The Teaching Pages for Investigations

The investigations are the "main event" of the teacher's guide. A thoughtful format displays the information you need as you present each session.

Left-hand pages detail the steps you'll follow as you present the session. Right-hand pages provide teaching support and considerations for the steps on the facing page. Sidebars and footers remind you of the larger purpose and context of the session.

Session summary
Including what students learn

Unit learning goals
Organized by the three *Seeds/Roots* science-literacy synergies

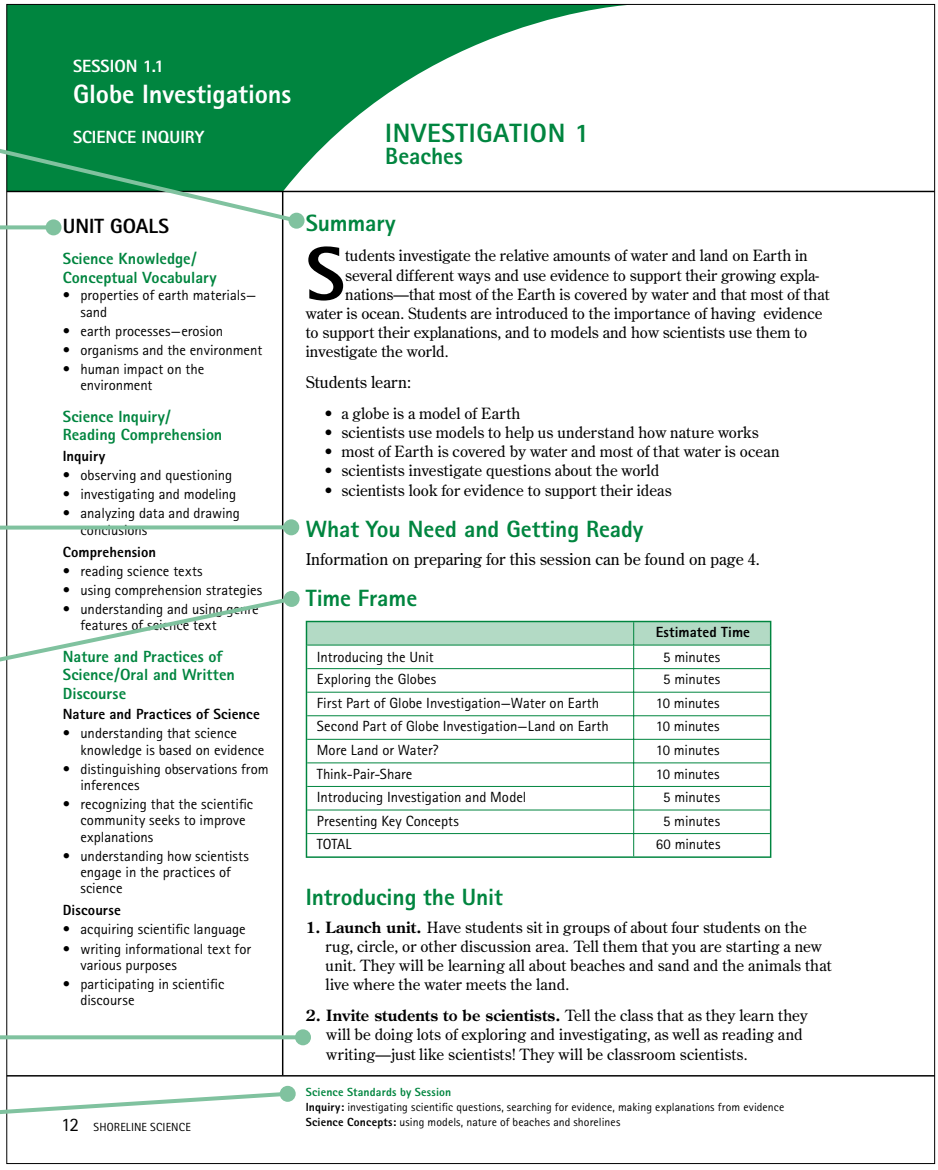
Materials/preparation
Where to find information describing the preparation necessary for each session

