Core Knowledge® SCIENCE

Science in Action: Laura and Sandra

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Teacher Guide

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Core Knowledge®

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GRADE 2

Introduction

About Science in Action

The goal of teaching students science from Kindergarten through high school graduation is not to turn every student into a scientist by profession. However, scientific advances occur at a faster rate year after year and this leads to a job market and society that needs people comfortable with science as part of their daily work lives. And while students traditionally receive an education in science, they may not be familiar how a path from learning about science leads to a career in the science. Students may have an imperfect understanding of how science will impact their future and future career. Students may be undecided about their futures and have no background or understanding about how science could inform their career as adults.

While STEM is now taught as a portion of classes in many grades, there are very few schools with dedicated engineering classes. Many industries have a focus on engineering which can change rapidly as a result of the faster evolution of technology. As a result, many students receive little exposure to this vital aspect of their future careers. Students are asked to learn about engineering and adapt to new engineering skills in a short time frame without developing the depth and breadth of how to put science in action.

With this in mind, Core Knowledge has developed the Science in Action readers. Each reader features two or more chapters. Students learn first about the early childhood of the subject and how their interest in the sciences and engineering was piqued. The second part features the subject in the present day and explores their academic and engineering experiences in college, their work experiences as they relate to their scientific and engineering experiences, and in some cases their careers post-college. Each account ends with an "Inspired by…" section which features one or more scientists or engineers who provided inspiration in their path. The goal is to help young students connect their own experiences at a younger age to their future endeavors and careers as part of the larger society outside the classroom.

Core Knowledge Foundation is committed to educating students in many disciplines. *Science in Action* is intended to show that a person, no matter what age, encounters science and engineering in their everyday experiences. Further, the program intends to help students connect their personal lives with the broader needs and interests of society so when they get to high school and beyond in their academic careers, they will more familiar with the paths they follow.

Standards

Core Knowledge Science offers units that comprehensively address all of the Next Generation Science Standards (NGSS) in a three-dimensional approach that integrates Disciplinary Core Ideas (DCIs), Science and Engineering Practices (SEPs), and Crosscutting Concepts (CCCs). The program clusters the

NGSS Performance Expectations into physical science, life science, and earth and space science units. Stemming from the commitment that background knowledge is essential, the units build around Student Books, which largely center on all of the NGSS DCI concepts. However, the pure NGSS approach de-emphasizes reading, and the standards do not treat the Science and Engineering Practices or the Crosscutting Concepts as *content*, or discrete ideas to be taught and learned. This omission makes the SEPs and CCCs logical concepts for focus of direct student attention. Core Knowledge maintains that it is favorable and valuable for students to read or hear stories that are specifically about practices and overarching concepts.

The lessons in Grade 2 Core Knowledge Science in Action are constructed to cultivate student exposure to and understanding of the ideas present in the following NGSS dimensions. Lessons also cite relevant support of Common Core State Standards for English and Language Arts. Additional cross-curriculum standards relevant to specific lesson will be listed at the lesson level.

Nature of Science

NOS1. Scientific Investigations Use a Variety of Methods

- Science investigations begin with a question.
- Scientists use different ways to study the world.

NOS2. Scientific Knowledge Is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world.

NOS3. Scientific Knowledge Is Open to Revision in Light of New Evidence

- Science knowledge can change when new information is found.

NOS4. Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Scientists use drawings, sketches, and models as a way to communicate ideas.
- Scientists search for cause-and-effect relationships to explain natural events.

NOS5. Science Is a Way of Knowing

- Science knowledge helps us know about the world.

Sources:

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.

National Research Council. 2012. *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K–12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

National Governors Association Center for Best Practices, Council of Chief State School Officers. 2010. *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects*. National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington DC.

NOS6. Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes natural events happen today as they happened in the past.
- Many events are repeated.

NOS7. Science Is a Human Endeavor

- People have practiced science for a long time.
- Men and women of diverse backgrounds are scientists and engineers.

NOS8. Science Addresses Questions About the Natural and Material World

- Scientists study the natural and material world.

Science and Engineering Practices

SEP1. Asking Questions (for science) and Defining Problems (for engineering)

A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested. Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. Both scientists and engineers also ask questions to clarify ideas. Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

SEP2. Developing and Using Models

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations. Modeling tools are used to develop questions, predictions, and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineered systems. Measurements and observations are used to revise models and designs. Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Distinguish between a model and the actual object, process, and/or events the model represents.
- Compare models to identify common features and differences. Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).
- Develop a simple model based on evidence to represent a proposed object or tool.

SEP3. Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- With guidance, plan and conduct an investigation in collaboration with peers (for K).
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences.

SEP4. Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis. Engineering investigations include analysis of data collected in the tests of designs. This allows comparison of different solutions and determines how well each meets specific design criteria—that is, which design best solves the problem within given constraints. Like scientists, engineers require a range of tools to identify patterns within data and interpret the results. Advances in science make analysis of proposed solutions more efficient and effective. Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
- Compare predictions (based on prior experiences) to what occurred (observable events).
- Analyze data from tests of an object or tool to determine if it works as intended.

SEP5. Using Mathematics and Computational Thinking

In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks, such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Mathematical and computational thinking in K–2 builds on prior experience

and progresses to recognizing that mathematics can be used to describe the natural and designed world(s).

- Decide when to use qualitative vs. quantitative data.
- Use counting and numbers to identify and describe patterns in the natural and designed world(s).
- Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.
- Use quantitative data to compare two alternative solutions to a problem.

SEP6. Constructing Explanations (for science) and Designing Solutions (for engineering)

The end products of science are explanations and the end products of engineering are solutions. The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories. The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints. Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Generate and/or compare multiple solutions to a problem.

SEP7. Engaging in Argument from Evidence

Argumentation is the process by which evidence-based conclusions and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims. Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Identify arguments that are supported by evidence.
- Distinguish between explanations that account for all gathered evidence and those that do not.
- Analyze why some evidence is relevant to a scientific question and some is not.
- Distinguish between opinions and evidence in one's own explanations.
- Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.
- Construct an argument with evidence to support a claim.
- Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.

SEP8. Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs. Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).
- Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.
- Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.

Crosscutting Concepts

CCC1. Patterns

In grades K–2, children recognize that patterns in the natural and human-designed world can be observed, used to describe phenomena, and used as evidence.

Patterns . . . are a pervasive aspect of all fields of science and engineering. When first exploring a new phenomenon, children will notice similarities and differences, leading to ideas for how they might be classified. The existence of patterns naturally suggests an underlying cause for the pattern. For example, observing snowflakes are all versions of six-side symmetrical shapes suggests something about how molecules pack together when water freezes; or, when repairing a device, a technician would look for a certain pattern of failures suggesting an underlying cause. Patterns are also helpful when interpreting data, which may supply valuable evidence in support of an explanation or a particular solution to a problem.

CCC2. Cause and Effect

In grades K–2, students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.

Cause and effect lies at the heart of science. Often, the objective of a scientific investigation is to find the cause that underlies a phenomenon, first identified by noticing a pattern. Later, the development of theories allows for predictions of new patterns, which then provides evidence in support of the theory. For example, Galileo's observation that a ball rolling down an incline gathers speed at a constant rate eventually led to Newton's Second Law of Motion, which in turn provided predictions about regular patterns of planetary motion, and a means to guide space probes to their destinations.

CCC3. Scale, Proportion, and Quantity

In grades K–2, students use relative scales (e.g., bigger and smaller; hotter and colder; faster and slower) to describe objects. They use standard units to measure length.

Scale, proportion, and quantity are essential considerations when deciding how to model a phenomenon. For example, when testing a scale model of a new airplane wing in a wind tunnel, it is essential to get the proportions right and measure accurately or the results will not be valid. When using a computer simulation of an ecosystem, it is important to use informed estimates of population sizes to make reasonably accurate predictions. Mathematics is essential in both science and engineering.

CCC4. Systems and System Models

In grades K–2, students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world(s) have parts that work together.

Systems and system models are used by scientists and engineers to investigate natural and designed systems. The purpose of an investigation might be to explore how the system functions or what may be going wrong. Sometimes investigations are too dangerous or expensive to try out without first experimenting with a model.

CCC5. Energy and Matter (flow in systems)

In grades K–2, students observe objects may break into smaller pieces, be put together into larger pieces, or change shapes.

Energy and matter are basic to any systems model, whether of a natural or a designed system. Systems are described in terms of matter and energy. Often, the focus of an investigation is to determine how energy or matter flows through the system, or in the case of engineering to modify the system, so a given energy input results in a more useful energy output.

CCC6. Structure and Function

In grades K–2, students observe the shape and stability of structures of natural and designed objects are related to their function(s).

Structure and function can be thought of as a special case of cause and effect. Whether the structures in question are living tissue or molecules in the atmosphere, understanding their structure is essential to making causal inferences. Engineers make such inferences when examining structures in nature as inspirations for designs to meet people's needs.

CCC7. Stability and Change (factors to always consider)

In grades K–2, students observe some things stay the same while other things change, and things may change slowly or rapidly.

Stability and change are ways of describing how a system functions. Whether studying ecosystems or engineered systems, the question is often to determine how the system is changing over time, and which factors are causing the system to become unstable.

Engineering and Design

ED.A. Defining and Delimiting Engineering Problems

Defining and delimiting engineering problems involves stating the problem to be solved as clearly as possible in terms of criteria for success, and constraints or limits.

- Define - Identify situations that people want to change as problems that can be solved through engineering.

ED.B. Developing Possible Solutions

Designing solutions to engineering problems begins with generating a number of different possible solutions, then evaluating potential solutions to see which ones best meet the criteria and constraints of the problem.

- Develop solutions - Convey possible solutions through visual or physical representations.

ED.C. Optimizing Design Solutions

Optimizing the design solution involves a process in which solutions are systematically tested and refined and the final design is improved by trading off less important features for those that are more important.

- Optimize - Compare solutions, test them, and evaluate each.

Science, Technology, Society, and the Environment

STSE1. Interdependence of Science, Engineering, and Technology

- Science and engineering involve the use of tools to observe and measure things.

STSE2. The Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. Taking natural materials to make things impacts the environment.

Common Core State Standards for English and Language Arts

Reading Standards for Informational Text

Key Ideas and Details:

- **CCSS.ELA-LITERACY.RI.2.1:** Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.
- **CCSS.ELA-LITERACY.RI.2.2:** Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.
- **CCSS.ELA-LITERACY.RI.2.3:** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

Craft and Structure:

- **CCSS.ELA-LITERACY.RI.2.4:** Determine the meaning of words and phrases in a text relevant to a *grade 2 topic or subject area.*
- **CCSS.ELA-LITERACY.RI.2.5:** Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.
- **CCSS.ELA-LITERACY.RI.2.6:** Identify the main purpose of a text, including what the author wants to answer, explain, or describe.

Integration of Knowledge and Ideas:

- **CCSS.ELA-LITERACY.RI.2.7:** Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
- **CCSS.ELA-LITERACY.RI.2.8:** Describe how reasons support specific points the author makes in a text.
- **CCSS.ELA-LITERACY.RI.2.9:** Compare and contrast the most important points presented by two texts on the same topic.

Range of Reading and Level of Text Complexity:

- **CCSS.ELA-LITERACY.RI.2.10:** By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range.

What Teachers Need to Know

Supportive information on the content standards and the science they address is provided throughout the lessons at points of relevance:

Know the Standards: These sections, found later in this Teacher Guide, explain what to teach and why, with reference to NGSS and Core Knowledge expectations.

Know the Science: These sections provide supporting, adult-level, background information or explanations related to specific examples or Disciplinary Core Ideas.

Students come to elementary classrooms across the country with a wide range of prior experiences. Some have grown up in cities away from nature. Others have grown up in the country, intimately involved in nature.

Some have had teachers and/or family members who have been reading aloud and sharing the wonderful world of animals and plants with them for several years, while others have not. Some have traveled to other cities, states, and countries, while others may know only their own family and neighborhood.

Draw out students. Give them the opportunity to express what they know about the natural world, about rocks, the stars, motion, giraffes, or matter. You can assess the prior knowledge students have about science, and since science deals with everything around a child, the wealth of their background in science should not be underestimated.

Features

Using the Student Book

The *Science in Action* Student Book includes four chapters, intended to be read aloud by the teacher as the students look at images on each page. The Student Book opens with stories of the source of inspiration for a scientist when they were young. The parts that follow the chapters introduce the scientist as an adult, the work they do as an adult in a science-based field. The final part discusses how they were inspired by scientists of the past.

Online Resources

The Student Book is spiral bound to allow students to lay it flat when reading or following along.

Because students in Kindergarten–Grade 2 are just learning to read and are learning how to decode written words, so the complexity and amount of text that these young students can actually read is quite limited.

While some advanced students may be able to read words on a given page of the Student Book, as a general rule, students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

The intent of the Grades K–2 CK Science in Action lessons is to build students' understanding and knowledge of science concepts, as well as of associated practices and skills, using a teacher Read Aloud, accompanied by example images and diagrams. Cognitive science research has clearly documented the fact that students' listening comprehension far surpasses their reading comprehension well into the late elementary and early middle school grades. Said another way, students are able to understand and grasp far more complex ideas and texts that they hear read aloud than they would ever be able to read or comprehend when they read to themselves. For a more thorough discussion of listening and reading comprehension and the underlying cognitive science research, teachers may want to refer to Appendix A of the Common Core State Standards for English Language Arts, noting in particular the Speaking and Listening section of the appendix.

Using the Teacher Guide

The *Science in Action* Teacher Guide is set up with lessons that parallel the chapters of the Student Book. Additionally, there are Experiences which follow some of the Lessons. Experiences are class-length labs which support the science content in the Student Book. Within the Teacher Guide are a list of the Nature of Science, SEPs, CCCs, and Literacy standards which students may encounter within the lessons and experiences.

Online Resources

Use this link to download the CKSci Online Resources for this unit, where the specific link to this appendix can be found:

www.coreknowledge.org/cksci-online-resources

Activity Pages

Activity Pages

AP 1–B.3

Black line reproducible masters for activity pages, as well as an answer key, are included in Teacher Resources on pages 78–87. The icon shown to the left appears throughout the Teacher Guide wherever activity pages (AP) are referenced.

Make sufficient copies for your students in advance of each lesson segment.

Online Resources

Online Resources

For each CKSci unit, the Teacher Guide includes references to online resources (including external websites and downloadable documents) to enhance classroom instruction. Look for the icon on the left.

Use this link to download the CKSci Online Resources for this unit:

www.coreknowledge.org/cksci-online-resources

Materials and Equipment

These lessons suggest a moderate variety of materials to support activities that enhance the Science in Action chapter readings. Prepare in advance by collecting the materials and equipment needed for all the demonstrations and hands-on investigations.

Internet access and the means to project images/videos for whole-class viewing are also required in many lessons but not repeated below.

Lesson 1

- markers or colored pencils

Lesson 2

- colored pencils or fine-line markers

Experience A

- earthworms from a garden center or bait shop and habitat bin to house them
- earthworm habitat
- plastic gallon container
- 1/2 cup dry yellow mustard
- plastic or foam trays
- all-purpose flour
- 1 spray bottle with distilled water
- rulers
- black and white construction paper
- tape

Lesson 4

- ruler with millimeter markings

Experience B

- scissors
- reference books and other research materials
- materials for assembling images such as index cards, string, tape, ribbon, glue, and paper plates
- map of North America
- magnetic compass

Pacing

The Core Knowledge Science in Action Student Book consists of four chapters, each ten pages long. This accompanying Teacher Guide contains one lesson of instructional support per chapter. Each lesson offers prompts for the teacher to use in facilitation of class discussion. Many lessons offer brief hands-on activities, teacher demonstrations, or online enhancements in addition to the reading support. All lessons include an Activity Page reproducible master.

The Science in Action lessons, requiring 30–45 minutes each, can be implemented in sequence, as a stand-alone unit across twenty consecutive class sessions. The unit can also serve as the basis of an enrichment program. Or, teachers may elect to use one lesson per week across the school year, layered in tandem with other physical, life, and earth/space science content units. To assist with the latter approach, the following table provides a key suggesting the science domain most prominently emphasized in each Science in Action chapter to help pair the chapters meaningfully with other units.

Science in Action Chapter/ Experience	Has content that ties to …	Core Knowledge Kindergarten Units
1. Birds and Bridges	Life science, STEM	• Needs of Plants and Animals, • Changing Environments, • Science All Around Us
2. Laura Stark: Wildlife Explorer	Life science, STEM	• Needs of Plants and Animals, • Changing Environments, • Science All Around Us
Experience A: Investigating Earthworms	Life science, habitats	• Needs of Plants and Animals, Changing Environments, • Our Five Senses, • Science All Around Us
3. Tumbling Into Science	Life science, STEM	• Needs of Plants and Animals, • Changing Environments, • Science All Around Us
4. Sandra Fischer: Always Learning	Life science, STEM	• Needs of Plants and Animals, • Changing Environments, • Science All Around Us
Experience B: What Do We Know About Monarch Butterflies	Life science, life cycles	• Needs of Plants and Animals, • Changing Environments, • Our Five Senses, • Science All Around Us

Online Resources

Also, see the Online Resources Guide for recommendations about when to best enhance instruction to support these chapters.

www.coreknowledge.org/cksci-online-resources

LESSON 1

Birds and Bridges

At a Glance

Learning Objectives

- ✓ Explain how science investigations begin with a question.
- ✓ Explain that people from many backgrounds become scientists.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary practice
- viewing online videos
- drawing and writing

NGSS and CCSS References

NOS1. Scientific Investigations Use a Variety of Methods: Science investigations begin with a question.

NOS5. Science Is a Way of Knowing: Science knowledge helps us know about the world.

NOS7. Science Is a Human Endeavor: Men and women of diverse backgrounds are scientists and engineers.

