Core Knowledge® SCIENCE

Science All Around Us

Science Literacy Teacher Guide

Looking closely

Noticing and wondering

Sharing what you know

Figuring things out

Science All Around Us

Science Literacy Teacher Guide

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Science All Around Us

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Science Literacy Teacher Guide

Core Knowledge Science™ K

GRADE K

Introduction

About Science Literacy

The goal of teaching students science from Kindergarten through high school graduation is not to turn every student into a scientist by profession, but rather it is to make scientifically literate citizens of them. At first glance, the term *science literacy* implies knowledge of the procedures and skills involved in scientific processes. A science-literate citizen does not necessarily commit to memory great volumes of content knowledge about the physical, life, or earth and space sciences. That person might know factual information, but science literacy is not limited to knowing facts. A science-literate person knows how to employ scientific thinking. Science literacy is a mindset that values the importance of observing, hypothesizing, and testing. Science literacy involves awareness of how scientists obtain and analyze data, what a conclusion is, how conclusions are shared, and what it means for an idea to be elevated to the status of a scientific theory or law. Furthermore, a person who is science-literate understands that science grows and that the science behind any subject may change as new facts become established. Certainly, science literacy must encompass all of these notions.

Expanding on this vision, a science-literate citizen understands the role of science in our society, acknowledging the importance of science knowledge in helping private and public groups make decisions based not on emotion, rumor, gossip, or hearsay but rather on the foundation of careful research and established scientific facts. One ethical commitment of a scientifically literate populace is a willingness to incorporate scientific thought into aspects of popular thought, emotion, and mood, and so scientific thinking helps balance discussions at all levels of government and all levels of private decision-making.

An even wider view of science literacy is that it can apply to all aspects of human learning, such as art, history, biography, mathematics, music, philosophy, and literature. To these areas of human endeavor, the scientifically literate person applies scientific thinking to make informed judgments about a novel or a painting to understand the artist's vision. A scientifically literate view of history, for example, focuses on how science and society interacted in the past, determines at what times science flourished, and examines when and why at other times it did not.

Core Knowledge Foundation is committed to a broad view of the term *science literacy* and to curricula that fosters science literacy in students incrementally over time. A person, no matter what age, can be conversant with grade-appropriate science processes. Young learners can consider science and its relationship to society. Relating a scientific mindset to other areas of human thought builds citizens capable of contributing, clarifying, and communicating worthy viewpoints to all aspects of societal life. Indeed, building a science-literate citizenry is an elevated goal.

Designed instructionally into the Core Knowledge curriculum, science literacy means students know the following:

- what science is,
- how to describe science and participate in it, and
- how to evaluate information as evidence and use data for decision-making.

With practice, students can grow into their own science literacy by knowing how to read about—and for emerging readers, listen to—scientific topics and discern validity. Science literacy is made more achievable for all learners with fortified background knowledge.

- In Grades K and 1, science literacy is focused on students learning science words.
- In Grades 2 and 3 science literacy expands to reading comprehension, to recognizing science concepts, and to students making connections from chapter contents
  - to processes in the day-to-day, and
  - to other content areas and disciplines.
- In Grades 4–5, science literacy expands to students understanding the uses of background knowledge and new information for decision-making and problem-solving.
- In Grades 6–8, science literacy increases in complexity with the evaluation of the quality of information and the legitimacy of claims and the evidence used to support them.

Vocabulary fluency is integral to background knowledge and literacy. By the end of the CK Science Literacy series for Kindergarten through Grade 5, students will have been repeatedly exposed to the meanings of dozens of science domain terms across multiple contexts.

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 discreet 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 Kindergarten Core Knowledge Science Literacy 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.

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 D.C.

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.

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.K.1:** With prompting and support, ask and answer questions about key details in a text.
- **CCSS.ELA-LITERACY.RI.K.2:** With prompting and support, identify the main topic and retell key details of a text.
- **CCSS.ELA-LITERACY.RI.K.3:** With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

Craft and Structure:

- **CCSS.ELA-LITERACY.RI.K.4:** With prompting and support, ask and answer questions about unknown words in a text.
- **CCSS.ELA-LITERACY.RI.K.5:** Identify the front cover, back cover, and title page of a book.
- **CCSS.ELA-LITERACY.RI.K.6:** Name the author and illustrator of a text and define the role of each in presenting the ideas or information in a text.

Integration of Knowledge and Ideas:

- **CCSS.ELA-LITERACY.RI.K.7:** With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).
- **CCSS.ELA-LITERACY.RI.K.8:** With prompting and support, identify the reasons an author gives to support points in a text.
- **CCSS.ELA-LITERACY.RI.K.9:** With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

Range of Reading and Level of Text Complexity:

- **CCSS.ELA-LITERACY.RI.K.10:** Actively engage in group reading activities with purpose and understanding.

What Teachers Need to Know

Why Study Science in Kindergarten?

For many Kindergarten teachers, the suggestion that science should be a part of the Kindergarten curriculum may seem questionable. For many teachers, the instructional time is devoted to teaching reading and math fundamentals to students.

The study of science in Kindergarten, however, is consistent with the Core Knowledge approach to learning. Learning science provides students with the experiences necessary to accelerate an almost innate sense of excitement and wonder about the natural world around them. Now is the time they can grasp a

more precise language, one that allows them to describe the living and nonliving environment they encounter every day.

Albert Einstein said, "Curiosity has its own reason for existing." It is the nature of children to be curious about the world around them, and Kindergarten is the right time to witness, promote, and accelerate that curiosity in a systematic way.

Teaching science to young children affords them the opportunity to take a deeper look at the world around them. Most young students' scientific knowledge is derived from their personal experiences, that is, from interactions with the air, water, land, and matter around them. All these lead to a student's wonder about life, earth, space, and physical science.

Students come to Kindergarten classrooms across the country with a wide range of prior experiences. Some students have attended preschool, while others have not. 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 All Around Us* Student Book includes twenty chapters, intended to be read aloud by the teacher as the students look at images on each page.

The Student Book is spiral bound to allow students to lay it flat when reading or following along. To help students locate the correct chapter, each chapter has a unique, color-coded border at either at the top, bottom, or outer side edge of a page. Core Knowledge offers a template for a bookmark.

Online Resources

(See the Online Resources Guide for a link to the template **www.coreknowledge.org/cksci-online-resources**) When starting any unit of study, you may wish to download the template, print one per student, and have the students create their personal bookmark.

As you will note when you examine the Student Book, limited text is included on each page. Instead, colorful photos and engaging illustrations dominate the Student Book pages. The design of the Student Book in this way is intentional because

students in Kindergarten–Grade 2 are just learning to read. At these grade levels, students 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 Literacy 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.

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 1–20

Black line reproducible masters for Activity Pages, as well as an Answer Key, are included in Teacher Resources on pages 176–197. 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.

Lesson 1—My Nature Notebook (AP 1)

Lesson 2—Communicating Science (AP 2)

Lesson 3—Observing Patterns (AP 3)

Lesson 4—Use Question Words (AP 4)

Lesson 5—Putting Away Luna's Party Game (AP 5)

Lesson 6—Make a Prediction! (AP 6)

Lesson 7—Recording Observations (AP 7)

Lesson 8—Practice Counting (AP 8)

Lesson 9—Facts About Mice (AP 9)

Lesson 10—Mole Evidence (AP 10)

Lesson 11—Sunrise Sunset (AP 11)

Lesson 12—Nature Pattern (AP 12)

Lesson 13—Cause and Effect (AP 13)

Lesson 14—Making Comparisons (AP 14)

Lesson 15—Parts in a System (AP 15)

Lesson 16—Old Parts, New Object (AP 16)

Lesson 17—New Shape, Different Job (AP 17)

Lesson 18—Compare Changes (AP 18)

Lesson 19—Problems and Solutions (AP 19)

Lesson 20—Spotting Technology (AP 20)

Online Resources and Digital Engagements

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. In addition to resources supporting specific chapter activities, Core Knowledge also offers a collection of Digital Engagements designed for teacher-facilitated classroom use.

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 Literacy 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

- chenille stems (4 per student or group)
- scissors
- stapler

Lesson 2

- drawing materials such as crayons or markers

Lesson 3

- paper bag
- lemon or orange
- reference books and other research materials

Lesson 4

- potted plant
- drawing materials
- cotton T-shirt or cotton balls (optional)

Lesson 5

- drawing materials

Lesson 6

- drawing materials
- non-interlocking building blocks, such as wood blocks
- board eraser
- small ball
- scissors

Lesson 14

- reference books and other research materials
- variety of natural items of different sizes that can be found outside (for example, rocks of different sizes, acorns or nuts, or leaves of different shapes)

Lesson 15

- drawing materials such as crayons or markers

Lesson 16

- images of various objects and structures, such as a log cabin, a catapult and the side view of car with the door open
- building materials such as plastic bricks, blocks, sticks, or pattern blocks OR drawing materials such as pencils, markers, and crayons

Lesson 17

- digital image of schoolyard or an area well known by students
- drawing materials such as pencils, markers, and crayons
- images of a shark mouth and a hummingbird and flower
- pattern blocks or interlocking plastic building blocks

Lesson 18

- plastic straw
- sand in a large flat tray
- scissors and glue or glue sticks

Lesson 19

- premade mud
- large white butcher paper
- various art materials such as drawing paper, markers, chalk, paints, crayons, colored pencils, etc.
- natural items such as sticks, rocks, and dirt

Lesson 20

- variety of scientific tools, such as microscope, binoculars, beakers, hand lens, ruler, scales, tweezers, droppers, measuring cups, stirrers, petri dishes
- images from James Webb Space Telescope

Pacing

The Core Knowledge Science Literacy Student Book consists of twenty chapters, each six 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 Literacy 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 Literacy chapter to help pair the chapters meaningfully with other units.

Science Literacy Chapter	Has content that ties to . . .	Science Literacy Chapter	Has content that ties to . . .
1. What Is Science?	Physical, life, and earth science	**11.** Science Clues	Physical science, sunlight
2. A Science Hall of Fame	Physical, life, and earth science	**12.** Nature Patterns	Life science, environments
3. So Much to Observe!	Physical, life, and earth science	**13.** Wiley Wyatt Wonders Why	Physical, life, and earth science
4. Wondering Is Smart	Life science, environments	**14.** Soohyun's Nature Notes	Life science, ecosystems
5. Luna's Party Plans	Physical science, forces, engineering and design	**15.** Arnie Looks at Parts	Life science, ecosystems
6. What Is an Investigation?	Physical science, forces	**16.** Building with Smaller Parts	Physical science, engineering
7. Honey Bea's Summer Science	Life science, environments	**17.** Shapes at a School Fair	Physical science, sunlight
8. Science and Numbers	Physical, life, and earth science	**18.** Changes All Around Us	Earth science, weather
9. Mailbox Mouse	Life science, needs of living things	**19.** Solving Art Problems	Earth science, weather
10. Dirt Mound Mystery	Life science, needs of living things	**20.** Science and Technology	Earth science, weather

Online Resources

Also, see the Online Resources Guide for recommendations about when to best enhance instruction through the use of the Core Knowledge Science Literacy Digital Engagements designed to support these chapters.

www.coreknowledge.org/cksci-online-resources

LESSON 1

What Is Science?

At a Glance

Lesson Question

What is science?

Learning Objectives

- ✓ Describe science as a way of figuring things out.
- ✓ Recognize that they can participate in science activities.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- hands-on science activity

Main Science Idea

Science is a process of figuring things out. It is a way of learning about everything in our world and the universe beyond.

NGSS and CCSS References

NOS1. Scientific Investigations Use a Variety of Methods: Science investigations begin with a question. Scientists use different ways to study the world.

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

NOS7. Science Is a Human Endeavor: People have practiced science for a long time. Men and women of diverse backgrounds are scientists and engineers.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

L.K.1.d. Conventions of Standard English: Understand and use question words (interrogatives) (e.g., *who, what, where, when, why, how*).

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

The 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 **science** **scientist**

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.

materials **problem**

Instructional Resources

Student Book

Ch. 1

Student Book, Chapter 1
"What Is Science?"

Activity Page

AP 1

Activity Page
My Nature Notebook (AP 1)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- chenille stems (4 per student or group)
- scissors
- stapler

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. 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 Question.

Online Resources

Show students an online video of a bird pulling a worm from the ground. Discuss what is going on. After some discussion, invite students to ask questions about what they saw. (See the Online Resources Guide for a recommended resource. **www.coreknowledge.org/cksci-online-resources**)

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What is science?

2. Read together: "What Is Science?"

Student Book

Ch. 1

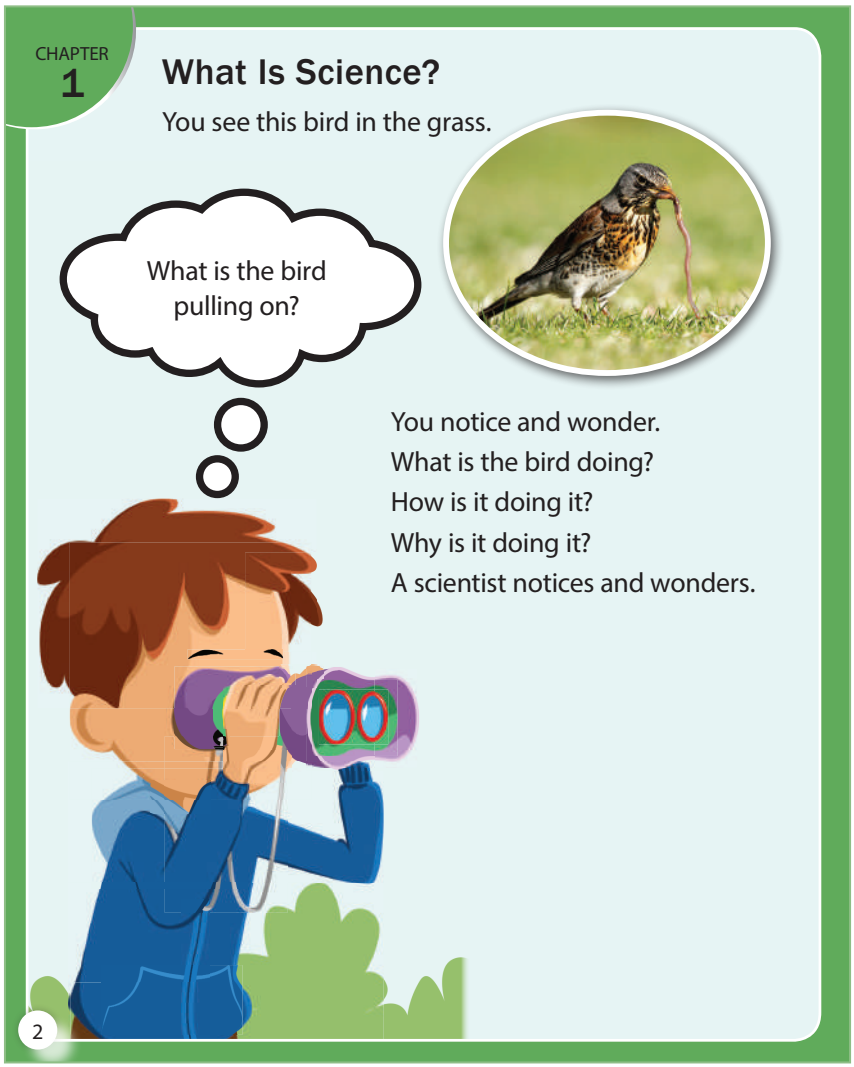
While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with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

Guide students to open their books to Chapter 1 on page 2. Tell students that the title of this chapter is "What Is Science?" and remind them to pay special attention as you read to things people do when they act like scientists.

Read Aloud Support

Page 2

Ask students to look at the images as you read aloud. Point out the thought balloon, and explain that the text inside it tells the reader what the child is thinking.



LITERAL—What is the bird in the photo doing?

» It is pulling on a worm.

INFERENTIAL—What kind of force is the bird using?

» a pulling force

EVALUATIVE—What do you think the bird is going to do with the worm?

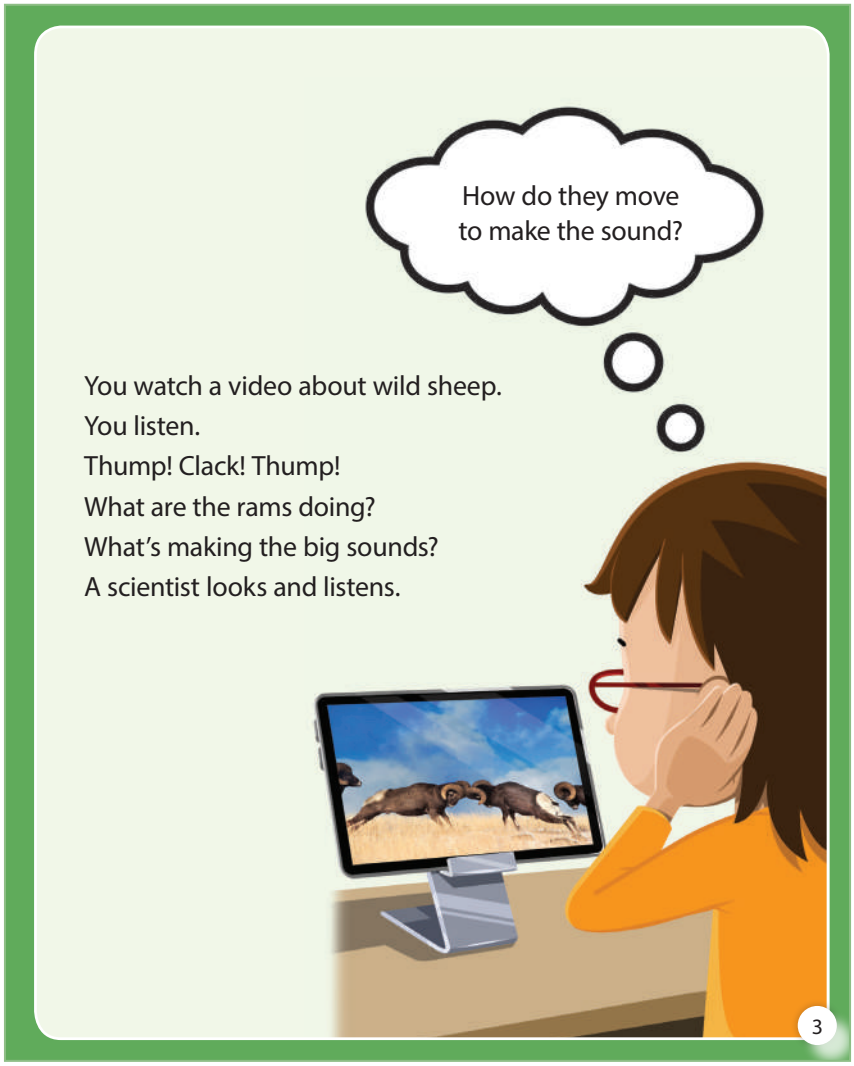
» The bird is going to eat the worm.

Invite students to share their own experiences observing living things in a park or in their neighborhoods.

Point out to students that when they ask questions about their world, they are acting like **scientists**.

Page 3

Ask students to look at the images as you read aloud. Discuss what the bighorn sheep in the photo are doing, the questions asked in the text, and the question in the thought balloon. Stress that the sheep are not mad at each other. This is the way they compete in nature.



Online Resources

SUPPORT—If students are not sure how bighorn sheep compete, show a video of rams in action. Have students listen for the sounds of the horns banging into one another. Point out that the rams with horns are adult sheep and are fighting over mates. (See the Online Resources Guide for a link to a sample video. **www.coreknowledge.org/cksci-online-resources**)

INFERENTIAL—What senses does a scientist use to observe these sheep?

» sight and hearing

Have students point to the three questions on the page, and ask them to identify the question words (*what*, *what's*, and *how*).

INFERENTIAL—What symbol is always at the end of a question?

» a question mark

Page 4

Ask students to look at the images as you read aloud. Talk about what makes the wood blocks a good material for trying to make sounds like the rams make.

INFERENTIAL—Should the student push or pull the blocks to make a sound like the rams?

» She should push the bocks together very fast.

Call attention to the word **science** on this page. Point out that people do science when they ask questions and **investigate** to answer their questions. Explain that investigating might require using materials, such as the wood blocks shown.

Online Resources

CHALLENGE—Replay the video of the rams suggested on page 18 without sound. Provide volunteers with two wood blocks, and have them make sound effects to accompany the video.

LITERAL—What question does the student ask to investigate?

» Should I push or pull the blocks?

Page 5

Ask students to look at the images and text as you read aloud. Have them point out what the scientist wonders about meerkats.

LITERAL—What are two ways this scientist can find answers to her questions?

» She can watch carefully or use materials to investigate.

Distribute four bendable and twistable chenille stems to each student or group of students. Have them use clues from the pictures and text to find ways to model a meerkat standing on four legs or two legs. Lead a discussion to develop the idea that the stability of standing on two legs is improved by using the tail like a third leg.

INFERENTIAL—How are the ways meerkats stand like some furniture you sit on?

» When they are down on all four legs, they are standing like a chair with four legs. When they are standing using their hind legs and their tail, they are standing like a three-legged stool.

Point out that by using materials to answer a question, they are doing science.

Page 6

Tell students that after you read aloud you will ask them to identify key details. Talk about how key details will help them answer the lesson question, "What is science?"

LITERAL—What problem does the boy want to solve?

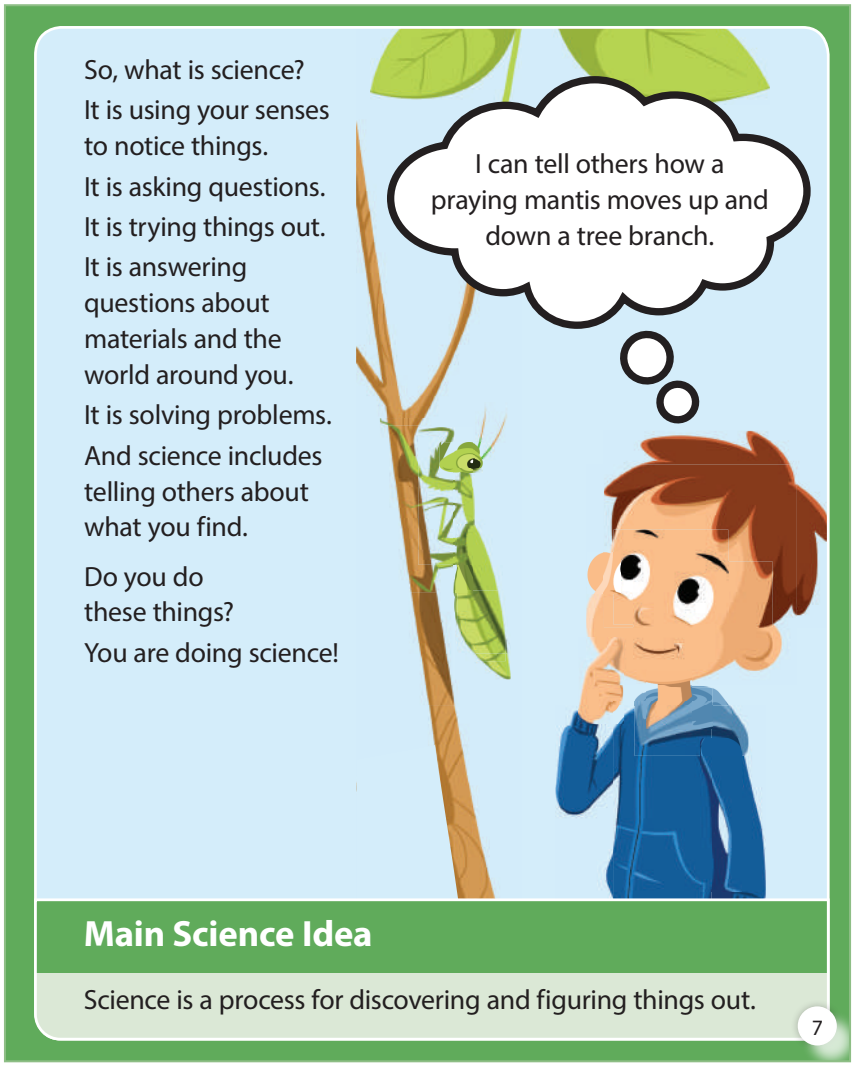
» He wants to make sure the bats can fly safely near the feeder.

Have students attempt to answer the final text question on the page. Point out that the boy has answered it in his own way. Elicit other problems to solve to make sure the bats can get the food. Possible problems might include the following: What's the best liquid to feed the bats? How high off the ground should the feeder be hung? How can we take photos of the bats when they visit the feeder? Do some bats feed in the daytime?

Know the Standards

NOS1.K–2. Connections to the Nature of Science: Science Is a Human Endeavor Use this page as an opportunity to discuss how people of any gender, from diverse backgrounds, and from many places around the world investigate how bats live and what they need to survive.

Page 7



Ask students the following question:

LITERAL—How is the boy in the picture doing science?

» He is making observations and planning to tell others what he finds.

Point out that doing science helps people know about the world.

3. Check for understanding.

Activity Page

AP 1

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms. Review the science activities in this lesson, and remind students that they can do science.

Distribute Activity Page 1 with scissors, and remind students that a park is a good place to learn about birds and other living things. Assist students in assembling a nature notebook, and allow them to take it outdoors with a pencil to record one thing they notice on each page.

See the Answer Key for sample student responses.

LESSON 2

A Science Hall of Fame

At a Glance

Lesson Question

What do people study in science?

Learning Objectives

✓ Articulate that science studies living things, planet Earth, and the way built objects work.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

People in science study every object and process imaginable, including all about both living and nonliving things.

NGSS and CCSS References

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.

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.

NOS8. Science Addresses Questions About the Natural and Material World: Scientists study the natural and material world.

