountain climbers must spend a lot of time planning a trip to K2. Only the most skilled climbers with the best equipment would dare attempt such a feat. Still, I’m sure things go wrong. I wonder if anything went wrong on this expedition, and if so, what. I’ll read on to find out.*

Before students begin reading, say: *As you read, pause from time to time and ask yourself questions about what you are reading. Re-read the text when you do not understand something, or read on to see if your questions are answered further on. Sometimes these questions will be answered, but at other times you may need to do research on your own.*

TURN & TALK

Revisit the **Read to find out** statement. Have students turn and talk about whether climbers reached the top of K2 and what challenges they had to overcome on their journey. Check students’ understanding by discussing the **Check In** question: *Which part of the 1978 K2 expedition do you think was most dangerous?* (Possible response: I think the route along the sharp, narrow ridge with a sheer drop on either side was the most dangerous. Climbers had to use ropes to avoid falling, and even a small mistake could have been fatal.)

**Describe Text Structure** Tell students that the structure of personal narratives is often chronological. Signal words, such as first, next, then, and finally, provide clues about the order. An author also might provide dates, times, or numbered events that help the reader understand the order of events. Encourage students to look for these clues as they read. Model by reading aloud the last paragraph on page 10. Then say: *In this paragraph, the author indicates the order of events with these dates: 1975, 1978, and mid-June. Have students turn and talk with a partner about the order of events in the text and why chronological order is important in this narrative. You may want them to make a time line to put the major events in order, including details from both Whittaker’s and Wickwire’s accounts.*

**Analyze Multiple Accounts** Remind students that “K2 1978” is a personal narrative told from the first-person point of view by two mountaineers from the expedition. Point out the two accounts beginning on page 10 and page 15. Say: *While both parts of the personal narrative are told from the first person point of view, of the two writers only Jim Wickwire climbed to the top. So of these two writers, only Wickwire can give a firsthand account of that final push to the summit.* Then model how to analyze and compare these accounts. Say: *To fully understand what happened on this expedition, I look for common times or events in both accounts. For example, on page 14 Whittaker describes spotting Lou on the summit at 5:20 p.m. That matches Wickwire’s reference to 5:20 p.m. on page 17. Whittaker loses sight of Lou after that, so it’s only because of Wickwire’s account that we know what happened next. Have students turn and talk to a partner about how Whittaker’s and Wickwire’s accounts complement each other, including which details can be found in both accounts and which are only given in one story.*

WRITE & ASSESS

You may want to have students do a “quick write” to assess understanding. It’s always helpful to have students reflect on both the content and their thinking process.

- What parts of the text indicate that teamwork was important to the success of the expedition?
- What do you still wonder about expeditions to K2?
"K2 2011" is a third-person narrative about a 2011 expedition to K2. It describes the hazards that the climbers faced—including avalanches, deep snow, and oxygen deprivation—as they took the especially challenging north route to the summit.

BUILD BACKGROUND FOR THE GENRE

Lead students to an understanding of the elements of a third-person narrative. Explain that "K2 2011" is a third-person narrative and has the following elements:

- It tells about real people, places, and events.
- The description of events is in chronological order, and the description includes dates, times, places, and people involved.
- The writer includes a map of ascent that details the different legs of the journey.

BUILD VOCABULARY & CONCEPTS

- oxygen
- force
- gravity

Remind students that Using Context Clues is a strategy to infer the meaning of an unfamiliar word. They can “read around” the word, or read a few sentences before and after it, to make meaning from the context. Remind them to look at the photographs, too.

Another helpful strategy is Playing Word Charades. Divide the class into small groups. Tell one student in each group that he or she will be silently acting out the word oxygen. Give those students about a minute to come up with a strategy. Then have the students act out the word oxygen as other students in the group try to guess the word. Repeat the steps for force and gravity.

You may want to point out other important words in the selection, such as peak and glaciers. Have students play charades or use context clues to determine their meaning. Some words lend themselves to charades; others may not. Decide which of these strategies is most appropriate for each word.
READ

The content goal for The Savage Mountain is for students to learn about the challenges mountaineers face when climbing K2 and how these relate to the concepts of force and gravity. Explain that “K2 2011” describes a more recent attempt to reach the top of K2, in which members of the expedition used forces to overcome hazards from gravity and other environmental challenges. Point out the Read to find out statement at the top of page 20 in the student book: Read to find out how a modern climb of K2 compares and contrasts with an earlier expedition.

