

Extreme EXPLORER

April 2010

Dear Educator:

Water is one of Earth's most precious substances—an essential ingredient to life. In the April issue of EXTREME EXPLORER, your students will kayak from Alaska to Seattle, chase severe storms in the central United States, and plunge deep into the oceans to meet nudibranchs. Readers also will learn about the interconnected elements of the water cycle and its impact on our lives.

“Paddle to Seattle” follows adventurers J. J. Kelley and Josh Thomas as they kayak 2,100 kilometers (1,300 miles) through the Inside Passage along the Pacific Northwest coast. Written by Kelley in a journal style, the story chronicles the pair’s challenges, aches, doubts, and ultimate success. Along the way, students will learn about the unique topography of the area and how it creates a relatively safe route for the kayakers and the perfect ingredients for a rare ecosystem, a temperate rain forest. Some of the unique flora and fauna of Alaska’s Tongass National Forest are featured on the classroom poster in your Teacher’s Edition. The Goal-and-Outcome chart on p. T8 will help students track the pair’s challenges and the strategies they used to reach their goal.

The “Water Ways” feature provides a graphic look at the constant circulation and transformation of Earth’s water. In addition to building background for the stories in the issue, you can use the feature to teach key concepts such as Earth systems, states of matter, weather patterns, water conservation, and the importance of resource management. Look for the water-cycle diagram reprinted on the classroom poster.

In “Storm Warning,” meteorologist Dr. Harold Brooks explains what causes supersize thunderstorms in the central United States. He also describes the work he and other scientists are doing to forecast killer storms and save lives. The activity master on p. T20 prompts readers to make connections between the text and what they know from the world around them.

Finally, “Super Slugs” takes readers into the oceans to meet the nudibranch, a shell-less mollusk. They will discover that nudibranchs truly are what they eat. The sea slugs take on the vibrant colors of sponges, use anemones’ stingers as defense, and even farm algae in their bodies. You can use the Preview Checklist on p. T27 to help students become more active readers.

I invite you and your students to immerse yourselves in the many wonderful resources related to water that National Geographic offers, including the April 2010 issue of NATIONAL GEOGRAPHIC magazine! Also, please be sure to visit

<http://environment.nationalgeographic.com/environment/freshwater>.

Sincerely,



Jacalyn Mahler
Editor in Chief



Paddle to Seattle

Teacher's Guide

EXTREME EXPLORER

April 2010

Curriculum Connections

- Language Arts
- Geography
- Earth Science

Standards Correlations

- Language Arts: Preview Text Structure; Understand Time Order Sequence; Relate Goal and Outcome
- Geography: Interpret Maps; Understand Ocean Currents and Tides; Understand How Landforms Impact Weather
- Earth Science: Earth Systems and Patterns; Ecosystems

Literacy Skills

- Reading Strategy: Plan and Monitor
- Vocabulary: Vivid Verbs
- Writing: Journal Writing

Activity Masters

- Goal and Outcome, T8
- Goal and Outcome, Answer Key, T9
- Comprehension Check, T10
- Comprehension Check, Answer Key, T11
- Access Geography Content, T12
- Access Geography Content, Answer Key, T13

Paddle to Seattle

About the Story

In “Paddle to Seattle,” J. J. Kelley takes readers on a dramatic adventure, kayaking 2,100 kilometers (1,300 miles) from Alaska to Seattle. Along the way, readers learn about ocean tides, weather patterns, and the ecology of a temperate rain forest. They also will discover what it takes to survive such a voyage, and what Kelley and his fellow kayaker, Josh Thomas, learned about themselves and the places they saw.

Fast Facts

- J. J. Kelley and Josh Thomas filmed their kayak trip and made an award-winning documentary called *Paddle to Seattle: Journey Through the Inside Passage*. It is the pair’s second film. *Pedal to the Midnight Sun* chronicled their 2,000 kilometer (1,200 mile) bike ride across Alaska from the Pacific Ocean to the Arctic Ocean.
- During the Klondike Gold Rush in the late 1800s, thousands of fortune-hunters traveled north along the Inside Passage on their way to Canada’s gold fields in the Yukon Territory.
- Kermode bears, also called ghost bears or spirit bears, live only along the Pacific Coast of Canada in that area’s temperate rain forest. The bear, a subspecies of the American black bear, gets its nicknames because about ten percent are born with white fur.

Vocabulary

Vivid Verbs Have a volunteer read aloud the first paragraph on p. 5. Tell students to listen carefully for vivid, **action verbs**. Then work together with students to list the action verbs they hear. (*hammers, squint, howl, paddle, push, hits, flip, feel*).

Then read this paragraph aloud. Invite students to compare it to the text in the story:
The waves are big. It is raining and windy. It is hard to paddle. I am tired. And this is just the first day of our trip!

Discuss the differences between the two paragraphs, focusing on how the words made students feel and what scenes they imagined. Point to the displayed list of verbs and ask: *Why do you think the writer chose these particular action words?*

Lead students to understand that the writer used precise action verbs to create a sense of adventure, make his writing lively, and help readers paint a vivid picture in their minds. Suggest that as students read the story, they list other action verbs in their Vocabulary Notebooks. Encourage them to use the words to add impact to their own writing assignments.

Paddle to Seattle

(continued)

Preview Text Structure

Display and discuss these questions: *How do you preview a story? Why is it good to preview a story before you read it?* Point out that the headline and opening photo are a good starting point. Ask students to look at the opener on pp. 2-3, read the headline and deck, and look at the photo and map. Ask them to use that information to predict what the story will be about. Ask students to write their prediction on a self-stick note and have volunteers share their prediction.

Next, ask students to page through the rest of the story, looking at the photos, captions, and, in particular, the subheads. Ask: *What clues do the subheads give you about the way the writer organized the story?* Point out that most subheads start with a numbered week and a place. Lead readers to understand that the story is organized chronologically. The journal-style entries follow the writer's trip in **time order sequence**. Then ask: *Why do you think using journal-style entries might be a good way to tell this story?*

As students read, they can follow the kayakers' route by locating on the map on p. 3 the place names included in the subheads. Using the map and the **compass rose**, ask students in which direction Kelley and Thomas paddled. If students answer *south*, encourage them to be a little more precise. Note that there are points on a compass between north, east, south, and west.