RI.2.1. Key Ideas and Details: Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.

SL.2.3. Speaking & Listening: Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

L.2.4.A. Speaking & Listening: Use sentence-level context as a clue to the meaning of a word or phrase.

For detailed information about the NGSS and CCSS References, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

investigate **veterinarian**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students themselves will use or explain the words.

rescue **wildlife**

Instructional Resource

Student Book

Ch. 1

Student Book, Chapter 1
"Birds and Bridges"

Activity Page

AP 1

Activity Page
If I Were a Veterinarian (AP 1)

Materials and Equipment

Collect or prepare the following:

- internet access and the means to project images/video for whole-class viewing
- markers or colored pencils

Advance Preparation

Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter when opening their book. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all student books so that the first page of Chapter 1 is visible.

The Core Lesson

1. Focus attention on the lesson purpose.

Have students recall a time they were awakened by a sound outside their home. Ask: What kinds of sounds woke you? What did you do when they did? If students cannot think of incidents, share one of your own, such as when you were awakened by the sound of thunder or a garbage truck.

2. Read together: "Birds and Bridges."

Student Book

Ch. 1

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 1 on page 2. Tell students that the title of this chapter is "Raccoon Rescue," and alert them to pay special attention to how Laura and her mother observe and react to things.

Read Aloud Support

Page 2

Ask students to look at the illustration as you read aloud. Talk about what they notice about the scene.

LITERAL—Is the bedroom and sky dark or light in this picture?

» light

INFERENTIAL—What time of day was it when Laura got out of bed?

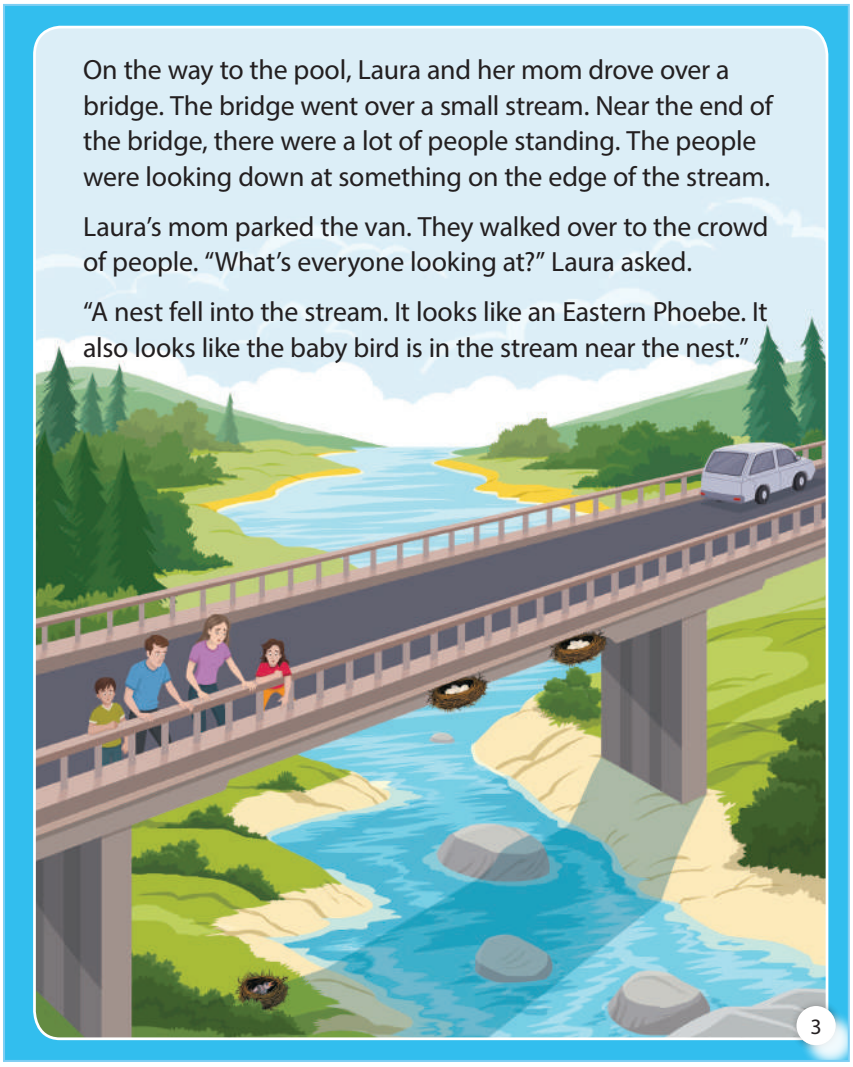
» It was morning.

EVALUATIVE—Why might the birds be chirping so much?

» because it was sunny and warm outside

Page 3

Ask students to look at the illustration as you read aloud. Talk about what they notice. Students should be able to point out the bridge over the stream, the people looking down, and the nest by the edge of the stream. Students might also notice additional Eastern Phoebe nests long the side of the bridge.



INFERENTIAL—What kind of baby was by the stream?

» a baby bird

INFERENTIAL—How is Laura acting like a scientist? (See Know the Standards.)

» She is observing what is happening near the stream.

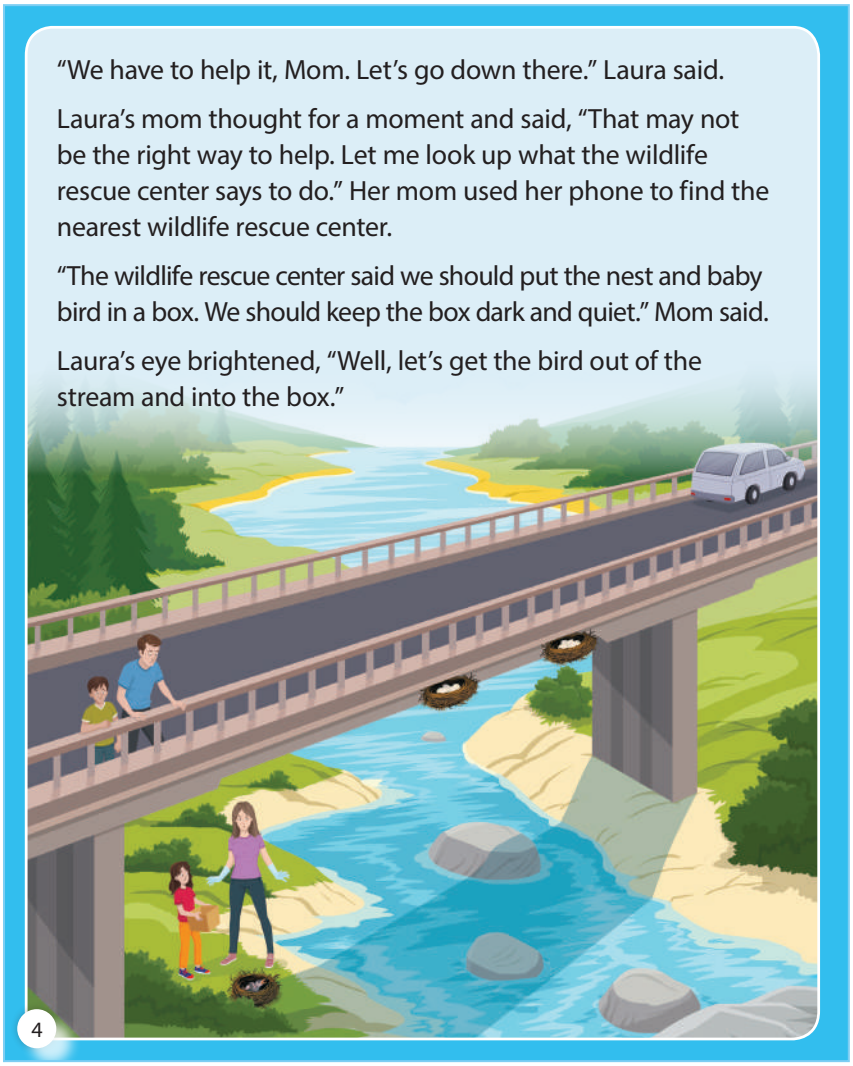
Without identifying the source, play a recorded audio clip of a baby bird for students. Explain that this is what Laura heard, and encourage discussion.

Know the Standards

NOS2. Scientific Knowledge Is Based on Empirical Evidence Use this page as an opportunity for students to observe patterns and order about the world.

Page 4

Ask students to look at the image as you read aloud. Talk about what they notice about the animal shown.



LITERAL—What did Laura and her mother see by the stream?

» a nest that fell off the bridge with a baby bird inside

EVALUATIVE—Is getting the nest and baby bird away from the stream a good idea? Why?

» Possible response: Yes, because the other bird nests are up off the ground so the baby birds can grow up in a safe space. The water is not a safe space for a baby bird.

Point out that Laura's mother found a nearby wildlife organization by searching online and then calling them. Use an internet-connected device and keywords that include your state or zip code or start with a national organization that has a directory to show students how he found a local wildlife organization.

Page 5

Ask students to look at the illustration as you read aloud. Talk about what they notice about how the towel and box are used.

Laura's mother knelt down and picked up the nest with the baby bird in it. "Stand back Laura. I want to make sure neither of us gets scratched." she explained. Her mom placed the nest and baby bird into the box.

Laura looked down at the baby bird. "I'm going to put a towel over the box. You'll be safe. We are going to take you to see an animal doctor."

"Should we put some food and water in the box with the baby bird?" Laura asked her mother.

"No," he replied, "the wildlife website says not to give food or water to an injured animal until it has seen the veterinarian."

They climbed up to their van and drove to the wildlife rescue center.

5

INFERENTIAL—How was the towel useful?

» It helps keep the box warm and makes it a quiet and dark place so the baby bird can stay calm.

ALERT—Make sure students understand that children should not pick up wild animals because they can be dangerous. For example, many wild mammals carry the rabies virus.

Have students use contextual clues to define the word **veterinarian** as a doctor who takes care of sick or injured nonhuman animals.

Page 6

Ask students to look at the two-page illustration as you read aloud. Talk about what they notice about the vet's office.

Laura's mom drove to the wildlife rescue center. She carried the box inside while Laura held the door open. Dr. Ortiz looked at the box and said, "What do we have here?"

Laura's words came spilling out. "It's a baby bird. It was crying so loud. But it fell into the stream along with the nest. What can you do?"

The vet took the baby bird and nest out of the box. Dr. Ortiz gently felt the animal, checking for broken bones. She said, "Laura, you did the right thing calling the wildlife rescue center. I have special training with wild animals and have even cared for injured chimpanzees and monkeys."

"I will put this wild baby in a dark and quiet part of my clinic and keep an eye on it for a few hours. Then, if all seems well, the wildlife rescue team will raise the little fellow until he is ready to live on his own. They know how to release them when they are able to care for themselves."

To avoid frightening the baby bird, Laura said her goodbyes in a tiny

6

LITERAL—What are some important details you can see in the vet's office?

» It looks like a hospital; there is a table to put the animals on; the vet and the assistant wear gloves and medical clothing.

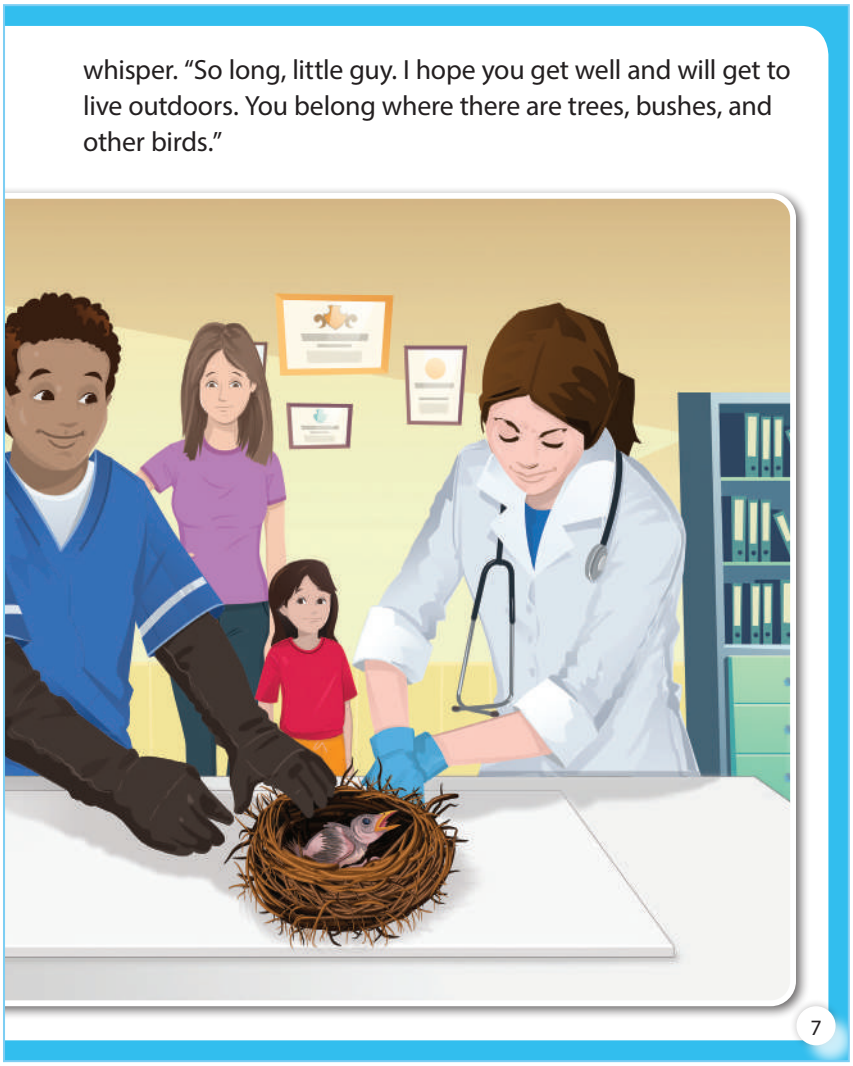
INFERENTIAL—What did Dr. Ortiz mean when she spoke about "wild animals"? What kinds of animals are wild? Not wild?

» Wild animals do not live with people—they live in nature. Most vets only care for animals that live with people, such as dogs, cats, horses, and chickens.

Point out that people working as a veterinarian or a vet's assistant use science knowledge and science thinking to do their jobs. Explain that becoming a vet requires about the same number of years of schooling as becoming a doctor who cares for humans.

Page 7

Ask students to continue looking at the illustration as you read aloud. Talk about what they notice about Laura and her mother.



LITERAL—Why did Laura whisper when she said goodbye to the baby raccoon?

» so that she would not frighten it

INFERENTIAL—Why would a dark and quiet spot be helpful for a baby bird?

» Because birds are wild animals, they are not used to being around people and animals like dogs and cats.

Point out that the people in the illustration helping the baby raccoon use science to do their jobs. Elicit from students that people of many backgrounds work in science. Poll your students to find out how many might like to use science to help animals when they are older.

CHALLENGE—Have interested students dictate a list of all the different kinds of jobs people could have that use science knowledge and skills. Post the list, and invite the rest of the class to star the jobs they would enjoy doing.

Page 8

Ask students to look at the illustration as you read aloud. Make sure they understand that the balloon contains a picture of what Laura is thinking.

LITERAL—What kind of veterinarian does Laura want to be when she grows up?

» the kind that cares for wild animals

EVALUATIVE—Do you think Laura has a clear idea of what a wildlife vet does? What clues in the picture support your answer?

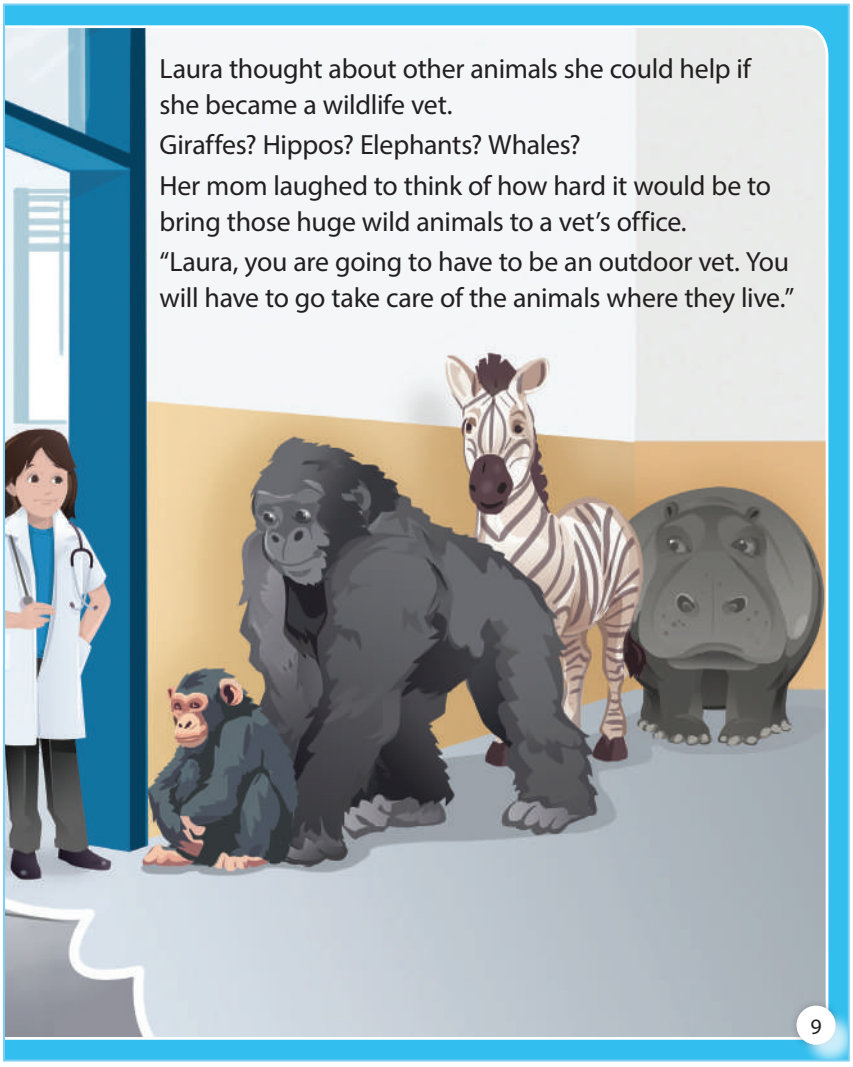
» Sample answer: no, because she seems to think that wild animals will line up to see her in her office

Distribute Activity Page 1 with drawing materials such as markers or colored pencils. Use a turn-and-talk routine to allow students to share their ideas about the kinds of animals they might want to treat. If they are not sure how to get started, prompt them by suggesting a few kinds of animals. Ask: Would you like to care for a sick crocodile? Panda? Polar bear? Rabbit? Turtle?