RI.K.4. Craft and Structure: With prompting and support, ask and answer questions about unknown words in a text.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details 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

The 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.

communicate

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.

asteroid **malaria** **particles** **planet** **tools**

Instructional Resources

Student Book

Ch. 2

Student Book, Chapter 2
"A Science Hall of Fame"

Activity Page

AP 2

Activity Page
Communicating Science (AP 2)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- drawing materials such as crayons or markers

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

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

Show students a video about primatologist Dr. Jane Goodall. Tell students to watch and listen for examples of how Jane Goodall communicates. Elicit questions from your students about the Core Vocabulary word **communicate** and *communicating*. (See the Online Resources Guide for a link to a recommended video. **www.coreknowledge.org/cksci-online-resources**)

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What do people study in science?

2. Read together: "A Science Hall of Fame."

Student Book

Ch. 2

While some advanced students may be able to read words on a given page of the Student Book, as a 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 2 on page 8. Tell students that the title of this chapter is "A Science Hall of Fame," and remind them to pay special attention to what kinds of discoveries scientists make as you read.

Read Aloud Support

Page 8

Ask students to look at the images as you read aloud. Explain that a hall of fame is a museum with exhibits about famous people—in this case, scientists.

Remind students that they learned the word *scientist* in Chapter 1. Have them point to that word on this page and identify Jane Goodall as a scientist.


CHAPTER 2

A Science Hall of Fame

Step right up!
Welcome to the Science Hall of Fame!
Learn what people study in science.

Science Hall of Fame

Here is Jane Goodall.
She made many discoveries about wild chimpanzees.
She studied how chimps live.
She watched them in the forest.
Jane Goodall saw chimps make tools.
They use the tools to get food and water.
That surprised many other scientists!

8

Discuss what she is doing and what the chimpanzees are doing.

INFERENTIAL—What is Jane Goodall doing?

» Sample answer: She is watching a baby chimp.

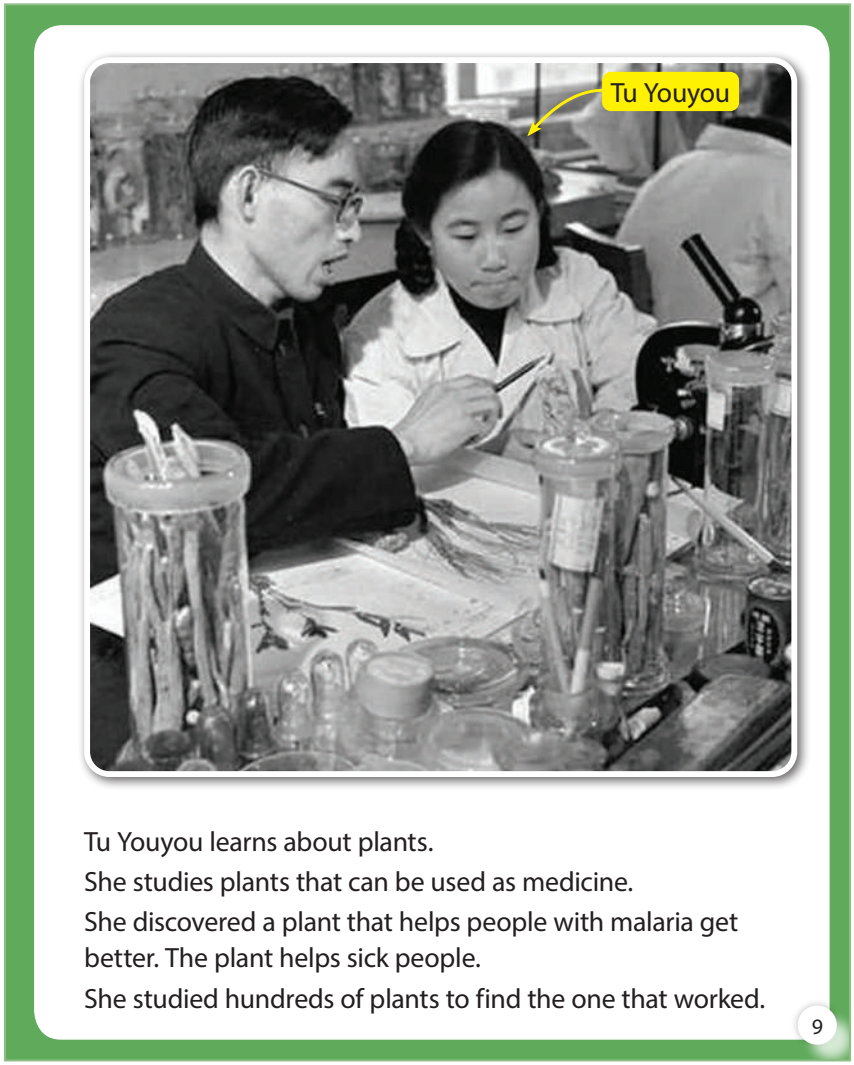
INFERENTIAL—What do you think the younger chimp is doing?

» Sample answer: It is looking at some objects on the ground and deciding if they can be eaten.

Point out that the older chimp appears to be using a twig as a utensil to eat. It has likely used the tool to pull insects from their burrow. Ask students what tools this resembles that they use.

Page 9

Ask students to look for clues in the image that scientists are at work here. Point out the lab coats, the microscope, the pictures of plants on the table, and the laboratory glassware. Explain that some scientists work indoors in laboratories.



INFERENTIAL—What do you think the scientist speaking to Tu Youyou is communicating?

» Sample answer: something about the plants he thinks can be used for medicine

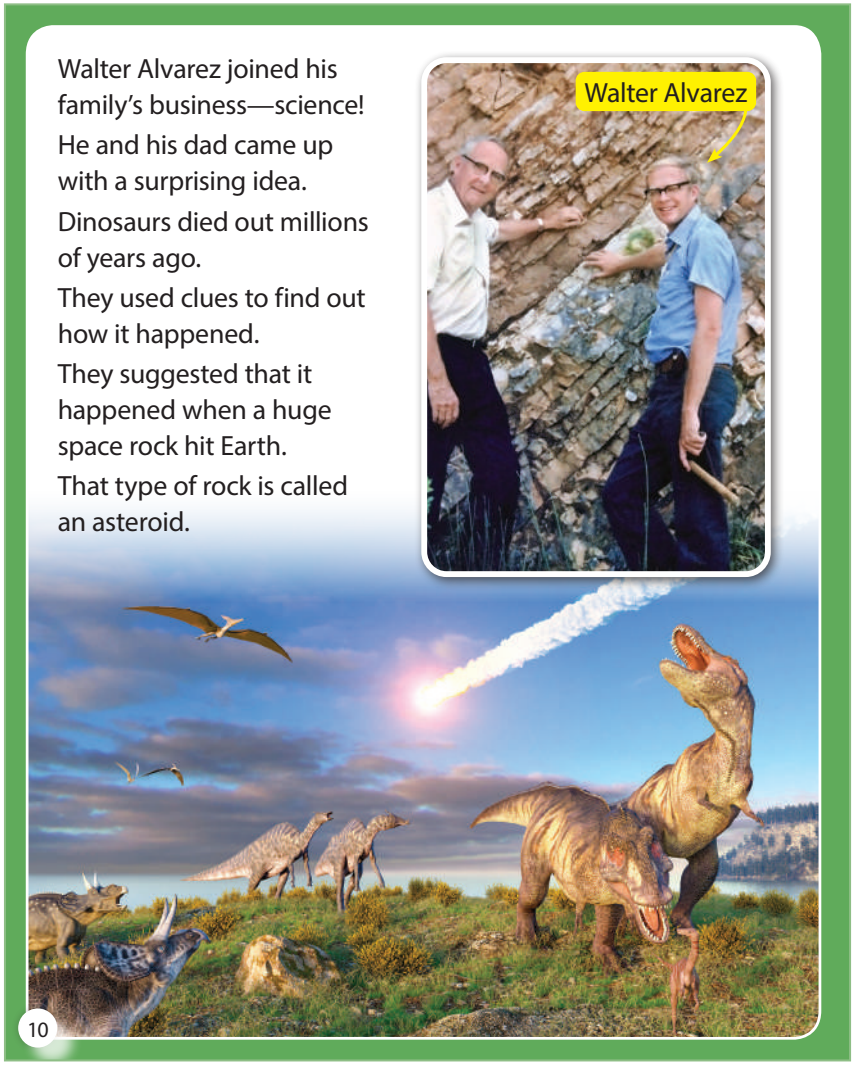
INFERENTIAL—Where does Tu Youyou do science compared to where Jane Goodall does science?

» Sample answer: Tu Youyou works in a lab indoors, and Jane Goodall works outdoors in the forest.

Have students identify words in the text that they did not understand (for example, *malaria*). Point out that malaria is an illness that may cause fever, chills, and headaches and that, if untreated, those sick with malaria can die. People get infected when they are bitten by a mosquito that has in its blood a very tiny (single-celled) living thing called *Plasmodium*.

Page 10

Ask students to look at the images as you read aloud. Explain that the scientist standing on the left is Walter Alvarez's father, named Luis Alvarez. Point out that the clues the two scientists found are part of the rock wall.



Talk about what they notice in the painting of the dinosaurs.

INFERENTIAL—What did the Alvarezes think caused the dinosaurs to die out?

» an asteroid hitting Earth

EVALUATIVE—How might having two scientists in a family help make discoveries?

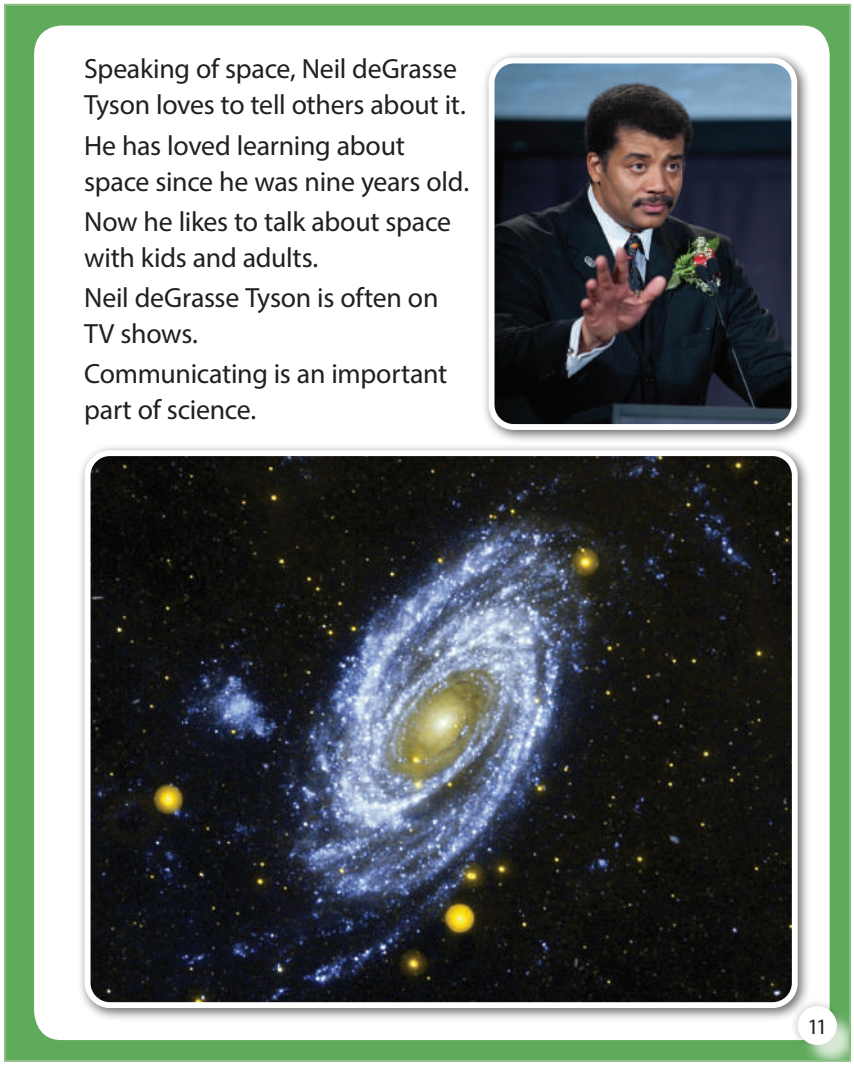
» Sample answer: because they can share ideas whenever they are together

Know the Standards

NOS4. Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
Understanding the nature of science is fundamental to science literacy. While kindergarten students are not expected to discuss scientific laws and theories, they can prepare to do so in later grades by identifying causal relationships. Cause and Effect is a Crosscutting Concept, and students should understand that events have causes that generate patterns.

Page 11

Ask students to look at the images as you read aloud. Call attention to the photo of the night sky. Explain that Neil deGrasse Tyson studied collections of stars, planets, gases, and dust called *galaxies*. The bright galaxy in the center of the photo is spiral shaped, like a pinwheel.



INFERENTIAL—What do you think the word **communicating** means?

» Sample answer: talking to people

INFERENTIAL—Scientists think that a spiral galaxy has curved "arms" because of how the galaxy moves. What kind of movement might cause that shape?

» spinning like a pinwheel or plate

Invite students to ask questions about space that they would like Neil deGrasse Tyson to answer.

Online Resources

EXTEND—Preview and then have students watch a video of Neil deGrasse Tyson speaking to experience how he communicates with people about science. (See the Online Resources Guide for a recommended resource. **www.coreknowledge.org/cksci-online-resources**)

Page 12

Ask students to listen for familiar and unfamiliar words as you read aloud. All three Core Vocabulary terms from Lesson 1 are used on this page: *science*, *scientist*, and *investigate*. Reinforce their meanings as needed.

SUPPORT—For any unfamiliar word, provide a simple definition. If students need more support, use the word in a sentence, and connect it to something familiar to students.

INFERENTIAL—How do you think Shirley Ann Jackson felt when she received a medal from President Obama?

» Sample answers: proud, happy, amazed

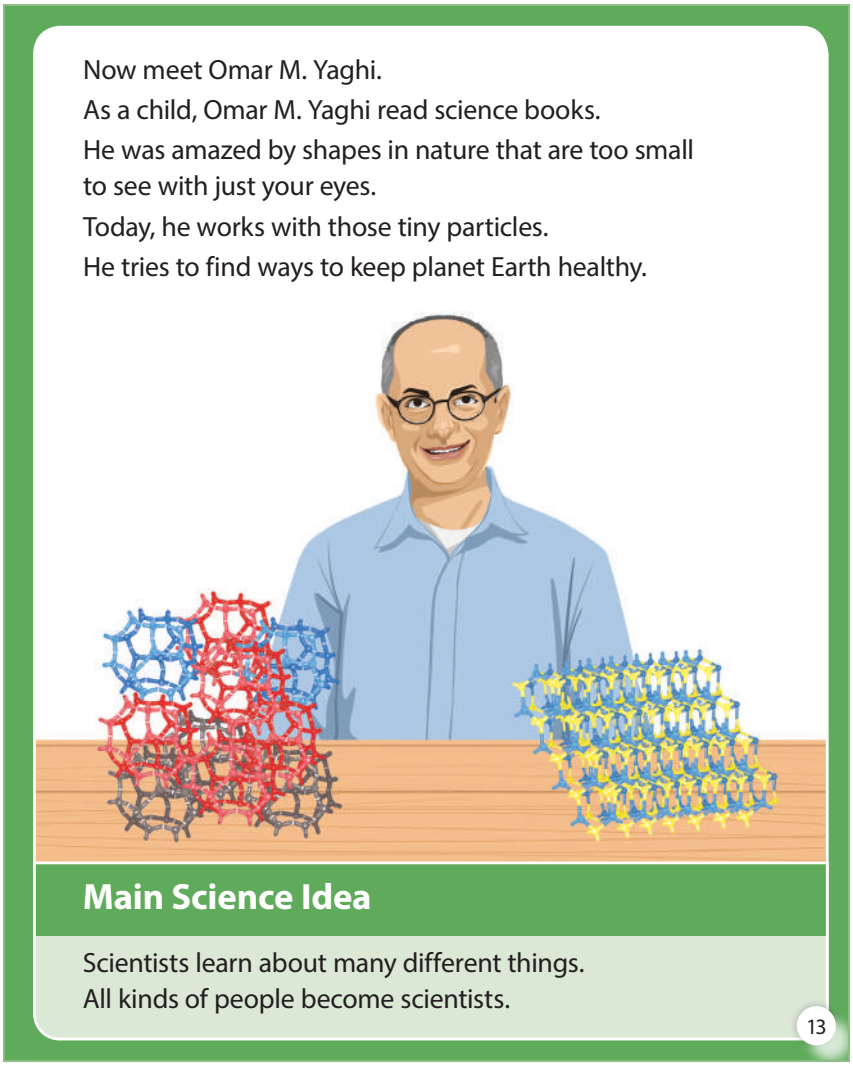
Call attention to text that indicates that Jackson studied the natural world.

LITERAL—What did Shirley Ann Jackson study?

» bees and tiny particles

Page 13

Ask students to look at the image before you read aloud. Talk about what they notice about the man's facial expression.



INFERENTIAL—How do you think Omar M. Yaghi feels about science?

» Sample answers: good, happy, that science is fun

3. Check for understanding.

Activity Page

AP 2

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms. Scientists learn about many different things. All kinds of people, including students themselves, can become scientists.

Use the activity page to assess students' understanding for the Core Vocabulary (communicate/communicating). Provide drawing materials such as pencils, markers, and crayons.

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

LESSON 3

So Much to Observe!

At a Glance

Lesson Question

What are observations?

Learning Objectives

- ✓ Define *observation*.
- ✓ Describe ways to observe.
- ✓ Observe objects and processes.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- game and puzzle

Main Science Idea

Observations happen when you use your senses and tools to observe things around you and gather information about those things.

NGSS and CCSS References

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.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

W.K.8. Research to Build and Present Knowledge: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

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Core Vocabulary and Language of Instruction

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observation **observe** **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.

hand lens **machine** **repeat** **telescope**

Instructional Resources

Student Book

Ch. 3

Student Book, Chapter 3
"So Much to Observe!"

Activity Page

AP 3

Activity Page
Observing Patterns (AP 3)

Materials and Equipment

Collect or prepare the following items:

- paper bag
- lemon or orange
- reference books and other research materials

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

Before class, place a lemon or orange in a paper bag, and close the opening.

The Core Lesson

1. Focus attention on the Lesson Question.

Show the bag with the lemon or orange inside to students, and challenge them to suggest ways to figure out what is inside it. Guide the discussion to how they could use one sense at a time—hearing, touch, smell, and sight. For example, they can shake the bag to hear the sound the object makes or reach inside to touch the object and determine its shape and texture. After volunteers use each sense, they can attempt to guess what the object is.

ALERT—For safety, do not allow students to taste the item.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What are observations?

2. Read together: "So Much to Observe!"

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 14. Point out that the side edges of the pages of this chapter are all light purple. Tell students that the title of this chapter is "So Much to Observe!" and remind them to pay special attention to how they make observations as you read.

Read Aloud Support

Page 14

Ask students to look at the images as you read aloud. Talk about what senses they might use if they visited a farm.

CHAPTER 3

So Much to Observe!

It is family day at a farm!
You can get close to the baby animals.
We can see. We can feel. We can hear too.
What will you notice with your senses?

You can hear the "peep-peep" sound of a chick.

You can touch the soft wool of a lamb.

Our senses help us to observe.
Observing means noticing and paying attention.
You can share your observations with other people.
Then they can observe the same things.

14

LITERAL—Which senses are mentioned in the picture captions?

» hearing and touch

LITERAL—What other sense is identified in the text?

» sight

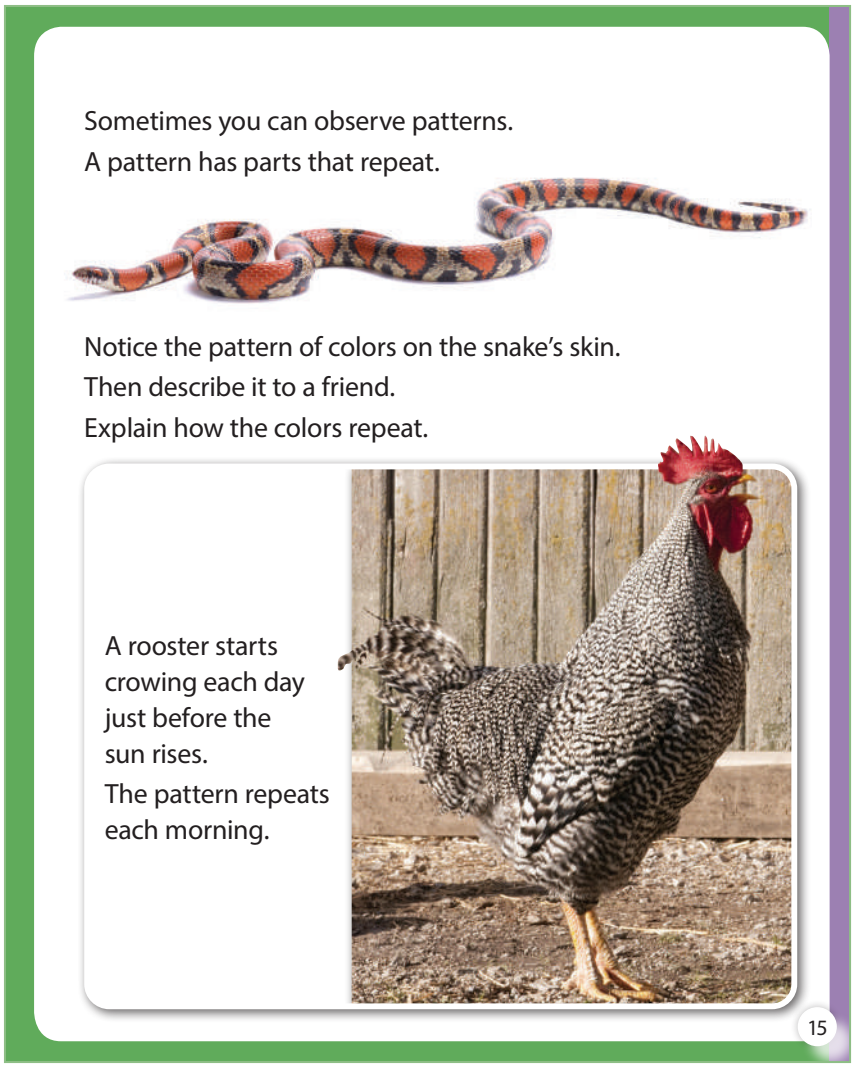
Point out that people have five senses, and discuss which two were not identified in the text (smell and taste).

As you read the last four sentences, have students listen for words with the same root in each line. They should find *observe*, *observing*, *observations*, and *observe*. Point out that using their senses to **observe** is part of doing science.

SUPPORT—Help students connect the new root word *observe* to something they already know by using it in a sentence. For example, they can find something in the classroom and share their **observation** about it.

Page 15

Ask students to listen for words you emphasize as you read aloud. Emphasize **pattern** and *repeat*. Explain that milk snakes are often found around farms.



Pair students so that they can take turns following the text directions to notice the snake's skin pattern and describe and explain it to a classmate.

INFERENTIAL—What did you observe about the color pattern?

» It has a red-black-white-black-red pattern.

Point out that when roosters crow is a time pattern that people hear.

LITERAL—How does the rooster's crowing repeat?

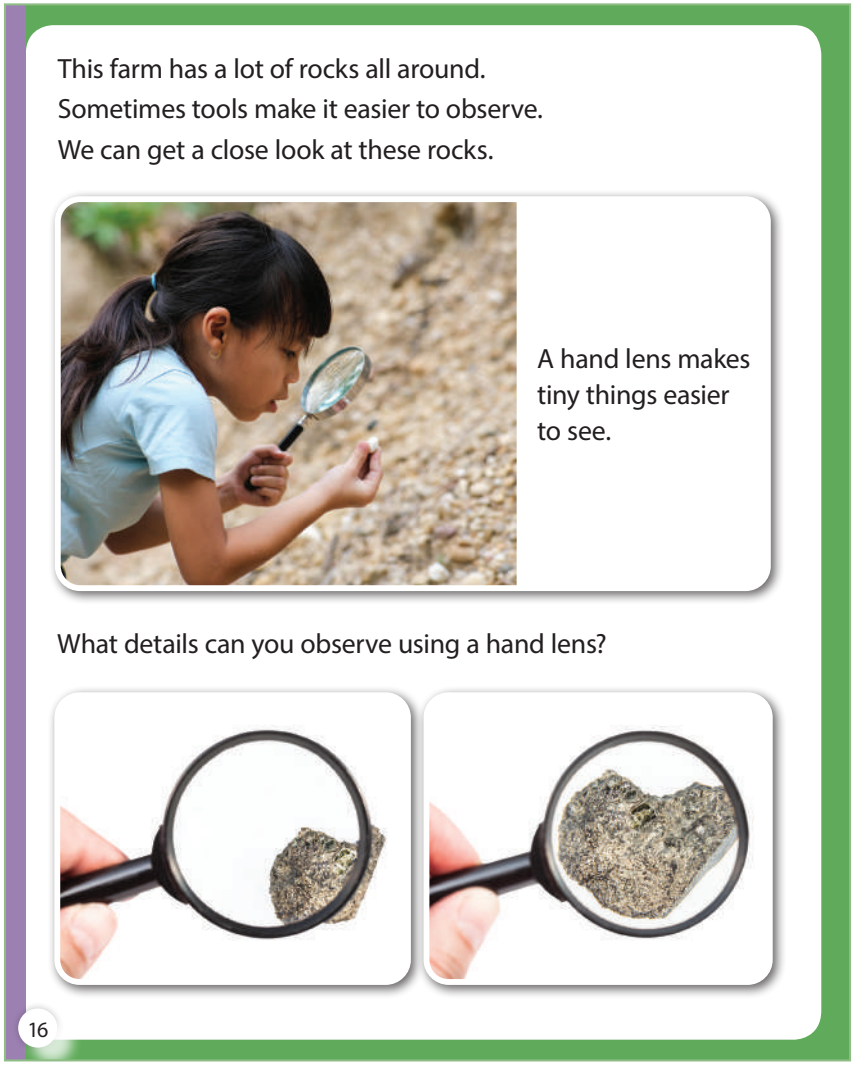
» It repeats every morning just before the sun comes up.