Continue to focus students' attention on the map's compass rose. Ask why they think north is not straight up. To help visualize, display a large map of North America. Point out how that map differs from the one on the opener. (On the bigger map, north is straight up. Also, the coast of Alaska curves west out into the Pacific Ocean. It's not vertical, like the one on the opener.) Explain that the map on the opener is placed vertically to show Kelley's and Thomas' trip, but to do it in a way that only uses a small section of the page. Using all of these resources, ask again in which direction the kayakers paddled. (Correct answer: *southeast*)

Build Background: Genre

Point out that "Paddle to Seattle" is an adventure story. Like many real-life adventure stories, the writer has a specific **goal**, or what he wants to accomplish. In this case, he wants to paddle his kayak 2,100 kilometers from Alaska to Seattle, Washington. To reach his goal, he takes certain actions. At the end of the adventure, students will discover the **outcome**. That tells them whether or not he reached his goal.

Read the last sentence of the deck aloud: *Now two friends faced their toughest challenge yet: Could they kayak from Alaska to Seattle?* Distribute the Goal-and-Outcome chart on p. T8. Ask students to predict the kind of challenges Kelley and Thomas might face, based on their preview of the map, photos, and captions. Accept all reasonable answers.

Finally, invite students to read the story to themselves. As they read, they should complete the activity master listing the goal Kelley and Thomas set, the obstacles or challenges they faced, how they overcame any obstacles, and the final outcome.

Paddle to Seattle

(continued)

Access Geography Content

After reading “Paddle to Seattle,” revisit the story to make sure students understand the key geography concepts.

Ocean Travel Have volunteers recount some of the writer’s descriptions of the ocean. Explain that the Pacific Ocean is the world’s largest ocean. Storms can create high winds, large waves, and extremely rough water. The storms get worse as winter approaches. Ask students what this information might mean to someone traveling from Alaska to Seattle in a kayak. To prompt conversation, refer them to the kayak photos on pp. 2-3, 4-5, 8, and 9. To underscore the challenge of the voyage, point out how low the kayaks sit in the water. Finally, remind them that the story mentions crossing international boundaries between countries. Ask students to locate the borders that look like a dotted line on the map on p. 3. Explain that the borders don’t stop where the land ends. They extend out into the water. During Paddle to Seattle, Kelley and Thomas crossed first from the United States into Canada, then later from Canada back into the United States.

Inside Passage Ask students to trace the red line shown on the map on p. 3. Explain that this route is called the Inside Passage. It is a water route that winds in between many islands, and between islands and the U.S. and Canadian **mainland**. Ask them to locate the Alexander Archipelago off the southwest coast of Alaska. An **archipelago** is a group of islands. The islands in this group are mountainous. Explain that when people travel along these islands, the land acts like a protective wall, blocking a lot of the ocean waves and wind. For this reason, the water in the Inside Passage typically is much calmer than the water in the open ocean. To help students understand, ask them to imagine finding shelter in a house during a storm but leaving all the doors and windows open. They might feel some of the effects of the storm, but not all. Also explain that ocean water flows around the islands, so the water in the Inside Passage is affected by some ocean **tides**. During the time leading up to high tide, the water rises and flows toward the mainland. During the time leading to low tide, the water drops and the water rushes back toward the ocean. This cycle occurs about every 12 hours.

Temperate Rain Forest Remind students that in the entry for Week 4, Kelley described paddling past a **temperate rain forest**. Invite students to share what they know about rain forests. Then display the poster, “A Really Cool Rain Forest,” in the Teacher’s Edition. Explain that the pictures show Tongass National Forest, a place Kelley and Thomas passed on their trip. It is part of the world’s largest stretch of temperate rain forest. Discuss the photos and captions. Point out that just like a tropical rain forest, a temperate rain forest gets a lot of rain. But it isn’t hot and steamy. It’s much cooler and has different plants and animals.

Sum Up

Invite students to share their completed Goal-and-Outcome charts. Ask whether or not they predicted that the writer would be successful in reaching his goal. Then ask: *Were there points in the story when you doubted the outcome? Did Kelley himself ever doubt that they’d manage to reach Seattle?* Discuss the different kinds of challenges Kelley and Thomas faced: natural (caused by the environment), mental, and physical. As you discuss the specific challenges they faced, help students categorize them. (Examples: natural: rain; mental: self-doubt; physical: aching muscles).

Paddle to Seattle

(continued)

Assess and Reteach

Materials: Comprehension Check, pp. T10 and T11; “Paddle to Seattle” story, “A Really Cool Rain Forest” poster in the Teacher’s Edition; Access Geography Content Activity Master, p. T12

Assign the Comprehension Check for “Paddle to Seattle” on p. T10. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key concepts about the **geography** of the region and how it created challenges for Kelley and Thomas. Distribute the Access Geography Content activity master on p. T12 and have students use what they learn to complete the web.

First, draw students’ attention to the map on p. 3 of the opener. Say: *As we read the story, we learned about the challenges created by the geography of this region. Flip back to this map often so you can visualize what we are talking about and identify the landforms.*

Then ask students to take another look at the “Getting Ready” section on p. 4. Point to the description of what storms are like out at sea in the first paragraph. Explain that this weather has an impact on **ocean travel**.

Together with students, read the rest of the “Getting Ready” section. Pause at the description of an archipelago. Ask students to turn to p. 7 and look at the photo of the **Inside Passage** at the top of the page. As they look at it, read aloud the author’s description of the mountainous islands acting like a buffer or wall that blocks the worst ocean waves and winds. Direct their attention to the water. Ask: *Do you think it would be hard to paddle a kayak in that water? Why or why not?* Explain that although Kelley and Thomas faced stormy weather in the Inside Passage, it would have been worse if they were out in the Pacific Ocean.

Finally, display the “A Really Cool Rain Forest” poster from the Teacher’s Edition. Turn to p. 6 of the story and work through the “Week 4: Deadman Island, Alaska” section. Explain that like tropical rain forests, **temperate rain forests** get a lot of rain and are very wet. In the Pacific Northwest, the wet weather comes from the ocean. The Coast Mountains trap that moisture along the coast, creating the perfect conditions for a rain forest. Since these forests are not close to the Equator, they are much cooler than tropical rain forests. Therefore, the kinds of plants and animals that thrive there also are different. Use the poster to show examples of a temperate rain forest’s flora and fauna.