See the Activity Page Answer Key for sample student responses.

Page 9

Before you read aloud, allow students to share their completed activity pages. Have them note similarities and differences in the kinds of animals students would like to care for.



LITERAL—What other kinds of animals is Laura thinking about caring for?

» giraffes, hippos, elephants, and whales

INFERENTIAL—Where would an outdoor vet have to work to care for these huge animals?

» a zoo, a park, a forest, a grasslands, or on a boat in the ocean

Online Resources

Point out that not all wild animals are too large to fit into a vet's office. Some wildlife vets care for smaller wild animals brought in by the people they live with or people who rescue them. Share an online video with students that shows what work as a wildlife vets entails. After showing the video, ask the following question.

EVALUATIVE—Is being a wildlife vet a fun job? Why or why not?

» Sample Answer: Yes, it is fun because every day there are different kinds of animals to care for.

Page 10

Ask students to look at the illustration as you read aloud. Talk about what they notice and how they think Laura feels about her adventure.

INFERENTIAL—How did Laura think like a scientist the day she and her mom were at the vet?

» She observed a situation and came up with a plan.

LITERAL—When did Laura and her mom sit at this table and talk?

» the morning after they took the baby bird to the vet

INFERENTIAL—How do you think Laura feels about what her mom says?

» very proud of how she investigated the crying sound and excited to think of being a wildlife vet

Point out that working with injured, sick, or orphaned wild animals involves three tasks that all start with the letter "R." The first task is to *rescue* the animal and bring it to a vet. The second is to *rehabilitate* the animal by caring for it until it is well enough or old enough to be on its own. The third "R" is for *release*, which means the animal is put back in the environment where it can survive on its own.

Page 11

Ask students to look at the illustration as you read aloud. Invite them to identify the kinds of animals they see.

EVALUATIVE—Do you think it is fun to hike to a pond and investigate frogs? What questions would you ask about them?

» Sample Answer: Yes! I'd ask what kinds of frogs are they? How long do they live? Do they sleep in water or on land?

3. Connect to lived experience.

Activity Page

AP 1

Invite students to share any details from the chapter that resemble someone or something familiar to them. Ask students to tell details about the chapter that interested them most, and invite students to ask questions about details that might not have been clear to them.

Use AP 1 to reinforce students' reflections on the chapter.

See the Activity Page Answer Key for sample student responses.

LESSON 2

Laura Stark: Wildlife Explorer

At a Glance

Learning Objectives

- ✓ Explain that many kinds of jobs involve science.
- ✓ Give examples of the varied activities used to investigate wildlife.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary practice
- comparing and contrasting earthworms

NGSS and CCSS References

NOS1. Scientific Investigations Use a Variety of Methods: Scientists use different ways to study the world.

NOS7. Science Is a Human Endeavor: People have practiced science for a long time.

NOS7. Science Is a Human Endeavor: Men and women of diverse backgrounds are scientists and engineers.

RI.2.1. Key Ideas and Details: Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.

RI.2.3. Key Ideas and Details: Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

RI.2.4. Craft and Structure: Determine the meaning of words and phrases in a text relevant to a *grade 2 topic or subject area*.

For detailed information about the NGSS and CCSS References, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

earthworm **human**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students themselves will use or explain the words.

college **sanctuary** **biologist**

Instructional Resource

Student Book

Ch. 2

Student Book, Chapter 2
"Laura Stark: Wildlife Explorer"

Activity Page

AP 2

Activity Page
Comparing Earthworms (AP 2)

Materials and Equipment

Collect or prepare the following:

- internet access and the means to project images/video for whole-class viewing
- colored pencils or fine-line markers

Advance Preparation

Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter when opening their book. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all student books so that the first page of Chapter 2 is visible.

The Core Lesson

1. Focus attention on the lesson purpose.

Explain that the purpose of this lesson is to learn about the real person who inspired the story students read in Chapter 1. Point out that Laura grew up to be a scientist. Tell students to listen carefully as you read to understand all the different kinds of science jobs Laura has done.

2. Read together: "Laura Stark: Wildlife Explorer."

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Student Book

Ch. 2

Guide students to open their books to Chapter 2 on page 12. Tell students that the title of this chapter is "Laura Stark: Wildlife Explorer," and alert them to pay special attention to all the different ways people do science as you read.

Read Aloud Support

Page 12

Ask students to look at the images as you read aloud. Talk about what they notice about the scientist holding a bird, and ask how and why it is being done.

CHAPTER 2

Laura Stark: Wildlife Explorer

Laura, the main character in Chapter 1, is a real person who is now a grown-up. Laura Stark is a scientist. She still loves wild animals. She still loves exploring outdoors. She still remembers the fun of catching frogs and learning about them.

So, when she started college, she worked in a vet's office. The job kept her indoors. That was not fun for Laura. So, she changed her plan.

Knowing that she wanted to work outdoors, she helped a professor research songbirds. She would get up at 4:40 in the morning to set up nets in a forest! When birds got caught by a net, she put ID bands on them. A band is "a little bracelet on their leg with a number," Laura explains. Then she would let the bird go. If the bird was caught again, scientists would know which bird it was.

12

Call attention to the word *college* on this page. Ask students if they know anyone who attends college. Explain that college is a school that students can attend after they complete their elementary, middle, and high schools.

INFERENTIAL—What questions could scientists try to answer when they catch a bird wearing a band?

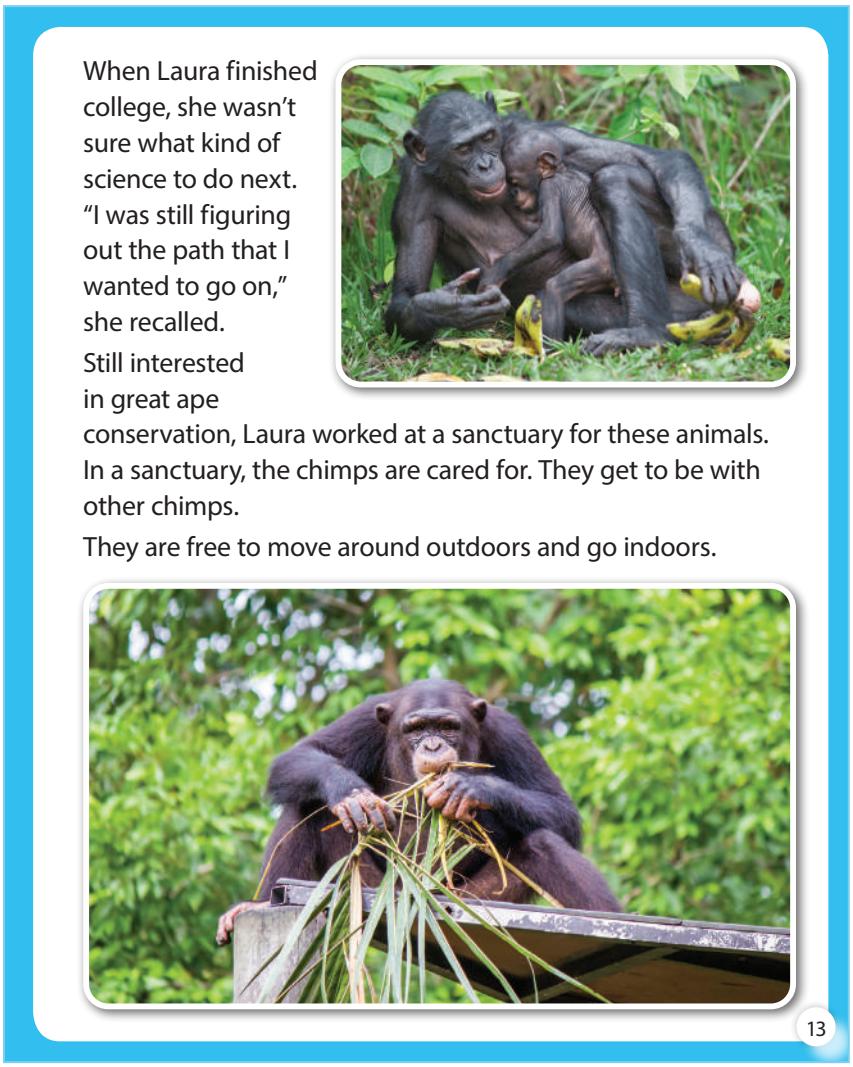
» Sample questions: How old is the bird? Where did it come from?

Online Resources

Explain that the procedure Laura Stark describes is called *banding*. Invite students to ask questions about bird banding, such as "Does it hurt the birds?" Then show one or more videos that explain this method of investigation and may answer their questions. The banding allows scientists to see which birds survive each year after returning from their southern migration, and how many baby birds that fledge during the breeding season.

Page 13

Ask students to look at the images as you read aloud. Talk about what they notice the chimps in the photos are able to do where they live.



Point out that that many animals at sanctuaries are rescued chimpanzees and orangutans from the entertainment industry and from labs. They get to live out their days peacefully in large enclosures where they have space to move around and spend time outdoors and indoors. Have students point to the word *sanctuary* on the page, and ask them:

LITERAL—What can the chimps at the sanctuary do during the day?

» They can go outside or indoors; they can be with other chimps; they can exercise; they can eat outdoors.

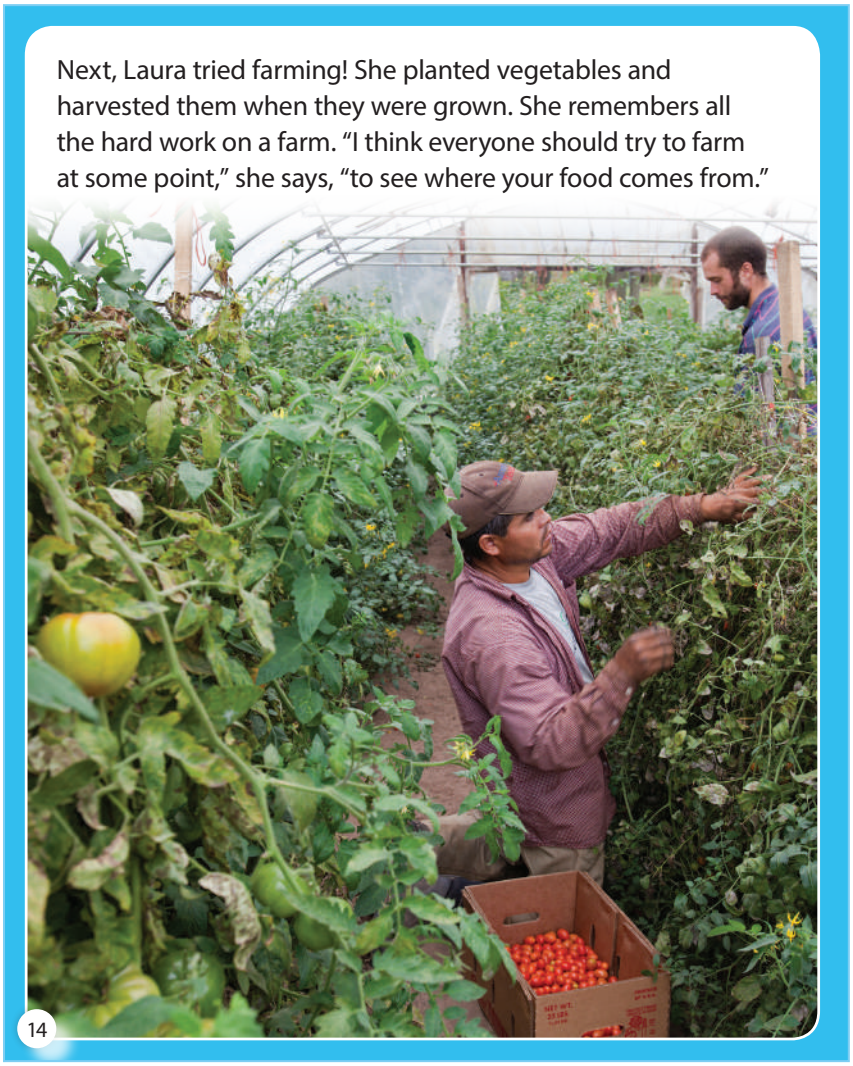
INFERENTIAL—What else would people like Laura, who work at the sanctuary, do to help the chimps?

» Sample answers: prepare their foods, take them to a veterinarian when they are sick or injured, play with them

SUPPORT—If students have trouble picturing a chimp sanctuary, share web pages that show a great ape sanctuary, its facilities, its staff, and the chimps who live there.

Page 14

Ask students to look at the image as you read aloud. Talk about what they notice about the farm and farming.



LITERAL—What are the workers doing on the farm?

» picking tomatoes off a tomato plant

INFERENTIAL—How might people who work on a farm think about their food?

» Sample answer: Since they know how hard it is to grow plants for food, they might not want to waste their food.

Point out that people who work on farms think like scientists every day: when they decide how much water plants need, when they figure out what kind of insects are eating the vegetables, or when they check the weather to decide if it is a good day to harvest fruits and vegetables.

Online Resources

EXTEND—If students are interested in farming, share some short videos that will give them more understanding of farms and the work of farmers.

Page 15

Activity Page

AP 2

Ask students to look at the image as you read aloud. Point out that **earthworms** have heads and tails.

Working as a farmer, Laura missed doing science investigations. So, she went back to school. Guess what creatures she investigated next? Earthworms!

You might think that earthworms have always lived in the soil around you. Many species came to America from other parts of the world. Laura investigated many kinds of worms. She noticed what plants grew in the same soil with different worms.

How did Laura tell one kind of worm from another?

Look at the photo. Notice the lines that go around the worms. Those lines separate body parts called segments. Now look for the body part that looks like a wide ring around each worm. Scientists count the segments from the mouth to the ring to figure out what kind of worm it is.

15

Call attention to the wide ring around each earthworm's body. Explain that the ring is usually closer to the head of the worm than the tail.

INFERENTIAL—Where are the heads on these earthworms? How do you know?

» On the worm to the right, the head is to the left of the ring. The ring is closer to that end.

Distribute AP 2 and colored pencils or fine-line markers to each student. Have students strategize in pairs how to accurately count the segments. When all pairs are finished counting and recording, have them discuss their results.
See the Activity Page Answer Key for correct answers.

INFERENTIAL—What does it mean if you got a different count than someone else?

» It means someone counted incorrectly.

Page 16 **Ask students to look at the illustration as you read aloud and think about how the materials are used to find earthworms.**

Most of the time, earthworms live underground. How did Laura know where to dig to find them? "If you pour mustard powder mixed with water in the ground, earthworms come to the surface," she explains. "It's pretty cool."

Think about hiking in the woods. Imagine that along the trail you see a young woman pouring a bucket of yellow water on the ground. What questions would you ask her? Laura always paused to explain her work to passersby. She answered many questions about the science work she was doing.

16

INFERENTIAL—How would Laura or another scientist prepare these materials?

» They would mix the mustard into the water and shake or stir.

INFERENCE—How could using the mixture help Laura decide where to dig for worms? Explain.

» She could pour the mixture on the ground in different places, wait to see how many worms come up in each place, and dig where she sees the most worms.

EXTEND—If you have access to a garden, park, or wooded area, take your class outdoors to see if they can bring earthworms to the surface using the method described. Dissolve ½ cup mustard powder in 1 gallon water. Slowly pour the solution over the soil so that it soaks into the ground.

Page 17

Ask students to listen for key ideas about why earthworms are important to people.

Laura knows that earthworms eat leaves that fall from trees. The worm's waste becomes part of the soil. People like earthworms in their gardens and farms but many worms are not native. They disrupt the balance of nature. They eat leaves that native animals need. They disrupt native plant life too. Laura studies the effects of these invasive worms.

17

When you read the first paragraph, pause to allow students to answer the text question, *What questions would you ask her? Possible questions:* *Why are you doing that? Does it hurt the earthworms? Will the worms go back in the soil after you pour mustard there?*

LITERAL—How do earthworms make spaces in soil to hold water?

» They dig tunnels as they move through the soil.

SUPPORT—If students struggle to visualize worm tunnels and how they work, obtain a small container of potting soil, poke a pencil into it, and slowly pour a cup of water onto the soil. Students will observe that the air-filled "tunnel" is soon filled with water.

Page 18

Ask students to listen as you read aloud for the word that names the kind of scientist Laura is. (See Know the Standards.)

When Laura finished school, she could call herself a biologist. A biologist is a scientist who investigates living things. Her first job as a biologist was on a farm. The team of scientists on that farm try to understand how farms can offer habitat for insects, wildlife, and native plants. They study how those plants and animals can benefit the farm.

They compare the insects living on the farm to those that live in the forests.

They find out what kinds of butterflies live on the farm and around it.

They also look at all the different kinds of birds found in the area.

Laura is also investigating insects that live in soil. The insects in the soil are native and important for plants, whereas the earthworms are invasive.

18

INFERENCE—What does the author mean by "wild places"?