Know the Standards

NOS2. Scientific Knowledge Is Based on Empirical Evidence This theme of empirical evidence most closely supports Science and Engineering Practices. Scientifically literate people understand that evidence is empirical when it is obtained through observation or by experimenting.

Page 16

Ask students to look at the images as you read aloud. Talk about what they notice about the pattern of colors in the rocks, including the speckling of white and black particles.



LITERAL—Which of our five senses does a hand lens help?

» sight

SUPPORT—If you have hand lenses, distribute them to students, and have them describe the details of objects they can see with them. Alternately, you can place a page with fine print on a desk, overlay it with a clear sheet of plastic, and place a drop of water on the plastic. When students move the plastic to position the water drop over text, they will observe that the letters are magnified.

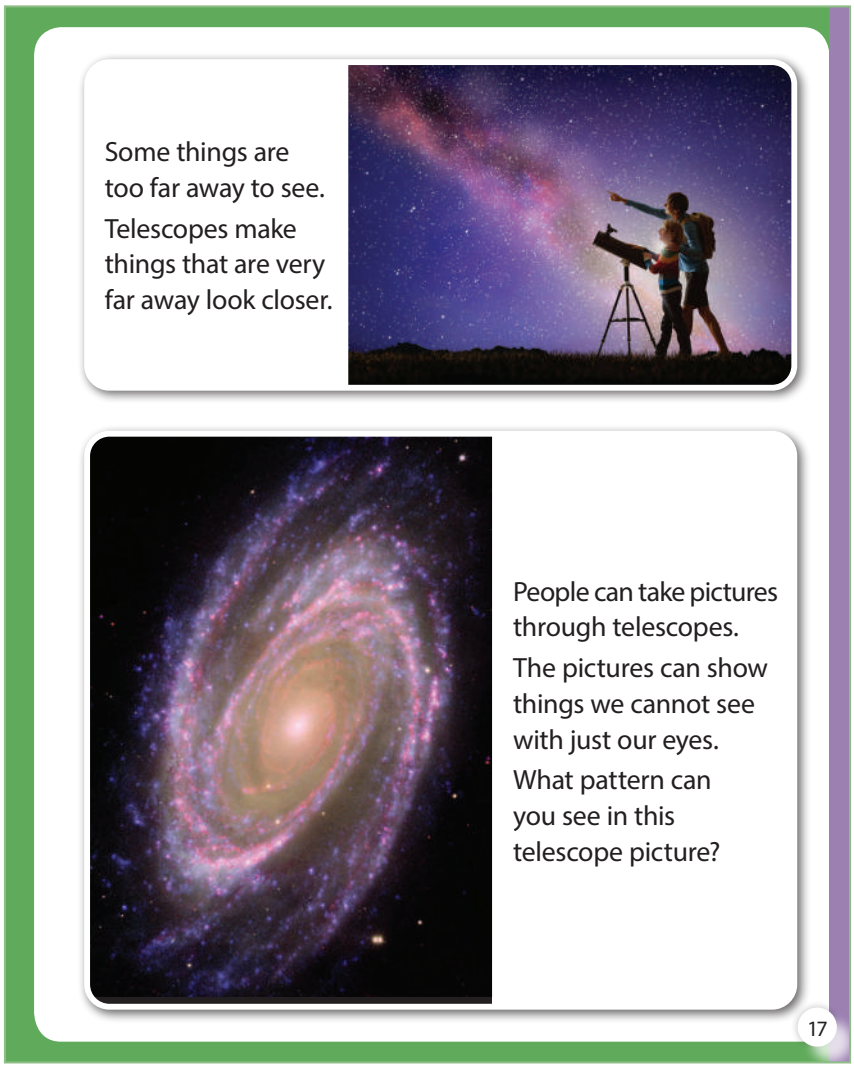
INFERENTIAL—Where else can we find pictures of how things look using tools such as hand lenses?

» in library books or on websites

Guide students to ask a librarian for help finding books that show magnified images from nature or appropriate images from safe online sources.

Page 17

Ask students to find the telescope in the images as you read aloud. Guide students to recall that they saw a photo of a galaxy when they read about scientist Neil deGrasse Tyson in Chapter 2.



Have students answer the text question:

INFERENTIAL—What pattern can you see in this telescope picture?

» The stars are grouped into two long, curved arms.

Ask a follow-up question:

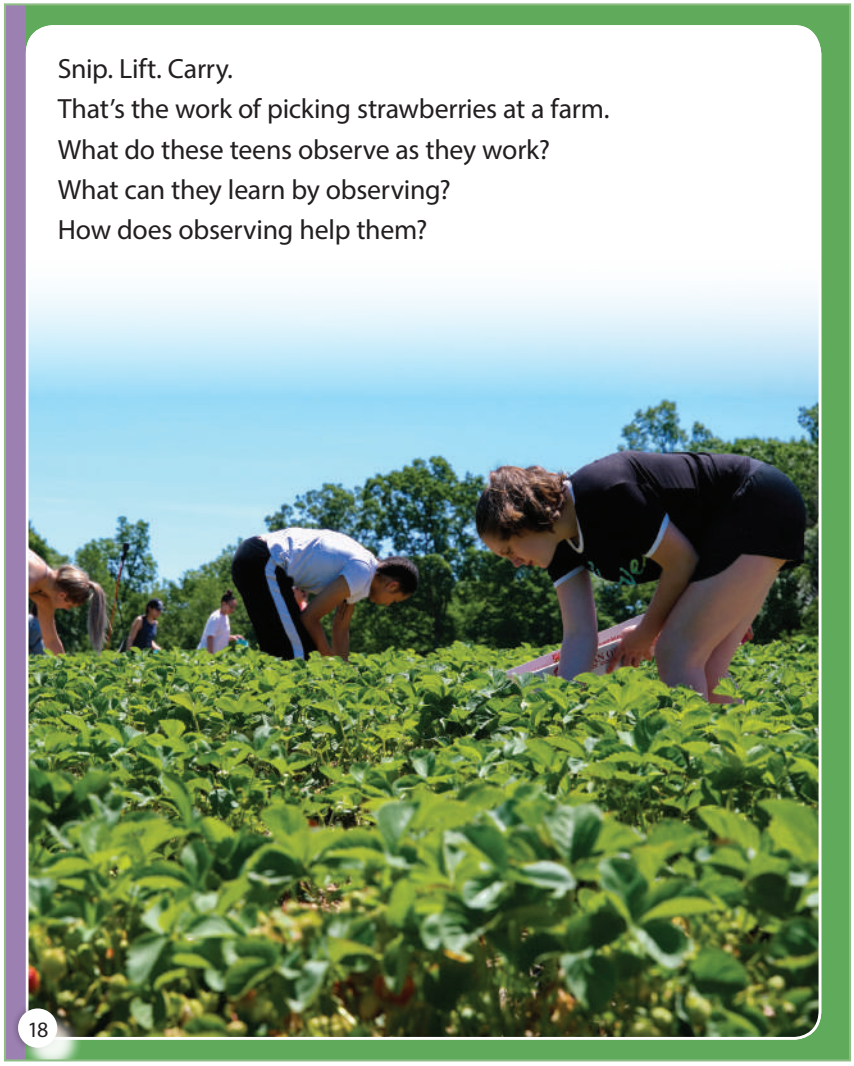
EVALUATIVE—How helpful do you think telescopes are to scientists? Why?

» Sample answer: very helpful, because they can see things in space that we cannot see with our eyes alone

Point out that the people in the photo with the telescope see the Milky Way galaxy as a bright cloud across the dark sky. Explain that the galaxy in the other photo was taken with a telescope and would look like a tiny dot to people looking up at the sky with their eyes alone.

Page 18

Remind students that this chapter began with family day at a farm. Have them listen for the questions in the text as you read aloud. Point out that some farms allow visitors to pick their own fruits and vegetables to buy and take home.



Give students the opportunity to offer responses to the questions asked in the text:

INFERENTIAL—What do these teens observe as they work?

» Sample answers: the smell of the soil and berries, the colors of the berries, the heat from the sun on their backs, the flavor of the berries

INFERENTIAL—What can they learn by observing?

» Sample answer: They can learn which color strawberries taste the sweetest.

INFERENTIAL—How does observing help them?

» Sample answer: It helps them decide which strawberries to pick and which ones to leave on the plants.

Page 19

Ask students to look at the image as you read aloud. Talk about what they can learn about farming grain from the photo.

Give students the opportunity to respond to the questions on the Student Book page:

INFERENTIAL—How do the machines cut grain?

» Sample answer: like a lawnmower, with sharp blades that turn

INFERENTIAL—How do they move the grain?

» Sample answer: The grain is dumped in the truck, and the big wheels turn to move the truck.

3. Check for understanding.

Activity Page

AP 3

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Distribute Activity Page 3, and make sure students understand that the first pattern in a row is on the left.

See the Answer Key for correct answers.

LESSON 4

Wondering Is Smart

At a Glance

Lesson Question

How do observations lead to questions?

Learning Objective

✓ Form questions about observations.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

Observations lead to asking questions about the natural world by introducing people to new phenomena.

NGSS and CCSS References

SEP1. Asking and Defining Questions: Ask questions based on observations to find more information about the natural and/or designed world(s).

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

W.K.2 Text Type and Purposes: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

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

The 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.

problem **question**

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.

soil nutrients

Instructional Resources

Student Book

Ch. 4

Student Book, Chapter 4
"Wondering Is Smart"

Activity Page

AP 4

Activity Page
Use Question Words (AP 4)

Materials and Equipment

Collect or prepare the following items:

- potted plant
- internet access and the means to project images/video for whole-class viewing
- drawing materials
- cotton T-shirt or cotton balls (optional)

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

The Core Lesson

1. Focus attention on the Lesson Question.

Take students to an open window or right outside a nearby school doorway. Point to something you see, feel, or hear outdoors at that moment, and describe it to students. Say, "I observe . . ." Follow up with an "I wonder . . ." statement to model how observations of the world can lead to science questions.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How do observations lead to questions?

2. Read together: "Wondering Is Smart."

Student Book

Ch. 4

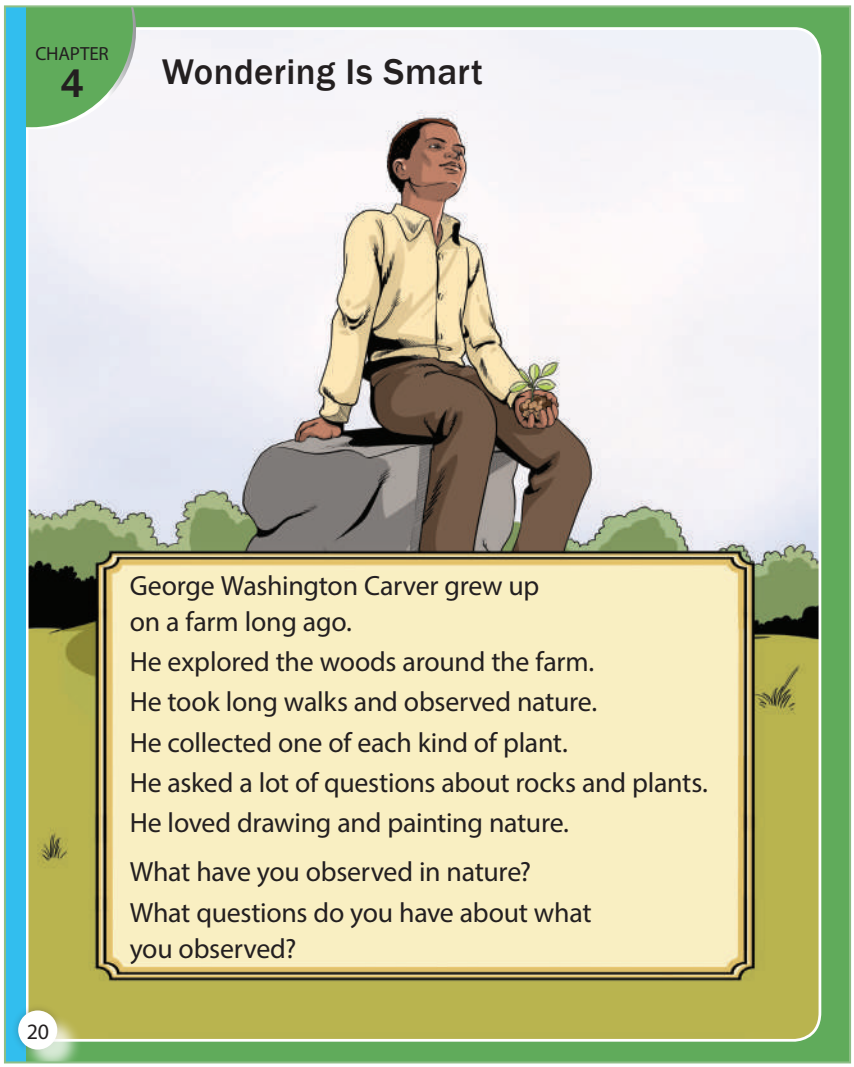
While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with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

Guide students to open their books to Chapter 4 on page 20. Point out that the side edges of the pages of this chapter are all light blue. Tell students that the title of this chapter is "Wondering Is Smart," and remind them to pay special attention to the questions George Washington Carver asked as you read.

Read Aloud Support

Page 20

Ask students to look at the image as you read aloud. Talk about how the young man is looking upward, as if he is thinking about something.

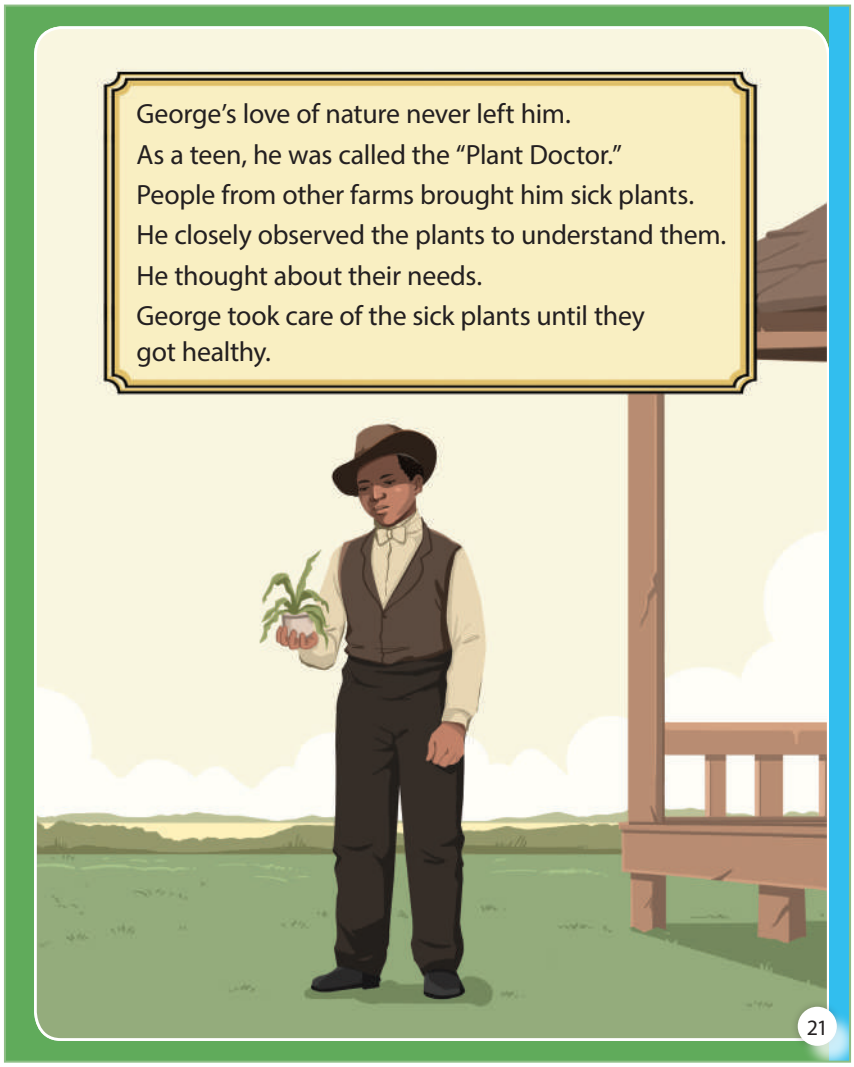


INFERENTIAL—What is George Washington Carver doing in this picture?

» He is sitting on a rock, holding a plant, and thinking about the world around him.

Have students identify the two **questions** on the page by finding the question marks. Make sure students understand that being "in nature" can occur in cities as well as on farms. Point out that parks and even sidewalks have trees, flowers, birds, and insects that are part of nature. Elicit students' questions in response to what they have observed in nature.

Page 21 **Ask students to look at the plant in the image as you read aloud.**



INFERENTIAL—What do you notice about the plant George Washington Carver is holding?

» It does not look too healthy.

Discuss how plants need water, air, soil nutrients, and sunlight. Explain that *soil nutrients* are parts of soil that get used up when farming.

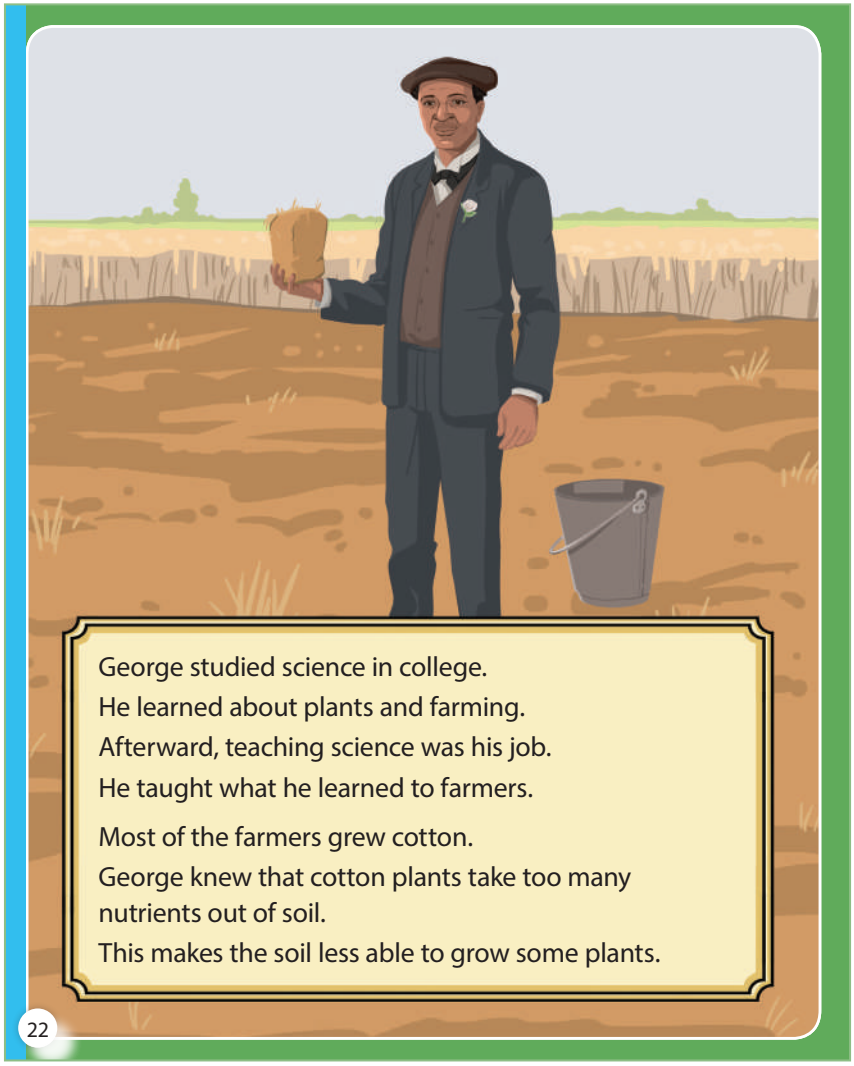
EVALUATIVE—How important was the teenaged George Washington Carver to his community? Why?

» He was very important because people depended on him to help make their plants healthy.

Have a potted plant in your classroom. Challenge students to make observations about the plant related to whether it is healthy or sick. Invite them to ask questions based on their observations.

Page 22

Ask students to listen for the name of the farm crop that caused a problem as you read aloud. Explain how cotton is used to make clothing, bedsheets, towels, artists' canvases to paint on, and bandages.



LITERAL—What crop did most of the farmers Carver taught grow?

» cotton

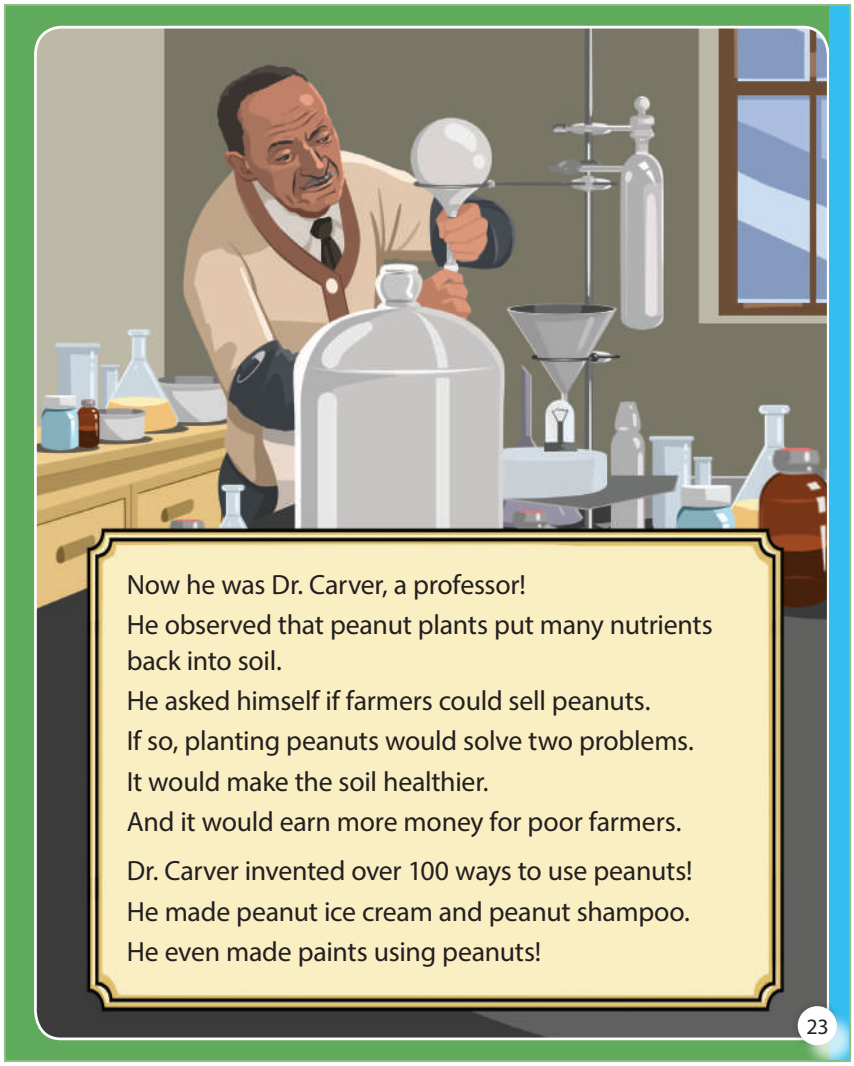
SUPPORT—Allow students to feel cotton products, such as a T-shirt. Point out that cotton feels soft against the skin and absorbs water well. Dip a corner of the T-shirt in water so students can observe how it holds the water until it is squeezed. Explain that these properties make cotton very useful.

INFERENTIAL—What problem did the farmers have that Carver might help solve?

» how to put nutrients back into the soil after growing cotton used them up

Page 23

Ask students to listen as you read aloud for the solution to the problem caused by growing cotton.



INFERENTIAL—What two problems did planting peanuts solve?

» First, growing cotton took too many nutrients out of the soil; second, farmers needed ways to earn money.

Explain that prior to Professor Carver's inventions, peanuts were mostly used to feed pigs. Back then, peanuts were farmed and picked by hand, which was very slow and difficult. Around the same time that Carver was finding new uses for peanuts, machines were invented that made picking peanuts faster and easier.

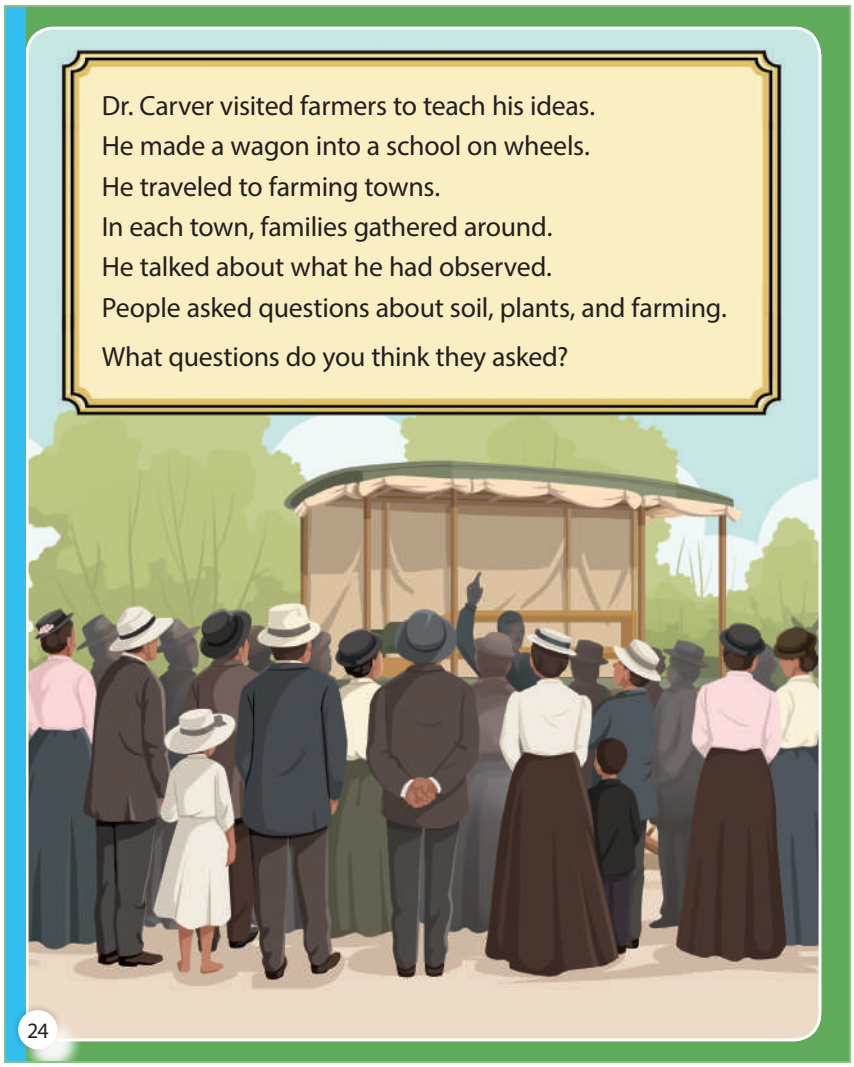
LITERAL—How many ways to use peanuts did Professor Carver invent?