Time Frame
Pacing for each activity

Step-by-step instructions
Suggestions for teaching the session, including thoughtfully worded prompts

Science standards
Daily correlation "snapshots"

Example left-hand page from *Shoreline Science*



SESSION 1.1
Globe Investigations
SCIENCE INQUIRY

INVESTIGATION 1
Beaches

UNIT GOALS

Science Knowledge/ Conceptual Vocabulary
- properties of earth materials—sand
- earth processes—erosion
- organisms and the environment
- human impact on the environment

Science Inquiry/ Reading Comprehension

Inquiry
- observing and questioning
- investigating and modeling
- analyzing data and drawing conclusions

Comprehension
- reading science texts
- using comprehension strategies
- understanding and using genre features of science text

Nature and Practices of Science/Oral and Written Discourse

Nature and Practices of Science
- understanding that science knowledge is based on evidence
- distinguishing observations from inferences
- recognizing that the scientific community seeks to improve explanations
- understanding how scientists engage in the practices of science

Discourse
- acquiring scientific language
- writing informational text for various purposes
- participating in scientific discourse

Summary

Students investigate the relative amounts of water and land on Earth in several different ways and use evidence to support their growing explanations—that most of the Earth is covered by water and that most of that water is ocean. Students are introduced to the importance of having evidence to support their explanations, and to models and how scientists use them to investigate the world.

Students learn:
- a globe is a model of Earth
- scientists use models to help us understand how nature works
- most of Earth is covered by water and most of that water is ocean
- scientists investigate questions about the world
- scientists look for evidence to support their ideas

What You Need and Getting Ready

Information on preparing for this session can be found on page 4.

Time Frame

	Estimated Time
Introducing the Unit	5 minutes
Exploring the Globes	5 minutes
First Part of Globe Investigation—Water on Earth	10 minutes
Second Part of Globe Investigation—Land on Earth	10 minutes
More Land or Water?	10 minutes
Think-Pair-Share	10 minutes
Introducing Investigation and Model	5 minutes
Presenting Key Concepts	5 minutes
TOTAL	60 minutes

Introducing the Unit

1. **Launch unit.** Have students sit in groups of about four students on the rug, circle, or other discussion area. Tell them that you are starting a new unit. They will be learning all about beaches and sand and the animals that live where the water meets the land.