» Sample answer: places that people do not live or work—forests, grasslands, oceans, mountains

INFERENCE—What kinds of place are not "wild places"?

» farms, cities, towns

EVALUATIVE—Does being a biologist on a farm sound like a fun job? Explain.

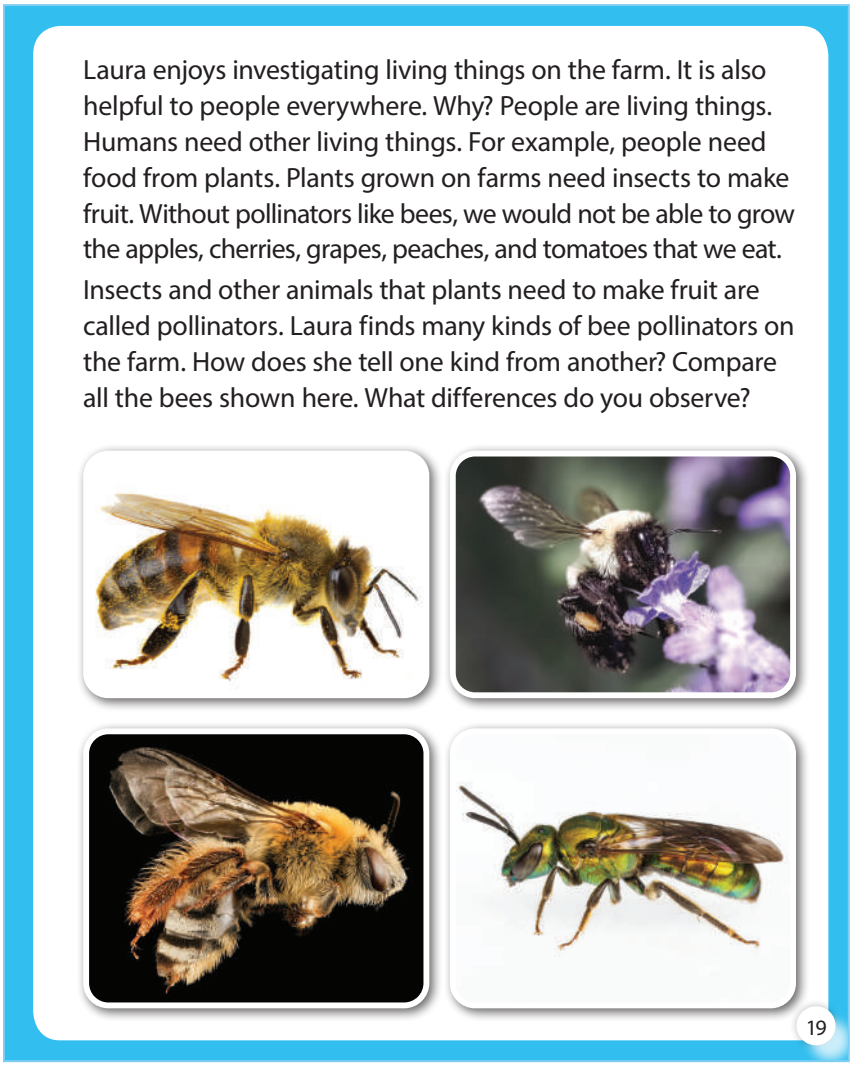
» Sample answers: I would like being outside all day. I wouldn't like the bugs that sting and bite me.

Know the Standards

NOS1. Scientific Investigations Use a Variety of Methods: Discuss different ways scientists investigate the world, including some tools (computers, telescopes, microscopes, cameras) they use.

Page 19

Ask students to look at the images of insects as you read aloud. Discuss what they notice about the insects' parts and other features.



Call attention to the word **humans** and ask students to determine its meaning using context clues.

Draw a diagram with arrows for the class to illustrate the text in the first paragraph, explaining why humans need insects.

If possible, project this page and have students respond to the text question, "What differences do you observe?" Possible answers: Some of the bees have fuzzy hair and others do not; they have different colors.

Online Resources

EXTEND—Call attention to the word *pollinator*. Invite students to use videos and other resources to find out how bees pollinate the flowers of plants.

Page 20

Ask students to look at the image as you read aloud. Talk about how Laura is doing science.

Laura has had many adventures in science. She didn't always know what would come next. But that often happens in science. Each experience leads you to ask more questions. In trying to answer them, you follow a new path and have an unexpected adventure.

Columbia County NY, is where Laura studies ecology.

20

Recap with students the different kinds of science Laura has done, flipping back to earlier pages as needed. The list should include rescuing a baby raccoon, working in a veterinarian's office, working in a chimp sanctuary, farming, investigating earthworms, and comparing insects and birds on farms to those in wild places. Discuss how all involve asking questions about living things.

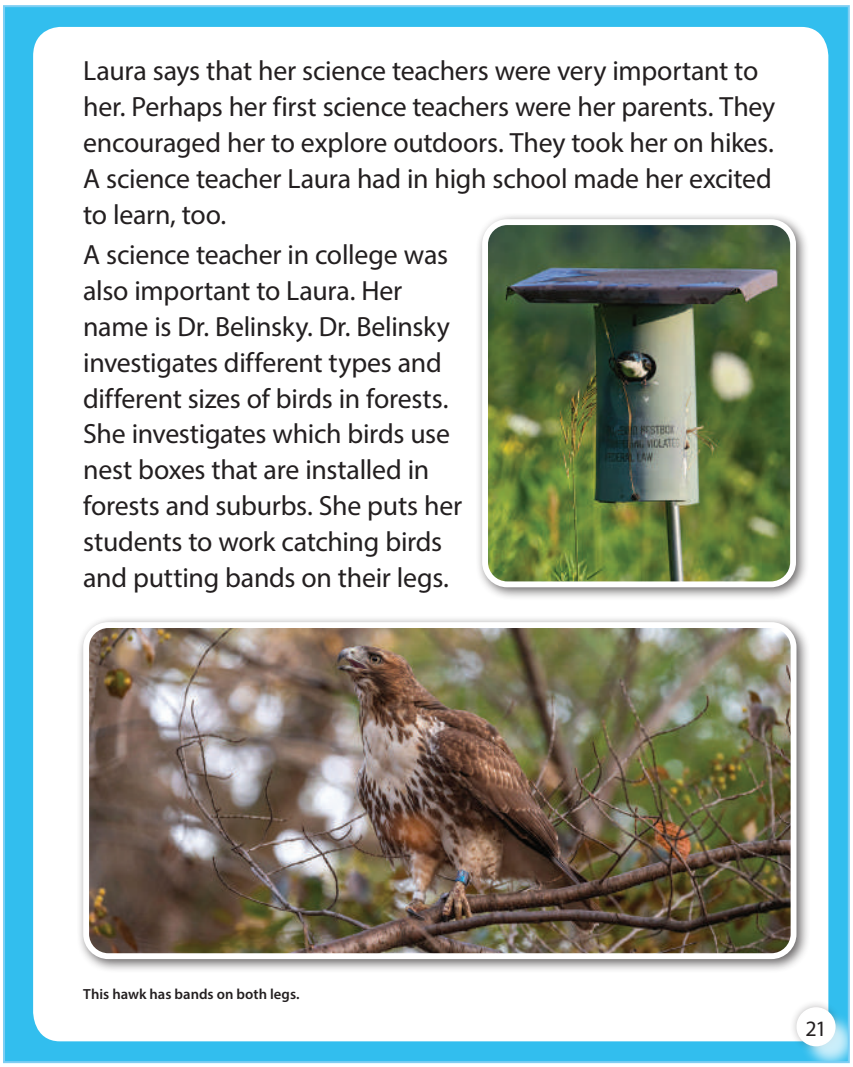
Point out that while some scientists investigate living things, others investigate nonliving things such as rocks, the weather, space, or forces.

EVALUATIVE—Which subjects in science do you think are most interesting to investigate?

» Answers will vary but should be supported with reasoning.

Page 21

Ask students to look at the image as you read aloud. Talk about what they notice the person is doing.



Point out that Laura's college teacher, Dr. Belinsky, is a biologist, too.

INFERENTIAL—What kinds of questions about birds might Dr. Belinsky answer by catching them, banding them, and letting them go?

» Sample questions: Do the same birds come back every year? Where do the birds fly when they leave the college? How long do these birds live?

Online Resources

EXTEND—If your school internet policy allows, show students Dr. Kara Belinsky's Instagram account, where there are photos and videos of many banded birds, and have students listen to you read some of the posts of the science students. Point out that students from many backgrounds do science at the college.

Page 22

Have students look at the images as you read aloud. Talk about where each person was when the photo was taken.

INFERENTIAL—Do the photos shows the two scientists indoors or outdoors? Why?

» outdoors, because they both investigate wildlife outdoors

LITERAL—What did Jane Goodall discover about chimps?

» Like humans, they use tools.

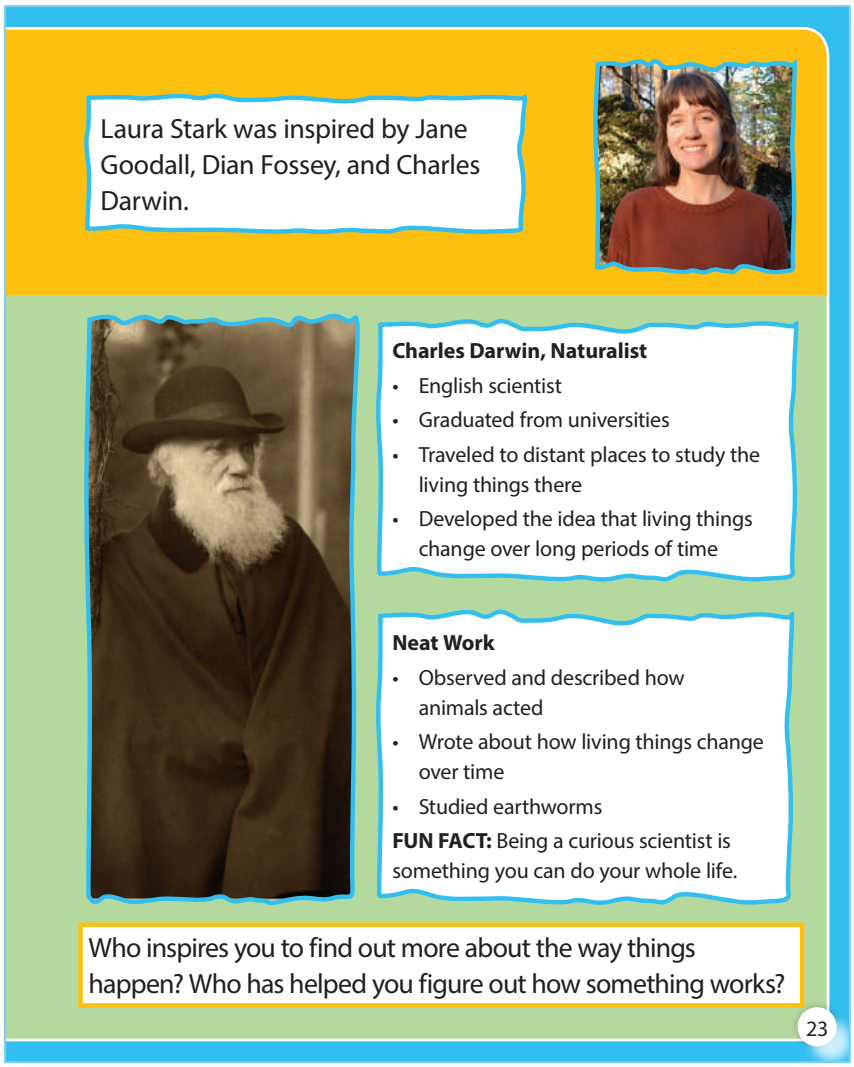
Call attention to the gorilla in the photo with Dian Fossey, and point out that it is a baby. Explain that while the baby may not look scary, an adult male gorilla is taller, much heavier, and much stronger than most human men.

INFERENTIAL—What are the connections between Jane Goodall and Dian Fossey?

» They both went to Africa, both met Dr. Leakey there, and both investigated wildlife there.

Page 23

Ask students to look on the right side of the infographic as you read aloud. Talk about how men and women from all over the world are scientists.



LITERAL—What did Charles Darwin write about?

» how living things change over time

Point out that as part of their studying, all three scientists observed, wrote about, and thought about the animals they observed.

3. Check for understanding.

Invite students to recap all the kinds of jobs Laura Stark had and how they all involved science investigations. Ask students to share details about the chapter that interested them most. And invite students to ask questions about details that might not have been clear to them.

EXPERIENCE A

Investigating Earthworms

At a Glance

Learning Objectives

- ✓ Compare habitats where earthworms are more or less likely to live.
- ✓ Use patterns in observations to identify cause-and-effect relationships in earthworm behavior.

Instructional Activities

- hands-on activities
- discussion
- writing and drawing

NGSS and CCSS References

LS4.D. Biodiversity and Humans: There are many different kinds of living things in any area, and they exist in different places on land and in water.

NOS2. Scientific Knowledge Is Based on Empirical Evidence: Scientists look for patterns and order when making observations about the world.

W.2.8. Research to Build and Present Knowledge: Recall information from experiences . . . to answer a question.

For detailed information about the NGSS and CCSS References, follow the links in the Online Resources Guide for this unit:

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habitat **pattern**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students themselves will use or explain the words.

vibrations **surface**

Instructional Resource

Activity Pages

AP A.1
AP A.2
AP A.3

Activity Pages
Where Are Worms Found? (AP A.1)
How Do Worms Move? (AP A.2)
Do Worms Like Light or Dark? (AP A.3)

Materials and Equipment

Collect or prepare the following items:

- earthworms from a garden center or bait shop
- earthworm habitat (See Advance Preparation)
- plastic gallon container
- 1/2 cup dry yellow mustard
- plastic or foam trays
- all-purpose flour
- 1 spray bottle with distilled water
- rulers
- black and white construction paper
- tape
- internet access and the means to project images/video for whole-class viewing

Advance Preparation

Investigation 1: Make the mustard-water mixture at least two hours before using it.

Investigation 2: Set up a habitat bin where earthworms can live for the few days it will take to complete the activities. Use a dark-colored plastic bin with a lid. Drill a few holes in the bottom and sides. Set the bin on a tray to catch excess water. Put moistened shredded paper (no ink) on the bottom of the bin and top with potting soil. Add the worms and top. Sprinkle chopped fruit or vegetables and cover with a moistened sheet of cardboard. Snap on the plastic lid.

The Core Lesson

1. Focus attention and preview the investigations.

Remind students that they read in Chapter 2 how Laura Stark investigated earthworms. Invite students to share their own experiences with earthworms.

Have students summarize how Laura got earthworms to come out of the ground.

Briefly set the stage for the investigations you plan to carry out with your students:

Investigation 1—Explain that the class will go outdoors and try the method Laura used to get earthworms to come to the surface.

Investigation 2—Explain that students will observe and compare the tracks earthworms make.

Investigation 3—Explain that students will determine whether earthworms prefer light or dark surfaces.

2. Facilitate Investigation 1.

Activity Page

AP A.1

- On a cool to warm day (not freezing or very hot), divide students into six teams.
- Distribute Where Are Worms Found? (AP A.1), and review the directions for this hands-on activity. Give each team one empty paper cup.
- Take students outdoors to a schoolyard or local park where they can access soil.
- Assign each team to different patches of ground that vary in environmental conditions (shaded, in direct sun, under trees, next to a sidewalk, and so on).
- Visit each team and dispense about 2 cups of mustard-water for students to slowly pour on the soil. Explain that though earthworms do not have ears, they can feel vibrations, so students should try not to move or speak for two minutes.
- Have students record the number of worms that come to the surface.
- Release the worms to a sheltered patch of soil near where they were found.
- Have students wash their hands after handling the mustard solution, soil, or earthworms.

  ALERT—Many people hold the misconception that worms come to the surface during rain because they might drown when their tunnels fill with water. However, worms can breathe underwater. Scientists hypothesize that worms find it easier to move along the top of the ground when it is wet so that they can find food or new habitats in which to live. The vibrations caused by heavy rain striking the ground seem to bring earthworms to the surface.

3. Facilitate Investigation 2.

Activity Page

AP A.2

- Have students reassemble in their six teams.
- Distribute How Do Worms Move? (AP A.2), and review the directions for this hands-on activity. Give each team one tray and just enough flour to coat the tray.
- Visit each team and spray just enough water over the tray to moisten the flour.
- Give each team a worm from the class habitat bin.
- Have each team follow the directions and record the tracks made by the worm.
- When finished, have each team return the worms to the class habitat.

4. Facilitate Investigation 3.

Activity Page

AP A.3

- Have students reassemble into their six teams.
- Distribute Do Worms Like Light or Dark? (AP A.3), and review the directions for this hands-on activity. Give each team one tray, a piece of black paper, a piece of white paper, and a strip of tape.
- Have students follow the directions to tape the sheets of paper together and place them on the tray.
- Visit each team and spray water over the tray to lightly moisten the paper. Give each team a worm from the class habitat bin.
- Have students place a worm on the tray as shown in the illustration, wait a few minutes, and then record the position of the worm.
- Have each team return the worm they observed to the class habitat.

5. Summarize and discuss.

- Have students refer to their notes on Activity Page A.1 and compare results for all teams. Then have them develop explanations that include cause-and-effect statements with the following prompts:
  - » What caused worms to appear in some **habitats** more than others? (*Sample answer: the soil is looser, the soil is moister, there is more sun or shade, how they poured the mustard water, etc.*)
  - » Discuss how the worms that came to the surface behaved. Have students identify any **patterns** in the results from all teams.
- Have students refer to their drawings on Activity Page A.2 and compare results for all teams. Elicit patterns statements with the following prompts:
  - » What did the tracks show about how worms move? (*Sample answer: They seem to move in curving lines and straight lines.*)
  - » What patterns do you notice from all the teams? (*Sample answer: Earthworm tracks always look like a line, either wavy or straight.*)
- Have students refer to their notes on Activity Page A.3 and share results with the class. Elicit patterns statements:
  - » What pattern(s) do you notice in where the earthworms moved? (*In most cases, earthworms move away from the light and toward darker surfaces.*)

6. Check for understanding.

Formative Assessment Opportunity

Have students summarize what they have learned about earthworms' habitats, how the move, and what surface conditions they prefer.