» over 100

Have students count to 100 by ones to appreciate the size of this quantity.

Page 24

Ask students to look at the image as you read aloud. Have them describe the wagon and the people.



INFERENTIAL—How do you know that whole families came to learn at Dr. Carver's wagon?

» because I can see men, women, and children in the picture

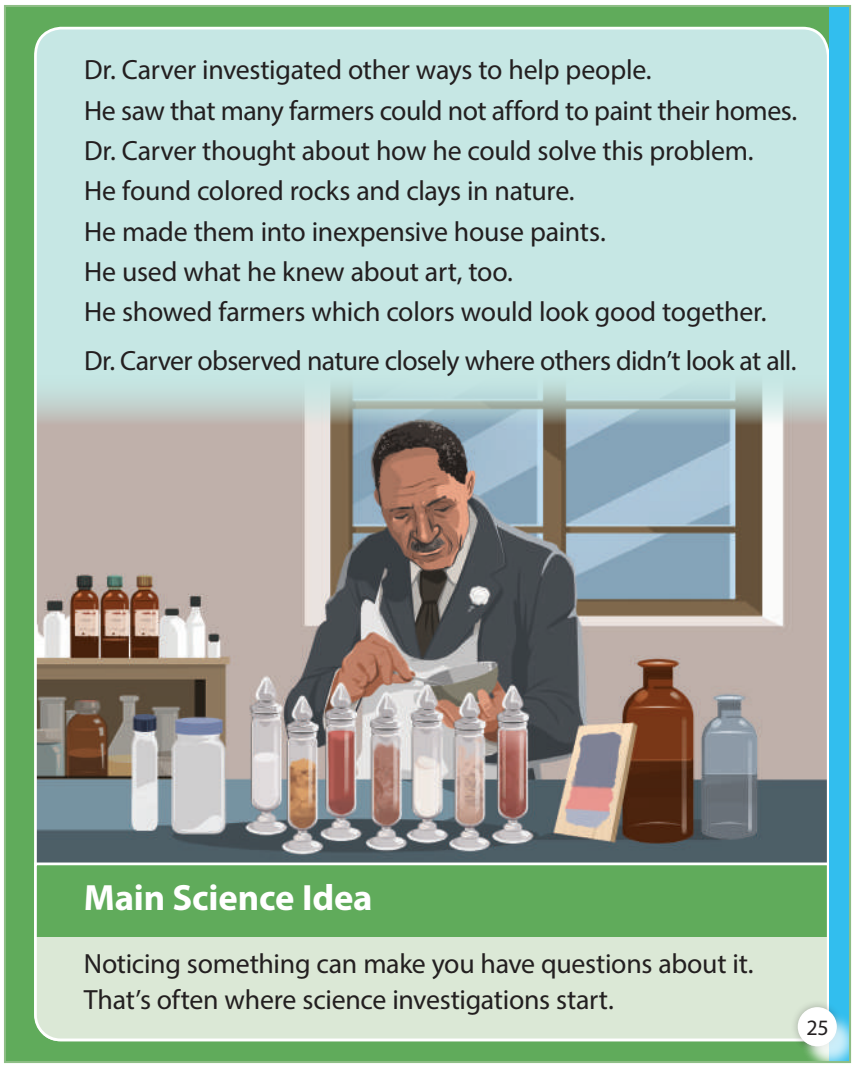
Invite students to answer the question in the final line of text using a brainstorming technique in which many answers are generated without criticism. Look for evidence that students understand that the farm families wanted to learn how to make their farms more productive so that their lives would be more comfortable.

Online Resources

EXTEND—Show students an animated biography of George Washington Carver spoken in verse. Have students listen for and identify the rhyming words at the ends of each pair of sentences. (See the Online Resources Guide for a recommended resource. **www.coreknowledge.org/cksci-online-resources**)

Page 25

Ask students to look at the image as you read aloud. Talk about the differences in the contents of the glass vials.



EVALUATIVE—What surprised you about this part of Dr. Carver's work?

» Sample answer: I thought he liked only plants.

3. Check for understanding.

Activity Page

AP 4

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Distribute Activity Page 4 to students along with drawing materials.

When students have selected their pictures and question starter words, have them share their questions orally with the class. Look for evidence that their questions are directly related to their observations.

See the Answer Key for sample answers and student responses.

LESSON 5

Luna's Party Plans

At a Glance

Lesson Question

How can drawings help us understand things?

Learning Objectives

- ✓ Explain what is happening in diagrams of concrete events.
- ✓ Draw a representation of a simple process.
- ✓ Draw a solution to a simple problem.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

Drawings help us understand things by providing a model for reference to test ideas out on.

NGSS and CCSS References

SEP2. Developing and Using Models: Distinguish between a model and the actual object, process, and/or events.

SEP2. Developing and Using Models: 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).

SEP2. Developing and Using Models: Develop a simple model based on evidence to represent a proposed object or tool.

RI.K.3. Key Ideas and Details: Describe the connection between two individuals, events, ideas, or pieces of information in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

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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.

diagram **solution**

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.

communicate **engineer**

Instructional Resources

Student Book

Ch. 5

Student Book, Chapter 5
"Luna's Party Plans"

Activity Page

AP 5

Activity Page
Putting Away Luna's Party Game (AP 5)

Materials and Equipment

Collect or prepare the following items:

- drawing materials

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 5 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students what needs they meet in their lives by making or reading drawings. Students may respond that they make drawings to give their families gifts, for enjoyment, to show where a treasure is hidden, or to remember something they saw in nature.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How can drawings help us understand things?

2. Read together: "Luna's Party Plans."

Student Book

Ch. 5

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 5 on page 26. Point out that the side edges of the pages of this chapter are all red. Tell students that the title of this chapter is "Luna's Party Plans," and remind them to pay special attention to how words and drawings work together to communicate ideas as you read.

Read Aloud Support

Page 26

Have students look at the drawing as you read aloud. Talk about what the child who drew it was trying to communicate. Remind students that to *communicate* means to share ideas with other people.

CHAPTER 5

Luna's Party Plans

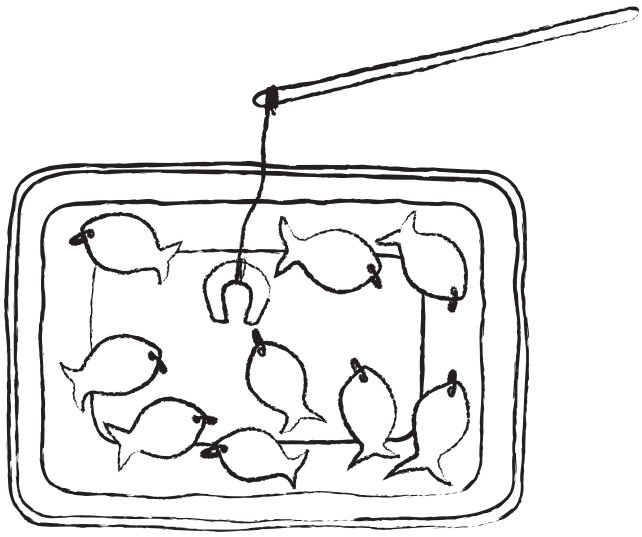
It is Luna's birthday tomorrow!

She asks her uncle, "Will you help me make a fishing game to play at my party?"

"Of course!" replies Uncle Elvio.

"Draw a picture of how the game should look."

Luna draws this picture.



26

LITERAL—What does Luna want her uncle to help her do?

» make a fishing game to play at her birthday party

INFERENTIAL—How is Luna related to Uncle Elvio?

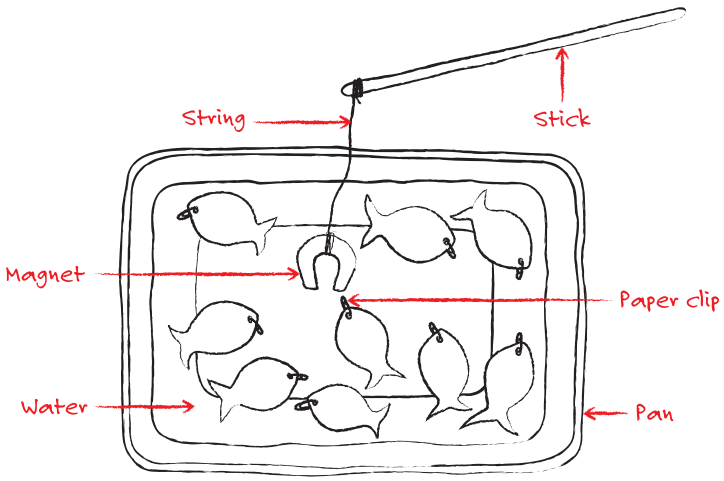
» She is his niece.

Some students may be familiar with this game. Invite them to share what they know about the parts needed and how it is played. Have them explain how the drawing supports their experiences with the game and how it does not.

Page 27

Before you read aloud, direct students to compare the image on this page to the one on page 28. Discuss how the two drawings are similar (show pictures of the parts) and different (the one on page 27 has arrows and labels).

Uncle Elvio looks confused.
He does not understand how the game will work.
Luna thinks a bit.
Then she says, "I can show it better if I add words and arrows."
Luna labels her sketch.
Now it is a diagram.
Here is what Luna's picture looks like when she finishes.



27

INFERENTIAL—Which part of the drawing is like the hook on a fishing pole?

» the magnet

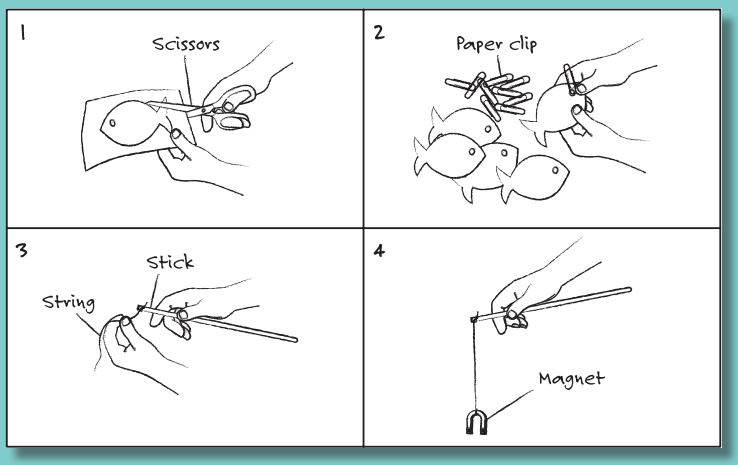
SUPPORT—If some students are not familiar with magnets, provide them with a small magnet, and have them investigate what materials around the classroom are attracted to it.

EVALUATIVE—How important are the arrows to understanding the drawing? Why?

» Sample answer: They are very important. Without them, it might not be clear which words go with each part of the game.

Page 28 **Ask students to look at the numbered pictures in order as you read aloud.**

"I understand now," says Uncle Elvio.
"Now we can figure out the steps needed to make the game."
Together, Luna and her uncle draw four steps.
Ask yourself, do drawings like this help?



28

Introduce the term **diagram**. Point out that Luna and Uncle Elvio have made a diagram to show how to assemble the parts needed to play the game.

LITERAL—How many steps are needed to make the game?

» four

INFERENTIAL—How are the numbers helpful to Luna and Uncle Elvio?

» They show the order in which to put together the parts of the game.

CHALLENGE—Invite students to make claims about the kinds of materials that would work best for the fish. Challenge them to support their claims with reasoning. Possible response: the material should be thin enough to cut easily with scissors but also waterproof so the fish will not fall apart in the water.

Page 29

Before you read aloud, have students look at the image and predict what Mami is thinking. Discuss how her gesture suggests that she is thinking about how to solve a problem. Have students mimic her gesture.

LITERAL—What are two steps Mami will take to get the materials for Luna?

» She will look around the house and then go to a store.

EVALUATIVE—Will the game work if Mami cannot get a magnet?

» not very well, unless they change the plan and make a hook

Call attention to the diagram on Student Book page 28. Have one student role-play what Luna should tell her mother to explain it. Have another student play the role of Mami and ask her daughter questions about the drawing.

Know the Standards

SEP2. Developing and Using Models Kindergarteners are beginning to understand that models they develop and use, one of the eight Science and Engineering Practices, can be two-dimensional, three-dimensional, or conceptual.

Page 30

Ask students to look at the image as you read aloud. Elicit what they notice about the scene at the party.

It is time for Luna's party!
Her friends are ready to play the fishing game.
"Building your fishing pole is part of the game," Uncle Elvio explains.
"These are the parts you can use," he continues.
Luna's friends each get a stick, string, and magnet.
Luna shows pictures 3 and 4 from the steps she drew with Uncle Elvio.
"How many fish can you catch in one minute?" Luna asks.
She says, "Go!"
The kids get busy making their fishing poles.

30

INFERENTIAL—What did Uncle Elvio have to do to get the game ready before the party?

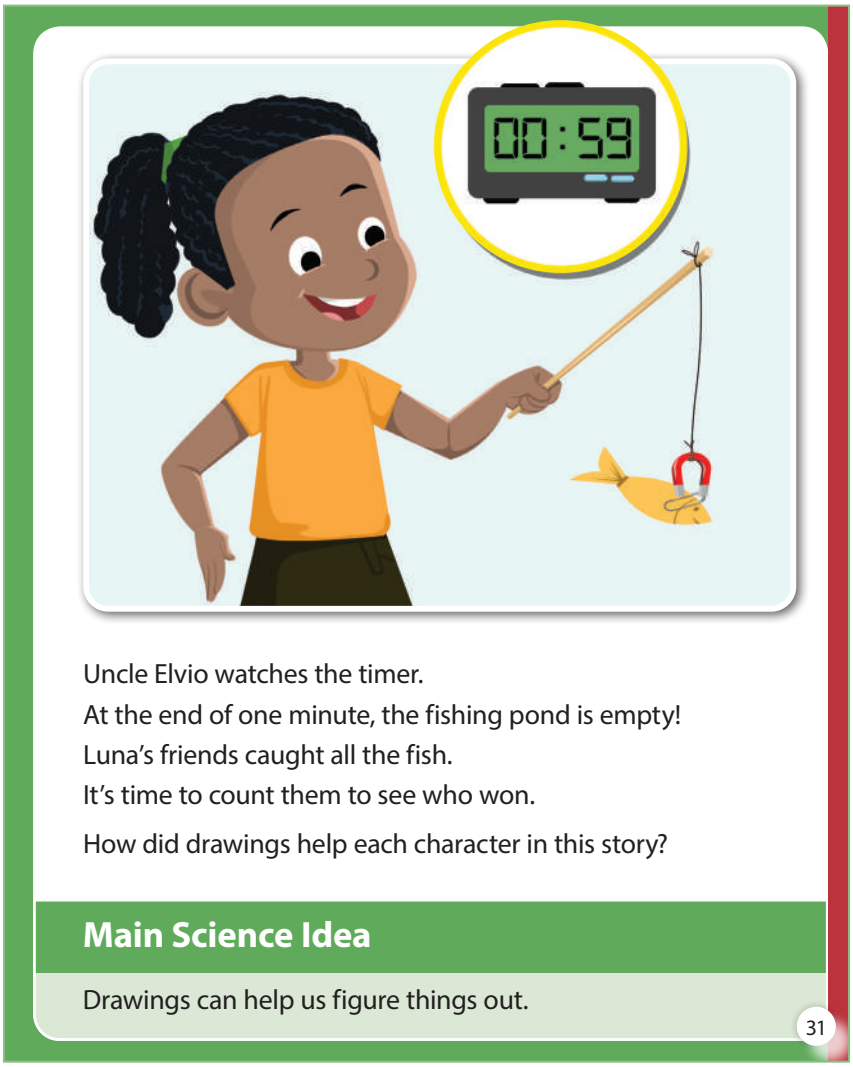
» He had to fill the pan with water, attach the paper clips to the fish, put the fish in the water, and attach the magnet to the fishing pole.

Distribute drawing materials, and have students draw a diagram that shows how to play the fishing game. Provide a list of words they may choose among as labels or directions, such as *lower, touch, raise, remove*.

As a problem-solving activity, challenge students to propose ways to measure 30 seconds that are fair to all the children. If they suggest counting to 30 for turns, discuss tools used to measure time more accurately, such as a wall clock with a second hand or a timer app on a smartphone.

Page 31

Ask students to think about **solutions** to solve the problem of catching fish quickly.



Explain that people who have jobs as engineers use mathematics and science to solve problems.

EXTEND—Along with the diagram on Student Book page 28, provide materials to make and play the fishing game. Allow students to work in pairs to build and then play the game.

3. Check for understanding.

Activity Page

AP 5

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Distribute Activity Page 5 and drawing materials to students. Then read the directions to them. As they draw the process of cleaning up the game, look for evidence that they understand that adding labels, arrows, and numbers to drawings makes them more understandable.

See the Answer Key for a sample student response.

LESSON 6

What Is an Investigation?

At a Glance

Lesson Question

What is an investigation?

Learning Objectives

- ✓ Explain what it means to investigate.
- ✓ Describe how trying something multiple times affects what they observe.
- ✓ Make a prediction based on observations.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

An investigation is a way to discover how something in the world works or why it works the way it does.

NGSS and CCSS References

SEP3. Planning and Carrying Out Investigations: . . . Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.

SEP3. Planning and Carrying Out Investigations: Make observations (firsthand or from media) . . . to collect data that can be used to make comparisons.

SEP3. Planning and Carrying Out Investigations: Make predictions based on prior experiences.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

SL.K.3. Comprehension and Collaboration: Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

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investigate **investigation** **predict** **prediction**

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.

test

Instructional Resources

Student Book

Ch. 6

Student Book, Chapter 6
"What Is an Investigation?"

Activity Page

AP 6

Activity Page
Make a Prediction! (AP 6)

Materials and Equipment

Collect or prepare the following items:

- drawing materials
- non-interlocking building blocks, such as wood blocks
- board eraser
- small ball
- scissors

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 6 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Show students any small toy that moves when pushed or pulled, such as a marble or model car. Ask: How do you predict the object will move when placed at the top of a ramp? How could doing an investigation help answer your question? Accept all reasonable answers.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What is an investigation?

2. Read together: "What Is an Investigation?"

Student Book

Ch. 6

While some advanced students may be able to read words on a given page of the Student Book, as a 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 6 on page 32. Point out that the side edges of the pages of this chapter are all dark blue. Tell students that the title of this chapter is "What Is an Investigation?" and remind them to pay special attention to how people answer science questions as you read.

Read Aloud Support

Page 32

Ask students to look at the images as you read aloud. Have them describe what the students are doing.

INFERENTIAL—What questions are the students in each photo thinking about?

» What parts are needed to make a small robot? How high will this ball bounce if I drop it from up here?

INFERENTIAL—How do you know that the students in one photo are measuring?

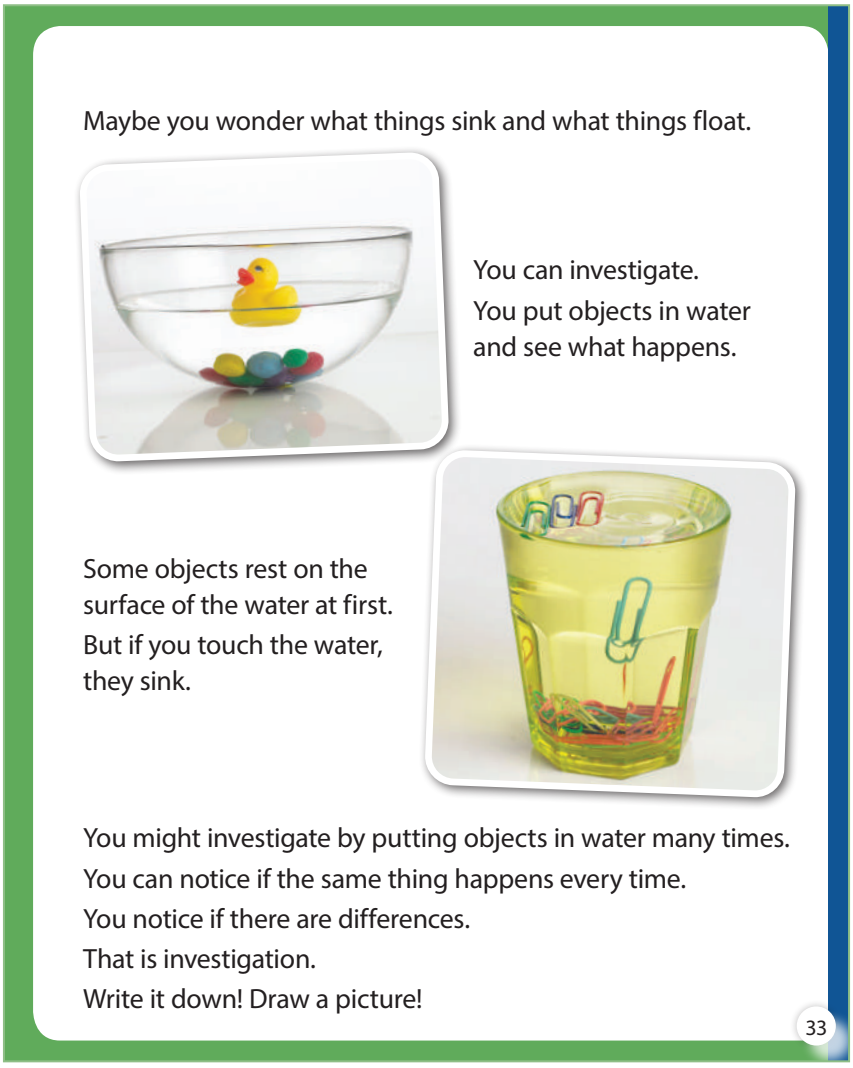
» because they are holding a meterstick and about to drop the ball right next to it

Have students consider how the ball will behave when it hits the sand-like material. Invite them to guess how deeply the ball will move. (Later in the lesson, you will define the terms *predict/prediction*.)

Point out that scientists answer questions by carrying out **investigations** like these.

Page 33

Have students look at the images as you read aloud. Talk about what questions are being investigated in each photo.



LITERAL—Which objects float and which objects sink in the first photo?

» The rubber duck floats, and the colored beads or pebbles sink.

Call attention to the second photo. Have students ask questions about what they see that can be investigated. Possible questions: Does it matter if the water is cold or hot? Does how you put the paper clips on the water make a difference?

Distribute drawing materials to students so that they can create diagrams to show how they would **investigate** one of these questions related to putting objects in water to see if they sink or float. Remind students that they learned in the last lesson that words and arrows make their drawings more understandable to others.

Page 34

Ask students to compare the two photos as you read aloud. Discuss what is the same and different in the two photos at this science center.

A hands-on science center is a fun place to investigate!

The clear tube has a fan at the bottom. When the fan is on, air pushes the parachute up.

What will happen when the air blows faster?

What will happen when the air blows slower?

The children investigate by changing the speed of the fan.

34

Point to each photo as you ask the following questions:

LITERAL—In the photo on the left, where is the parachute?

» in the lower part of the clear tube

LITERAL—In the photo on the right, where is the parachute?

» It is above the top of the clear tube.