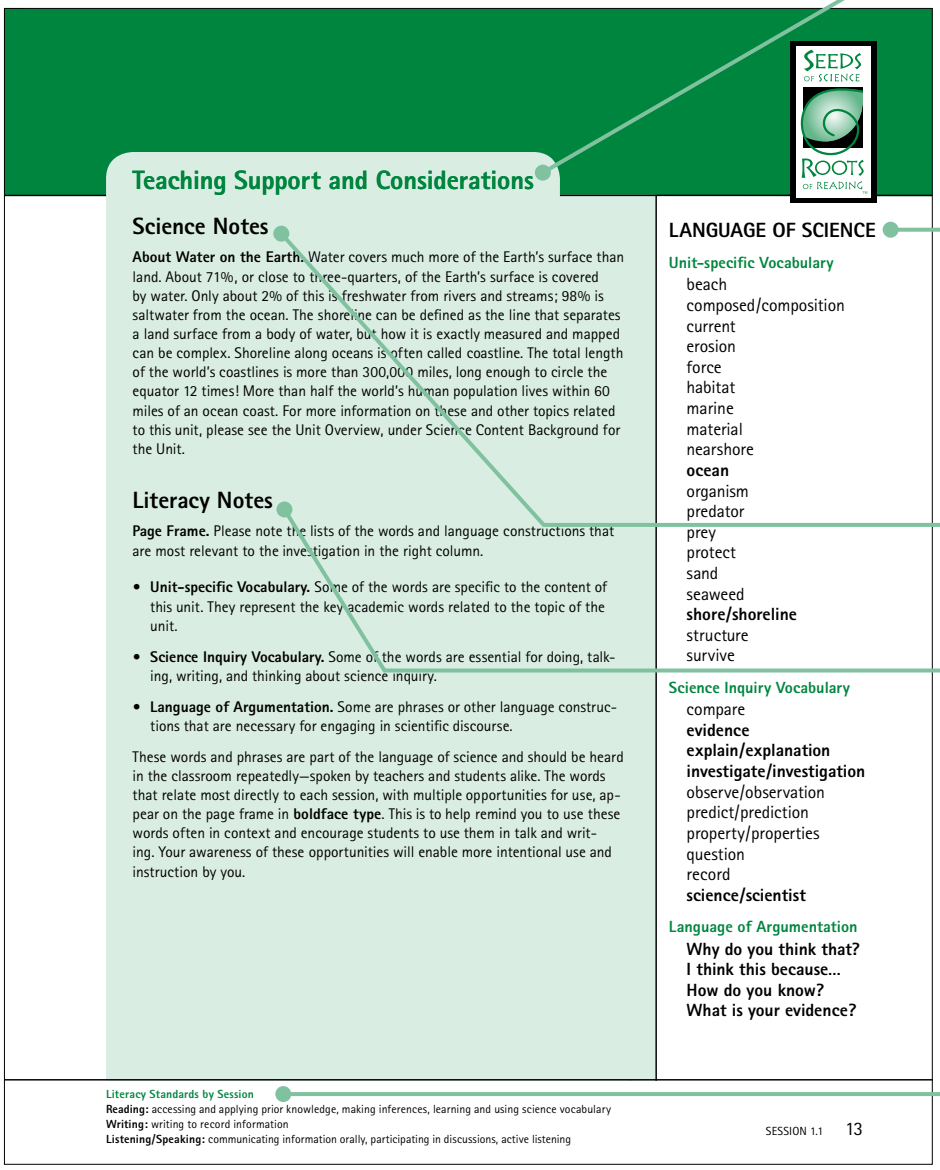
2. **Invite students to be scientists.** Tell the class that as they learn they will be doing lots of exploring and investigating, as well as reading and writing—just like scientists! They will be classroom scientists.

Science Standards by Session
Inquiry: investigating scientific questions, searching for evidence, making explanations from evidence
Science Concepts: using models, nature of beaches and shorelines

12 SHORELINE SCIENCE

Each right-hand page offers teaching support and considerations for the steps on the facing left page. You'll find everything you need to inform and extend your teaching of the session. Examples of the wide range of valuable tips and ideas to support you are shown below and on the next two pages.

Example right-hand page from *Shoreline Science*



Teaching Support and Considerations

Science Notes

About Water on the Earth. Water covers much more of the Earth's surface than land. About 71%, or close to three-quarters, of the Earth's surface is covered by water. Only about 2% of this is freshwater from rivers and streams; 98% is saltwater from the ocean. The shoreline can be defined as the line that separates a land surface from a body of water, but how it is exactly measured and mapped can be complex. Shoreline along oceans is often called coastline. The total length of the world's coastlines is more than 300,000 miles, long enough to circle the equator 12 times! More than half the world's human population lives within 60 miles of an ocean coast. For more information on these and other topics related to this unit, please see the Unit Overview, under Science Content Background for the Unit.

Literacy Notes

Page Frame. Please note the lists of the words and language constructions that are most relevant to the investigation in the right column.

- **Unit-specific Vocabulary.** Some of the words are specific to the content of this unit. They represent the key academic words related to the topic of the unit.
- **Science Inquiry Vocabulary.** Some of the words are essential for doing, talking, writing, and thinking about science inquiry.
- **Language of Argumentation.** Some are phrases or other language constructions that are necessary for engaging in scientific discourse.

These words and phrases are part of the language of science and should be heard in the classroom repeatedly—spoken by teachers and students alike. The words that relate most directly to each session, with multiple opportunities for use, appear on the page frame in **boldface type**. This is to help remind you to use these words often in context and encourage students to use them in talk and writing. Your awareness of these opportunities will enable more intentional use and instruction by you.