Review students' written and drawn responses on the activity pages.

See the Activity Page Answer Key for correct answers and sample student responses.

LESSON 3

Tumbling into Science

At a Glance

Learning Objectives

- ✓ Explain that one can learn science from using materials, reading, and discussion.
- ✓ Identify cause-and-effect science questions.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary practice
- gathering information from videos

NGSS and CCSS References

NOS1. Scientific Investigations Use a Variety of Methods: Science investigations begin with a question.

NOS4. Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena: Scientists search for cause-and-effect relationships to explain natural events.

NOS5. Science Is a Way of Knowing: Science knowledge helps us know about the world.

RI.2.1. Key Ideas and Details: Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.

RI.2.3. Key Ideas and Details: Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

For detailed information about the NGSS and CCSS References, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

grit **dolphin**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students themselves will use or explain the words.

tumbler **marine biologist**

Instructional Resource

Student Book

Ch. 3

Student Book, Chapter 3
"Tumbling into Science"

Activity Page

AP 3

Activity Page
What Would Each Character Say? (AP 3)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing

Advance Preparation

Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter when opening their book. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all student books so that the first page of Chapter 3 is visible.

The Core Lesson

1. Focus attention on the lesson purpose.

Online Resources

Show students a video of ocean waves crashing on a pebble beach. Have them notice the shapes and textures of the rocks, the force of the waves, and the sounds that are made. Tell students to keep their observations in mind as they listen to the story in this chapter.

2. Read together: "Tumbling into Science."

Student Book

Ch. 3

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 3 on page 24. Tell students that the title of this chapter is "Tumbling into Science," and alert them to pay special attention to how the main character learns science as you read.

Read Aloud Support

Page 24

Ask students to look at the illustration as you read aloud. Talk about what they notice the girl is carrying.

LITERAL—What does Sandy like to do when she is outdoors on a walk?

» She likes to collect things and bring them home.

INFERENTIAL—What questions might Sandy have about the flies she observes?

» Sample questions: How do their wings work? How can they walk upside down? What do they eat?

Point out that Sandy learns about the world by collecting and observing things she finds in nature. Ask students what else Sandy can do if she has questions about the objects in her collection. She can read a book, watch a video, or ask a scientist.

Page 25

Have students look at the illustration as you read aloud. Talk about what they notice is going on.

On her birthday, Sandy's parents gave her a big box covered in wrapping paper. They sang "Happy Birthday to You," and Sandy grinned.

She eagerly tore the wrapping paper off the box. Looking at the strange machine inside the box, she asked, "What does it do?"

"It's a rock tumbler," her mom explained. "You put rocks in it, with water and grit. When we turn it on, the machine will make the rocks tumble over and over. In a few weeks, the rocks will be smooth and shiny."

Sandy ran toward her bedroom. She said, "I'll get some rocks from my collection to put in the machine."

"Come back," said Mom. "Some rocks came in the box. Let's try those first."

Sandy's parents helped her read the directions. They set up the tumbler on the kitchen counter. They put the rocks inside the round drum. Then they added water and the sandy grit labeled "Number 1."

25

LITERAL—What was in the box Sandy received as a birthday present?

» a tumbler machine, grit, rocks

Call attention to the word **grit** on the page. Offer another example of the word in a sentence, such as "When I was chewing my salad, I felt some grit in my mouth." Then ask a volunteer to explain this meaning of *grit*.

INFERENTIAL—How are the rocks that came in the kit different from the grit?

» The rocks are much larger than pieces of grit.

SUPPORT—Make sure students understand that *grit* is very tiny pieces of rock. Obtain some fine sand or sandpaper and allow student to feel its texture using their fingers. Point out that some types of grit have even smaller particles than sand.

Page 26

Ask students to think about what Sandy and her parents hear as you read aloud. Talk about what they notice the parents are doing.

Soon after, Sandy's grandfather called from Chicago to wish her a happy birthday. "What's that racket I hear?" he asked.

"It's my new rock tumbler! We put rough, gray rocks into the machine, and it's supposed to make them shiny. It takes a long time," answered Sandy.

Sandy's mom and dad looked at each other. They held their hands over their ears. "I think the rock tumbler should move to the garage," Dad said. "That way we can get some sleep!"

When the call with her grandfather ended, Sandy said, "I don't know if I can wait to see the rocks. I wish I had something to read about rocks. Or even about animals or places around the world—something with new discoveries."

26

INFERENTIAL—What causes the rock tumbler to make so much noise?

» When rocks crash into each other, you hear a loud banging sound.

Compliment students for using cause-and-effect thinking, like scientists do.

Point out that smooth rocks are often found near the ocean or mountain streams. Explain that a rock tumbler works much like ocean waves or a stream does. Moving water causes rocks to tumble over one another and hit other rocks. The effect is that their edges are slowly smoothed.

EVALUATIVE—Did Sandy's parent make a good decision in moving the tumbler to the garage?

» yes, because the noise was loud, and the machine would be on for a few weeks

Page 27 **Ask students to listen for a problem and solution as you read aloud.**

"I know what we can do, Sandy," said Mom. "Let's stop by our church. Mrs. Johnson, who goes to our church, left a pile of science magazines that people can take home."

27

LITERAL—What problem did Sandy express?

» She needs something to keep her busy while she is waiting for the rocks to finish tumbling.

EVALUATIVE—Is the solution suggested by Sandy's mom a good one? Explain why.

» yes, because Sandy can take home the magazines to keep her busy

Point out that Sandy's family may not have science magazines and science books at home, but there are places to read them that are free, such a school library, public library, using websites, or borrowing them from a friend.

Know the Standards

NOS5.K–2. Science Is a Way of Knowing Use this page as an opportunity to discuss different ways people acquire science knowledge—answering questions by doing experiments, by making observations, by talking to experts, and by reading.

Page 28

Ask students to look at the illustration as you read aloud. Talk about what they notice is on the table.

They found the magazines on a table. "Help yourself, Sandy!" Mrs. Johnson encouraged. "Take as many as you want."

The *National Geographic* magazine on the top of the pile had a picture of dolphins diving in the ocean. Sandy found the pages that explained how scientists learn about dolphins. "That is what I want to do when I grow up!" she told Mrs. Johnson.

"So you want to be a marine biologist! Wouldn't that be exciting? To go help dolphins and protect them from the dangers they face.?" Mrs. Johnson replied.

28

LITERAL—How did Sandy meet Mrs. Johnson?

» Her mother took her to their church, where Mrs. Johnson works, and introduced them.

INFERENTIAL—How do you think Sandy felt when she looked at the article about **dolphins**?

» Maybe she felt excited and hopeful that she could be a scientist like the people in the magazine.

INFERENTIAL—How many of the magazines do you think Sandy took home? Explain.

» Sample answer: I think she only took the magazines with stories about dolphins.

Call attention to the term *marine biologist*. Remind students that the word *biologist* was in Chapter 2 and means *a scientist who investigates living things*. Point out that *marine* means *having to do with the ocean*.

Page 29

Ask students to look at the questions in the illustration as you read aloud. Elicit what they notice about the expression on Sandy's face.

INFERENTIAL—Do you think Mrs. Johnson could answer all of Sandy's questions? Explain.

» probably not, because she said she would look for more magazine articles about them

EVALUATIVE—Which of Sandy's questions are you most interested in? Why?

» Sample answer: *How do they protect themselves from sharks?* because they don't seem to have big teeth like sharks

CHALLENGE—If your students are strongly engaged with Sandy's questions, challenge them to add their own questions about dolphins or whales to Sandy's list. After students generate a list of questions, have them vote to choose which one they would most like to investigate.

Page 30

Ask students to look at the illustration as you read aloud. Talk about how they would feel if they were in the same situation as Sandy.

Sandy took the magazine about dolphins home with her. At bedtime, she took the magazine and a flashlight to bed with her. She continued to study the pages well past her bedtime.

That night, she dreamed about helping dolphins. She slipped over the side of a boat into warm ocean water. Soon a dozen dolphins appeared. Sandy floated quietly in the water without moving. She held her breath.

The dolphins circled around her. Some swam close and touched her with their fins. She could hear the sounds they made. Just as suddenly as they had appeared, the dolphins swam away, jumping above the waves. Then they disappeared below the water's surface.

30

INFERENTIAL—What details in the story show that Sandy was very excited to have the magazine?

» She took the magazine to bed. She read it under the covers. She dreamed about what she read.

EVALUATIVE—Was Sandy's dream scary or happy? Explain.

» Sample answer: I think happy, because she wants to learn about dolphins and the dolphins were friendly.

Call attention to how, in her dream, Sandy was very still in the water and waited for the dolphins to swim near her. Point out that marine biologists try not to disturb dolphins but do use tools such a underwater video or audio recorders to learn about them.

Page 31

Ask students to think about how Mrs. Johnson is like a teacher as you read aloud.

Online Resources

The next day, Sandy told Mrs. Johnson about her dream. "Why did they disappear?" Sandy asked.

Mrs. Johnson was thoughtful. "I read that dolphins sleep during the day and hunt for food at night. I suppose the dolphins might have gone to get some sleep," she said.

"When I am a marine biologist, I'll really get to swim near dolphins," Sandy told Mrs. Johnson.

"Oh, Sandy, you would be a great marine biologist! And from all I've learned from you, I know you would be a great teacher, too," Mrs. Johnson replied with a smile.

And so, Mrs. Johnson did just what she promised. For many years, she brought Sandy science magazines. They talked about what they read. Those magazines helped Sandy learn about science.

31

LITERAL—What question did Sandy ask about the dolphins she saw in her dream?

» Why did they suddenly swim away and disappear?

INFERENTIAL—Why does Mrs. Johnson think Sandy would make a great marine biologist?

» because she wants to be near dolphins and has many questions about them to investigate

Online Resources

EXTEND—Some of your students may announce that they would make great marine biologist, too. Share with them videos that answer some of their questions about dolphins.

INFERENTIAL—How is Mrs. Johnson acting like a teacher?

» She answers Sandy's questions; she encourages her; she shares her science magazines with Sandy.

Page 32

Ask students to look at the illustration as you read aloud. Talk about what they notice Sandy and her mom are doing.

Six days after Sandy's birthday, it was finally time to open her rock tumbler. Sandy's mom unplugged the machine. Sandy was eager see if the rocks had changed. She opened the drum and poured the rocks into a strainer. She put the strainer in the sink and rinsed off the rocks.

"Not much change yet," she said with disappointment.

"They need more time and more grit," explained her mom.

So, they put the rocks back into the tumbler and added grit from the package labeled "Number 2." They added water and turned on the machine. After another six days, they did the same thing, this time using grit labeled "Number 3."

"They look smoother now," said Sandy. "Let's try grit Number 4 for six more days."

32

LITERAL—How do Sandy and her mom wash off the grit?

» They put the rocks in a strainer and run water over it.

Point out that Sandy was disappointed after the first six days of rock tumbling.

INFERENTIAL—How do you think Sandy felt after the rocks tumbled for twelve more days?

» She could see a difference and felt encouraged/happier.

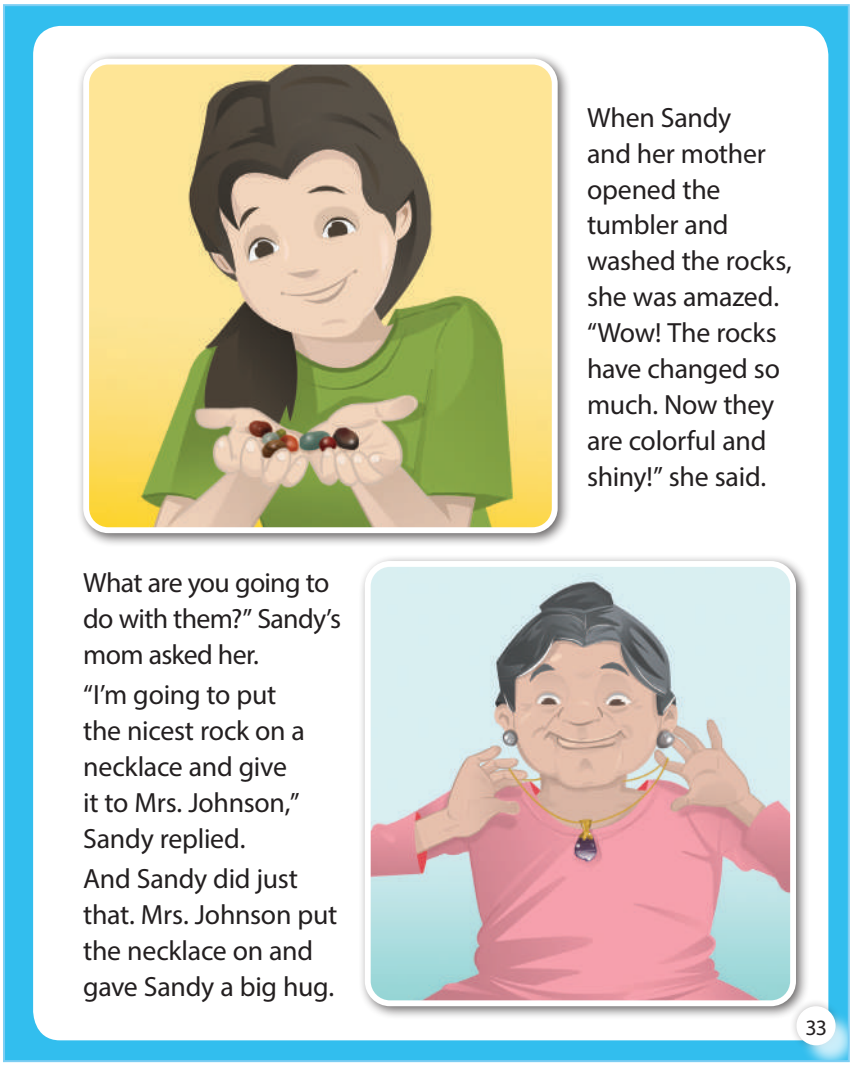
INFERENTIAL—What caused the changes to the rocks?

» Students may infer some of the following: The tumbling machine makes the grit rub against the rocks, and this knocks off little pieces of rock to make them smooth.

SUPPORT—Provide more evidence to students of the effects of tiny particles of rock on larger rocks by allowing students to rub a medium-grade sandpaper again a soft rock (limestone) or a piece of chalk over a dark-colored sheet of paper.

Page 33

Ask students to look at the illustrations as you read aloud. Talk about what they notice about how Sandy felt when she rinsed off the rocks for the final time.



INFERENTIAL—Why did Sandy choose to give the nicest rock to Mrs. Johnson?

» to show that she appreciated the science magazines and all their science talks

3. Connect to lived experience.

Activity Page

AP 3

Invite students to share any details from the chapter that resemble someone or something familiar to them. Ask students to tell details about the chapter that interested them most. Invite students to ask questions about details that might not have been clear to them.

Use AP 3 to reinforce students' reflections on the chapter.

See the Activity Page Answer Key for guidelines to evaluate student responses.

LESSON 4

Sandra Fischer: Always Learning

At a Glance

Learning Objectives

- ✓ Explain that there are many ways for people to act like scientists.
- ✓ Give examples of cause-and-effect relationships related to science investigations.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary practice
- modeling by measuring and drawing

NGSS and CCSS References

NOS1. Scientific Investigations Use a Variety of Methods: Scientists use different ways to study the world.

NOS4. Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena: Scientists search for cause-and-effect relationships to explain natural events.

RI.2.2. Key Ideas and Details: Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.

RI.2.8. Integration of Knowledge and Ideas: Describe how reasons support specific points the author makes in a text.

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Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

marine mammal **wildlife center**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students themselves will use or explain the words.

bay **stranded**

Instructional Resource

Student Book

Ch. 4

Student Book, Chapter 4
"Sandy Fischer: Always Learning"

Activity Page

AP 4 .1

Activity Page
Mrs. Fischer's Investigation (AP 4 .1)

Materials and Equipment

Collect or prepare the following items:

- ruler with millimeter markings
- internet access and the means to project images/video/maps for whole-class viewing

Advance Preparation

Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter when opening their book. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all student books so that the first page of Chapter 4 is visible.

The Core Lesson

1. Focus attention on the lesson purpose.

Allow students to quickly skim the chapter and then predict what it is about from clues in its title, headings, and images. As needed, provide thinking prompts for students to complete (*I'm guessing ___ ; I think Sandy will ___ ; I think it is about ___ because ___*).

2. Read together: "Sandy Fischer: Always Learning"

Student Book

Ch. 4

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 4 on page 34. Tell students that the title of this chapter is "Sandy Fischer: Always Learning," and alert them to pay special attention to the choices Sandy made and her reasons for them as you read.

Read Aloud Support

Page 34

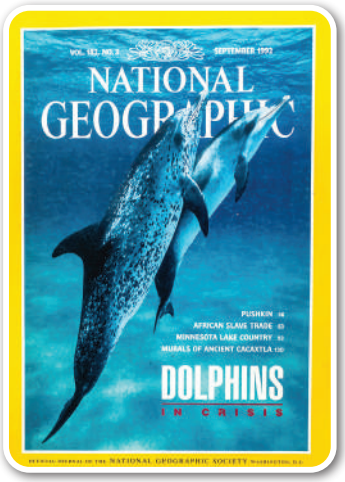
Ask students to think about what the main idea of this page is as you read aloud. Remind them that images as well as text contain clues.