Paddle to Seattle

(continued)

Extend the Learning

Compare and Contrast Tell students that there are two kinds of rain forests: tropical and temperate. Encourage them to find out how they are similar and how they differ. Suggest they research such issues as location, temperature, amount of rainfall, plants, and animals. For great ideas on how to expand this lesson, go to National Geographic's Xpeditions lesson on comparing two ecosystems:

<http://www.nationalgeographic.com/xpeditions/lessons/08/g68/venn.html>.

Journal Writing Kelley and Thomas kept an almost-daily journal on their trip to record daily activities, observations, and feelings. Ask students to imagine they are the third member of the Paddle to Seattle expedition and to write a journal entry from any day of the trip. Remind them of the vivid verbs vocabulary lesson and encourage them to use vivid verbs in their entries as they describe what they saw, any challenges they faced, and how they felt.

Plan a Trip Remind students that Kelley and Thomas spent a year preparing for their trip, including making their own kayaks, getting into shape, and planning their route. Ask students to pick an outdoor adventure in a natural place, such as climbing Mt. Everest, rafting down the Colorado River, exploring the Amazon rain forest, or crossing the Sahara desert. Then ask them to plan their imaginary trip. Students should figure out what clothes they'll need, what route they'll take, if they need any immunizations or a guide, what time of year to go, etc.

Paddle to Seattle

As you read "Paddle to Seattle" in **EXTREME EXPLORER**, fill in the boxes below.

Goal

What was J. J. Kelley's and Josh Thomas' goal?



Obstacles

What challenges or obstacles did they face?



Strategies

What strategies did they use to face those challenges?



Outcome

What was the end result?

Paddle to Seattle

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Goal

What was J. J. Kelley's and Josh Thomas' goal?

To paddle kayaks 2,100 kilometers (1,300 miles) from Skagway, Alaska, to Seattle, Washington



Obstacles

What challenges or obstacles did they face?

Being strong enough to paddle eight hours a day
Surviving flipping upside down in cold water
Endless wet weather
Winds that pushed them backwards
Whales
High tides
Doubts that they could reach their goal



Strategies

What strategies did they use to face those challenges?

Practicing paddling and rolling their kayaks before the trip
Paddling early in the morning, when winds weren't so strong
Knocking on kayaks to keep whales away
Making camp inland to avoid high tide
Keep going despite doubts



Outcome

What was the end result?

They made it to Seattle!

COMPREHENSION CHECK

Answer these questions about "Paddle to Seattle." For items 1-4, fill in the circle by the correct answer. Write your answer to item 5.

1. The Inside Passage was a better route for the kayakers than the Pacific Ocean because—

- ☐ (A) the path is better marked.
- ☐ (B) the water is calmer.
- ☐ (C) no humpback whales swim there.
- ☐ (D) all storms stay out at sea.

2. It was important to complete the trip in three months because they wanted to—

- ☐ (A) avoid winter weather.
- ☐ (B) set a record.
- ☐ (C) use all their supplies.
- ☐ (D) return to Alaska.

3. An archipelago is—

- ☐ (A) a watery path between islands.
- ☐ (B) a long range of mountains.
- ☐ (C) a group of many islands.
- ☐ (D) a type of rain forest.

4. Both temperate rain forests and tropical rain forests—

- ☐ (A) are cool.
- ☐ (B) get a lot of rain.
- ☐ (C) are home to bears.
- ☐ (D) all of the above

5. Explain why Paddle to Seattle was such a challenging trip. Give at least three reasons.

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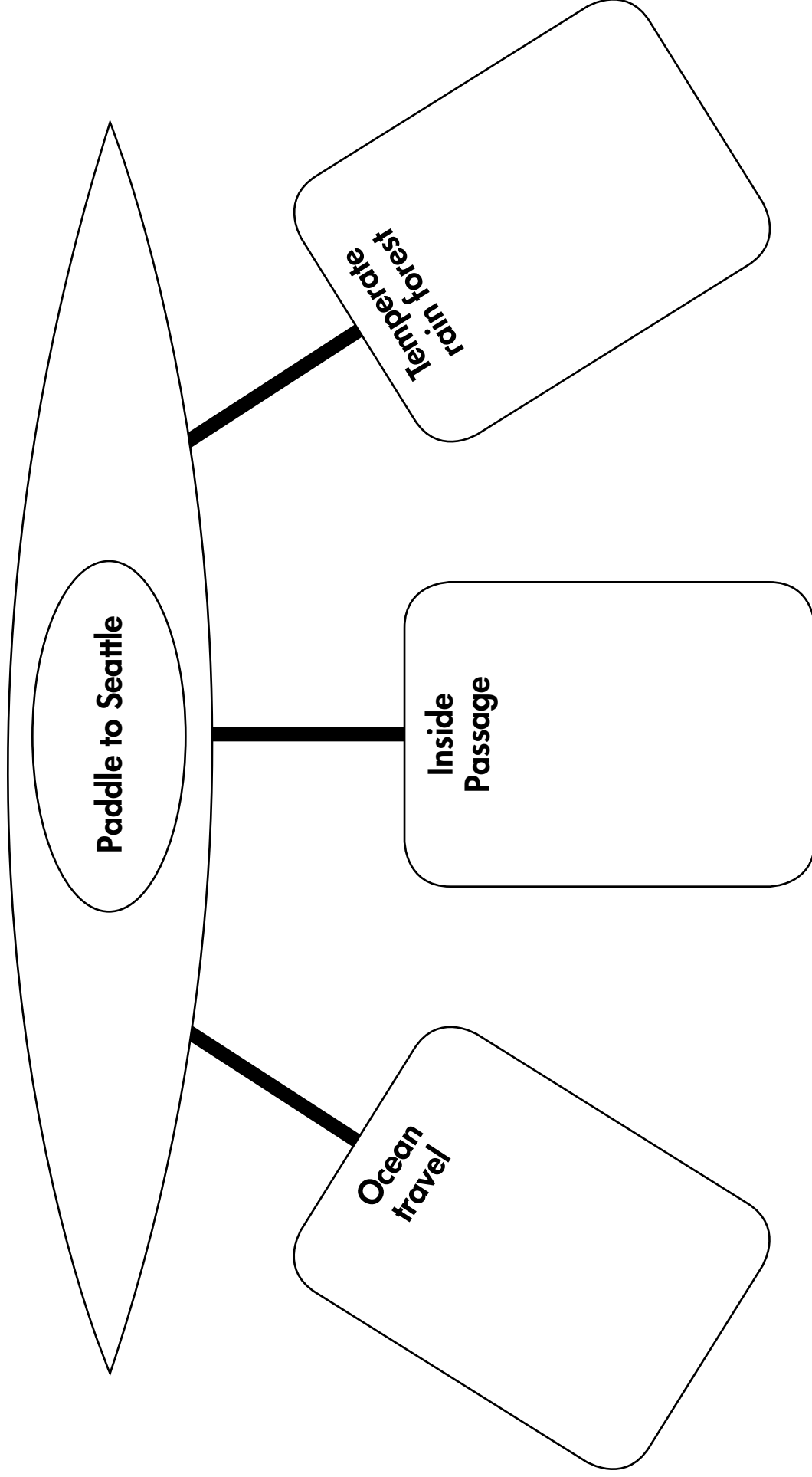
5. Explain why Paddle to Seattle was such a challenging trip. Give at least three reasons.