LANGUAGE OF SCIENCE

Unit-specific Vocabulary

beach
composed/composition
current
erosion
force
habitat
marine
material
nearshore
ocean
organism
predator
prey
protect
sand
seaweed
shore/shoreline
structure
survive

Science Inquiry Vocabulary

compare
evidence
explain/explanation
investigate/investigation
observe/observation
predict/prediction
property/properties
question
record
science/scientist

Language of Argumentation

Why do you think that?
I think this because...
How do you know?
What is your evidence?

Literacy Standards by Session
Reading: accessing and applying prior knowledge, making inferences, learning and using science vocabulary
Writing: writing to record information
Listening/Speaking: communicating information orally, participating in discussions, active listening

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Teaching Support and Considerations
See the following pages for more

Language of Science
Every right page reminds you of important vocabulary to stress, with this session's important words in bold type

Science Notes
Background information on the session's topic

Literacy Notes
Getting the most from the science–literacy connection

Literacy standards
Daily correlation "snapshots"

PROGRAM COMPONENTS AND FEATURES

Assessments
When and how to take advantage of the program's assessment tools

Providing More Experience
Ideas for additional student experiences to address needs revealed by assessments

English Language Learners
How to amplify the science, literacy, and language learning experiences of English learners

Teaching Support and Considerations

Instructional Suggestions

On Explanations. One of the most important and foundational scientific skills is the ability to make evidence-based explanations. The explanations scientists make about the natural world are based on evidence gathered through systematic investigations. As new data and additional evidence become available, previous scientific explanations are revised and improved, or rejected and replaced. Throughout the unit, students will be asked to make explanations about the things they observe and to support their explanations with evidence. For more on the importance of evidence-based explanations in science, see the Program Introduction, under Science in *Seeds of Science/Roots of Reading*.

English Language Learners

Vocabulary. Students learning English as a second language can encounter language-related problems in science classrooms because of the number of new vocabulary words being introduced. Multiple meaning words—words with more than one distinct meaning—can be particularly challenging. For example, consider the word *model*. English Language Learners may know the everyday use of the word, but not its special meaning in science. Explain that many words in English have two (or more) meanings. The word *model* can mean someone who is paid to show clothes, but can also mean a smaller scale or other representation of an object (using a picture of a person who is a model and a globe serving as a model could help students understand the distinction). Give students practice with the following multiple meaning words: *pitcher, check, light*. Have students write each word and illustrate at least two meanings. Students with more advanced English skills can write sentences using the words and see how many meanings they can represent. Tell students that they will find many words in science that have a special meaning and that they should be on the lookout for these words. Emphasize that the context in which a word is found often provides clues about the word's meaning.

Figure 1–3 Model how to "drive" a finger on land

LANGUAGE OF SCIENCE

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Science Inquiry Vocabulary
compare
evidence
explain/explanation
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science/scientist

Language of Argumentation
Why do you think that?
I think this because...
How do you know?
What is your evidence?

Literacy Standards by Session
Reading: accessing and applying prior knowledge, making inferences, learning and using science vocabulary
Writing: writing to record information
Listening/Speaking: communicating information orally, participating in discussions, active listening

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Teaching Support and Considerations

Instructional Suggestions

Evidence of Humans. If your students have a good grasp of the categories, you might want to point out that evidence of humans could be abiotic (plastic, glass, metal) or biotic (chicken bones, paper, lumber).

Assessment

Critical Juncture #2: Using Evidence for Sorting Objects. During the discussion about sorting the beach objects, take note of whether students are able to generate evidence for their placement of beach objects. At this point they should be able to explain their own reasoning and follow the logic behind others' thinking. If they are having trouble with this, you may use the Providing More Experience activity described below. You could also gain more insight into students' thinking by reading their responses to the Daily Written Reflection at the beginning of Session 1.5.