Help students with the comprehension goal of accessing content by asking questions. Model by reading page 22 aloud. Say: The text says that some of the climbers had tried to reach the top of K2 but failed. I wonder why they failed? It also says that Gerlinde reached the summit of the 13 highest peaks without bottled oxygen. It seems like climbing without bottled oxygen was an important challenge. I wonder about that, too. I have ideas about both questions, but I’m going to read on to see if I can find the answer.

Before students begin reading, say: As you read, look for answers to questions you have about the selection. Remember, all your questions may not be answered. Sometimes further research is needed.

TURN & TALK

Revisit the Read to find out statement. Have students turn and talk about how the 2011 expedition to K2 is similar to and different from the 1978 expedition. To check understanding, have students turn and talk about the Check In question: Why was Gerlinde’s climb to the summit of K2 so remarkable? (Gerlinde was the first woman to reach the summit of all of Earth’s 8,000-meter peaks without using bottled oxygen.)

Determine Word Meaning Share with students that they can use context clues and what they already know about a topic to determine the meaning of an unfamiliar word. Model this strategy for the word sure-footed by reading aloud the fourth paragraph on page 22. Then say:

WRITE & ASSESS

You may want to have students do a “quick write” to assess understanding. It’s always helpful to have students reflect on both the content and their thinking process.

• What were some exceptional challenges taken on by Gerlinde and the team on this expedition?
• What did this text remind you of?
“Geared Up!” is a reference article that describes various types of equipment that mountaineers use. Photos and descriptions help the reader understand the importance of having the right equipment to protect the climbers as they face hazardous conditions.

BUILD BACKGROUND FOR THE GENRE

Lead students to an understanding of the elements of a reference article. Explain that “Geared Up!” is a reference article and has the following elements:

- The content does not have to be read sequentially. Readers can dip in and out of the article as needed over time.
- Its purpose is to provide concise, easy-to-scan descriptions.
- Facts are conveyed through informational inserts.

BUILD VOCABULARY & CONCEPTS

Remind students that Using Context Clues is a strategy to infer the meaning of an unfamiliar word. They can “read around” the word, or read a few sentences before and after it, to make meaning from the context. Remind them to look at the photographs, too.

Another helpful strategy is Using Visual Vocabulary. Have students find pictures that they feel help explain the meaning of the word force. Then have them turn and talk with a partner about the picture they chose and how it demonstrates the meaning of force.

Identify other important words in the selection, such as trudging, treacherous, insulated, and spikes. Then have students use context clues or visual vocabulary to determine the meaning of these and any words that may be unfamiliar.
READ

The content goal for The Savage Mountain is for students to learn about the challenges and hazards mountaineers face when climbing K2 and how these relate to the concepts of force and gravity. As students read “Geared Up!” they will learn about supplies the mountaineers use to protect themselves from K2’s harsh environment and to climb the treacherous and icy slopes of the mountain. Point out the Read to find out statement at the top of page 16 in the student book: Read to find out what a mountaineer needs to climb snow-covered mountains.

Help students with the comprehension goal of accessing content by asking questions as they read. Read the first paragraph on page 30 and then say: It says here that mountaineers bring only the most essential equipment on the mountain because they need to save on weight and that their equipment must be light and durable. I wonder what kind of equipment is considered the most essential for climbing a mountain? I think I will read on to find out.

Before students begin reading, say: Remember to ask questions about what you are reading. If you are curious about something, you may find the answer if you read on.

TURN & TALK

Revisit the Read to find out statement. Have students turn and talk about what a mountaineer needs to climb snow-covered mountains. To check understanding, have students turn and talk about the Check In question: Which one of these items would you most not want to lose? Tell why. (Possible response: I would not want to lose my boots. They are insulated with many layers, so without them my feet would probably get frostbite. In the picture, I can also see the ground is rocky and covered with snow, so without them I would also get wet and injure my feet.)

Explain Relationships Help students understand that mountaineers need all of the equipment shown and described on pages 30–31 because of the hazardous conditions they face. Point out that each piece of equipment is designed to deal with a specific hazard or obstacle. Model how to identify this relationship by drawing students’ attention to the ropes in the picture on page 31. Say: I know that mountaineers need ropes for climbing. They attach the ropes to rocks or strong ice to lift themselves up steep slopes. Linking ropes is also useful for helping mountaineers find each other in a heavy snowstorm. Ropes must be strong and durable because mountaineers rely on them in these situations. Have students turn and talk with a partner about the other types of equipment and how each is related to a challenge mountaineers face.

Use Multiple Sources Ask students what questions they have about the gear in the article, including its features and benefits. Model by saying: It’s hard to imagine what it would be like to sleep on a cold, windy mountain like K2. Temperatures are well below freezing! What kind of sleeping bag is warm enough for those temperatures? I think I could find an answer by searching online. I might start by using terms like, “sleeping bag” and “temperature.” Also, the text says that Gerlinde wrote in a journal. What did she write with? When I’ve tried to write in really cold weather, the pen wouldn’t work! Have students turn and talk with a partner about questions they have related to gear featured in the selection or to other gear. Encourage them to find answers to their questions by using print or digital sources.