Sample top-scoring response: First, the kayakers had a really far way to go. They had to paddle 2,100 kilometers (1,300 miles). Second, they faced a lot of bad weather. The first day, the wind blew so hard, they almost went backwards! It was so rainy, mold grew in J. J.'s sleeping bag. Finally, it was physically hard. They paddled eight hours a day. That made their hands raw and all their muscles ache.

Name: _____

Paddle to Seattle

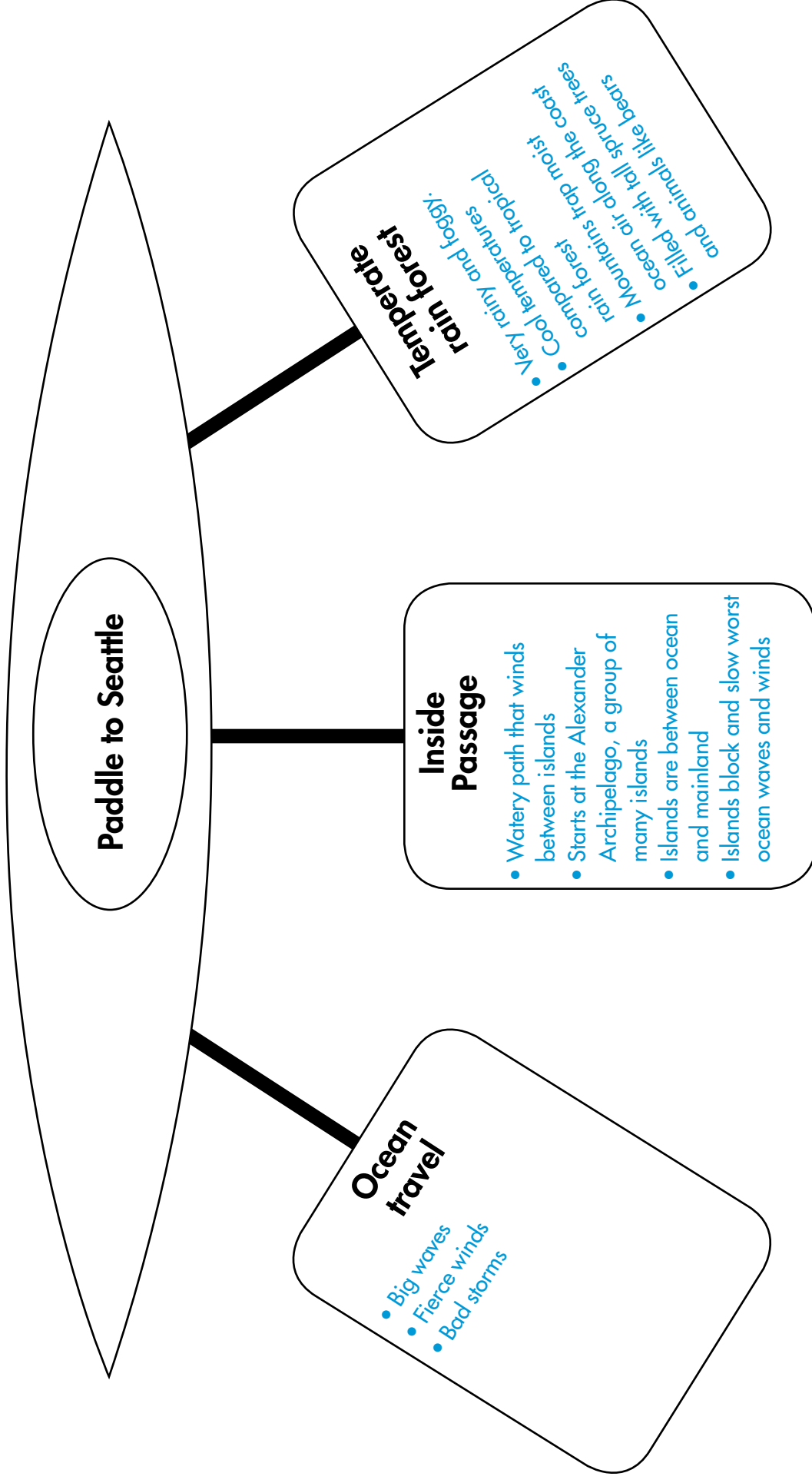
As you read "Paddle to Seattle" in *EXTREME EXPLORER*, fill in the geography facts you learn.