Providing More Experience

Reinforce: More Sorting. Do additional sorting together as a class. Have students take turns volunteering to sort the objects in front of the class and to explain their reasoning. They should be talking aloud about the decisions they make and the properties and evidence that they are using for sorting. During this process, ask for others to respond about whether they agree or disagree.

LANGUAGE OF SCIENCE

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Science Inquiry Vocabulary
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Language of Argumentation
Why do you think that?
I think this because...
How do you know?
What is your evidence?

Literacy Standards by Session
Reading: making inferences, learning and using science vocabulary
Writing: writing to record information
Listening/Speaking: communicating information orally, making explanations from evidence

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Teaching Support and Considerations

Daily Written Reflection

Daily Written Reflections are short, open-ended, optional writing prompts that you can use with students to "jump-start" each session. They can also be used at another time in the school day, or as homework. The prompts give students opportunities to reflect on what they have been learning, activate their prior knowledge, make connections, and/or use science vocabulary in context. Student responses to the Daily Written Reflections are also a good window into how students are thinking about important concepts as the unit progresses.

Students can respond to the Daily Written Reflections in their Investigation Notebooks. For each prompt, there are lines for students to write their response, as well as a space to draw a picture if it helps them to explain their thinking. Explain to students that they do not need to fill up all of the lines with writing, nor do they need to draw a picture unless they feel it is useful. Daily Written Reflections are meant to be brief—allow about five minutes for students to respond in writing.

Why do scientists use models to help them understand the world? The Daily Written Reflection prompt for this session is on page 2 of the Investigation Notebook. It asks students to think back on what they learned about models from working with the globes. It asks them to generalize about the reasons for, uses of, and advantages of models to scientists. An important focus in this unit is helping students learn about and gain specific understandings about the nature and practices of science. Using and critiquing models is an important part of scientific inquiry.

Scientists investigate questions about the world.

Scientists look for evidence to support their ideas.

LANGUAGE OF SCIENCE

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Language of Argumentation

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I think this because...
How do you know?
What is your evidence?

Literacy Standards by Session
Reading: visualizing, learning and using science vocabulary, making inferences
Writing: writing to record information
Listening/Speaking: active listening, participating in discussions

Daily Written Reflections
Optional opportunities for students to reflect in writing about what they are learning

Teaching Support and Considerations

Daily Written Reflection

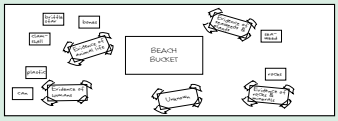
We sorted beach objects into these five groups: evidence of animal life, evidence of seaweeds and plants, evidence of rocks and minerals, evidence of humans, unknown. Which evidence was hardest to sort by? Tell why you think so. The purpose here (on page 8 of the Investigation Notebook) is to have students think back on previous class discussions when they talked about what constituted evidence of animals, plants, humans, etc. This will help to reinforce the important idea of using evidence to help make explanations in science.

Instructional Routine

Concept Mapping. Concept maps are a useful way of organizing information and showing the relationships among ideas in both science and the language arts. In this unit, we use concept maps in several ways—to represent the relationships between key concepts, as a tool for structured brainstorming, to sort and categorize information, and to organize information for writing. Concept maps can take many forms. In this unit, we use simple web diagrams (sometimes called spider diagrams), which are boxes or circles with lines drawn between them to represent their connection(s) to one another. See Teacher Resources, under *Seeds/Roots* Instructional Routines for more about this routine and others that accomplish similar goals.

Figure 1–13 Step 1 of creating a concept map—sort beach bucket

Figure 1–14 Step 2 of creating a concept map—label the sorted objects



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Language of Argumentation

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I think this because...
How do you know?
What is your evidence?

Literacy Standards by Session
Reading: making inferences, learning and using science vocabulary
Writing: concept mapping, writing to record information, making explanations from evidence
Listening/Speaking: participating in discussions, making explanations from evidence

Instructional Routines
Repeated effective instructional sequences that help students and teachers know what to do so they can focus on concepts rather than procedures