WRITE & ASSESS

You may want to have students do a “quick write” to assess understanding. It’s always helpful to have students reflect on both the content and their thinking process.

• Why didn’t Gerlinde bring her journal to the top of K2?
• What are some other supplies that you think climbers would need on an expedition to K2?
Discuss

CONTENT & COMPREHENSION GOALS

Guide students to discuss what they learned about how force and gravity relate to the topics discussed in The Savage Mountain. Ask:

What are some ways climbers overcome the challenges they face on K2?

(Possible responses are given in the concept map. Students may have more or different information.)

The four selections in The Savage Mountain are a science article, a personal narrative, a third-person narrative, and a reference article. Physical science concepts (energy, force, and gravity) thread through the selections. Guide a discussion about these science concepts.

What makes the selections especially interesting, though, is the interdisciplinary context—real-life stories and events that include not only physical science but also history, Earth science, technology, engineering, and geography.

Remind students that the selections “K2 1978” and “K2 2011” are narratives about climbers’ experiences on K2. Have student pairs compare and contrast these two narratives. Then discuss as a class. (“K2 1978” is written in first person, so we see the mountaineers’ words and know what they thought and felt. “K2 2011” is written in third person, so we read about the experiences of the mountaineers through the words of another writer.)
DISCUSS

Have students collaboratively answer the questions on page 32 as you move about the room and listen in to support and scaffold student conversations and clarify misconceptions.

1. How did the information in “A Mountain Called K2” help you understand the other three pieces in the book? (Possible response: The first selection provided background information that helped me understand the geography of K2 and some of the hazards the climbers face. It also explained some of the history of previous attempts to climb K2.)

2. Compare and contrast the expeditions described in “K2 1978” and “K2 2011.” (Possible response: All expeditions to the summit of K2, including the one in 1978, faced extreme hazards, but the expedition in 2011 used the north route, which includes steeper slopes that are more dangerous. The climbers all used bottled oxygen part of the time in 1978, but in 2011 Gerlinde reached the summit of K2 without extra oxygen. The expedition in 1978 carried 9 tons of supplies, but the expedition in 2011 carried only 2 tons of supplies.)

3. Cite examples of the effects of forces such as gravity on climbers from “A Mountain Called K2,” “K2 1978,” and “K2 2011.” (Possible response: Avalanches can cause snow to exert tremendous forces against the climbers. Gravity constantly pulls climbers toward the center of Earth, and it can cause them to fall off steep slopes if they aren’t careful. Winds exert a strong force against the climbers. In 2011, the climbers overcame the force of fast-moving water.)

4. Explain how gear from “Geared Up” helps a climber handle mountain-climbing challenges such as blinding snow, gravity, and freezing temperatures. (Possible responses: Goggles protect the climbers’ eyes from the reflection of strong sunlight. A GPS device and a compass can protect climbers from getting lost. Ropes protect climbers from falling on steep slopes. A tent and sleeping bag protect climbers from the wind and freezing temperatures at night. Boots protect climbers from frostbite to their feet. Crampons protect climbers from slipping on the ice and snow. An ice axe protects climbers from slipping if they wedge it into the ice of a steep slope. It can also protect equipment such as a sleeping bag if the climber uses the ice axe to pin it down.)

5. What do you still wonder about mountain-climbing expeditions such as “K2 1978” and “K2 2011”? What would be some good ways to find more information? (Answers will vary, but students should describe a variety of references, such as book and magazine articles, reliable Internet sites, and talking with experts.)
In small groups or individually, offer students the chance to explore questions they have or ideas they still wonder about, based on their reading in *The Savage Mountain*. Use question 5 on the Discuss page of the student book as an example of further information related to mountain climbing that students might research.

**EXPLORE**

Encourage students to express their curiosity in their own way. The questions students have matter. You might have students talk with peers, write about what they wonder, or create drawings based on what they learned from reading the different selections in *The Savage Mountain*. Guide them to immerse themselves in resources related to what they are most interested in learning more about. They might ask questions or make statements about their interests, for example:

- What are some of the other mountains higher than 8,000 meters, and how does climbing them compare with climbing K2?
- What happens to an expedition if someone gets sick or injured while climbing the mountain?
- How are expeditions to the world's highest peaks affecting the environment? How are these effects being addressed?