Name: _____

Paddle to Seattle

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STORM WARNING

Teacher's Guide
EXTREME EXPLORER
April 2010

Curriculum Connections

- Language Arts
- Earth Science
- Geography

Standards Correlations

- Language Arts: Make Connections
- Earth Science: Understand the Hydrologic Cycle; Understand Causes of Hazardous Weather
- Geography: Interpret Maps; Understand Interaction of Landforms and Weather

Literacy Skills

- Reading: Plan and Monitor Your Reading
- Vocabulary: Hyphenated Adjectives
- Writing: Creative Writing; Safety Tips

Activity Masters

- Make Connections, T20
- Comprehension Check, T21
- Comprehension Check, Answer Key, T22

STORM WARNING

About the Story

TORNADO COMING! These words can be frightening, but meteorologists are working hard to understand how dangerous storms form and where they are likely to strike. In this story, Dr. Harold Brooks teaches readers about thunderstorms, severe storms, and supercells. He also introduces readers to the science of storm forecasting and storm-warning systems. Together with the “Water Ways” feature on pp. 10-11, you can use this story to help students explore the connection between Earth’s water cycle and weather patterns.

Fast Facts

- Tornadoes travel at an average speed of 48 kilometers per hour (30 mph) with occasional bursts of up to 113 kph (70 mph). They can last as long as one hour but rarely travel more than ten kilometers (six miles).
- A tornado’s funnel cloud is transparent. The cloud becomes visible when water droplets from the moist air condense or when dust and debris are taken up.
- Waterspouts are tornadoes that form over warm water. They can cause damage if they move onshore.
- These are among the signs of a possible approaching tornado: dark or green-colored sky; large, dark, low-lying clouds; large hail; a loud roar like a freight train.
- About ten percent of the moisture in the atmosphere comes from plants. Water travels up through a plant’s roots to its leaves, where it evaporates in an invisible process called transpiration. For more information about the water cycle, encourage students to visit <http://ga.water.usgs.gov/edu/watercycle.html>.

Vocabulary

Hyphenated Adjectives Display the following sentence: *A fast-moving storm hit the Midwest.* After they read the sentence, ask students to tell what it means in their own words. Underline the hyphenated word. Explain that a hyphen can be used to join two words together such as *fast* and *moving*. When the words are combined, they form a new word. In this case, they form an adjective that describes a storm. Invite students to suggest other things that could be described as “fast-moving.” (Sample responses: a car, a jet, herd of animals, etc.)

Invite pairs of students to scan the story for other examples of hyphenated adjectives. Ask them to record each word with the noun that it describes. Have partners discuss what each adjective means. Then call on students to share their responses. (Hyphenated adjectives in the story include: *58,000-foot-tall*, *hurricane-force*, *first-hand*, *fast-spinning*, *storm-making*, *softball-size*, *baseball-size*, *three-minute*.)

STORM WARNING

(continued)

Preview/Tap Into Prior Knowledge

Fast Write Have students preview the story by reading the headline and introduction on pp. 12-13 and viewing all the photographs and captions. Tell them they will be doing a Fast Write of all the things they know about storms. Explain that this is a way to tap into information they may not even realize they know and to make connections to their own experiences.

Before students begin to write, explain that they should not worry about writing complete sentences or using perfect spelling or punctuation. Say: *Just write down everything that comes to mind after looking at the title page, photographs, and reflecting on your own experiences with storms. Keep writing until I ask you to stop. You will have about two minutes.* **NOTE: This activity may not be appropriate for students who have had direct experiences with extreme storms and suffered personal loss.**

When their Fast Writes are completed, have students turn to a partner and read some of their thoughts and personal reflections. Invite several students to share their work with the class. Lead students to listen for repeated words, experiences, or ideas. You may want to display these for students to refer to.

Finally, have students turn their Fast Write papers over and set a purpose for reading this story. Say: *Think about why you want to read this story and what you want to learn. Write your answer in one or two sentences on the back of your paper.*

Access Science Content

Build Background You can use the “Water Ways” feature on pp. 10-11 to build background before students read “Storm Warning.” Ask students to raise their hands if they have ever been in a storm with thunder and lightning. Display the word *thunderstorm* in the center of a concept web and read it aloud. Then display these words in a cluster: *rain, hail, lightning, and thunder*. Say: *These are all ingredients of a thunderstorm. But let’s look at how these storms begin.*

Have volunteers take turns reading the text on p. 10 aloud. Then work through the diagram with students, beginning with precipitation. After you discuss the information in each label, invite volunteers to talk through the entire water cycle in their own words. You may want to use the following prompts to help students better understand the constant circulation and transformation of water:

- Where does water go when it disappears or evaporates?
- What role does the sun play?
- Where does water come from when it rains?
- How are clouds formed?
- What are some examples of surface water?
- At what points in the water cycle is water a solid, liquid, and gas?
- On p. 10, what does “There’s no more” mean?

STORM WARNING

(continued)

Access Science Content, continued

Invite students to read “Storm Warning,” keeping in mind their purpose for reading. Remind them that they learned about the water cycle and ask: *Where does the moisture in clouds come from?* As students respond, help them understand that as the sun heats water in rivers, lakes, or the ocean, water molecules evaporate, or turn into a gas and rise into the atmosphere.

Display the words *thunderstorm*, *severe storm*, and *supercell*. Then ask: *What are clouds made of?* Lead students to understand that as the evaporated water rises, it cools and condenses, or becomes a liquid again in the form of water droplets that collect and form clouds.

Next, ask: *What causes rain?* Tell students that as the water droplets in clouds grow, they become heavy. When they get too heavy, they fall back to Earth in a form of precipitation. It might be rain, hail, sleet, or snow depending on the temperature of the air.

Point out that they learned that not all storms are the same. Refer back to the three displayed types of storms and explain that although all storms are part of the water cycle and most are beneficial, some storms can become quite violent and dangerous.

Below the phrase *severe storm*, display these related details: *winds at 58 mph, golf ball-size hail, tornadoes*. Explain that it takes the right ingredients for the worst thunderstorms to form, and in some parts of the United States, all these ingredients come together. The central United States provides the perfect location for severe storms because of the open plains, cold air from the Rocky Mountains, and warm moist air from the Gulf of Mexico. To help students visualize these features, you may want to display a topographical map. You can access an interactive map at <http://maps.nationalgeographic.com/map-machine#s=h&c=21.28937435586042,%200&z=1>.