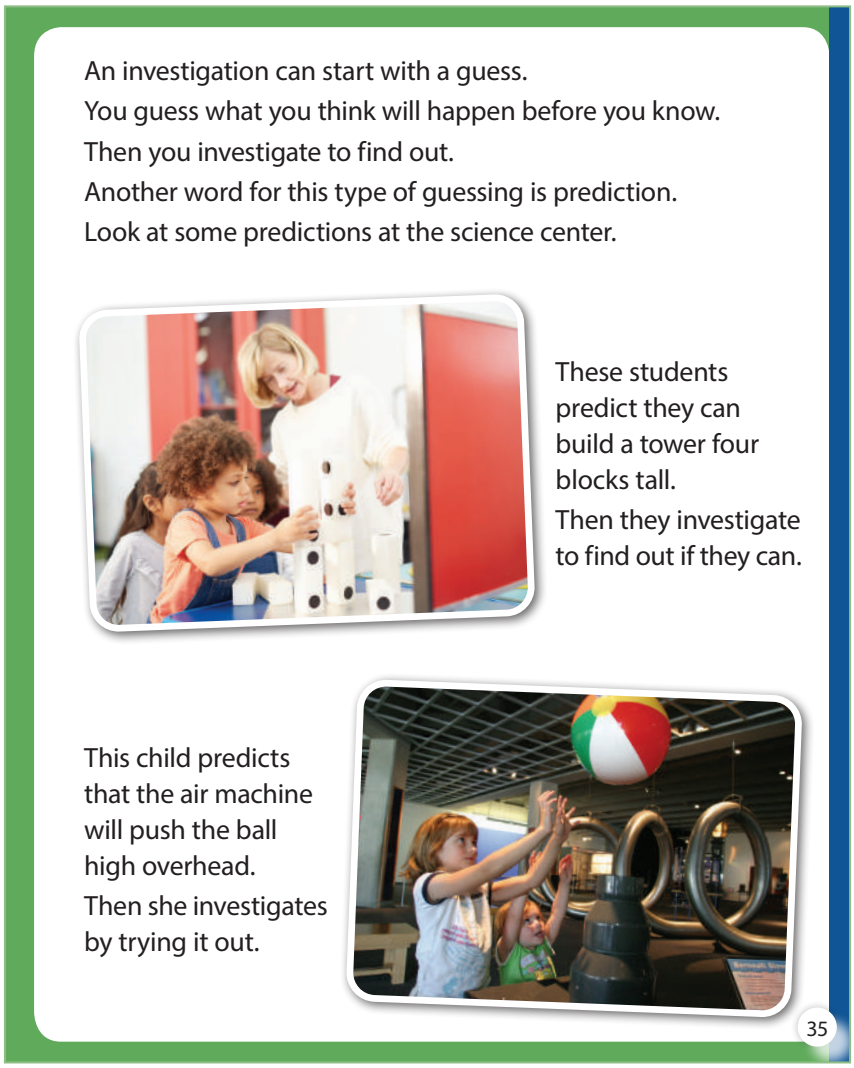
INFERENTIAL—What does the text mean when it says the children are *investigating*?

» It means they are trying things out so see what will happen.

Point out that each child in the group tries turning the fan on and off while the other children watch. Discuss how observing the changes multiple times makes it clearer what causes the changes.

Page 35

Have students look at the images and guess what the page is about. Invite them to ask questions, and then elicit what they think these children who are visiting a hands-on science center are trying to do.



INFERENTIAL—How will the child using blocks find out if his **prediction** is correct?

» Once he adds the third block, he should try to add a fourth block on top of it.

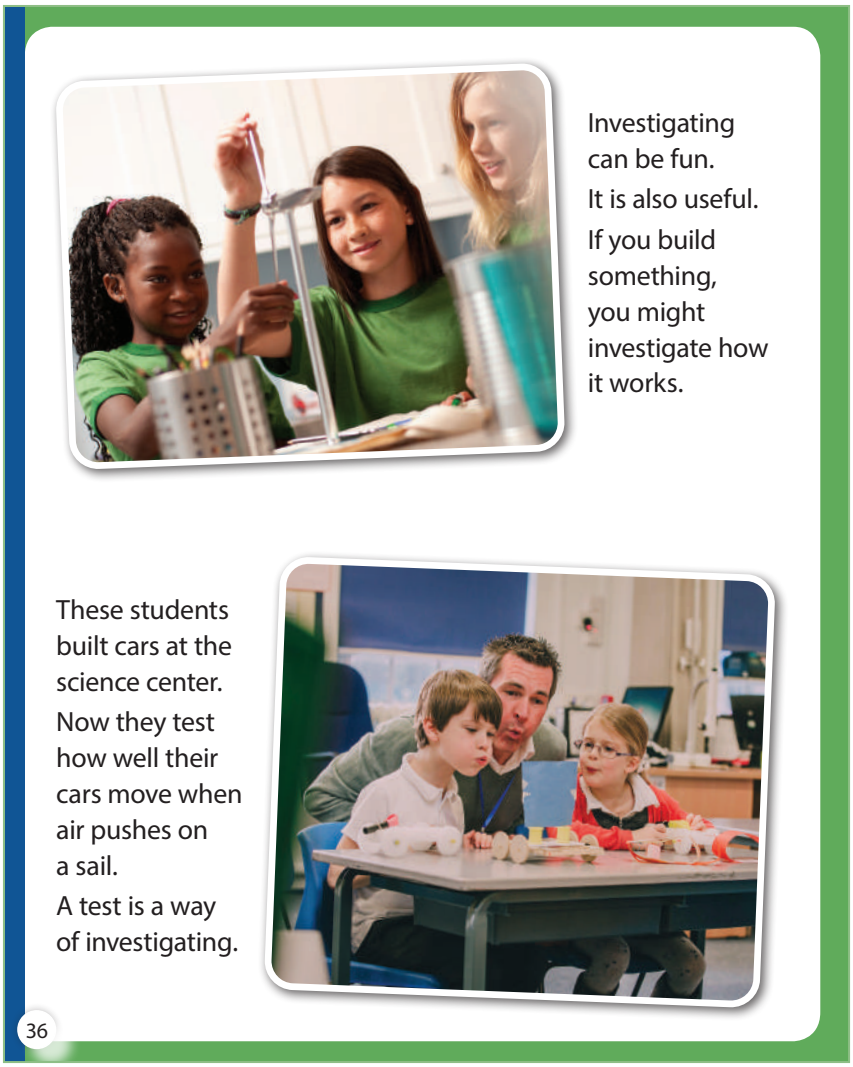
INFERENTIAL—How can the girl playing with the beach ball test her prediction?

» She can turn the air machine on and off and see how high the ball moves each time.

Point out that when people **predict**, they tell what they think will happen next. Illustrate your point by holding a board eraser and a small ball at the same height. Have students predict how the two objects will move when you let go of them. Say, "Let's investigate." Then drop the eraser and ball.

Page 36

Ask students to look at the image as you read aloud. Discuss how the model vehicles could be used to build something useful.



INFERENTIAL—What do you predict will happen when the children blow air toward the car with the sail?

» The air will push on the sail, and the car will move forward.

Remind students that the character Uncle Elvio in Chapter 5 is an engineer who solves problems. Point out that testing how well a solution to a problem works is part of the work of engineers.

While most people are more familiar with sailing boats and ships that move over the surface of water, land sailing has existed since at least the early twentieth century. The models the children have built are related to "sail wagons" or "land yachts." More recently, a NASA engineer proposed that the planet Venus could be explored with a land-sailing rover.

Page 37

Ask students to picture themselves at the science center bubble station as you read aloud. Talk about how they would investigate there.

The science center has a giant bubble station!
What kind of investigation could you do there?
What could you notice?

Here is an example of a question you might wonder about:
"Would blowing softer or harder make a bigger bubble?"

Here is an example of a prediction you could make:
"I think blowing harder will make a bigger bubble."

Then you try it out.
You can test your idea again and again.
That's an investigation!

Main Science Idea

Investigating is a way to find out whether or not something you think will happen actually does happen that way. The more times you do an investigation, the more you can be sure of what you learn from it.

37

EVALUATIVE—Of all the science center activities shown in this chapter, which is the most fun? Why?

» Possible answer: The parachute and fan activity is the most fun. It's cool to make something fly.

3. Check for understanding.

Activity Page

AP 6

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Distribute Activity Page 6, and have students cut out the four cards. Have them hold up one card at a time and take turns answering the question to make a prediction. Look for evidence that they have integrated their learning about pushes and pulls with understanding that to *predict* means to tell what will happen in the future.

See the Answer Key for correct sample student responses.

LESSON 7

Honey Bea's Summer Science

At a Glance

Lesson Question

How can we record what we observe?

Learning Objectives

- ✓ Record observations by drawing.
- ✓ Describe what they see in recorded observations.
- ✓ Detect a pattern in a provided pictorial data set.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- data display

Main Science Idea

Observations are recorded so there is evidence of the observations. The recordings can be in charts, drawings, digital media, and many other formats.

NGSS and CCSS References

SEP4. Analyzing and Interpreting Data: Scientific investigations produce data that must be analyzed in order to derive meaning.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

The 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.

observe **record**

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.

drawing **science**

Instructional Resources

Student Book

Ch. 7

Student Book, Chapter 7
"Honey Bea's Summer Science"

Activity Page

AP 7

Activity Page
Recording Observations (AP 7)

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 in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 7 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

Ask students to share their observations, experience, and knowledge of bees and butterflies. Some may have been stung by a bee or visited a butterfly garden. Show students videos about observing bees and butterflies. (See the Online Resources Guide for a link to a recommended video. **www.coreknowledge.org/cksci-online-resources**) Discuss their observations about bees and butterflies, including how they are the same, such as having six legs and wings.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How can we record what we observe?

2. Read together: "Honey Bea's Summer Science."

Student Book

Ch. 7

While some advanced students may be able to read words on a given page of the Student Book, as a 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 7 on page 38. Point out that the side edges of the pages of this chapter are all dark purple. Tell students that the title of this chapter is "Honey Bea's Summer Science," and remind them to pay special attention to how to record observations as you read.

Read Aloud Support

Page 38

Ask students to look at the image as you read aloud. Talk about what they **observe** about the garden and how Aunt Amy and Beatriz are dressed to work in the garden.

CHAPTER 7

Honey Bea's Summer Science

It is summer.
Beatriz is out of school.
She spends a week with Aunt Amy.
Beatriz likes Aunt Amy's flower garden.
But she misses school.
She misses science the most.

"There is plenty of science to learn in the garden," says Aunt Amy.
"Let's keep track of what we see, Honey Bea!"

38

LITERAL—How can you tell Aunt Amy and Beatriz are planning to work in the garden?

» Sample answer: They have gloves, hats, boots, and garden tools.

INFERENTIAL—What senses can they use to make observations?

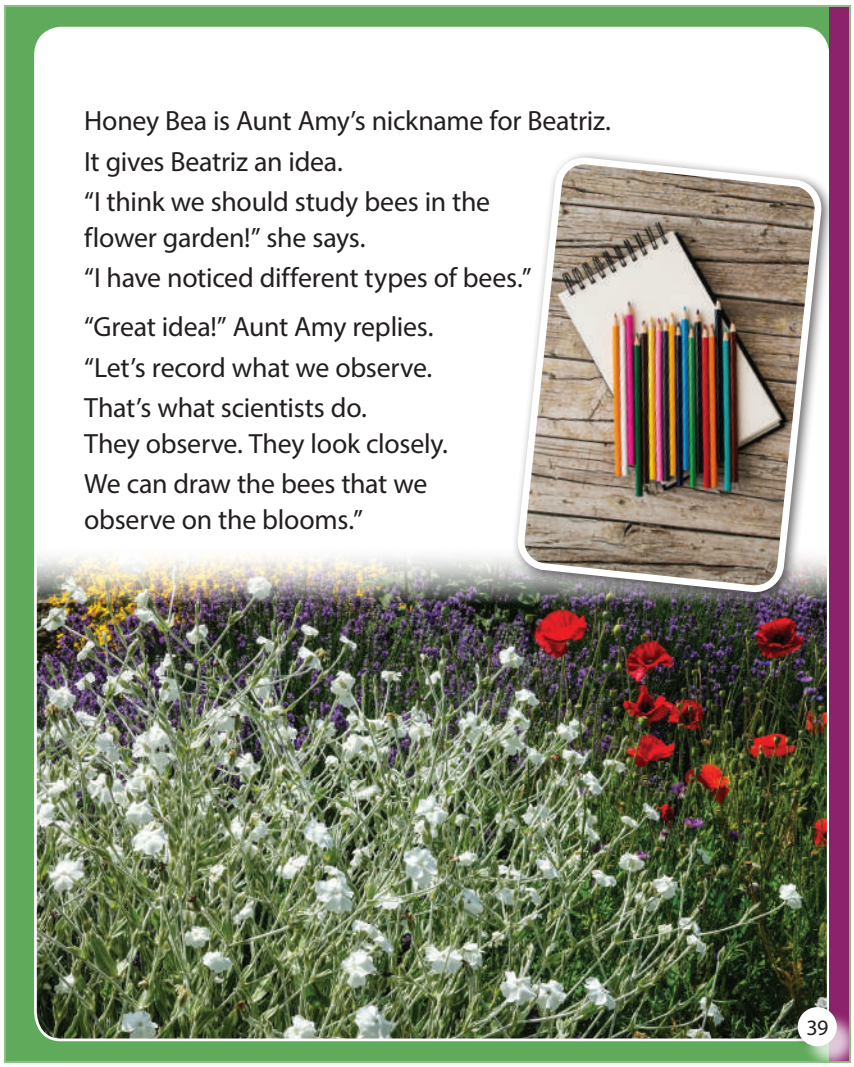
» Sample answer: seeing, hearing, smelling, touching

INFERENTIAL—What kinds of animals would you expect they would see in the garden?

» Sample answer: birds, insects, dog, or cat

Page 39

Ask students to look at the images as you read aloud. Discuss what they observe using their senses about the flowers.



INFERENTIAL—Why might bees and butterflies come to Aunt Amy's garden?

» Sample answer: They would be looking for nectar for food to eat.

EVALUATIVE—Would bees and butterflies find what they are looking for in this garden?

» Sample answer: yes, because the flowers are blooming and the sun is shining

SUPPORT—Ask students to think about the difference between seeing and observing. Emphasize that when you observe you look for details and similarities and differences.

Page 40

Ask students to look at the images as you read aloud. Talk about what they notice about how they could count the number of bees and butterflies they see.

INFERENTIAL—How could you **record** the number of bees and butterflies you see in a garden?

» Sample answer: I could draw them.

EVALUATIVE—How long would it take to draw each insect?

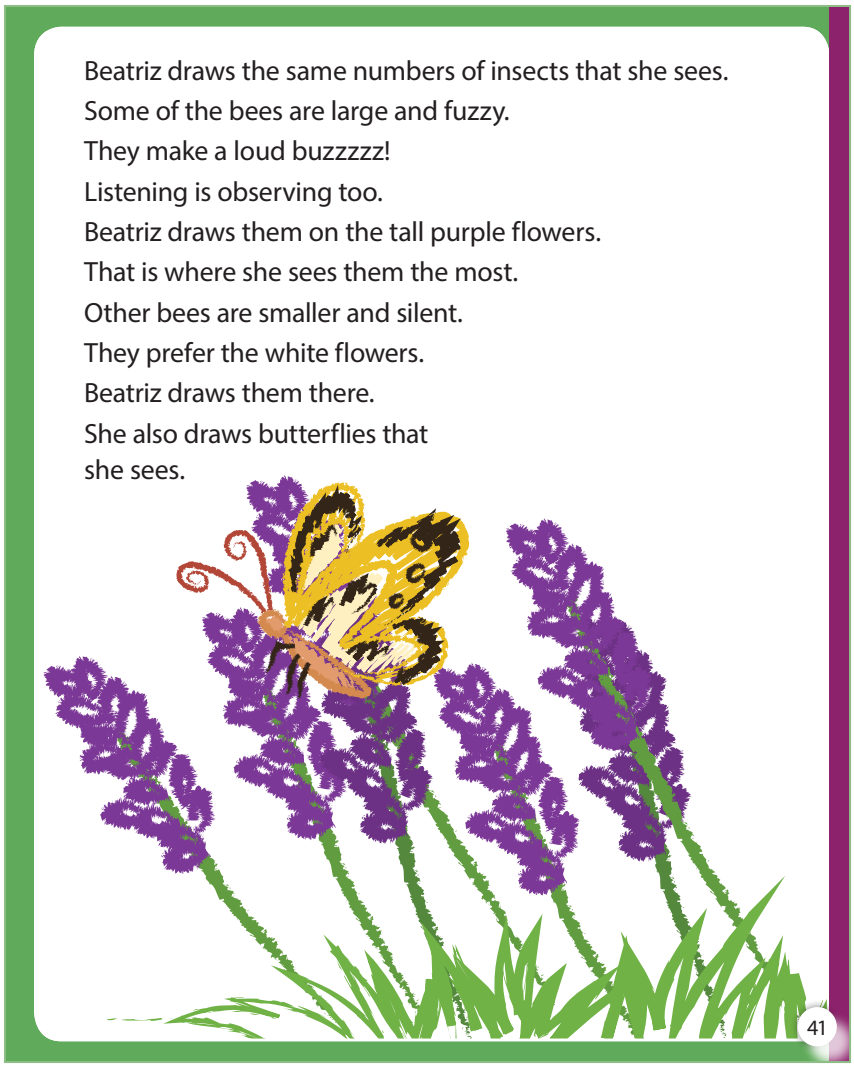
» Sample answer: It would take a long time, and I would miss some of them.

INFERENTIAL—What are some ways you could make sure you could count all the insects you see?

» Sample answers: Just count for a certain period of time, maybe ten minutes in the morning, after lunch, and in the evening. Make a code for each type of insect so I can record quickly.

Page 41

Ask students to look at the images as you read aloud. Talk about their observations of the differences between and among the insects.



LITERAL—What differences do Aunt Amy and Beatriz observe between and among the different insects?

» Sample answer: Some bees are large and fuzzy and make a loud buzz. Butterflies have different colors.

INFERENTIAL—How could they make sure they recorded all the different insects they saw?

» Sample answer: Make a recording chart with three different pictures for each time of day. Then record in an easy code the number of each type of insect they saw in each time period.

EVALUATIVE—Why should you record the date and time of each observation?

» Sample answer: so you know when you saw something

Point out that keeping track of when you see things helps you know if they happen again and again. You might spot a pattern.

Page 42

Ask students to look at the images as you read aloud. Talk about what they notice about how Aunt Amy wants to organize the data they collected.

It is Honey Bea's last day at Aunt Amy's.
Beatriz has an idea.
"Let's put all our drawings into one book!" she says.

Aunt Amy likes that idea.
"What order should we put the pages in?" she asks Beatriz.
"Let's sort them different ways to help us decide."

42

INFERENTIAL—Why would Aunt Amy want to organize the observations and data?

» Sample answers: to make a diary of the experience, to compare how many different types of bees and butterflies she observed, to learn about the types of insects that visit the garden and what they like

EVALUATIVE—What would be the *best* way to organize the observations?

» Sample answer: create a book that compares the insects they saw at different times of day

Know the Standards TEACHER DEVELOPMENT

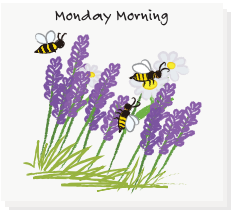
SEP4. Analyzing and Interpreting Data In this lesson, students learn about recording observations in a way that they can analyze and draw conclusions from their data.

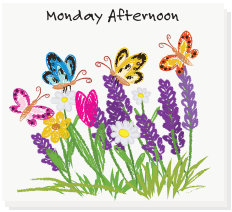
Page 43

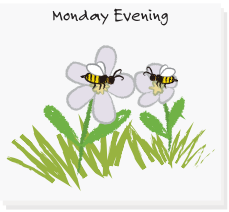
Ask students to look at the images as you read aloud. Talk about what they notice about what Beatriz learned from her observations.

First, they put the pages in order by day and time.
Next, they group all the morning drawings together.
They make one group for the afternoon drawings.
They make another for the evening drawings.

Beatriz notices something about these groups of drawings.
Only the afternoon pictures include butterflies.
She has made a discovery by recording what she observed!
Beatriz likes science more than ever now.







Main Science Idea

People can learn a lot by looking and listening closely.
Recording what you observe can help you discover new things.

43

Ask students the following questions:

LITERAL—What did Beatriz learn from analyzing her observations?

» Sample answer: Butterflies were only observed in the afternoons.

INFERENTIAL—What else might Beatriz have learned from her observations?

» Sample answer: when the bees were active and what types of flowers each insect liked

3. Check for understanding.

Activity Page

AP 7

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' understanding of how to record observations.

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

LESSON 8

Science and Numbers

At a Glance

Lesson Question

How does science use numbers?

Learning Objectives

- ✓ Count items in a science scenario where quantity is relevant.
- ✓ Use counting to roughly measure time for a science scenario.
- ✓ Consider numerical information to select a solution.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- practice with numbers

Main Science Idea

Numbers are used in science to quantify the phenomena that scientists observe when conducting investigations.

NGSS and CCSS References

SEP5. Using Mathematics and Computational Thinking: In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

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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.

count **measure**

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.

numbers **science**

Instructional Resources

Student Book

Ch. 8

Student Book, Chapter 8
"Science and Numbers"

Activity Page

AP 8

Activity Page
Practice Counting (AP 8)

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 in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 8 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students to share their observations, experience, and knowledge of counting by asking how old they and their siblings are.

Online Resources

Show students a video about counting different things in the natural world. (See the Online Resources Guide for a link to a recommended video. **www.coreknowledge.org/cksci-online-resources**) Confirm that the video addressed the question of "how many" but that numbers also answer other scientific questions. Have students look for numbers around the room, and make a class list of different questions numbers answer, such as what time, how tall, how old, and how long. Explain that science uses numbers in all these ways to help us understand the world. Math is considered the "language" of science.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How does science use numbers?

2. Read together: "Science and Numbers."

Student Book

Ch. 8

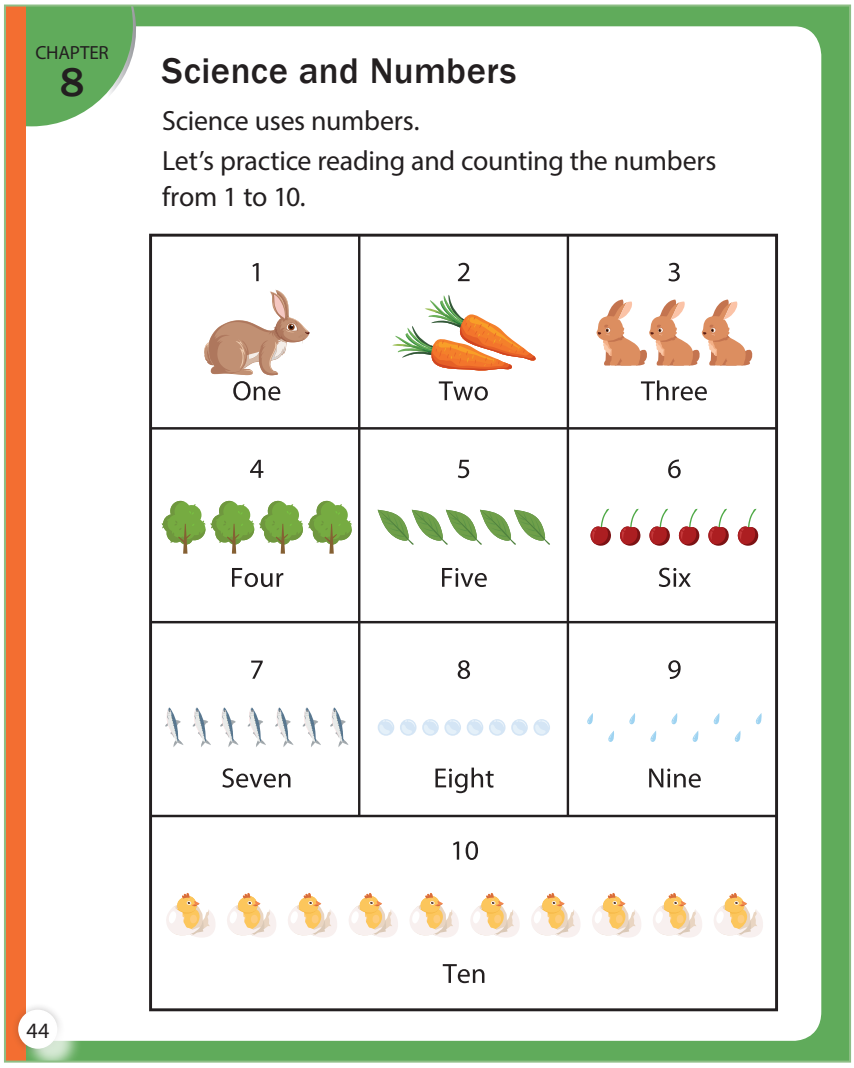
While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 8 on page 44. Point out that the side edges of the pages of this chapter are all orange. Tell students that the title of this chapter is "Science and Numbers," and remind them to pay special attention to numbers in the chapter as you read.

Read Aloud Support

Page 44

Ask students to look at the image as you read aloud. Have them count with you to 10 to review the page.


CHAPTER 8

Science and Numbers

Science uses numbers.

Let's practice reading and counting the numbers from 1 to 10.

1 One	2 Two	3 Three
4 Four	5 Five	6 Six
7 Seven	8 Eight	9 Nine
10 Ten		

44

LITERAL—Which of the pictures are plants, which are animals, and which are not living things?

» Sample answer: animals: rabbit, bunnies, fish, birds; plants: carrots, trees, leaves, cherries; not plants or animals: bubbles, raindrops

INFERENTIAL—Why would people want to be able to use numbers to **count** things in the natural world?

» Sample answers: to know how many young a mother has had, to know how many plants have come up in a garden

EVALUATIVE—Why is it important for scientists to be able to count?

» Sample answers: to compare populations of animals, to measure how big or how small something is, to tell if something is growing or not

Page 45

Ask students to look at the images as you read aloud. Together, count the number of animals in each picture.

INFERENTIAL—Do you think animals know how many young they have?

» Sample answer: Yes and no. Some animals, such as insects and fish, don't take care of or feed their young, so they wouldn't know how many they have.

Adult female elephants maintain a pace for the traveling herd so the young can keep up. They teach the calves which plants are edible and guide and assist the young. The adults are very aware of the number of calves they take responsibility for.