**GATHER INFORMATION**

After students explore, they should arrive at a question that will drive their research. Students may want to read, listen to, and view information with their question in mind. Guide students to use resources, such as reliable sites on the Internet, science texts and articles, library books, and magazines, that address the question they posed. Collecting information may lead students to revise or narrow their question. You may want students to follow a specific note taking system to keep track of their thinking and findings as they gather information. In addition to taking notes, ask students to make a list of their sources. You may want to model how to take notes by interacting with text, jotting down your thoughts in the margins or on sticky notes, and demonstrating how to summarize the most important information. Remind students that their question will drive their research and note taking.
ANALYZE & SYNTHESIZE

Guide students to carefully and thoughtfully review their notes to determine the big ideas related to their question. As students prepare to use the information they’ve gathered to formulate an answer to their question, support them as they analyze and synthesize. Be sure they do the following:

• Revise any misconceptions.
• Notice incongruities in their information.
• Evaluate all the various pieces of information.
• Pull together the most pertinent information that addresses their question.

While analyzing and synthesizing their research, students may realize that the more they learn, the more they wonder. To help focus their thinking, students may want to talk with classmates or write in a research notebook. Remind them that just as in real-world scientific research, there may not be a final answer to the question they posed.

SHARE

When students share their research, they become teachers, consider how their ideas were shaped by the investigation, and pose new questions. Students may express their knowledge by writing, speaking, creating a visual piece, or taking action in the community. The best culminating projects are ones with authentic purposes. For example, the student who wants to know about other types of equipment mountaineers use on K2 could research the information by looking at mountaineering supply stores online. The student could then make a computer presentation with pictures of the equipment and descriptions of how climbers use it.

When students are given the time to gather information about a topic that interests them, they will find unique and individual ways to share what they learned. Some options you can suggest might include the following:

• eBooks with photos and text to share with other students who are building background on the topic
• An online video explaining the equipment and demonstrating how to use it
• An interview with a climber who has made journeys to tall mountains and can explain some of the hazards he or she faced
Correlation

Grade 5 Common Core State Standards for English Language Arts and 
A Framework for K–12 Science Education 
correlated to National Geographic Ladders Science

<table>
<thead>
<tr>
<th>Common Core State Standards for English Language Arts, Grade 5</th>
<th>The Savage Mountain Teacher’s Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading Standards for Informational Text</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key Ideas and Details</strong></td>
<td></td>
</tr>
<tr>
<td>1. Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.</td>
<td>Pages 11–16</td>
</tr>
<tr>
<td>2. Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.</td>
<td></td>
</tr>
<tr>
<td>3. Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</td>
<td>Pages 7–8, 13–14</td>
</tr>
<tr>
<td><strong>Craft and Structure</strong></td>
<td></td>
</tr>
<tr>
<td>4. Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</td>
<td>Pages 7–8, 11–12</td>
</tr>
<tr>
<td>5. Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.</td>
<td>Pages 9–10</td>
</tr>
<tr>
<td>6. Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.</td>
<td>Pages 9–10, 15–16</td>
</tr>
<tr>
<td><strong>Integration of Knowledge and Ideas</strong></td>
<td></td>
</tr>
<tr>
<td>7. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</td>
<td>Pages 15–16</td>
</tr>
<tr>
<td>8. Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).</td>
<td></td>
</tr>
<tr>
<td>9. Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</td>
<td>Pages 15–16</td>
</tr>
<tr>
<td><strong>Range of Reading and Level of Text Complexity</strong></td>
<td></td>
</tr>
<tr>
<td>10. By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.</td>
<td>If the entire NG Ladders Science grade 5 program is used throughout the year, students will have had exposure to multiple genres, multiple levels, and appropriate scaffolding.</td>
</tr>
<tr>
<td><strong>Writing Standards</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Text Types and Purposes</strong></td>
<td></td>
</tr>
<tr>
<td>1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.</td>
<td></td>
</tr>
<tr>
<td>2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</td>
<td></td>
</tr>
<tr>
<td>3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.</td>
<td></td>
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</tbody>
</table>

(continues on p. 20)
### Production and Distribution of Writing

4. Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

5. With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6. With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.

### Research to Build and Present Knowledge

7. Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

8. Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

### Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

### A Framework for K–12 Science Education

**Core Idea PS2: Motion and Stability: Forces and Interactions**

*How can one explain and predict interactions between objects and within systems of objects?*

**Core Idea ESS3: Earth and Human Activity**

**ESS3.B: Natural Hazards**

*How do natural hazards affect individuals and societies?*
energy (noun) the ability to do work or cause a change
force (noun) a push or a pull
gravity (noun) a force that pulls things toward the center of Earth
oxygen (noun) a gas in the air that all living things need to live