Below the word *supercell*, display these related details: *winds at 175 mph, gigantic clouds, huge hail, long-lasting, strongest tornadoes*. Explain that supercells can be deadly and destructive.

Finally, tell students that in the 1970s, Ted Fujita developed a scale to classify the intensity of a tornado. Display or share this scale with the class. Then ask: *What do scientists learn from rating tornado damage? How can we make people safer during a tornado?* Accept responses and invite deeper discussion.

Sum Up

Distribute the activity master on p. T20. Ask students to list five things they learned about storms in the first column of the chart. Then ask them to connect each thing they read to their own lives or to events in their community or the world. You may want to model **making connections** for students. For example, say: *I've seen in movies and read in books about sirens that warn people that a tornado is coming. In the story, I learned that meteorologists now can warn people about 13 minutes before a tornado strikes. Now I understand how people know when to sound warning sirens and how the warnings save lives by giving people time to get to a safe place.* After completing the charts, ask students to share one thing they learned and the connection they made.

STORM WARNING

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Assess and Reteach

Materials: Comprehension Check, pp. T21 and T22; “Storm Warning” story

Assign the Comprehension Check for “Storm Warning” on p. T21. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key science concepts. For example, students may be unclear about how a thunderstorm forms and the differences between severe storms and a supercell. Divide the class into four groups. Assign each group one of the sections on pp. 14-15. Ask each group to read and discuss the section. Group members should agree on the main ideas and select one student to report back to the class.

Use these questions to review the connection between storms and the water cycle:

- Where does water go from a puddle on the street?
- What happens to the water in wet clothes you put in the dryer?

Lead students to understand that the process of water disappearing into the air is called evaporation. Point out that it is heat that makes the water turn into a vapor or gas.

Next, ask students to consider what happens to the evaporated water.

- What happens to the evaporated water when it rises in the air and cools?
- What is inside a cloud?

Point out that as the water vapor rises and reaches cooler air, it condenses and turns into water droplets. This is what forms clouds. The droplets continue to grow and get heavy. This process is called condensation.

Then say, let’s consider what happens next.

- How does rain happen?
- Why do clouds sometimes drop snow or hail?
- When can a severe storm or tornado occur?

Help students understand that when the water droplets in clouds become so large that the air or wind cannot keep them in the atmosphere any longer, they begin to fall as precipitation. This can be in the form of rain, sleet, hail, or snow depending upon the air temperature. Also, under the right conditions, tornadoes can develop when rotating winds are squeezed and start to spin faster. This creates a funnel of wind. When it touches the ground, it becomes a tornado.

Wrap up by emphasizing that scientists are still working hard to learn more about tornadoes to help warn people before they touch ground. Ask students what they learned about ways scientists currently follow storms.

STORM WARNING

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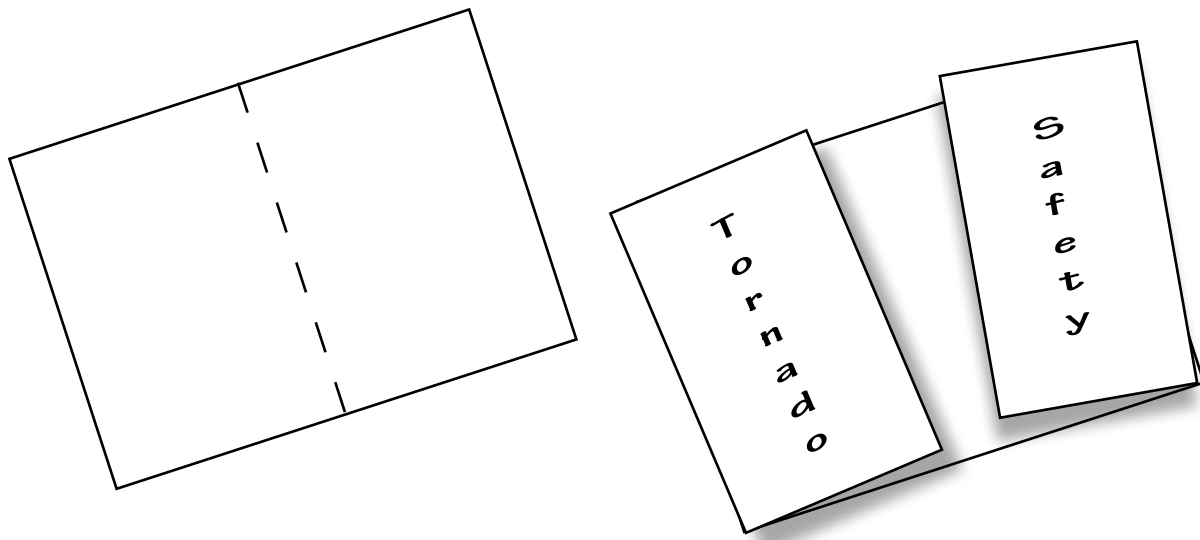
Extend the Learning

Creative Writing Encourage students to apply what they have learned about the water cycle by imagining they are a drop of water and writing a short “autobiography.” To learn more about the water cycle, they can visit the U.S. Environmental Protection Agency Water Sourcebook Series website at <http://www.epa.gov/safewater/kids/wsb/index.html> or The Franklin Institute’s Water in the City website at <http://www.fi.edu/city/water/>.

Storm Safety Tell students that improving the warning system for tornadoes is very important. But equally important is knowing what to do in case you find yourself in a severe storm. Have students research the various safety tips that are recommended if a tornado or severe storm is approaching your area. You can adapt this activity for any kind of extreme weather that may occur in your state or region such as hurricanes or floods. Students can present these important tips in a Two-Fold Book. (See sketch below)

Instructions

- Fold an 8.5x11 or 11x17 plain paper in half horizontally. Do not crease the fold. Make a small pencil mark to show the mid-point.
- Fold the outer edges inward to meet at the mid-point, creating two flaps or outer doors.
- On the flaps, think of a title for your safety tips book.
- Inside the flaps on the large area of the paper, neatly list the safety precautions anyone caught in a tornado or severe storm should follow.