CHAPTER 4

Sandra Fischer: Always Learning

Young Sandy, who you read about in Chapter 3, is a real person. Sandra Fischer, who inspired the story, is now a real grown-up and still a person who loves science. She really did collect flies! And Sandra did get a rock tumbler when she was seven years old.

The story of how Sandra Fischer got the idea to be a marine biologist is also true. When Sandra was young, Mrs. Johnson gave her a magazine with dolphins on the cover. She read about how scientists investigate these animals. Mrs. Johnson encouraged Sandra's interest in science. She and Sandra each read the articles. Then they talked about them.



34

INFERENTIAL—What is the main topic of this page?

» It tells which parts of the story in Chapter 3 about Sandy are true.

INFERENTIAL—What was the reason Sandy decided she wanted to be a marine biologist? (See Know the Standards.)

» She read an article in a magazine about scientists learning about dolphins, and Mrs. Johnson encouraged her.

Know the Standards

NOS4.K-2. Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena: Point out to students that the word *reason* may signal cause-and-effect relationships and that much of the work of scientists involves identifying causes or effects.

Page 35

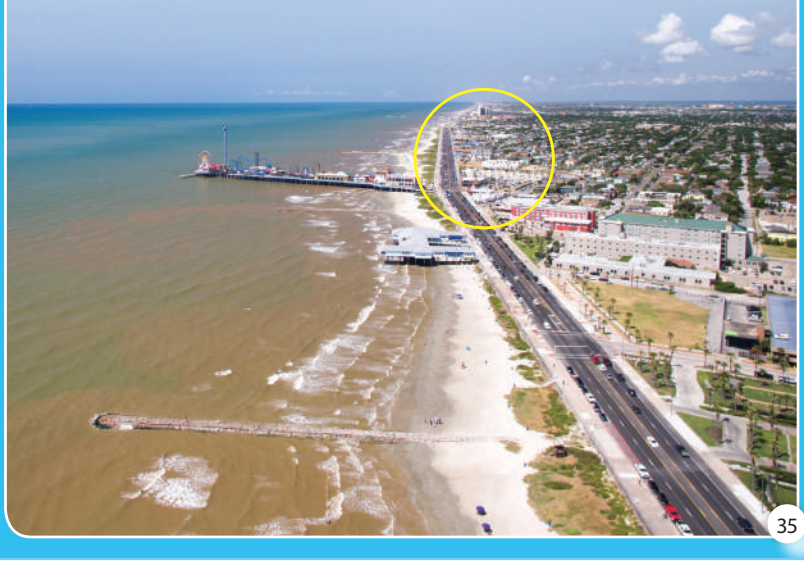
Ask students to listen as you read aloud for details about how Sandy chose a college to attend.

Online Resources

Sandra held on to her dream of becoming a marine biologist. But, one day, a math teacher told her she wasn't good enough at math to become a scientist. Sandra felt sad, but she did not give up on her dream.

When it was time for college, Sandra chose one in Galveston, Texas. It was far from her family in New York. But it was a good place to learn more about many kinds of marine life.

The circled area is where Sandra worked.



35

LITERAL—How did Sandy respond to what her math teacher told her?

» She was sad but decided she still wanted to try to be a marine biologist.

LITERAL—Why did Sandy choose to go to a college so far away from her home?

» because it was a good place for her to learn more about dolphins

INFERENTIAL—How far would Sandy have to travel from her college to see dolphins? Explain.

» probably not far since the ocean is right there

Use online maps show students Pelican Island, where the Texas A&M Galveston campus is located, and point out the bays on one side of the island and the Gulf of Mexico to the other side.

INFERENTIAL—How do you think Sandy felt when she arrived at her college in Texas?

» proud, happy, excited

Page 36

Ask students to look at the images as you read aloud. Talk about what the dolphins are doing.

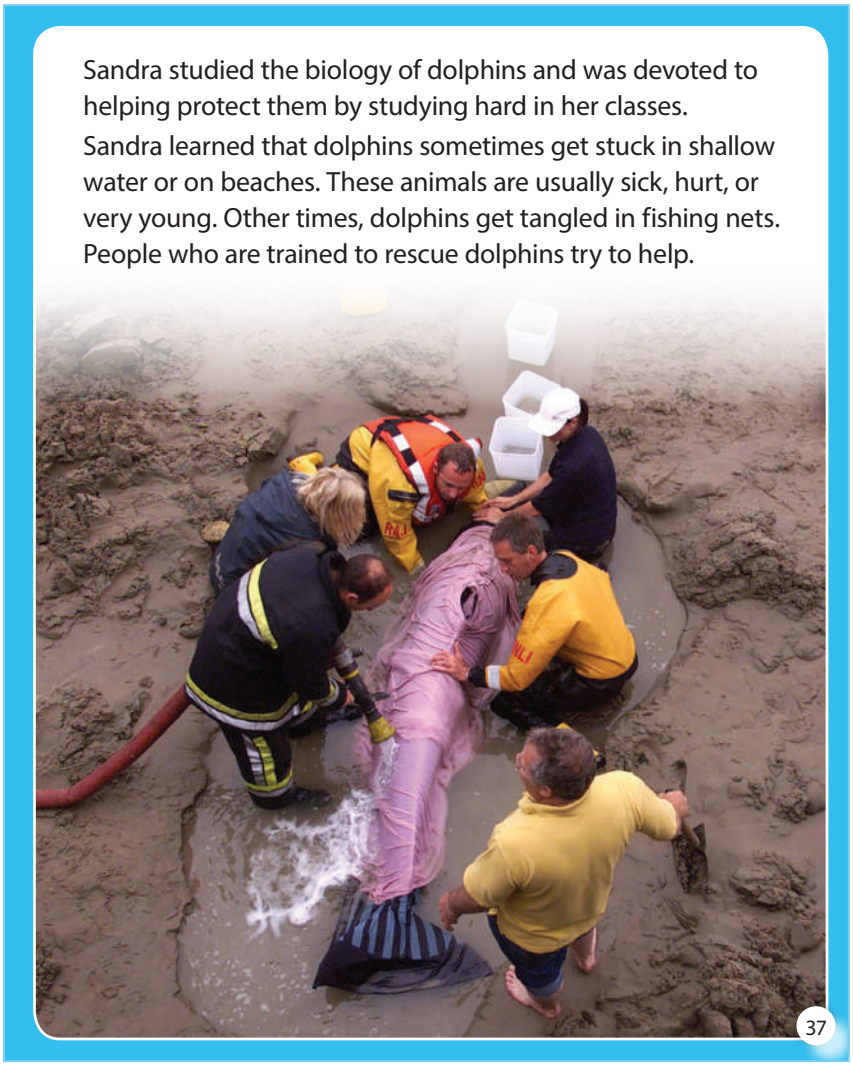
Call attention to the word *cause* in each of the following questions, and explain to students that scientists have different ways to try to answer such questions to explain what they see.

INFERENTIAL—What might cause dolphins to swim near boats?

» Sample answer: to see if the people in them will give them some fish to eat

Page 37

Ask students to look at the image as you read aloud. Talk about what they notice the people are doing and what they are wearing.



LITERAL—What causes dolphins to get stuck in shallow water or on beaches?

» The could be sick, injured, or too young to take care of themselves.

INFERENTIAL—What are the rescue workers wearing? Why?

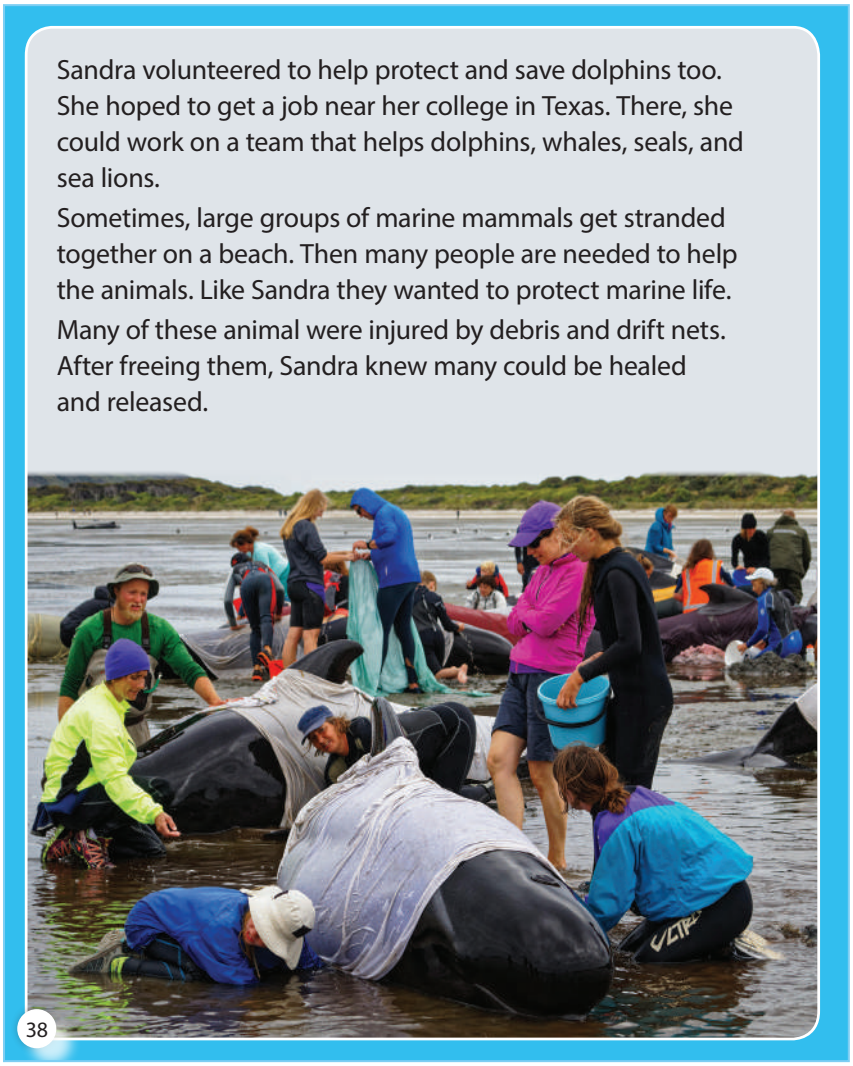
» Possible answer: They are wearing clothes for their own protection, such as reflective vest/jackets, so that other people can find them when it gets dark.

INFERENTIAL—What would scientists on a rescue team ask themselves about a dolphin stuck in shallow water?

» Sample questions: Is the dolphin injured? Is it sick? Is it a baby? Is it tangled in fishing gear? What help does it need to go back to deep water?

Page 38

Ask students to look at the images as you read aloud. Talk about what kind of work Sandy wanted to do after she graduated from college.



LITERAL—Where did Sandy want to work when she graduated from college? Doing what?

» near her college in Texas; helping dolphins, whales, seals, and sea lions

INFERENTIAL—How are the people in the other image trying to help stranded whales?

» They have covered them with blankets and are carry buckets of water to pour on them.

EXTEND—If students show high interest in dolphins, guide them in the use of online resources from science organizations that may provide answers to their questions.

Point out that scientists are still searching for the causes of **marine mammal** (dolphins, whales, seals, sea lions, etc.) strandings, especially when a large group of animals get stuck in shallow water or on beaches together, but that some strandings have been linked to loud underwater noises made by humans.

Page 39

Ask students to think about why and how Sandy changed her plans as you read aloud.

But Sandra's plans changed when her mom got sick. Sandra moved back home to help her family. She realized that working as a marine biologist wouldn't be practical near her home.

A friend suggested that Sandra try teaching. Sandra liked the idea and took the steps needed to become a teacher. When she finished her teacher training, she became a science teacher at a school near her home.

39

LITERAL—Why did Sandy change her plan to work with stranded marine mammals?

» because she wanted to take care of her mom

SUPPORT—Show students a map of the United States and how far upstate New York is from Galveston, Texas, where Sandy had hoped to get a job after college.

INFERENTIAL—What are some reason why it was a good idea for Sandy to become a science teacher?

» because she could be close to her family; because she loved science; because she had learned a lot of science in college that she could teach her students

Page 40

Explain to students that Mrs. Fischer is a science teacher in a high school. Tell students to think about what it would be like to visit her classroom as you read aloud.

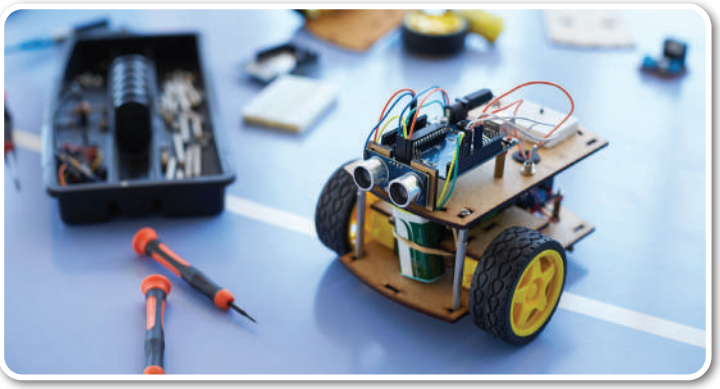
If you could visit Mrs. Fischer's science classroom, this is what you would see.

There's a huge aquarium with clownfish.

There are plants everywhere. She has frogs. The walls are painted with science murals.

She has free snacks for her students.

Mrs. Fischer is also a robotics coach at her school. She won an award from the local TV news station for being a great science teacher.



40

INFERENTIAL—How do you think Mrs. Fischer's students feel about being in her classroom?

» Sample answer: They might be happy because there is so much to see and she has snacks.

Call attention to the aquarium in the classroom, and point out that it contains salt water, like the ocean.

INFERENTIAL—What questions do you think her students have about the clownfish in the saltwater aquarium?

» Sample questions: What does the clownfish eat? Why is it so colorful? Would a shark eat it? Will it have babies?

Page 41

Ask students to look at the images as you read aloud. Talk about how they would feel if they could learn science on a sailing ship or at a **wildlife center**.

Mrs. Fischer knows it is important for students to learn outside the classroom. She took her students on a sailing ship on the Hudson River. They learned about rivers and the living things found there. They sailed on a special ship called The Clearwater. This ship is dedicated to protecting the water and living thing in New York's largest river.

On another field trip, they went to the Lucky Rehabilitation Wildlife Center. They learned how people help injured and orphaned animals. Mrs. Fischer is trained to care for wild animals. When she is not with her students, she is often working at the wildlife center.

41

LITERAL—What happens at a wildlife center?

» People care for injured or orphaned animals.

SUPPORT—Make sure students understand that an *orphaned* animal is a baby animal that has no parent to feed it or protect it but needs one.

Point out that not all baby animals need parental care—fish, reptile, and amphibian babies generally do not need parental care—but most bird and mammal, including marine mammal, babies do.

Remind students that in Chapter 1, Laura Stark and her dad called a wildlife rescue center to ask what to do with an injured baby raccoon. Explain that some wildlife centers focus on getting animals ready to return to nature and rarely allow visitors, while other wildlife centers take in animals that cannot live on their own and allow visitors to come and learn about them.

Page 42

Ask students to look at the image as you read aloud. Have them describe the monarch butterfly and the milkweed plant.

Mrs. Fischer loved teaching. But she continued to learn more science. So, she went back to college and investigated monarch butterflies.

Monarch butterflies visit New York State in the summer. They lay their eggs on milkweed plants growing in fields. When the eggs hatch, the caterpillars eat the milkweed leaves.

Monarch butterfly

There are not as many monarch butterflies now as there used to be. Scientists are trying to learn how to help. Mrs. Fischer's team thought that more milkweed plants might help. So, they planned an investigation to find out.

42

LITERAL—What does the milkweed plant look like?

» It has long green leaves and small pink flowers in groups.

LITERAL—What does the monarch butterfly look like?

» It has four wings, colored in black, orange, and white.

INFERENTIAL—What question did Mrs. Fischer and her team have about milkweed plants and monarchs?

» Sample question: Will there be more butterflies if there are more milkweed plants?

As of 2024, scientists had not pinpointed a direct cause of monarch butterfly declines, though there is evidence that land development, climate change, and the use of weedkillers on farms has reduced populations of milkweed plants that these butterflies need to complete their life cycle.

Page 43

Activity Page

AP 4

Have students look at the images as you read aloud. Ask them what they notice about milkweed plants, the monarch egg, and the monarch caterpillar (larva).

Call attention to the image of the field of milkweed plants and explain that, when conditions are right, the plants grow closely together.

Point out that a monarch egg is about 1 mm by 1 mm in size, or about the size of the head of a straight pin. Have students use a ruler with millimeter markings to draw the egg life sized.

INFERENTIAL—How easy or hard is it to count monarch eggs? Explain.

» hard, because they are very small

Use AP 4 to help students interpret the text and understand how the two fields were used in Mrs. Fischer's investigation.

See the Activity Page Answer Key for correct answers and sample student responses.

Page 44

Ask students to listen carefully as you read aloud. Tell them that, afterward, you will ask them the main idea of the text about Rachel Carson.

LITERAL—What did Charles Darwin and Jane Goodall have in common?