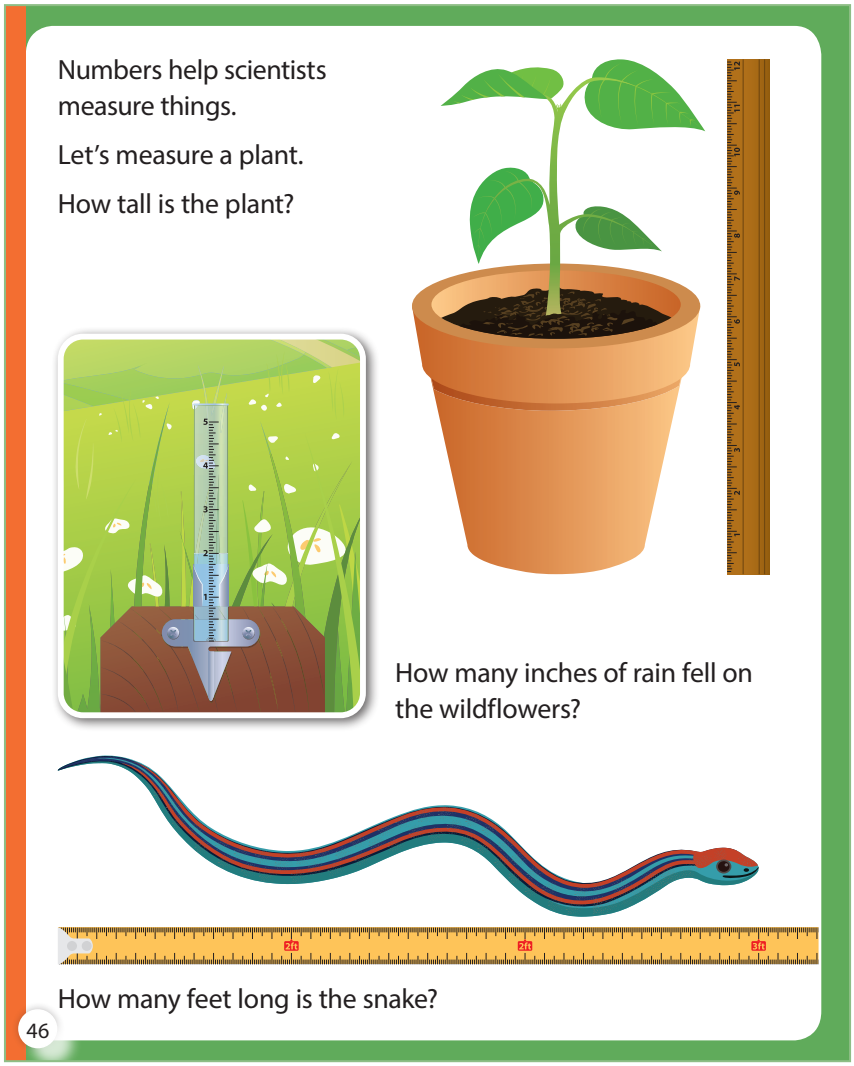
INFERENTIAL—Why would scientists want to know how many young are born?

» Sample answer: to learn if the animal is healthy or sick or to learn if the population can survive in the environment

CHALLENGE—Challenge students to think of ways to count really high numbers of insects, fish, or sea turtles.

Page 46

Ask students to look at the images as you read aloud. Talk about ways students **measure** things, such as with a ruler or measuring cup.



LITERAL—How is each thing in each picture being measured?

» Sample answer: a ruler, a rain gauge or measuring cup, a measuring tape

INFERENTIAL—What are some other ways people measure things?

» Sample answer: clock, scale, thermometer

INFERENTIAL—Why is it important to measure when cooking?

» Sample answer: to make sure the recipe turns out right and tastes good, that there is not too much salt or water

Page 47

Ask students to look at the images as you read aloud. Talk about how they use clocks and calendars.

We can measure time, too.

You can count to measure a short time.

How long between a lightning flash and thunder?

1 second
2 seconds
3 seconds
4 seconds

BOOM!!

Count how many days old the ducklings are.

Count how many months it takes for an apple to form.

47

LITERAL—How do people know what month, day, and time it is?

» Sample answer: They look at the calendar and the clock.

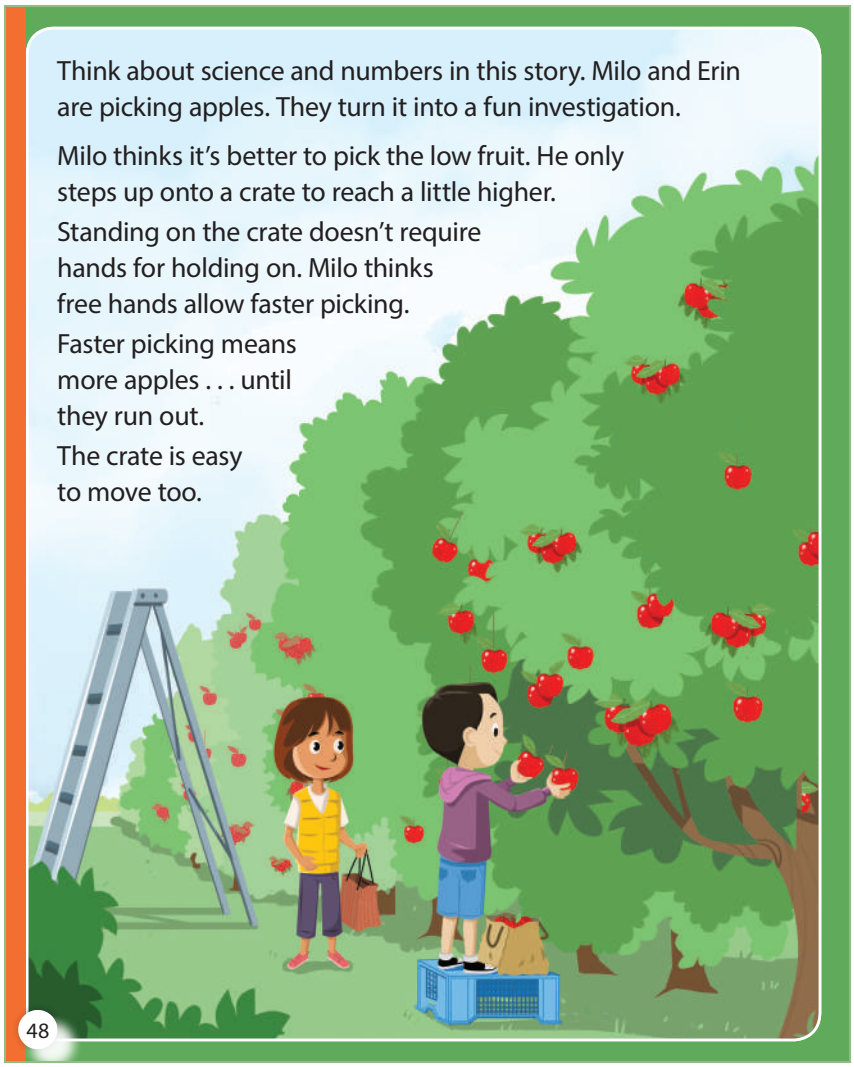
EVALUATIVE—Why is it important to know how long it takes for an egg to hatch or some fruit to ripen?

» Sample answer: so you can be ready to take care of chicks or harvest the fruit

SUPPORT—Discuss student experience with thunder and lightning. The thunder and lightning really occur at about the same instant, but at a distance, you will see the lightning before you hear the thunder. Explain that this is because light travels faster than sound.

Page 48

Ask students to look at the images as you read aloud. Talk about different ways to count and measure in an orchard.



LITERAL—What is the question Milo and Erin want to answer about picking apples?

» Sample answer: Do you get more apples if you pick low fruit with both hands or reach more fruit by standing and holding on to a ladder?

EVALUATIVE—Why does Milo think he will pick more fruit?

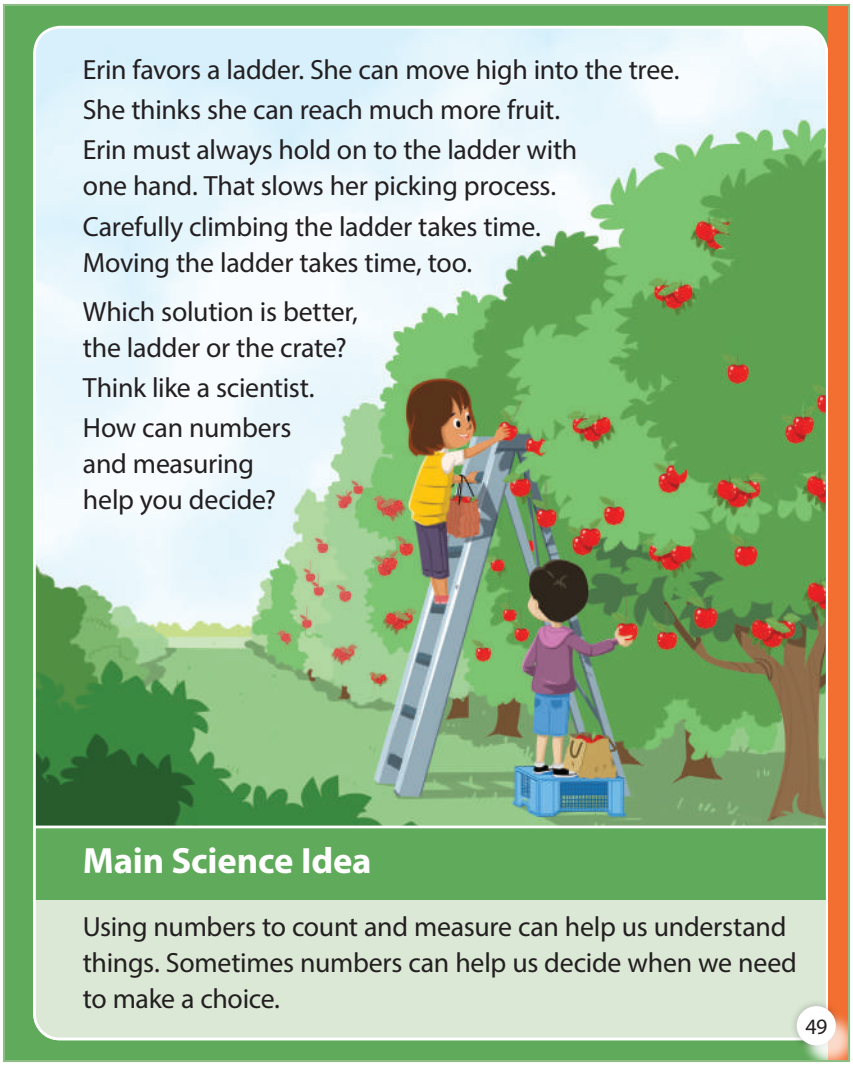
» Sample answer: He can use both hands.

Know the Standards TEACHER DEVELOPMENT

SEP5. Using Mathematics and Computational Thinking In this lesson, students explore many ways that scientists use mathematics, or the language of science, to count, measure, compare, and identify patterns.

Page 49

Ask students to look at the images as you read aloud. Talk about the different ways Milo and Erin are picking fruit.



LITERAL—Why does Erin think she will pick more fruit?

» Sample answer: She can reach more fruit.

INFERENTIAL—How are numbers being used in the investigation?

» Sample answer: They are considering time to find out how much fruit they can pick in a certain time.

3. Check for understanding.

Activity Page

AP 8

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to reinforce students' understanding of how numbers are part of observing in science.

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

LESSON 9

Mailbox Mouse

At a Glance

Lesson Question

How can we use information?

Learning Objectives

- ✓ Articulate what it means to explain.
- ✓ Use observations in an explanation.
- ✓ Differentiate irrelevant from relevant details in an explanation.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- differentiation of examples

Main Science Idea

Information is used to support explanations in science and to support design solutions in engineering.

NGSS and CCSS References

SEP6. Constructing Explanations and Designing Solutions: 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.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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detail **explanation**

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.

cubby **nest** **shelter**

Instructional Resources

Student Book

Ch. 9

Student Book, Chapter 9
"Mailbox Mouse"

Activity Page

AP 9

Activity Page
Facts About Mice (AP 9)

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 in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 9 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students to share their observations, experience, and knowledge of mice. They may have seen wild mice, or they may know stories about fictional mice from children's literature.

Online Resources

Show students a video about mice. Discuss what children learned about mice from the video. (See the Online Resources Guide for a recommended resource. **www.coreknowledge.org/cksci-online-resources**)

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How can we use information?

2. Read together: "Mailbox Mouse."

Student Book

Ch. 9

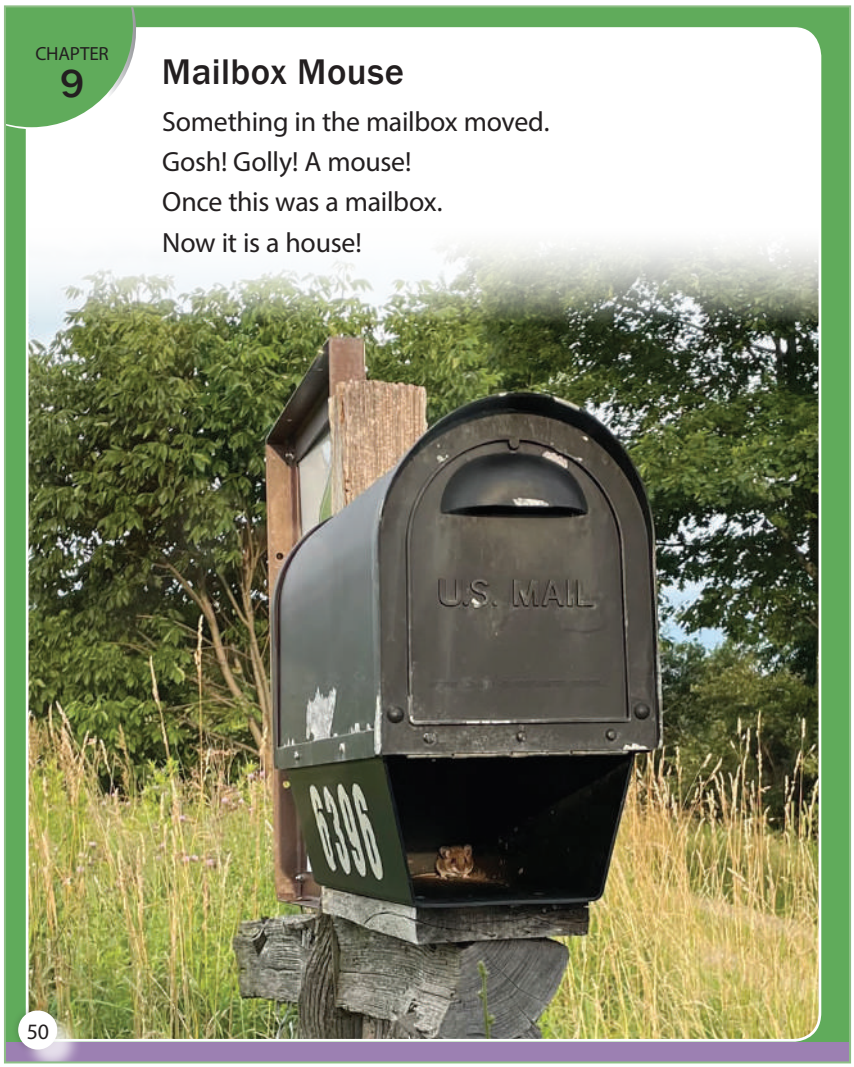
While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 9 on page 50. Point out that the bottom edges of the pages of this chapter are all light purple. Tell students that the title of this chapter is "Mailbox Mouse," and remind them to pay special attention to useful information in the story as you read.

Read Aloud Support

Page 50

Ask students to look at the image as you read aloud. Ask students to think about why a mouse might want to live in a mailbox cubby.



LITERAL—How would you describe the details of the mailbox?

» Sample answer: It is black metal and has a door for mail and a cubby for newspapers and circulars. It has a wooden post and is in a grassy area.

INFERENTIAL—Why would a mouse want to build a nest in this mailbox?

» Sample answer: It has shelter from the rain and wind and some protection from predators.

EVALUATIVE—Do you think it is a good place for a mouse nest?

» Sample answer: no, because people would constantly be disturbing it when they put things in the mailbox

Page 51

Ask students to look at the images as you read aloud. Have them think about different **explanations** about mice.

LITERAL—What do mice need to live?

» Sample answer: food, water, and shelter

INFERENTIAL—Does the mailbox provide food, water, and shelter?

» Sample answer: It provides shelter, but the mouse would have to go out for food and water.

INFERENTIAL—Use observations to explain why the man is on the chair.

» Sample answer: He looks scared. He would rather be on the chair than on the floor. He is afraid of the mouse.

INFERENTIAL—What is an explanation?

» Sample answer: An explanation gives reasons and details to make something clear or easy to understand.

Page 52

Ask students to look at the image as you read aloud. Talk about ways people could keep a mouse from building a nest in the mailbox.

INFERENTIAL—What would a mouse have to do to build a nest in the mailbox cubby?

» Sample answer: The mouse would have to spend a lot of time dragging dry pieces of grass or plant matter up the wooden post.

INFERENTIAL—What could people do to keep a mouse from building a nest in the mailbox?

» Sample answer: put a door on the cubby or put a metal barrier around the post that mice could not climb on

Challenge students to provide **details** about what an ideal nest for a mouse would be.

Page 53

Ask students to look at the images as you read aloud. Talk about detailed characteristics of mouse nests.

LITERAL—What are some ideas for different types of mouse nests?

» Sample answer: a nest made of twigs and bark or a nest made from a tennis ball or coconut

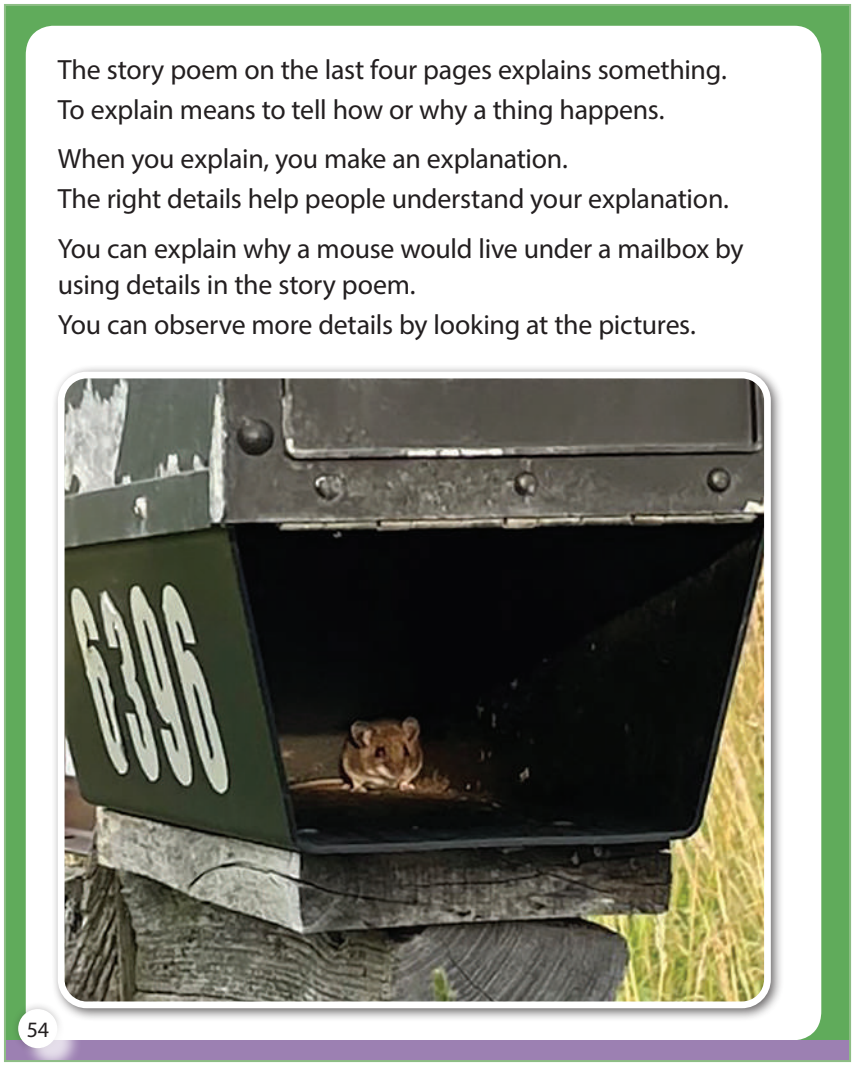
EVALUATIVE—What would make an ideal mouse nest?

» Sample answer: a space with a solid roof to keep out the rain that is near a water source and a source of food

SUPPORT—Make a list or draw simple pictures of different types of animal nests, such as a bird nest in a tree or birdhouse, a burrow underground, and a doghouse. Have students explain the characteristics of a good nest: provides shelter and safety from predators and is near a source of water and food.

Page 54

Ask students to look at the image as you read aloud. Talk about the benefits and drawbacks to having a nest in this mailbox.



INFERENTIAL—What can you observe from the picture to explain why a mouse would make a home in the mailbox?

» Sample answer: It provides shelter and a wooden post to make it easy to get food and water.

EVALUATIVE—What details do you notice that wouldn't affect whether it's a good or bad place for a mouse to build a nest?

» Sample answer: The number on the mailbox and the peeling paint would not matter.

Know the Standards TEACHER DEVELOPMENT

SEP6. Constructing Explanations and Designing Solutions In this lesson, students construct an explanation based on observations as to why a mailbox would and would not make a good home for a mouse. They also consider irrelevant details.

Page 55

Ask students to look at the images as you read aloud. Talk about the details in the chapter text that do not help explain about a mouse home.

EVALUATIVE—What would make a terrible mouse house?

» Sample answer: a place that is exposed to the weather or predators

3. Check for understanding.

Activity Page

AP 9

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' understanding of relevant and irrelevant information. Discuss the differences between facts and opinions and details that matter in an explanation and other details that do not matter.

Read each statement about mice, and have students examine the images. Then ask them to discuss which statement is not a fact about mice.

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

LESSON 10

Dirt Mound Mystery

At a Glance

Lesson Question

What are claims and evidence?

Learning Objectives

- ✓ Describe what a claim is.
- ✓ Select evidence that supports a claim from provided options.
- ✓ Make a claim from provided evidence.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- identification of evidence

Main Science Idea

A claim is a scientific claim based on observation and evidence. Evidence are facts that support or dispute a claim.

NGSS and CCSS References

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.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

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claim **evidence** **support**

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.

false **right** **true** **wrong**

Instructional Resources

Student Book

Ch. 10

Student Book, Chapter 10
"Dirt Mound Mystery"

Activity Page

AP 10

Activity Page
Mole Evidence (AP 10)

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 in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 10 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students to share their observations, experience, and knowledge of moles. Some may not be aware of moles because they are rarely seen. There are some fictional moles like Moley in *The Wind in the Willows* or Beatrix Potter's Diggory Delvet.

Online Resources

Show students a video about moles. (See the Online Resources Guide for a link to a recommended resource. **www.coreknowledge.org/cksci-online-resources**) Discuss what children learned about moles from the video.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What are claims and evidence?

2. Read together: "Dirt Mound Mystery."

Student Book

Ch. 10

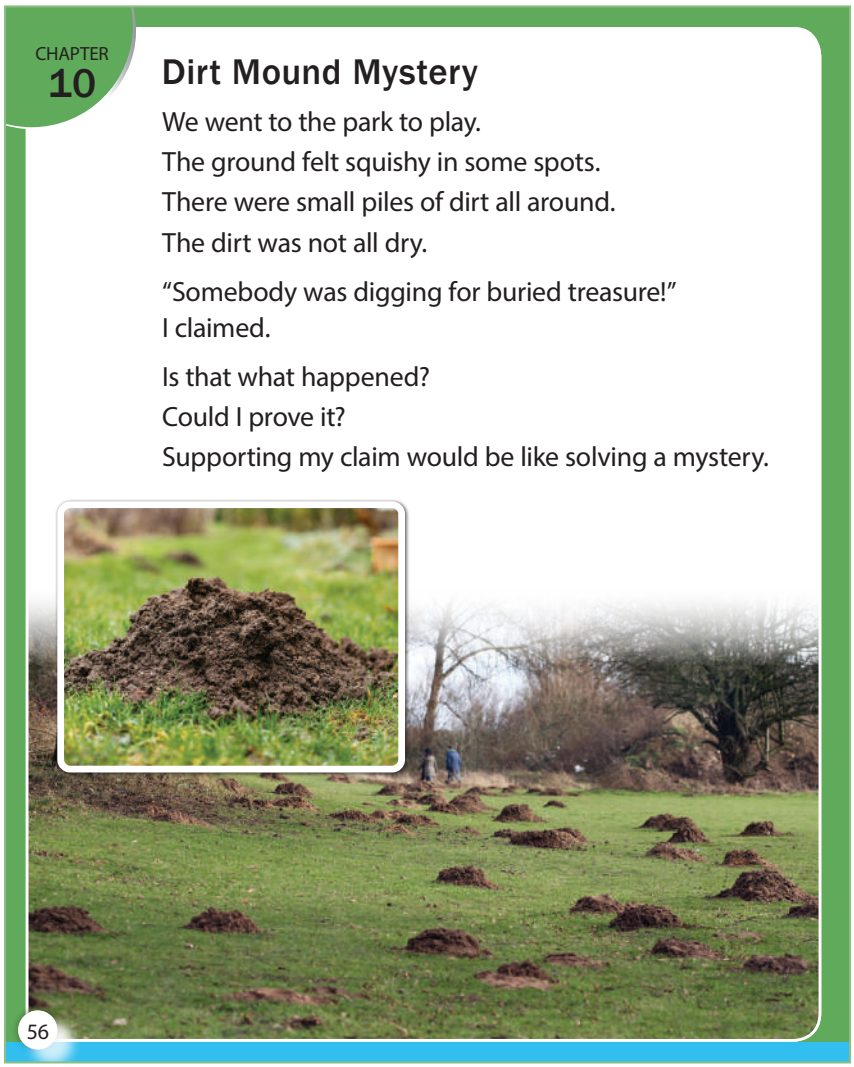
While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 10 on page 56. Point out that the bottom edges of the pages of this chapter are all light blue. Tell students that the title of this chapter is "Dirt Mound Mystery," and remind them to pay special attention to clues and evidence as you read.

Read Aloud Support

Page 56

Ask students to look at the images as you read aloud. Ask students to think about what could have made the dirt piles.



CHAPTER 10

Dirt Mound Mystery

We went to the park to play.
The ground felt squishy in some spots.
There were small piles of dirt all around.
The dirt was not all dry.

"Somebody was digging for buried treasure!"
I claimed.

Is that what happened?
Could I prove it?
Supporting my claim would be like solving a mystery.