Map Tornado Alley Help students visualize the area that is most susceptible to tornadoes in the United States by having them label the states that make up Tornado Alley on a map. Using www.nationalgeographic.com/xpeditions/atlas, you can print out an outline map of the United States. Challenge students to find in the story the area described as Tornado Alley and outline that section in red.

STORM WARNING

In column 1, write five things you learned about storms. What do they remind you of?
In column 2, connect the information to your experiences or what you know from news stories, TV, school, or movies.

What I Learned

How It Connects

1.

2.

3.

4.

5.

COMPREHENSION CHECK

Answer these questions about “Storm Warning” and “Water Ways.” For items 1-4, fill in the circle by the correct answer. Write your answer to item 5.

1. Which of these is not true about thunderstorms?

- ☐ (A) They make rain and lightning.
- ☐ (B) Their lightning heats the air, which causes a loud sound.
- ☐ (C) They start when moist, warm air rises.
- ☐ (D) They occur only in the central United States.

2. What makes a supercell storm so dangerous?

- ☐ (A) Its winds are fast and spin in a circle.
- ☐ (B) It lasts longer than a typical thunderstorm.
- ☐ (C) It drops a huge amount of rain.
- ☐ (D) all of the above

3. How has better weather forecasting saved lives?

- ☐ (A) It gives people more time to find shelter.
- ☐ (B) It tells people exactly where tornadoes will hit.
- ☐ (C) It stops lightning from striking Earth.
- ☐ (D) all of the above

4. Which of these is most useful in helping meteorologists forecast killer storms?

- ☐ (A) chasing storms
- ☐ (B) following weather balloons
- ☐ (C) observing radar
- ☐ (D) watching clouds

5. Explain how thunderstorms are part of Earth’s water cycle. Use the information in “Water Ways” to help you answer.

COMPREHENSION CHECK

Answer these questions about “Storm Warning” and “Water Ways.” For items 1–4, fill in the circle by the correct answer. Write your answer to item 5.

1. Which of these is not true about thunderstorms?
 - (A) They have rain and lightning.
 - (B) Their lightning heats the air, which causes a loud sound.
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5. Explain how thunderstorms are part of Earth’s water cycle. Use the information in “Water Ways” to help you answer.

Sample top-scoring response: Thunderstorms produce precipitation, which is part of Earth's water
cycle. In the water cycle, water evaporates from Earth's surface and becomes water vapor. The
vapor rises and cools. Then it becomes water droplets that cling to dust. This forms clouds. The
clouds then drop rain on the ground. This is what happens to water before, during, and after a
thunderstorm.

Super Slugs

Teacher's Guide

EXTREME EXPLORER

April 2010

Curriculum Connections

- Language Arts
- Life Science
- Biology

Standards Correlations

- Language Arts: Descriptive and Figurative Language; Preview and Set Purpose for Reading
- Life Science: Development of Living Organisms; Adaptation
- Biology: Anatomy; Photosynthesis

Literacy Skills

- Reading: Determine Importance
- Vocabulary: Similes and Metaphors; Idioms
- Writing: Comparisons; Idioms

Activity Masters

- Preview Checklist, T27
- Comprehension Check, T28
- Comprehension Check, Answer Key, T29

Super Slugs

About the Story

Nudibranchs are colorful, shell-less mollusks that live on the ocean floor. In this story, students will discover that nudibranchs truly are what they eat. Their diet provides them with more than nutrition and energy. They get color, weapons, and more from their food. Sea slugs can take on the vibrant colors of the sea sponges they eat. Some use colors as camouflage, blending into a colorful coral reef; others use bright colors to warn predators that they taste bad. Some nudibranchs use anemone stingers as a defense, while others even farm algae inside their bodies.

Fast Facts

- Students and their families can read more about nudibranchs in the story “Living Color” in the June 2008 issue of NATIONAL GEOGRAPHIC magazine. Or go to: <http://ngm.nationalgeographic.com/2008/06/nudibranchs/holland-text>.
- Nudibranchs are related to land snails. Land snails have two sets of tentacles that are extremely sensitive to touch and smell. The tiny black eye dots on their tentacle tips give them much better vision than their sea slug cousin. Nudibranchs’ eyes are embedded in their skin and can only sense light and dark.
- Nudibranch predators include sea spiders, turtles, sea stars, some crabs, and people.
- The word *nudibranch* comes from the Latin *nudus*, which means “naked,” and the Greek word *branchis*, which means “gills.” The word is pronounced nu-deh-brank.

Vocabulary

Similes and Metaphors Explain that writers often compare things to help readers understand and remember what they read. If the comparison uses the word *like* or *as*, it is called a **simile**.

Display a picture of a flamenco dancer. Invite students to describe the dancer’s swishy skirt. Then display the sentence, “As [the nudibranch] swims, it looks like the swishing red skirt of a flamenco dancer.” Ask: *Why do you think the writer is making this comparison. How does it help you to “see” what this nudibranch looks like?* Direct students’ attention to the photo of the Spanish dancer nudibranch on p. 23 and ask them if it looks like what they expected, based on the simile.

Next, tell students that writers often use another kind of comparison without using the words *like* or *as*. Explain that this kind of comparison is called a **metaphor**. Ask students to describe a handful of jewels. Then display the sentence, “These jewels of the sea come in all the colors of the rainbow—and more.” Ask: *Why do you think the writer would compare a sea slug to a jewel?*

As a class, preview the photos in the story. Invite students to come up with their own metaphors or similes to describe each animal shown.

Super Slugs

(continued)

Preview and Set a Purpose

Tell students that just as road signs help drivers plan for what lies ahead, good readers preview a story to prepare them for what they will read about. Point out that nonfiction stories have “road signs” to help the reader. In this story, the signs include the headline and deck, the subheads, photos, captions, and boldface words.

Distribute the preview activity on p. T27. Have students work in pairs to complete items 1-4 on the story preview checklist. Ask volunteers to share responses.

Then ask students to think about what else they want to learn about nudibranchs. Explain that asking that question ahead of time allows them to set a purpose for reading and focus on the information that is the most important to them. Model how to complete item 5 on the preview checklist. Say: *I read in the deck on p. 18 that sea slugs can turn food into weapons. I wondered what that means since I can't imagine them having a food fight! I want to read to find out about this.* Ask them work to independently to answer item 5. Tell them they will have an opportunity to revisit their purpose for reading later to determine if the story answered their questions.