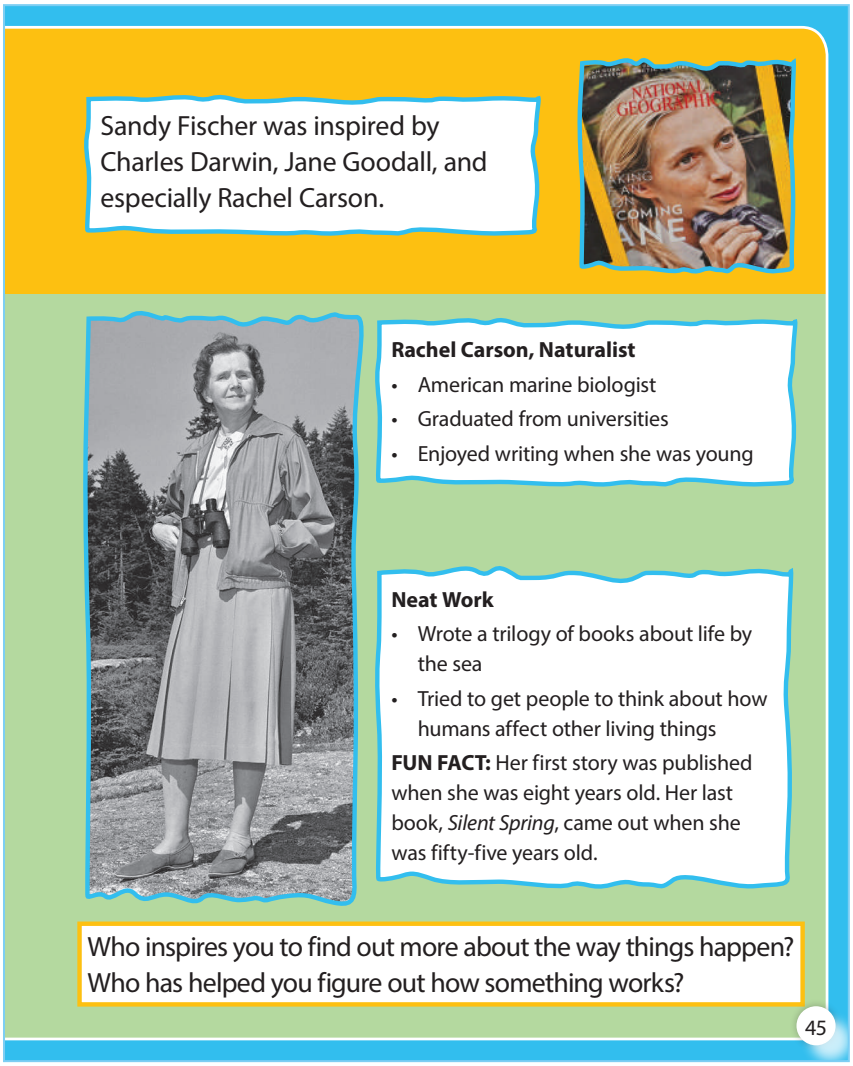
» Both studied plants and animals where they lived in the wild.

INFERENTIAL—What things has Mrs. Fischer done that Jane Goodall would think are important?

» Sample: She wanted to rescue dolphins and whales, she did an investigation to help monarch butterflies, and she works at a wildlife center.

Page 45

Ask students to look at the image of each scientist as you read about them aloud. Talk about the clues in the picture to the investigations they did.



EXTEND—Students who are interested in nature and writing will take inspiration from reading an award-winning children's picture book called Rachel *Carson and Her Book That Changed the World*, written by Laurie Lawlor and illustrated by Laura Beingessner.

Point out that one of the best ways to protect nature is by being a teacher who inspires her own students, as Mrs. Fischer does.

3. Connect to lived experience.

Invite students to share any details from the chapter that resemble someone or something familiar to them. Ask students to tell details about the chapter that interested them most. And invite students to ask questions about details that might not have been clear to them.

EXPERIENCE B

What Do We Know About Monarch Butterflies?

At a Glance

Learning Objectives

- ✓ Display the life stages of a monarch butterfly in the correct order.
- ✓ Explain the connection between monarch migration and compasses.
- ✓ Draw a picture graph to display monarch butterfly counts data.

Instructional Activities

- hands-on activities
- discussion
- graphing

NGSS and CCSS References

NOS4. Science Model, Laws, Mechanisms, and Theories Explain Natural Phenomena: Scientists use drawings, sketches, and models as a way to communicate.

NOS5. Science Is a Way of Knowing: Science knowledge helps us know about the world.

2.NBT.A.2: Represent and Interpret Data: Count within 1000; skip-count by 5s, 10s, and 100s.

2.MD.D.10: Represent and Interpret Data: Draw a picture graph . . . to represent a data set with up to four categories . . .

For detailed information about the NGSS and CCSS References, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

migrate **picture graph**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students themselves will use or explain the words.

data **north** **south** **east** **west** **compass**

Instructional Resource

Activity Pages

AP B.1
AP B.2
AP B.3

Activity Pages
Looking for Monarchs (AP B.1)
Go North, Go South! (AP B.2)
Graph Butterfly Counts (AP B.3)

Materials and Equipment

Collect or prepare the following items:

- scissors
- reference books and other research materials
- materials for assembling images such as index cards, string, tape, ribbon, glue, and paper plates
- map of North America
- magnetic compass
- internet access and the means to project images/video for whole-class viewing

Advance Preparation

Identify reference materials for students to use about monarch butterfly life cycle stages.

The Core Lesson

1. Focus attention and preview the investigations.

Remind students that they read in Chapter 4 how Sandy Fischer investigated monarch butterflies on milkweed plants. Invite students to share their own experiences with butterflies.

Set the stage for the investigations you plan to carry out with your students:

Investigation 1—Discuss how Mrs. Fischer counted monarch eggs and caterpillars in fields of milkweed plants. Point out that monarchs look different at different times in their lives. Ask: If you wanted to count monarchs at all stages of their lives, how would you recognize them?

Online Resources

Investigation 2—Show and discuss a video about monarch migrations. Explain that monarch butterfly adults migrate south to stay in warm places over the winter and north to cooler places in the summer. How do they find their way over a thousand miles? Scientists have a couple of ideas that students will explore.

Know the Standards

NOS4. Science Model, Laws, Mechanisms, and Theories Explain Natural Phenomena: Graphing data is an essential part of carrying out scientific investigations and communicating results. It is also an opportunity to combine science with mathematics instruction for representing and interpreting data and understanding place value.

Investigation 3—Point out that birds and butterflies often fly very high over certain mountains when they **migrate**. During spring and fall, people climb to the top of these mountains to see and count the migrating animals. Explain that, in this activity, students will display data about migrating monarchs in **picture graphs**.

2. Facilitate Investigation 1.

Activity Page

AP B.1

- Decide if you prefer students to work in pairs or individually. Then distribute Looking for Monarchs (AP B.1) and review the directions.
- Distribute scissors, and have students cut out the images of the life stages of the butterfly, along with the title.
- Direct students to arrange images in the order that they occur in the butterfly's life. If students need help, make available books, websites, or other references that will guide them.

  CHALLENGE—While it's not necessary that students learn the correct names for each life stage, some students will enjoy labeling their pictures as *egg, larva/caterpillar, pupa, adult emerging from pupa,* and *adult*.
- Show students the assortment of materials you have for assembling a display. Have them make a plan, choose materials, and make their displays that include the title provided on AP B.1.

3. Facilitate Investigation 2.

Activity Page

AP B.2

- Display a map of North America, and discuss how the compass rose shows directions on the map. Point out that Canada is to the north of 48 states, Mexico is to the south, the Pacific Ocean is to the west, and the Atlantic Ocean is to the east.
- Distribute Go North! Go South! (AP B.2), and have students follow the directions to draw arrows and labels on the map showing that monarchs **migrate** north in the spring and south in the fall.
- Explain that scientists think monarchs find their way north and south by noticing where the sun is in the sky. The sun rises in the east, sets in the west, and in North American, is always toward the southern part of the sky. Ask: But how do monarchs find their way when the sky is covered in clouds?
- Tell students that scientists think monarchs can feel the pull of Earth's magnetic force. Show students a magnetic compass, and explain that it is a tool used to find directions on Earth—north, south, east, or west.
- Demonstrate how to use the compass, holding it flat in your hand or placing it on the ground and rotating it until the north-seeking end of the needle lines up with North on the compass. Explain that when the needle points to North on the compass, it also points to north on planet Earth.

  EXTEND—If students are interested, explain that Earth acts like a giant magnet and the pointer inside the small compass is also a magnet, but much smaller. Tell students that the needle, like all magnets, has north and south poles. Since opposite poles on magnets attract, the south end of the needle is attracted to the north pole of Earth.

4. Facilitate Investigation 3.

Activity Page

AP B.3

- Distribute Graph Butterfly Counts (AP B.3) to students. Explain that the data in the table shows how many monarchs people counted on each of five days on Bald Mountain.
- Guide students to use the data set in the table to create a picture graph in which each butterfly they draw equals ten real butterflies counted.

  SUPPORT—Use place value concepts to help students determine the number of butterflies to draw. Since there are zero ones, they can use the tens digits to find the number of butterflies to draw.
- To answer the question at the bottom of the activity page, students can skip count by tens.

5. Summarize and discuss.

- For Investigation 1, have students present their design ideas for displaying the monarch life stages. Ask:
  - » How does your design help people see the order of the stages? (*Student responses will depend on the design.*)
  - » Why is it important that scientists recognize all life stages when counting monarch butterflies? (*because that is the only way to know the total number of butterflies in an area*)
- For Investigation 2, have students refer to their labeled maps on AP B.2. Ask:
  - » In what direction do monarch butterflies migrate in the fall? (*south)*
  - » In what direction do they migrate in the spring? (*north*)

  EXTEND—Explain to students that monarch migration allows butterflies to find food as they travel north and south. Point out that while the caterpillars only eat milkweed leaves, the adult butterflies sip sweet nectar from many kinds of wildflowers.
- For Investigation 3, use a turn-and-talk routine to have students share their picture graphs with another student and answer these questions:
  - » How did you know how many butterflies to draw for each day on the graph? (*I looked in the tens place.*)
  - » How did you check your work when you found the total number of butterflies on the graph? (*Possible answers: I skip counted, I added.*)

6. Check for understanding.

Invite students to summarize what they learned about monarch butterflies' life stages, migration, and counting them, prompting them as needed.

See Activity Page Answer Key for correct answers and sample student responses.

GRADE 2

Teacher Resources

Activity Pages

Name _____ Date _____

Activity Page 1 Use with Lesson 1

If I Were a Veterinarian

Think about working as a vet. What kinds of animals you would like to care for? Draw and label the animals.

Write questions you would ask yourself when you care for these animals.

_____

_____

_____

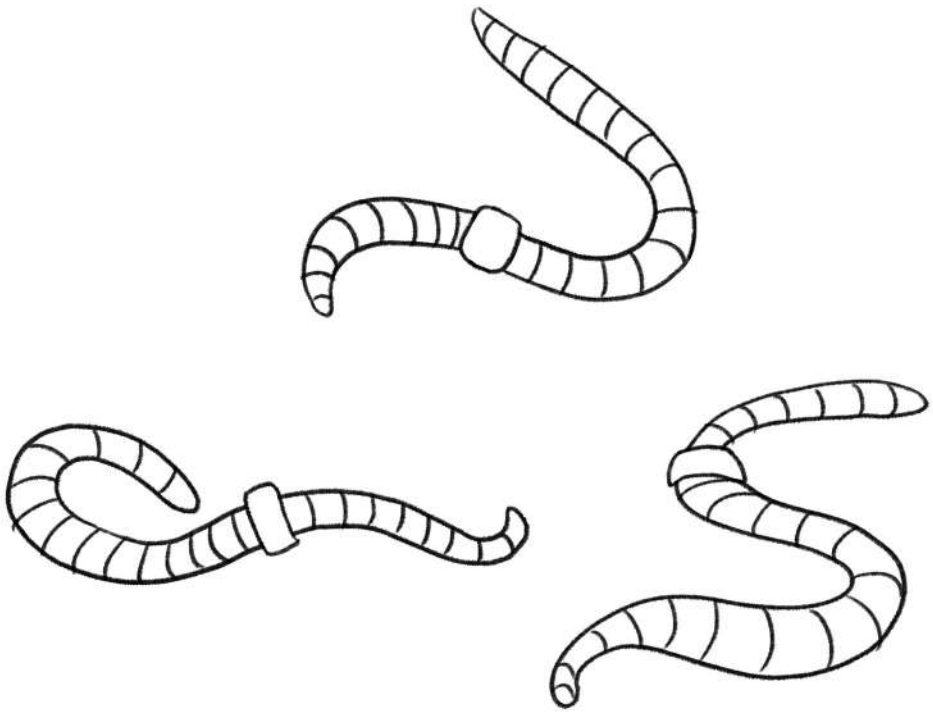
Name _____ Date _____

Activity Page 2 Use with Lesson 2

Comparing Earthworms

There are many kinds of earthworms. You can compare them by counting segments.

1. **Work with a partner. Make a plan for counting. You might use a pencil, colored pencils, or markers.**
2. **Count the segments at either end of each worm. Write the numbers on the drawing.**
3. **Share your results with other students.**



Name _____ Date _____

Activity Page A.1 Use with Experience A

Where Are Worms Found?

Follow the directions with your teacher. Write and draw what you observed.

1. Go outdoors to the patch of soil assigned to your team by your teacher.

2. Slowly pour two cups of mustard water over the patch of soil.

3. Wait two minutes, standing still and not talking.

4. Look for worms. How many did you find?

_____

5. List what other teams found. Are there no worms in some places but many worms in others? Write about the patterns you find.

_____

_____

_____

Name _____ Date _____

Activity Page A.2 Use with Experience A

How Do Worms Move?

Carry out this investigation with your team.

1. Spread a thin coating of flour on a tray.
2. Ask your teacher to lightly spray water over the tray. This will keep the worm moist.
3. Place a worm in the middle of the tray.
4. Watch the worm. Describe how it moves.

_____

_____

_____

5. Get a ruler. Measure and record how far the worm moves in one minute.

_____

_____

6. Put the worm back in its habitat. Draw the tracks the worm made on your tray.

Name _____ Date _____

Activity Page A.3 Use with Experience A

Do Worms Like Light or Dark?

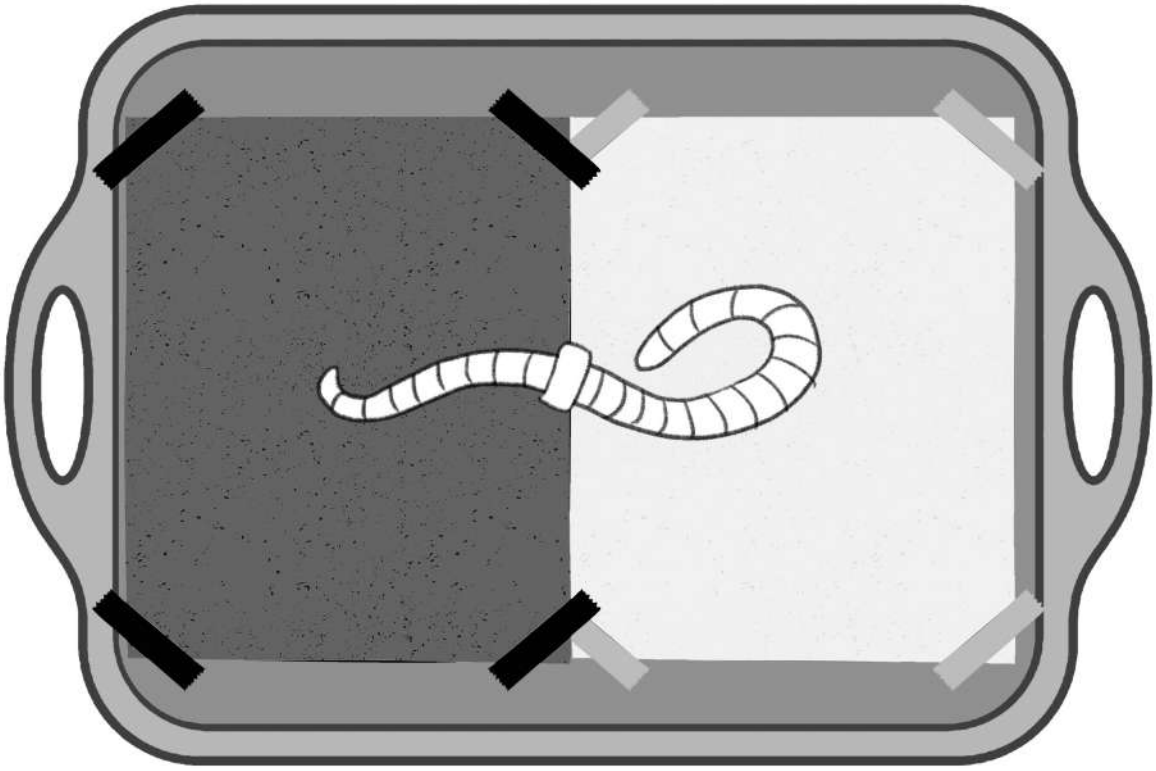
Follow the directions with your team.

1. Tape a piece of black paper to a piece of white paper.
2. Place the taped paper on a tray.
3. Lightly spray water over the paper.
4. Place a worm so half its body is on the black paper and half on the white paper.
5. Wait five minutes.
6. Observe if the worm moves. Write what you observed.

_____

_____

_____



Name _____ Date _____

Activity Page 3 Use with Lesson 3

What Would Each Character Say?

Think about the story in this chapter from the viewpoint of different characters. Answer the questions.