56

LITERAL—How would you describe the details of the dirt piles?

» Sample answer: They are in the form of small, random hills. There are no holes nearby. They are fresh piles of dirt, not clumps.

INFERENTIAL—What could have caused these piles to appear?

» Sample answers: some animal from underground, someone dumping piles of dirt they dug from some other place

EVALUATIVE—Why might the piles be a problem?

» Sample answer: You could trip over them. They could destroy plants. They are not attractive.

Page 57

Ask students to look at the images as you read aloud. Have them think about steps to solve a mystery.

INFERENTIAL—What would be the first step in solving a mystery?

» Sample answer: identify and describe the mystery

INFERENTIAL—What is the mystery to solve in this story?

» Sample answer: What made the piles of dirt?

INFERENTIAL—What is a **claim**?

» Sample answer: A claim is a statement that something is true even if you don't have any evidence.

INFERENTIAL—What is **evidence**?

» Sample answer: something that gives proof or a reason to believe something is true

Page 58

Ask students to look at the image as you read aloud and think about any evidence that a person made the dirt piles.

I claimed someone was digging for buried treasure.
To search for buried treasure, someone would make holes.
There were no holes near the dirt piles.

Instead, maybe someone was preparing to plant a garden!
A gardener would usually make organized holes or rows.
The piles were scattered all about.

Shovels often leave marks where they went into the ground.
There was no evidence of those kinds of marks.
A person probably did not make the dirt piles.

58

LITERAL—What claim is made?

» Sample answer: The dirt piles were made by someone digging for buried treasure.

INFERENTIAL—What evidence would prove that someone was digging for buried treasure?

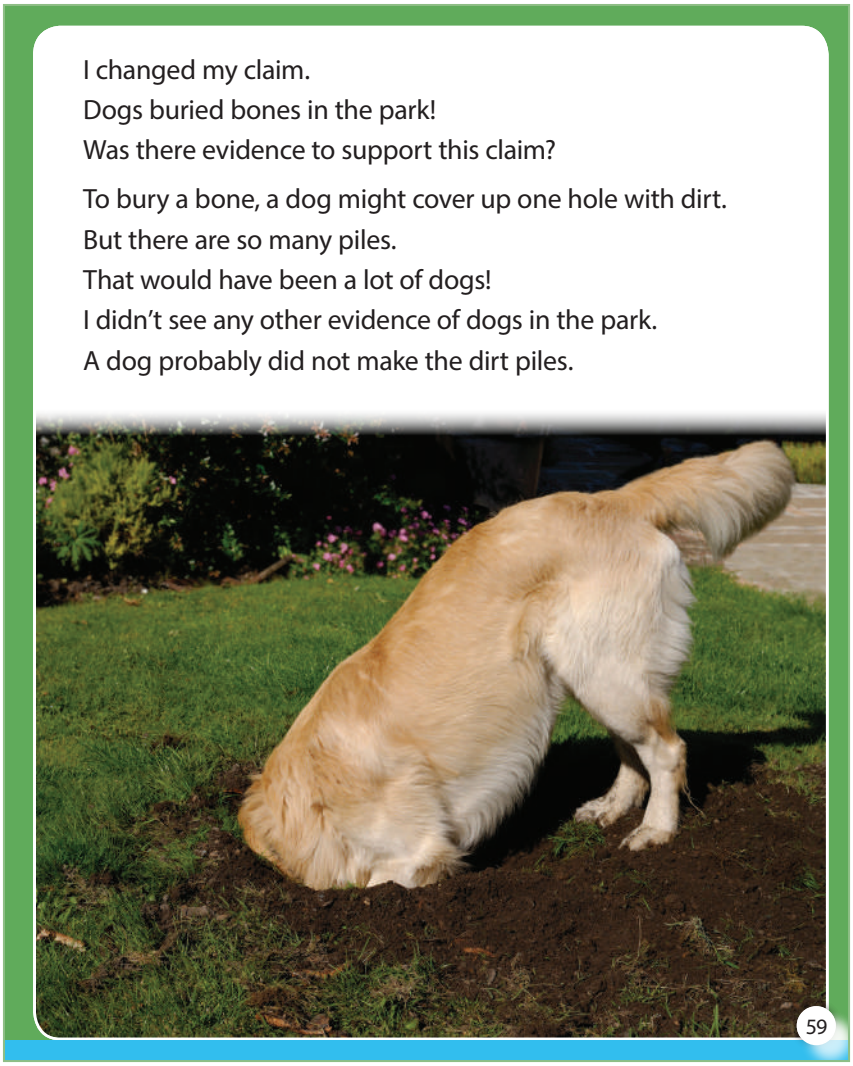
» Sample answer: There would be deep holes in the ground with dirt piled around.

EVALUATIVE—Does the evidence of the piles of dirt **support** this claim?

» Sample answer: no, because there are no holes

Page 59

Ask students to look at the image as you read aloud. Talk about why dogs dig up dirt.



LITERAL—What is the new claim on this page as to what created the dirt piles?

» Sample answer: A dog was burying a bone.

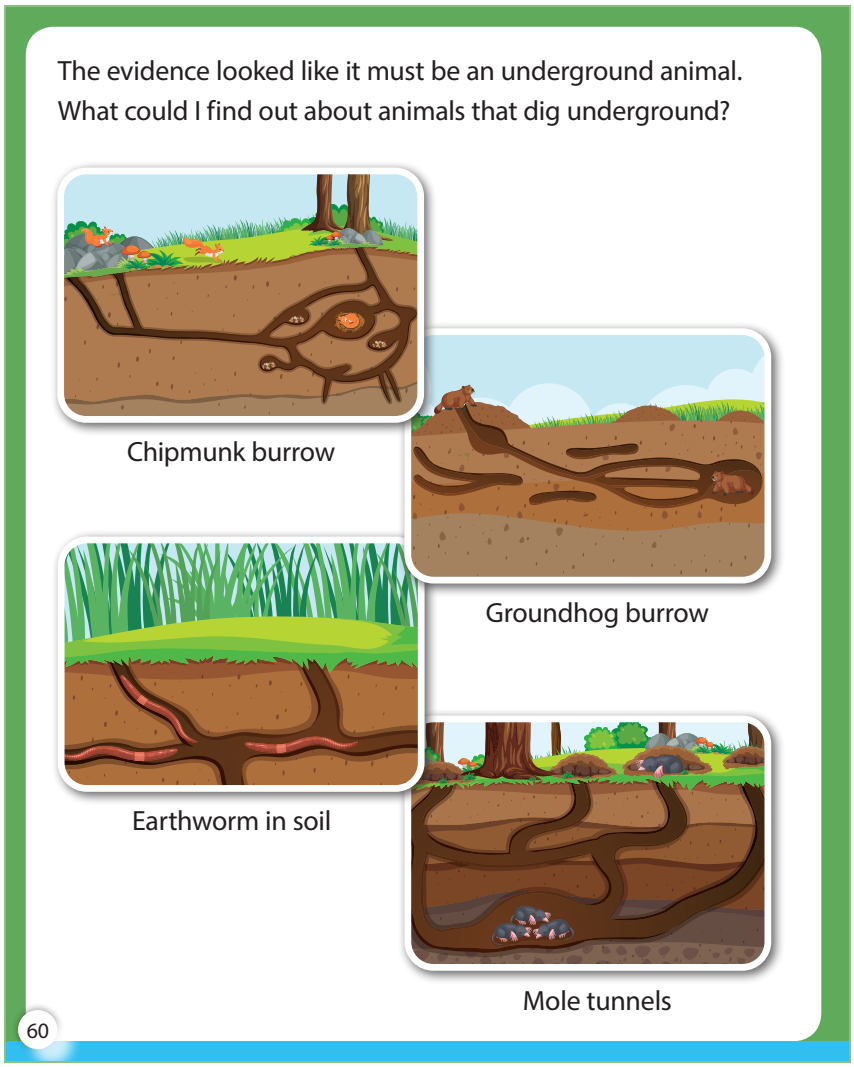
EVALUATIVE—Is this claim supported by evidence?

» Sample answer: No. There is no hole, and there are too many dirt piles.

SUPPORT—Discuss the word *support*. Have students think of words that mean the same as *support* (hold up, help, provide for, agree with). Explain that *support* can also mean "to provide proof or evidence for." Ask children to describe the evidence that does not support that a dog created the dirt piles.

Page 60

Ask students to look at the images as you read aloud. Have them think of different animals that live underground.



LITERAL—Describe the features of the different underground animal homes.

» Sample answer: A chipmunk has many tunnels and many tunnels and often several entrances. An earthworm has a very small tunnel. A mole creates many piles as it pushes up dirt looking for food.

INFERENTIAL—What do you know about what the different underground animals eat?

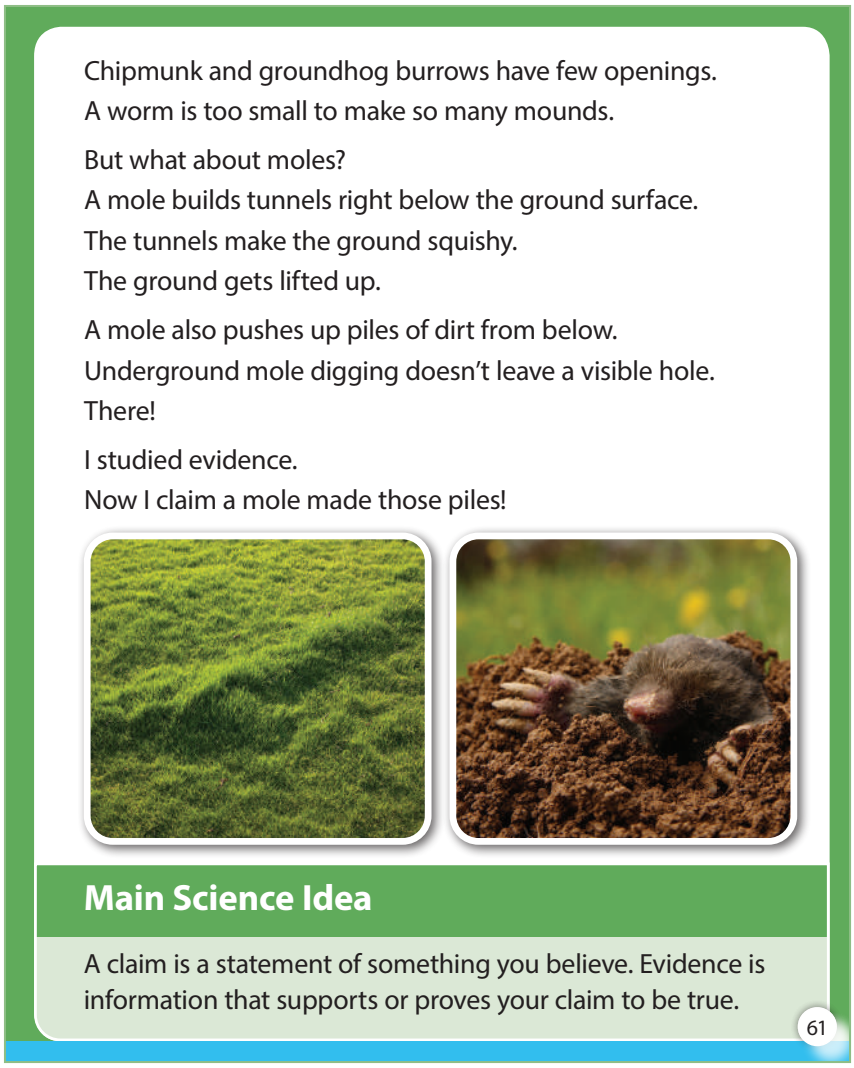
» Sample answer: Chipmunks eat berries and nuts. Rabbits and groundhogs eat plants. Worms eat decaying matter.

EVALUATIVE—Would a chipmunk, groundhog, or worm push up dirt piles searching for food?

» Sample answer: no, because they eat foods that are all aboveground

Page 61

Ask students to look at the images as you read aloud. Talk about the evidence that supports the claim that the dirt piles were made by moles.



LITERAL—Look back through the pages of the story. What evidence supports the claim that moles made the dirt piles?

» Sample answer: The piles are pushed up from below the ground. They seem to be random. There are no holes around them.

3. Check for understanding.

Activity Page

AP 10

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' understanding of relevant and irrelevant information.

Discuss each picture and whether it does or does not provide evidence of moles.

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

LESSON 11

Science Clues

At a Glance

Lesson Question

What is scientific information, and where can we get it?

Learning Objectives

- ✓ Recognize text, photos, diagrams, and data visualizations as potential sources of science information.
- ✓ Identify evidence about a natural phenomenon from an image.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

Scientific information is information that describes phenomena. Some potential sources of scientific information can be media such as images, charts, and graphs.

NGSS and CCSS References

SEP8. Obtaining, Evaluating, and Communicating Information: 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.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

The 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.

diagram **photograph**

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.

shadow **sunrise** **sunset**

Instructional Resources

Student Book

Ch. 11

Student Book, Chapter 11
"Science Clues"

Activity Page

AP 11

Activity Page
Sunrise Sunset (AP 11)

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 in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 11 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students to share their observations, experience, and knowledge of sunrise and sunset. They may describe some of these events as spectacular and others as a gradual lightening or darkening of the sky.

Online Resources

Show students a video about sunrise and sunset. (See the Online Resources Guide for a link to a recommended resource. **www.coreknowledge.org/cksci-online-resources**) Discuss what students learned about how the sun moves across the sky during the day from the video.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What is scientific information, and where can we get it?

2. Read together: "Science Clues."

Student Book

Ch. 11

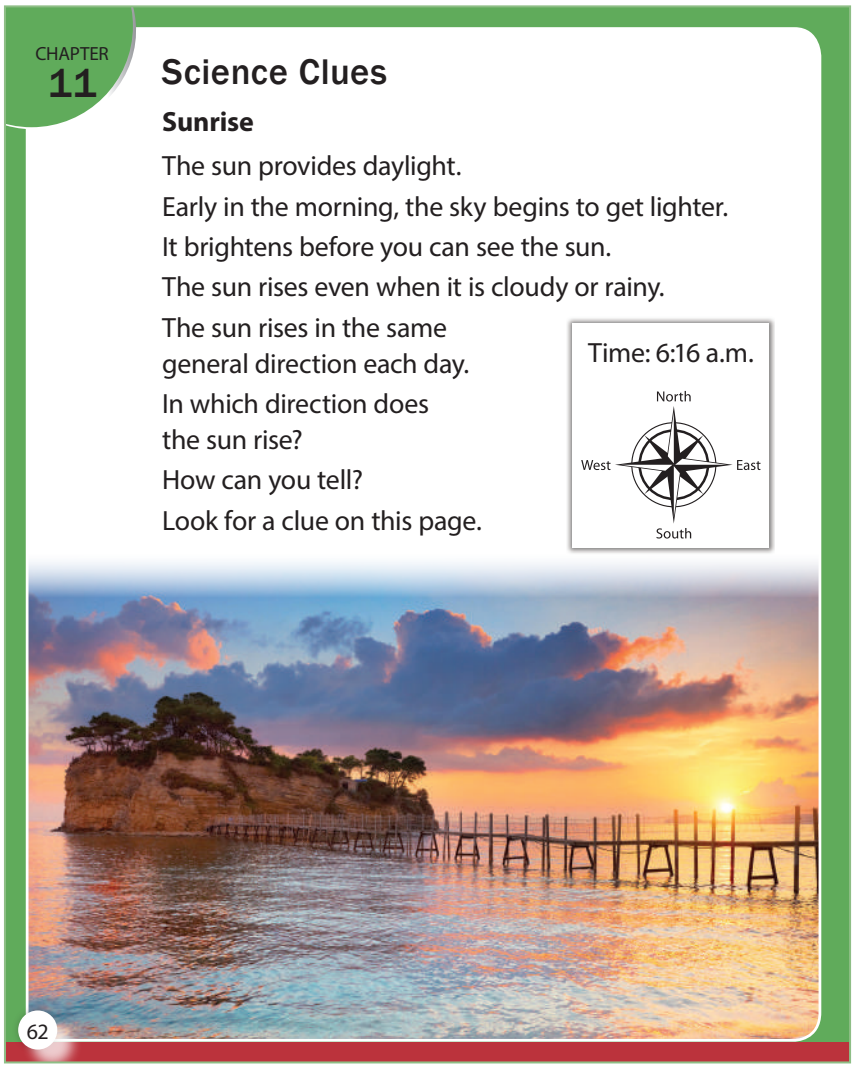
While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 11 on page 62. Point out that the bottom edges of the pages of this chapter are all red. Tell students that the title of this chapter is "Science Clues," and remind them to pay special attention to where they spot science clues on the pages as you read.

Read Aloud Support

Page 62

Ask students to look at the image as you read aloud. Ask students to think about what is happening in the picture.



LITERAL—How would you describe the details of a sunrise?

» Sample answer: Sunrise starts when the night sky gets lighter. Soon the colors and darkness are gone, and you can see everything outside.

INFERENTIAL—How can you tell which direction the sun rises from by combining information on the page?

» The compass icon that shows directions tells that the sun in the photo is in the east.

INFERENTIAL—How do you know this is a sunrise and not a sunset?

» Sample answer: The title tells you it is sunrise.

Page 63

Ask students to look at the image as you read aloud. Ask students to think about what is happening in the picture.

LITERAL—How would you describe the details of a sunset?

» Sample answer: The sun is low in the sky, near where the sky meets the land.

INFERENTIAL—How do you know this is a sunset and not a sunrise?

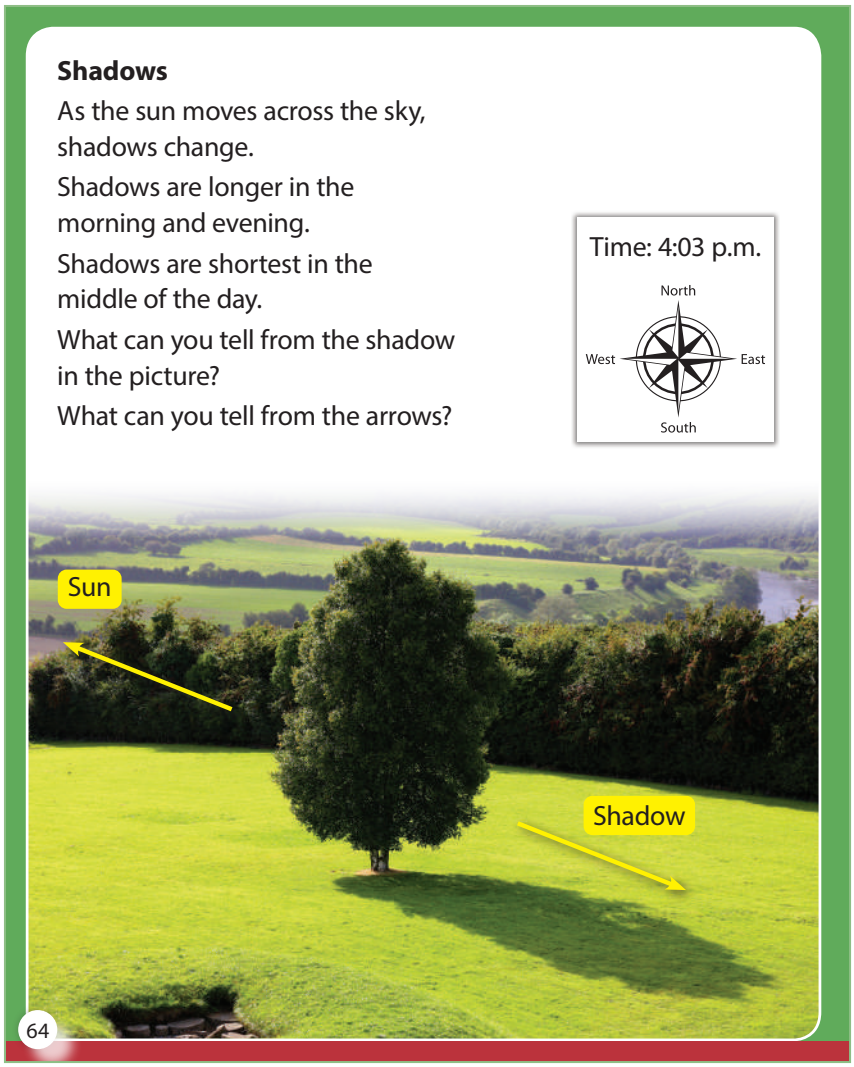
» Sample answer: The title tells you it is sunset.

INFERENTIAL—What is the difference between a sunrise and a sunset?

» Sample answer: The sun rises in the east. It sets in the west.

Page 64

Ask students to look at the image as you read aloud and think about what the picture tells you about what time of day it is.



LITERAL—Describe the picture.

» Sample answer: A shadow of the tree is in the grass.

INFERENTIAL—What does the shadow tell you about what time of day it is?

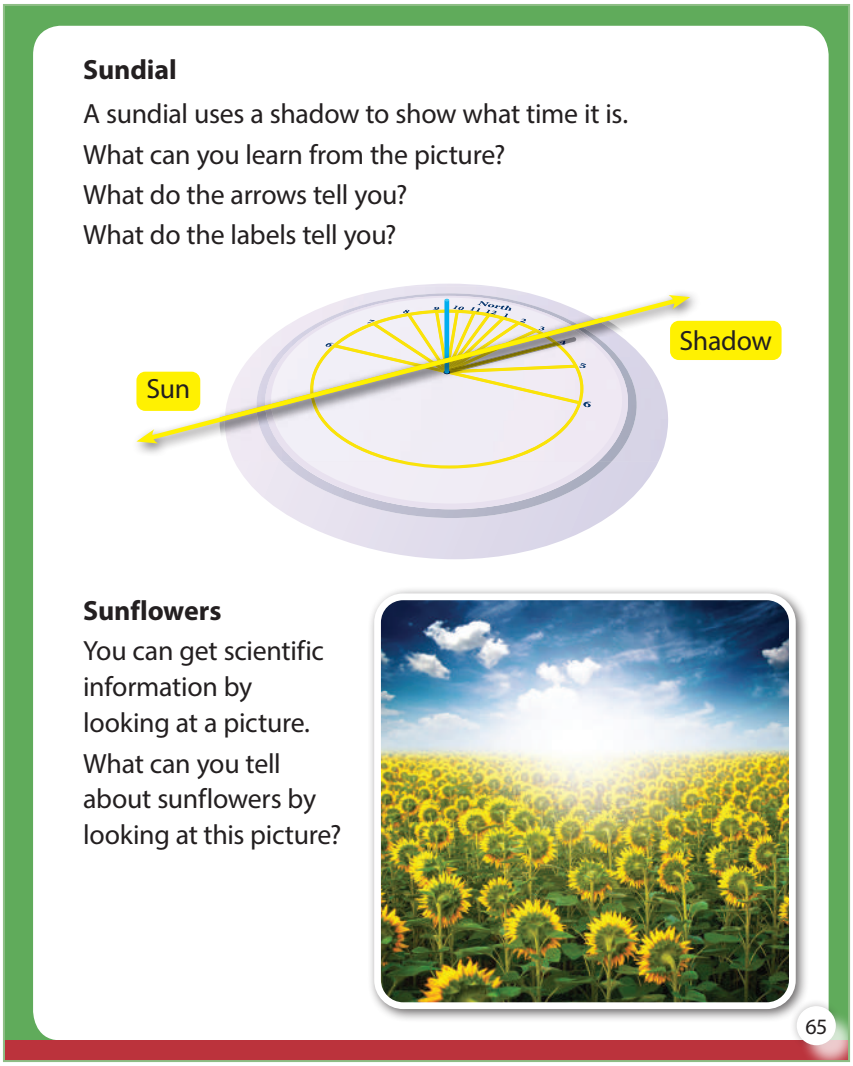
» Sample answer: It is either early morning or late afternoon because the sun is making a long shadow.

Know the Standards TEACHER DEVELOPMENT

SEP8. Obtaining, Evaluating, and Communicating Information In this lesson, students obtain, evaluate, and communicate information they find in photographs, drawings, and diagrams.

Page 65

Ask students to look at the images as you read aloud. Ask them to think about how shadows change throughout a sunny day.



INFERENTIAL—How can a sundial tell time?

» Sample answer: Because the sun moves across the sky, the sun's shadows change during a sunny day. If you position the sundial and leave it in place, the shadows can show how the time is changing along with the shadows.

EVALUATIVE—Is a paper plate sundial a good timekeeper?

» Sample answer: no, because it would be hard to place in a reliable location and would not be accurate during night or a windy or cloudy day

Discuss the differences between a **diagram** and **photograph**. Lead students to conclude that both are images. A photograph is an image of a real thing or event. A diagram is a drawing that explains or shows something. Have them compare the diagram of the sundial and the picture of the sunflowers.

Page 66

Ask students to look at the images as you read aloud. Have them think about why they need to be protected from the sun's rays.

LITERAL—Describe the setting of the photographs.

» Sample answer: a beach on a hot, sunny day

INFERENTIAL—How do you know it is a beach in the summer and what time of day it is?

» Sample answer: You can see sand and water and summer toys. The shadow shows that it is in the middle of the day.

EVALUATIVE—Why is it important to protect yourself from the sun?

» Sample answer: Your skin can burn.

CHALLENGE—Challenge students to develop a safety chart of ways to communicate how people can protect themselves from the sun's rays.

Page 67

Ask students to look at the images as you read aloud. After each step, discuss how they could perform the process.

Sundial at the Beach

You can get information from drawings.
These drawings provide instructions.
They show how to make a sundial at the beach.
You can follow these instructions without words.

Main Science Idea

We can learn scientific information from printed words, from photos, and from drawn pictures and diagrams.

67

Ask students the following question:

INFERENTIAL—Compare the paper plate sundial to this sundial. How are they the same? How are they different?

» Sample answer: They both use the sun's shadows to tell time with a stick or straw in the middle of a circular clock. One uses a drawing on a plate. The other uses shells in sand.