Access Science Content

Before students begin reading, read aloud these descriptions from p. 20 of the story: “These sea slugs are soft and squishy,” and “Nudibranchs don’t have shells. They’re slow.” Underline or highlight the words *soft*, *squishy*, and *slow*. Ask students about what other kinds of animals, particularly predators, live in the oceans. Then ask students how they think a soft, squishy, slow sea slug might be able to survive in an ocean full of potential predators. Explain that in spite of appearing defenseless, nudibranchs have special **adaptations** that allow them to survive. These adaptations are certain traits, body parts, or behaviors that help keep sea slugs safe from hungry predators such as sea turtles and crabs.

As students read “Super Slugs,” ask them to look for ways these sea slugs have found to survive. Suggest that they place self-stick notes next to each example they find.

After reading, lead students in discussing the story’s big idea: adaptation. Ask students: *Why do nudibranchs need to adapt? How have they adapted? What would happen to them if they did not adapt?* You may want to use a Fishbowl cooperative learning strategy to discuss these ideas.

Sum Up

Ask students to look at their list of things they wanted to learn from the story (item 5 on the Preview activity master). Take a quick poll to see how many students found answers to their questions. Pair those who found answers with those who did not, and have the pairs work together to go back through the text to see if they can find answers. Then ask volunteers to share one question and the answer they found in the text. Remind students that if they could not find all the information they wanted in “Super Slugs,” they can use other resources such as encyclopedias, the Internet, magazines, and science texts to find additional information.

Super Slugs

(continued)

Assess and Reteach

Materials: Comprehension Check, pp. T28 and T29; “Super Slugs” story

Assign the Comprehension Check for “Super Slugs” on p. T28. Use the Answer Key to score the assessment. Based on the results, you may want to reteach key science concepts. For instance, students may not understand the concept of **adaptation** and why nudibranchs need to develop certain defenses in order to survive.

Assign students to five groups. Using an adaptation of the Four Corners cooperative learning strategy, assign each group one of the sets of questions listed below related to nudibranch risks (anatomy) or survival strategies (camouflage, defense, mimicry, diet and food production). Ask each group to create a lesson. Explain they will be teaching the concepts to their peers.

Anatomy What special body parts do nudibranchs have? How do nudibranchs move? In what ways are sea slugs vulnerable? (Introduction, “Slugs on the Move,” labeled photograph, p. 20; “Tasty Treats,” p. 21)

Camouflage Where do nudibranchs get their bright colors? How do their colors help them? (“Living Color,” p. 21)

Defense How does what they eat help nudibranchs defend themselves? How does this keep them and their eggs safe? (“Snack Attack” and the first two paragraphs of “Poison Power,” p. 22)

Mimicry Why do some nudibranchs look exactly like others? How does that help them? (last part of “Poison Power,” p. 22)

Diet and Food Production How is having a limited diet a drawback for most nudibranchs? How does the blue dragon make its own food? (“Solar Slugs,” p. 22)

Then have each group present their lesson to the rest of the class.

Extend the Learning

Idioms The author begins “Super Slugs” with the idiom “You are what you eat.” Say: *What does this mean? Does it mean if I eat a strawberry, I am a strawberry?* Explain to students that the phrase is an idiom, or a colorful way to say something. The phrase as a whole means something different from what the words mean by themselves. “You are what you eat” is often a way to describe someone’s health. Ask students to make a list of other idioms they may be familiar with (examples include: *piece of cake, getting cold feet, hitting the nail on the head, pie in the sky*) and use them in a sentence. For fun, ask them to create their own idiom, demonstrate its use, and see if their classmates can use context clues to figure out what it means.

Author’s Point of View Remind students that all authors have a purpose for writing. The title they choose often gives us the first snapshot of their point of view. Ask why they think the author chose “Super Slugs” for the title of this story. Challenge students to think of three other possible titles and prepare to defend their ideas. Invite the class to vote on their favorites.

Classification Nudibranchs belong to the phylum, or group, of animals called mollusks. Other animals that are mollusks include land snails, clams, and octopuses. Encourage students to research these different animals to find out how they are alike and how they are different.

Super Slugs

Before you read "Super Slugs" in **EXTREME EXPLORER**, preview the story. Use this checklist to see what lies ahead.

Preview Checklist

- ☐ 1. Read pp. 18-19 and the introduction on p. 20.
What are you going to learn about?

- ☐ 2. Scan the subheads. Which section sounds most interesting to you?

- ☐ 3. Find the four boldfaced words. Check their definitions in Wordwise on p. 23.

- ☐ 4. Scan the photos and read the captions. Which information is new to you?

- ☐ 5. After you complete the preview, list three things you want to learn more about in the story.

COMPREHENSION CHECK

Answer these questions about "Super Slugs." For items 1-4, fill in the circle by the correct answer. Write your answer to item 5.

1. Which body part do nudibranchs use to feel, taste, and smell?

- ☐ (A) gills
- ☐ (B) cerata
- ☐ (C) rhinophores
- ☐ (D) radula

2. What is unusual about the blue dragon sea slug?

- ☐ (A) It makes its own food.
- ☐ (B) It feeds on sea anemones.
- ☐ (C) It has a short lifespan.
- ☐ (D) It is blue in color.

3. Which of these is not something nudibranchs do with their food?

- ☐ (A) use it for coloration
- ☐ (B) store it for later use
- ☐ (C) use it as a weapon
- ☐ (D) use it for transportation

4. How do toxins help some nudibranchs?

- ☐ (A) to find mates
- ☐ (B) to change color
- ☐ (C) to avoid being eaten
- ☐ (D) to move faster

5. Explain why nudibranchs need protection. Then describe one way in which they get help from the food they eat.

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Sample top-scoring response: Nudibranchs are soft and squishy. They have no shells. Some
of their body parts, like their gills, are on the outside! And they can't move very fast. It
seems it would be easy for predators to gobble them up. But their looks can fool you. For
instance, some nudibranchs eat stinging sea anemones. The stinging parts end up in the
nudibranch's cerata. So a predator gets a mouth full of stingers instead.