1. What would Sandy say she learned when she met Mrs. Johnson?

_____

_____

_____

_____

2. What would Mrs. Johnson say about her science talks with Sandy?

_____

_____

_____

_____

3. What would Sandy's parents say about choosing the rock tumbler as a gift for Sandy?

_____

_____

_____

_____

Name _____ Date _____

Activity Page 4 Use with Lesson 4

Mrs. Fischer's Investigation

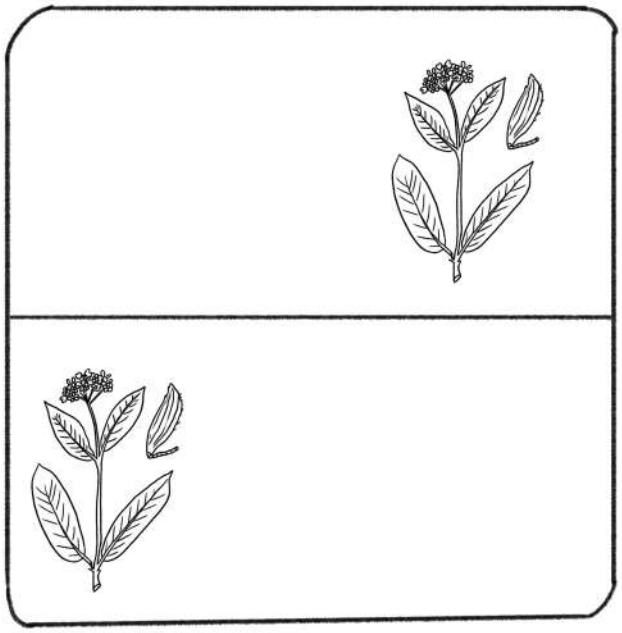
Use this page to show your understanding of how Mrs. Fischer investigated monarch butterflies.

Write each cause to tell what Mrs. Fischer did to the field.

Then write and draw the effects to tell what she learned.

Field 1

Field 2

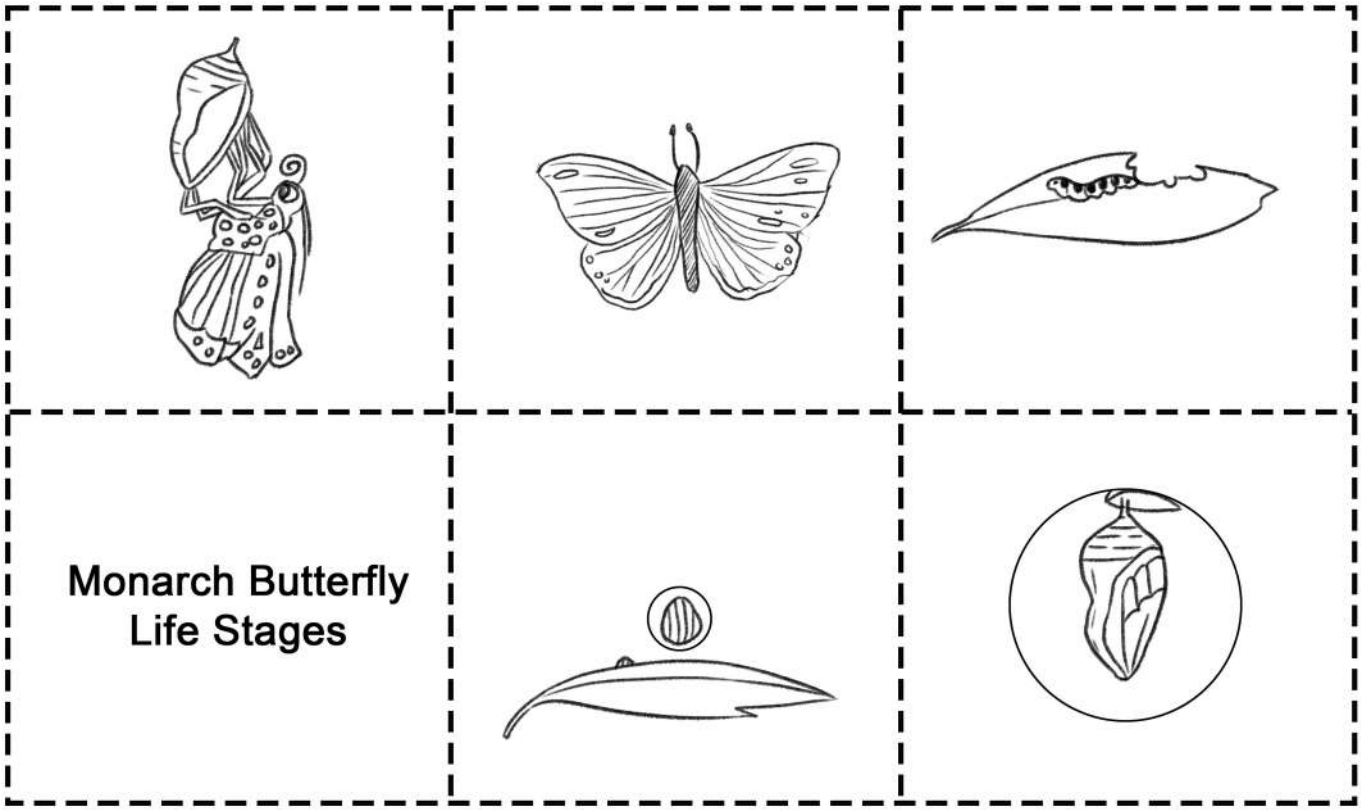


Name _____ Date _____

Activity Page B.1 Use with Experience B

Looking for Monarchs

1. **Use scissors to cut out the pictures and the title.**
2. **Think of a way to display them so that people can see the order in which they happen.**
3. **Use books or other sources to check the order.**
4. **Make your design and share it with others.**

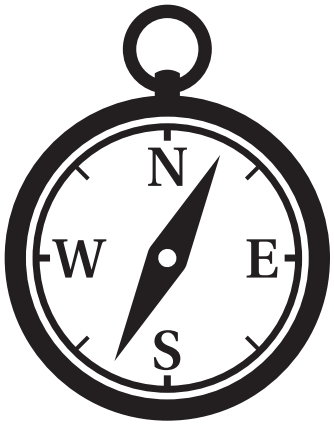


Name _____ Date _____

Activity Page B.2 Use with Experience B

Go North! Go South!

Draw a red arrow on the map and label it "Fall" to show where monarchs fly in the fall. Draw a blue arrow and label it "Spring" to show where they fly in the spring. Hold a magnetic compass in the palm of your hand. Notice in what direction it points.



1. In what direction on Earth does the needle inside the compass point?

_____

2. How might a monarch butterfly act like a magnet?

_____

Name _____ Date _____

Activity Page B.3 Use with Experience B

Graph Butterfly Counts

Volunteers on Bald Mountain counted monarch butterflies flying south. They counted on five days and made a chart.

Day	Monarchs Counted
Monday	20
Tuesday	20
Wednesday	40
Thursday	50
Friday	60

1. Use the numbers in the chart to make a picture graph. Each butterfly you draw stands for ten butterflies flying by.

 **= ten butterflies**

Number of Monarchs Flying South

	Monday		Tuesday		Wednesday		Thursday		Friday

2. How many total butterflies were counted over five days?

Activity Pages Answer Key

This answer key offers guidance to help you assess your students' understanding. Here, you will find descriptions of expectations, reasonable sample responses for open-ended items, and where called for, singularly correct answers for each activity page of this grade level.

If I Were a Veterinarian (AP 1) (page 78)

Students should draw a real animal. The questions they might ask themselves should be relate to the care of the animal they have drawn.

Comparing Earthworms (AP 2) (page 79)

The worm at the top of the drawing has nine segments on one end and fifteen segments on the other end for a total of twenty-four segments. The bottom left worm has fifteen segments and nine segments for a total of twenty-four segments. The bottom right worm has sixteen segments and seven segments for a total of twenty-three segments.

Where Are Worms Found? (AP A.1) (page 80)

Sample answers: We found five worms. Our worms came out of the ground between two bushes. The groups that looked for worms close to the sidewalks and parking lot did not find many worms. Worms were found closer to areas with plants.

How Do Worms Move? (AP A.2) (page 81)

The worm squeezed its segments together, then released them and started moving forward. The worm was three inches long. Student drawings should show the worm movements, both in a straight line and in any curved lines in which the worm travelled.

Do Worms Like Light or Dark? (AP A.3) (page 82)

Sample answer: The worm moved to the darker-colored paper.

What Would Each Character Say? (AP 3) (page 83)

Sample answers: 1. Mrs. Johnson gave me science magazines where I learned about dolphins. We talked about what I read and about being a scientist. 2. Sandy was very eager to talk about dolphins, and I am glad I was able to help her learn about dolphins, other sea animals, and about being a teacher. 3. We were happy to see Sandy taking an interest in a hobby. We just wish it had been a little quieter.

Mrs. Fischer's Investigation (AP 4) (page 84)

Field 1 had some monarch butterflies visit it. Field 2 had been divided into two area, and there were more monarch butterflies on the parts of Field 2 where the milkweed had been more recently cut.

Looking for Monarchs (AP B.1) (pages 85)

Student answers should show the butterfly starts as an egg, then becomes a caterpillar. The caterpillar then becomes a pupa, forming a coccoon in which it transforms into a butterfly. Once out of the coccoon, the butterfly can fly and make eggs with other butterflies.

Go North! Go South! (AP B.2) (page 86)

The needle in a compass points to the north. Butterflies act like compasses when they migrate by traveling south in the colder months and traveling north when the northern parts of the country warm up.

Graph Butterfly Counts (AP B.3) (page 87)

Student graphs should match the data in the table. There are a total of 190 butterflies in the table.

Appendix A

Glossary

Blue words and phrases are Core Vocabulary in the lessons, though the terms are not called out with color or bold treatment on the Student Book pages. **Boldface words and phrases** are additional vocabulary terms related to the lessons that you should model for students during instruction. Many of these also appear in the Student Book. Vocabulary words are not intended for use in isolated drill or memorization.

B

bay, n. area of shoreline that curves inward

biologist, n. scientist who studies life

C

college, n. institution for higher education after high school

compass, n. instrument that points to magnetic north

D

data, n. recordable details or measurements

dolphin, n. sea-dwelling mammal that looks similar to a fish

E

earthworm, n. a worm that lives in and moves through soil

east, n. the direction toward the horizon where the sun rises

G

grit, n. small, loose stone and sand particles

H

habitat, n. the environment where organisms usually live

human, n. another word for person

I

investigate, v. to observe and study something to collect information

M

marine biologist, n. scientist who studies animals living in lakes and oceans

marine mammal, n. mammal that lives in the sea most or all of the time

migrate, v. to move from one place to another in different seasons

P

pattern, n. a regular or repeated way in which something occurs

picture graph, n. graph that shows the data with pictures or symbols

R

rescue, v. to save someone or something from a dangerous situation

S

sanctuary, n. a safe place

south, n. the direction to the right of someone facing east and opposite of north, in line with Earth's South Pole

stranded, adj. left without a way to move from a place

surface, n. the outermost layer of an object

T

tumbler, n. machine that uses grit and water in a container to polish objects over a period of time

V

veterinarian, n. doctor who treats animals

vibration, n. movement of an object or material back and forth past its starting position

W

west, n. the direction toward the horizon where the sun sets

wildlife, n. organisms that live naturally in a place, not bred or tended or planted by people

wildlife center, n. place where wild animals are held until they are ready to return to the wild

Appendix B

Safety

Classroom Safety: In the Core Knowledge Science program (CKSci), activities and demonstrations are a vital part of the curriculum and provide students with active engagement related to the lesson content. The activities and demonstrations in the Science in Action lessons make comparatively modest use of materials and hands-on science experiences. Some activities and demonstrations do make use of materials and equipment that are typically deemed classroom safe and readily available.

Safety should be a priority when engaged in science activities. With that in mind, observe the following safety procedures when the class is engaged in activities and demonstrations:

- Report and treat any injuries immediately.
- Check equipment prior to usage, and make sure everything is clean and ready for use.
- Clean up spills or broken equipment immediately using the appropriate tools.
- Monitor student behavior to ensure they are following proper classroom and activity procedures.
- Do not touch your eyes, ears, face, or mouth while engaging in an activity or demonstration.
- Review each step of the lesson to determine if there are any safety measures or materials necessary in advance.
- Wear personal protective equipment (e.g., safety goggles, aprons, etc.) as appropriate.
- Check for allergies to foods, latex, and other materials that students may have, and take appropriate measures.
- Secure loose clothing, hair, or jewelry.
- Establish storage and disposal procedures for chemicals as per their Safety Data Sheet (SDS), including household substances such as vinegar and baking soda.

Internet Safety: Though online resources present many rich opportunities for student learning, unsupervised online activity for children is not advised. The U.S. Department of Justice provides the following guidelines, Keeping Children Safe Online:

- Discuss internet safety and develop an online safety plan.
- Supervise young children's use of the internet.
- Review games, apps, and social media sites.
- Adjust privacy settings and use parental controls for online games, apps, social medial sites, and electronic devices.
- Tell children to avoid sharing personal information, photos, and videos online.
- Teach children about body safety and boundaries.
- Be alert to potential signs of abuse.
- Encourage children to tell a parent, guardian, or other trusted adult if anyone asks them to engage in sexual activity or other inappropriate behavior.
- Copy and distribute the Student Online Safety Contract, found on the next page. Prior to the start of the first lesson, do a read-along, and have students agree to the expectations for when they engage in computer and online activities.

Online Resources

For additional support concerning internet safety and online instruction, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Student Safety Contract

Dear Parent or Guardian,

During science class, we want to create and maintain a safe classroom. With this in mind, we want students to be aware of the behavior expectations for engaging in online science activities. Please review the safety rules below with your student and sign this contract. If you have any questions, please feel free to contact me.

For important safety information about children, computers, and the internet, consider resources at these sites:

https://protectyoungeyes.com/

https://sharedhope.org/

https://www.justice.gov/coronavirus/keeping-children-safe-online

---

Teacher signature and date

_____ _____/_____/_____/

Parent or guardian signature and date

_____ _____/_____/_____/

When doing online activities, I will do the following:

- Only do online activities with the supervision of an adult.
- Only visit websites and use apps that I am guided to by my teacher, parent, or trusted adult guardian.
- Never use my real name or reveal personal information if I communicate with others online.
- Tell a trusted adult right away if anyone online asks questions about my name, where I live, or where I go to school.
- Be careful around electronic devices and only plug them in or unplug them when an adult is supervising.

I understand and agree to the safety rules in this contract.

Student signature and date

_____ _____/_____/_____/

Print name

_____

Appendix C

Strategies for Acquiring Materials

The materials used in the Core Knowledge Science in Action program are readily available and can be acquired through both retail and online stores. Some of the materials are reusable and are meant to be used repeatedly. This includes items such as plastic cups that can be safely used again. Often, these materials are durable and will last for more than one activity or even one school year. Other materials are classified as consumable and cannot be used more than once.

Online Resources

The Material Supply List for this unit's activities can be found online. Follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

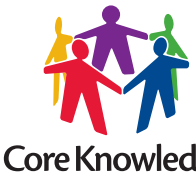
Ways to Engage with Your Community

The total cost of materials and technology can add up for an entire science program, even when the materials required for activities and demonstrations have been selected to be individually affordable. The time needed to acquire the materials adds up, too. Reaching out to your community to help support STEM education is a great way to engage parents, guardians, and others in the teaching of science as well as reduce the cost and time of collecting the materials. With that in mind, the materials list can be distributed or used as a reference for the materials teachers will need to acquire to teach the unit.

Consider some of the following as methods for acquiring the science materials:

- School Supply Drive—If your school has a supply drive at any point in the year, consider distributing materials lists as wish lists for the science department.
- Open Houses—Have materials lists available during open houses. Consider having teams of volunteers perform an activity to show attendees how the materials will be used throughout the year.
- Parent-Teacher Organizations—Reach out to the local PTO for assistance with acquiring materials.
- Science Fair Drive—Consider adding a table to your science fair as part of a science materials drive for future units.
- College or University Service Project—Ask service organizations affiliated with your local higher education institutions to sponsor your program by providing materials.
- Local Businesses—Some businesses have discounts for teachers to purchase school supplies. Others may want to advertise as sponsors for your school/programs. Usually, you will be asked for verifiable proof that you are a teacher and/or for examples of how their sponsorship will benefit students.

Remember: If your school is public, it will be tax-exempt, so make sure to have a Tax Identification Number (TIN) when purchasing materials. If your school is private, you may need proof of 501(c)(3) status to gain tax exemption. Check with your school for any required documentation.



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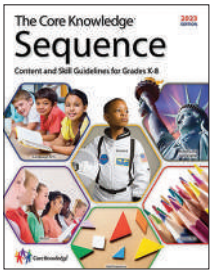
Core Knowledge Curriculum Series™

CKSci™

Core Knowledge SCIENCE™

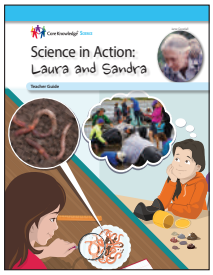
Science in Action: Laura and Sandra

Core Knowledge Science 2



What is the Core Knowledge Sequence?

The *Core Knowledge Sequence* is a detailed guide to specific content and skills to be taught in Grades K–8 in language arts, history, geography, mathematics, science, computer science, and the fine arts. In the domain of computer science, the *Core Knowledge Sequence* outlines topics that build systematically grade by grade to support student learning progression coherently over time.



For which grade levels is this book intended?

In general, the content and presentation of this book are appropriate for students in the early elementary grades. For teachers and schools following the *Core Knowledge Sequence*, this book is intended for Grade 2 and is part of a series of **Core Knowledge SCIENCE** units of study.

For a complete listing of resources in the **Core Knowledge SCIENCE** series, visit **www.coreknowledge.org**.

CKSci™

Core Knowledge Science™

A comprehensive program in science, integrating topics
from Earth and Space, Life, and Physical Sciences
with concepts specified in the Core Knowledge Sequence
(content and skill guidelines for Grades K–8)

CK Science in Action™
units in this series include:

Grade K: Kyle and Jamie
Grade 1: Daniela and Thaís
Grade 2: Laura and Sandra
Grade 3: Christian and Skylar
Grade 4: Pearl, Dan, and Ken
Grade 5: Rowan and Gianna

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