3. Check for understanding.

Activity Page

AP 11

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' ability to create a series of drawings to communicate a process.

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

LESSON 12

Nature Patterns

At a Glance

Lesson Question

What are patterns, and where can we see them in nature?

Learning Objectives

- ✓ Identify and describe a pattern from a photo.
- ✓ Identify and describe a pattern from a diagram.
- ✓ Identify and describe a pattern from a numerical data set.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

Patterns are phenomena that repeat over and over. Patterns can be used as evidence to predict that something will happen again.

NGSS and CCSS References

CCC1. Patterns: Children recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

CCSS.MATH.PRACTICE.MP7: Look for and make use of structure.

CCSS.MATH.PRACTICE.MP8: Look for and express regularity in repeated reasoning.

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

The 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.

chart **diagram** **pattern** **table**

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.

desert **sand dune** **season**

Instructional Resources

Student Book

Ch. 12

Student Book, Chapter 12
"Nature Patterns"

Activity Page

AP 12

Activity Page
Nature Pattern (AP 12)

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 in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 12 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students to share their observations, experience, and knowledge of patterns in nature. They may tell about the number of legs on different animals; how plants grow from seeds, flower, and die; how leaves change color with the season; or weather patterns they have observed.

Online Resources

Show students a video about patterns in nature. Discuss what patterns they have seen when they go outside. (See the Online Resources Guide for a link to a recommended video. **www.coreknowledge.org/cksci-online-resources**)

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What are patterns, and where can we see them in nature?

2. Read together: "Nature Patterns."

Student Book

Ch. 12

While some advanced students may be able to read words on a given page of the Student Book, as a 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 12 on page 68. Point out that the bottom edges of the pages of this chapter are all dark blue. Tell students that the

title of this chapter is "Nature Patterns," and remind them to pay special attention to patterns they see on the pages as you read.

Read Aloud Support

Page 68

Ask students to look at the images as you read aloud. Ask students to identify what is repeating in each photograph.


CHAPTER 12

Nature Patterns

Ocean waves wash toward the shore.
They make lines of tumbling water.
The lines appear again and again.
The process repeats over and over.
It's a pattern.

A raindrop falls on a still puddle.
What pattern can you see in this picture?
What about the pattern repeats?

68

LITERAL—Ask students to describe the repeating **pattern** in each photograph.

» Sample answer: The waves and ripples create a pattern in water.

INFERENTIAL—How might water patterns change?

» Sample answer: In a storm, the waves will get bigger. The ripples will be bigger if a large rock is dropped in the water.

EVALUATIVE—How does knowing about patterns help you?

» Sample answer: Patterns let you know what is going to happen next.

Page 69

Ask students to look at the images as you read aloud. Ask students to think about the pattern in each photograph.

LITERAL—Ask students to describe the pattern in each photograph.

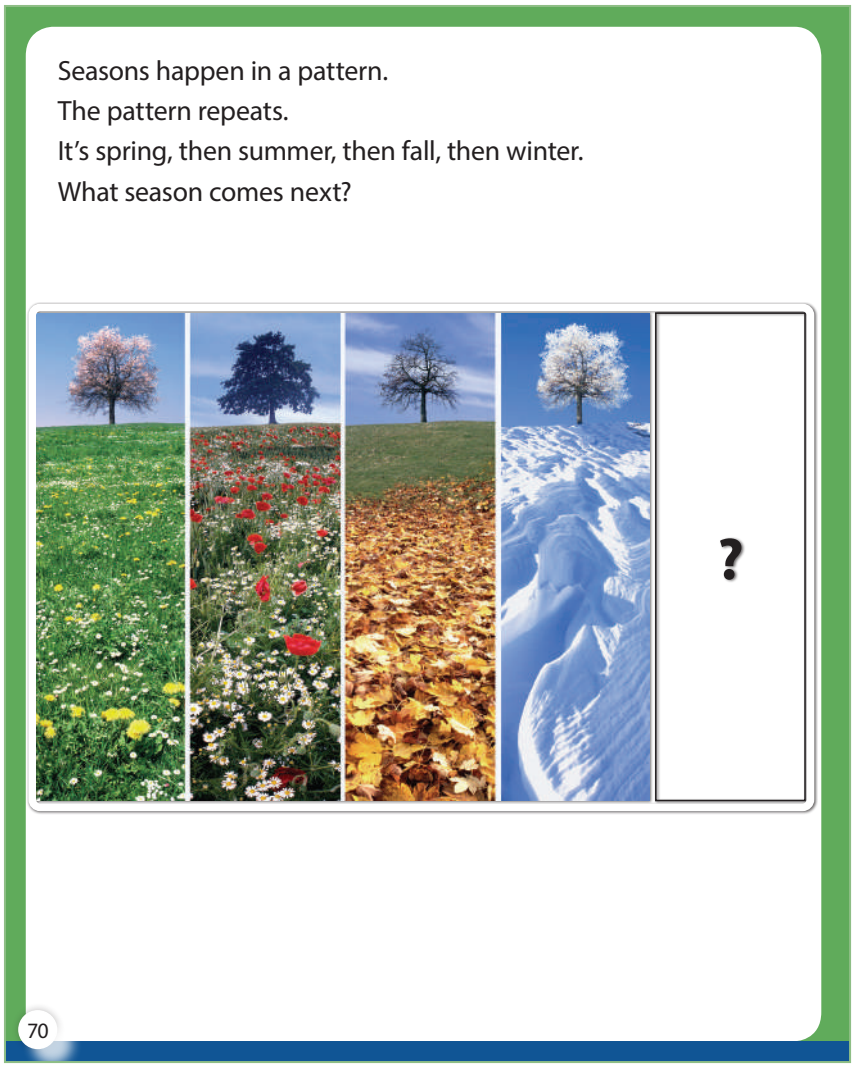
» Sample answer: The sand appears like ripples. The stones are all smooth. The spider web is circular, and the drops are clinging to the web strands.

INFERENTIAL—What caused the pattern to appear in each photograph?

» Sample answer: The wind caused the sand ripples. The water caused all the stones to be smooth. A spider created the web pattern to catch insects.

Page 70

Ask students to look at the images as you read aloud and think about what the picture tells about patterns.



LITERAL—Describe the pattern in the photographs.

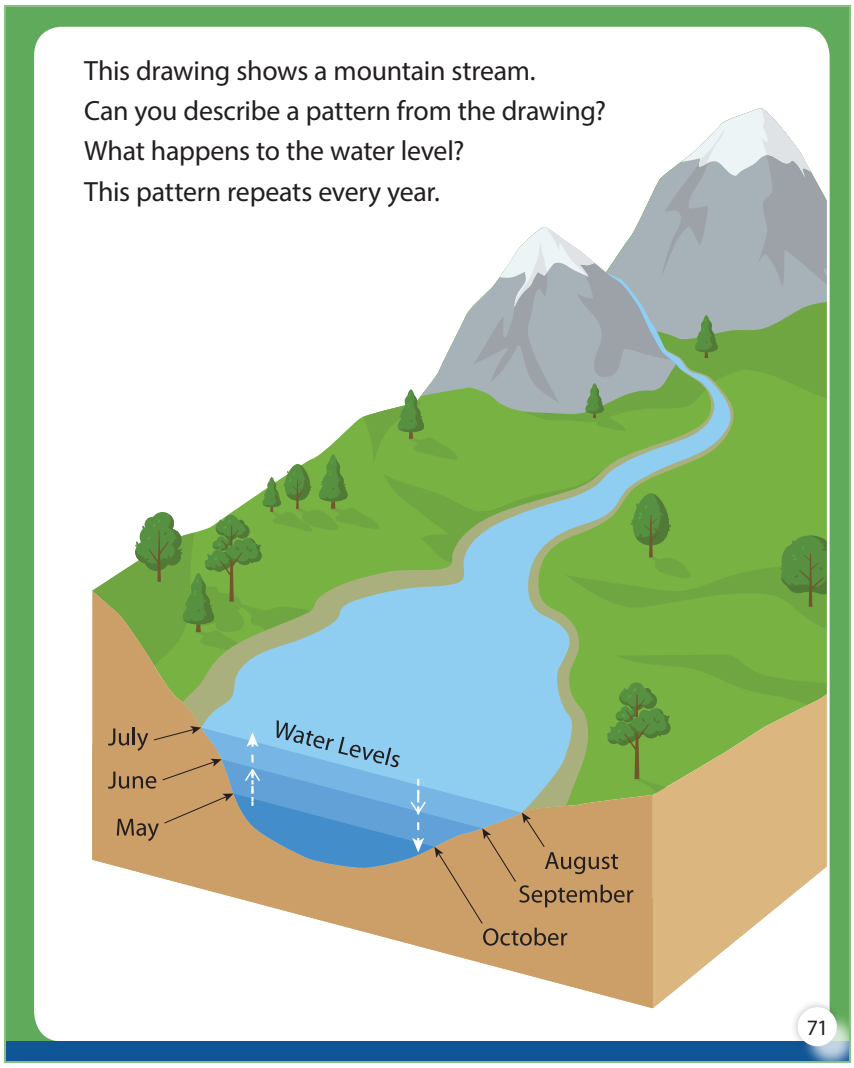
» Sample answer: In spring, the tree is flowering; in summer, it is green; in fall, the leaves fall off; and in winter, snow covers the branches.

Know the Standards TEACHER DEVELOPMENT

CCC1. Patterns Crosscutting concepts apply across all domains of science and in other disciplines as well. Observed patterns in nature guide organization, classification, and prediction and prompt questions about relationships and underlying concepts. In this lesson, students encounter different kinds of patterns found in nature.

Page 71

Ask students to look at the image as you read aloud. Ask them to think about how the water level changes.



LITERAL—Describe the water pattern in the drawing.

» Sample answer: The water level rises in May, June, and July. It goes down in August, September, and October.

Explain that snow in the mountains melts in the summer months. It runs downhill in streams. It collects in mountain ponds and lakes, making them fuller in the summer.

INFERENTIAL—Why doesn't water fill up lakes as much in the winter?

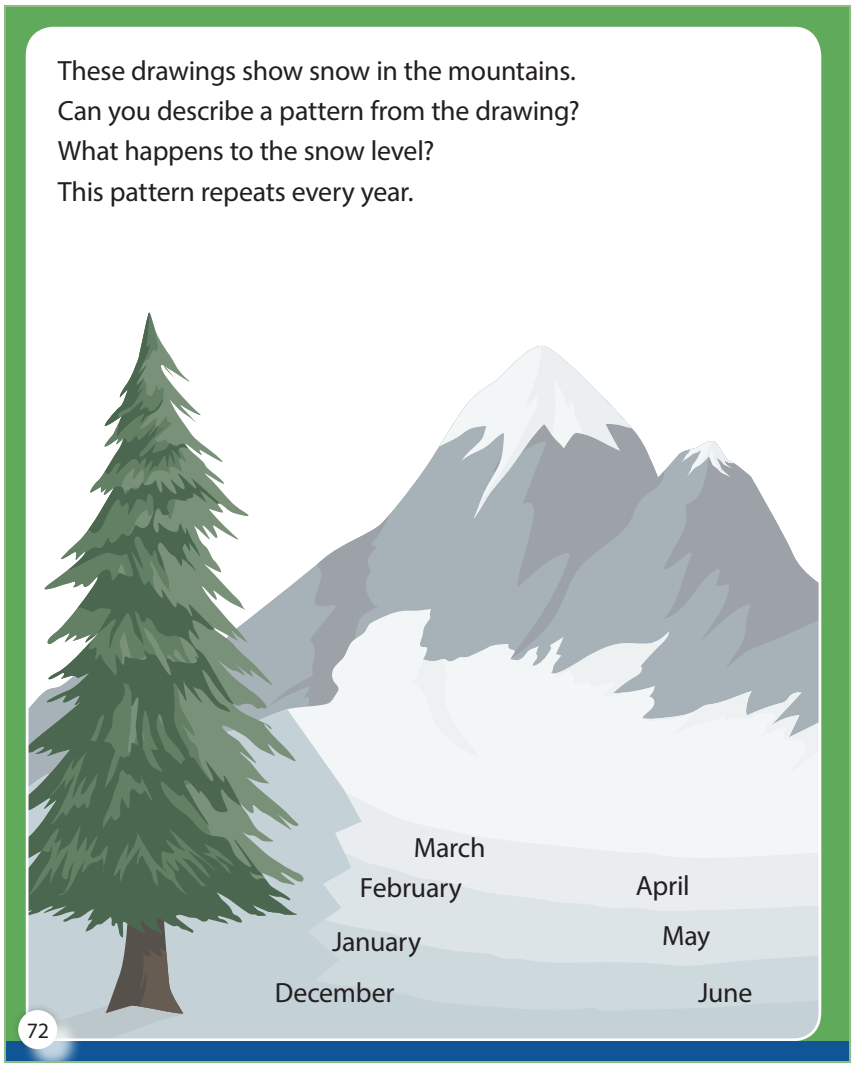
» Sample answer: because snow in the mountains stays frozen

INFERENTIAL—How could you show this pattern in photographs instead of drawings?

» Sample answer: You would have to take pictures of the mountain and a lake at different times of the year.

Page 72

Ask students to look at the image as you read aloud. Have them think about how the level of snow changes.



LITERAL—Describe the pattern of the snow in the pictures.

» Sample answer: The amount of snow goes up from December through March. Then the amount of snow goes down from April through June.

INFERENTIAL—How does knowing the pattern help people predict what will happen the next year?

» Sample answer: If you know how much snow to expect in an area, you can be prepared for staying safe.

CHALLENGE—Challenge students to describe how they think the pattern of the amount of snow might relate to the lives of animals that live in the mountains. During the months with the most snow, many animals probably hibernate or migrate to someplace else. In which months is this probably true?

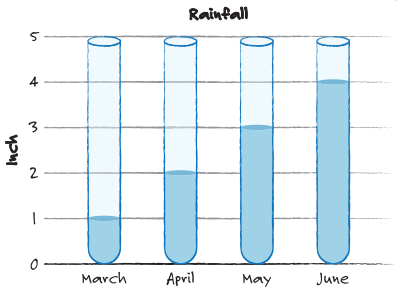
Page 73

Ask students to look at the images as you read aloud. Have them think about the way the **chart** and **table** arrange the information in a way that makes the patterns easier to see.

A chart can show a pattern.

This chart shows how much rain falls in a valley during the spring.

What is the pattern from March to April to May to June?



Numbers can show a pattern, too.

Look at the numbers in the table.

What pattern do they show about the insects?

Type of Insect	How many body sections?	How many legs?
	3	6
	3	6
	3	6
	3	6

Main Science Idea

A pattern is something that repeats in a predictable way.
We can notice patterns when we observe.

73

LITERAL—Describe the pattern in each image.

» Sample answer: The chart shows the pattern of rainfall over four months. The table shows the pattern of insect body sections and legs.

3. Check for understanding.

Activity Page

AP 12

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' ability to create a drawing to identify a pattern in nature.

Discuss different patterns students have seen in nature. Have each student describe the pattern they will draw or have drawn.

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

LESSON 13

Wiley Wyatt Wonders Why

At a Glance

Lesson Question

What are causes and effects?

Learning Objectives

- ✓ Identify causes of outcomes in different scenarios.
- ✓ Identify effects produced by causal factors in different scenarios.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- matching exercise

Main Science Idea

A cause is something that results in an event or condition. An effect is the result of the cause.

NGSS and CCSS References

CCC2. Cause and Effect: 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.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

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Core Vocabulary and Language of Instruction

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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.

cause **effect**

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.

lightning **thunder**

Instructional Resources

Student Book

Ch. 13

Student Book, Chapter 13
"Wiley Wyatt Wonders Why"

Activity Page

AP 13

Activity Page
Cause and Effect (AP 13)

Materials and Equipment

Collect or prepare the following items:

- none

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 13 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students to share their observations, experience, and knowledge of causes and effects. Ask what happens if you leave the cap off a marker. Explain that the cause of a marker drying out is that the cap was left off. Have students explain the causes of different things that have happened to them.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What are causes and effects?

2. Read together: "Wiley Wyatt Wonders Why."

Student Book

Ch. 13

While some advanced students may be able to read words on a given page of the Student Book, as a 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 13 on page 74. Point out that the bottom edges of the pages of this chapter are all dark purple. Tell students that the title of this chapter is "Wiley Wyatt Wonders Why," and remind them to pay special attention to things that cause other things to happen as you read.

Read Aloud Support

Page 74

Ask students to look at the images as you read aloud. Ask students to think about times they have experienced thunderstorms.

CHAPTER 13

Wiley Wyatt Wonders Why

Wiley Wyatt wonders
Why it thunders after lightning.
She's just a little curious.
She doesn't find it frightening.

Does one thing cause the other?
Can a flicker make a crash?
She wonders, "Could the thunder
Come *before* a lightning flash?"

Wiley thinks it over
As the rain begins to fall.
When it comes to science questions,
Wiley Wyatt asks them all!

74

LITERAL—Ask students to describe the lightning and thunder experience.

» Sample answer: First, you see lightning, and then you hear thunder.

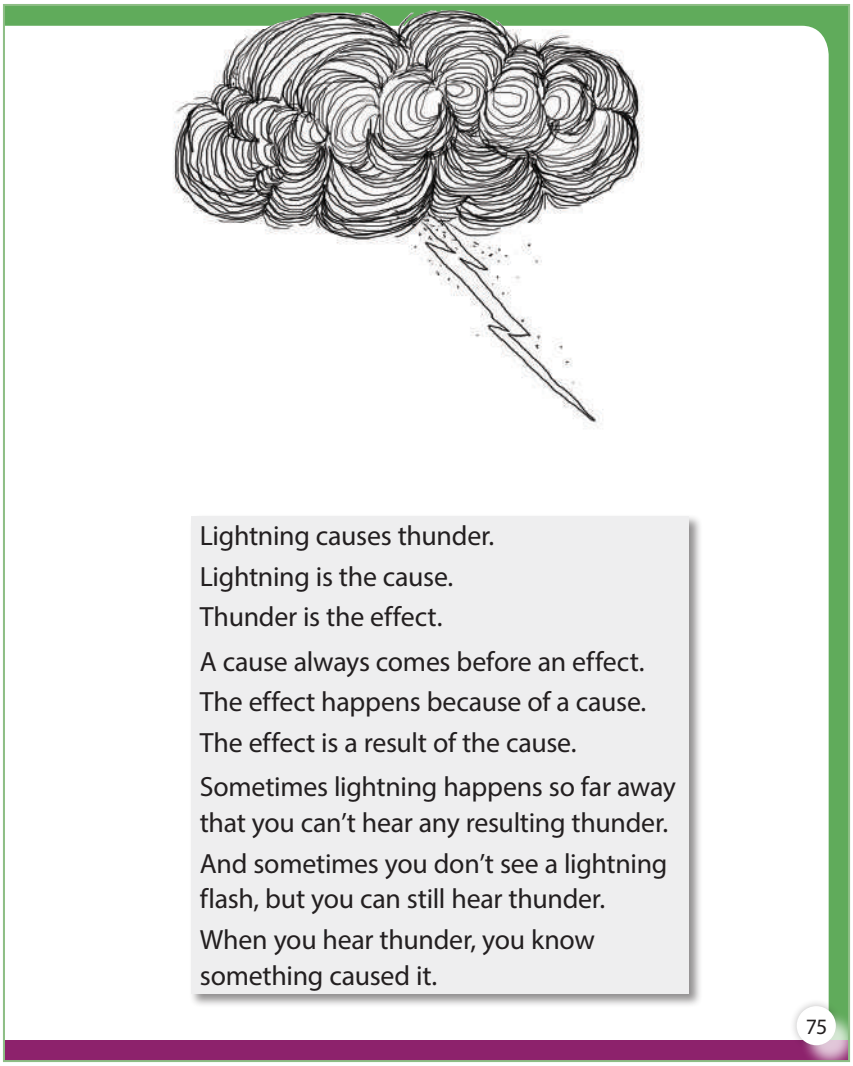
INFERENTIAL—What are some other likely effects of a thunderstorm?

» Sample answer: It will rain, and the wind will blow.

Ask students to provide another word or synonym for the word **cause**. Relate it to the words *reason for.* Next, have them think of a synonym for **effect**. Relate it to the word *result*. Then, have them use the words *cause* and *effect* in a sentence. For example, *Leaving the porch light on at night was the cause of the effect that so many insects were flying around the light.*

Page 75

Ask students to look at the picture as you read aloud. Ask students to think about the difference between thunder and lightning.



LITERAL—Ask students to describe the pattern of cause and effect.

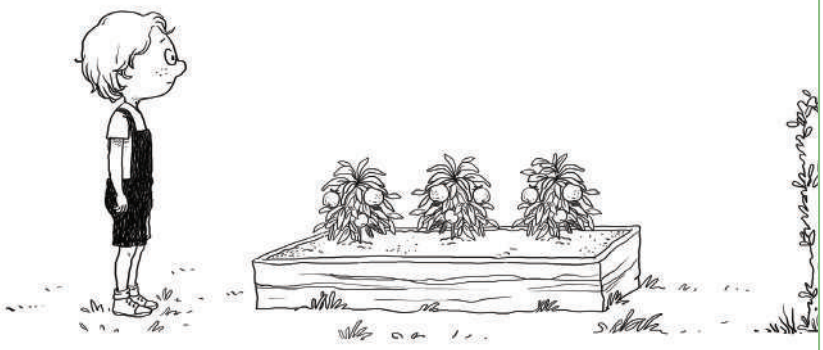
» Sample answer: A cause comes before an effect. The effect happens because of a cause.

INFERENTIAL—If you hear a loud sound like thunder but have not seen lightning, does that mean that something else caused the thunder?

» Sample answer: It could be that it was not thunder but a big crash. It could also be that the lightning was hidden by clouds or was far away. Something caused the effect of the loud sound.

Page 76 **Ask students to think about how Howie's and Joe's tomato plants are different.**

Howie Houser wonders
How to make tomatoes grow.
Howie likes to garden.
So does Howie's neighbor Joe.
Howie has some plants that he
Can barely keep alive.
Joe grows huge tomato plants.
What causes his to thrive?
What does Joe do differently
That makes his plants grow tall?
When it comes to science questions,
Howie Houser asks them all.



76

LITERAL—Describe the difference in Howie's and Joe's tomato plants.

» Sample answer: Howie's plants are small and not healthy. Joe's are large, leafy, and strong.

INFERENTIAL—What could be causes of the differences between Howie's and Joe's tomato plants?

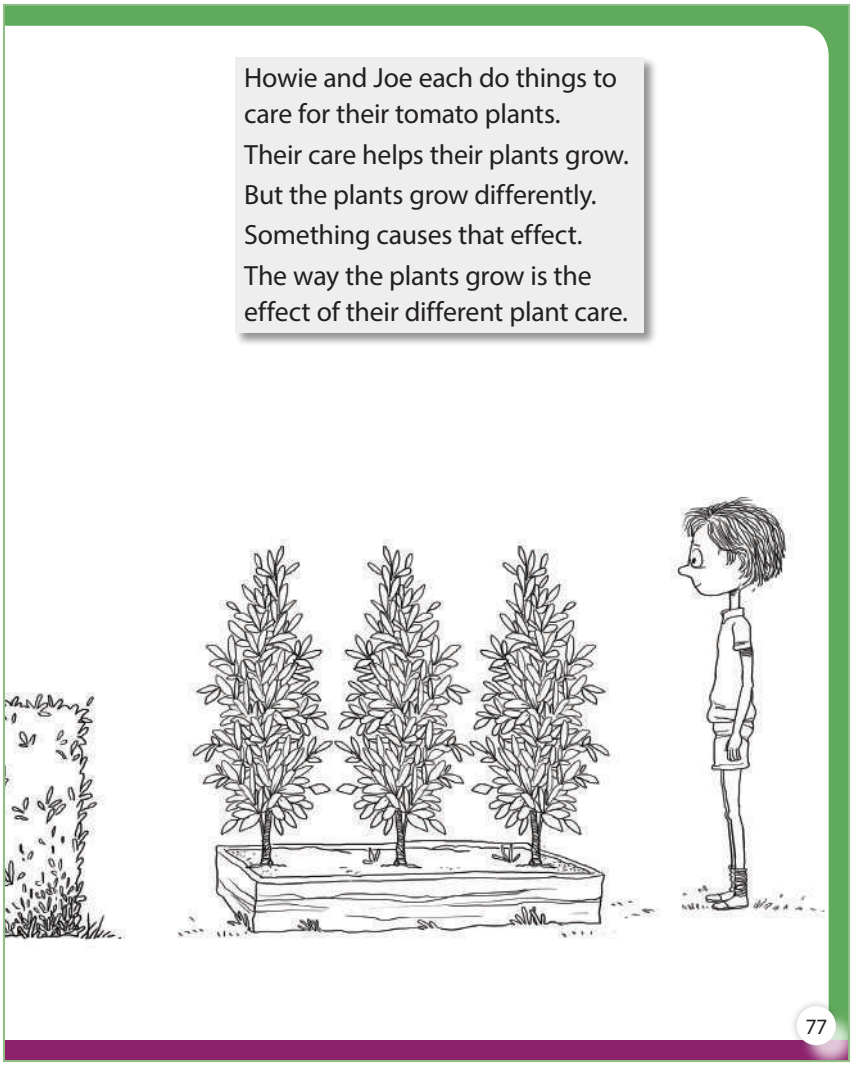
» Sample answer: Joe may have more sun or better soil, or he may water and fertilize the plants.

Know the Standards TEACHER DEVELOPMENT

CCC2. Cause and Effect In this lesson, students encounter different examples of the cause-and-effect relationship in nature, including causes and effects in weather and plant and animal behavior.

Page 77

Ask students to look at the image as you read aloud. Ask them to think about what causes plants to grow.



INFERENTIAL—Explain what Joe might be doing that Howie is not doing to help his plants grow.

» Sample answer: Joe might be watering his plants more often.

INFERENTIAL—What would the effect of not enough water be in tomato plants?

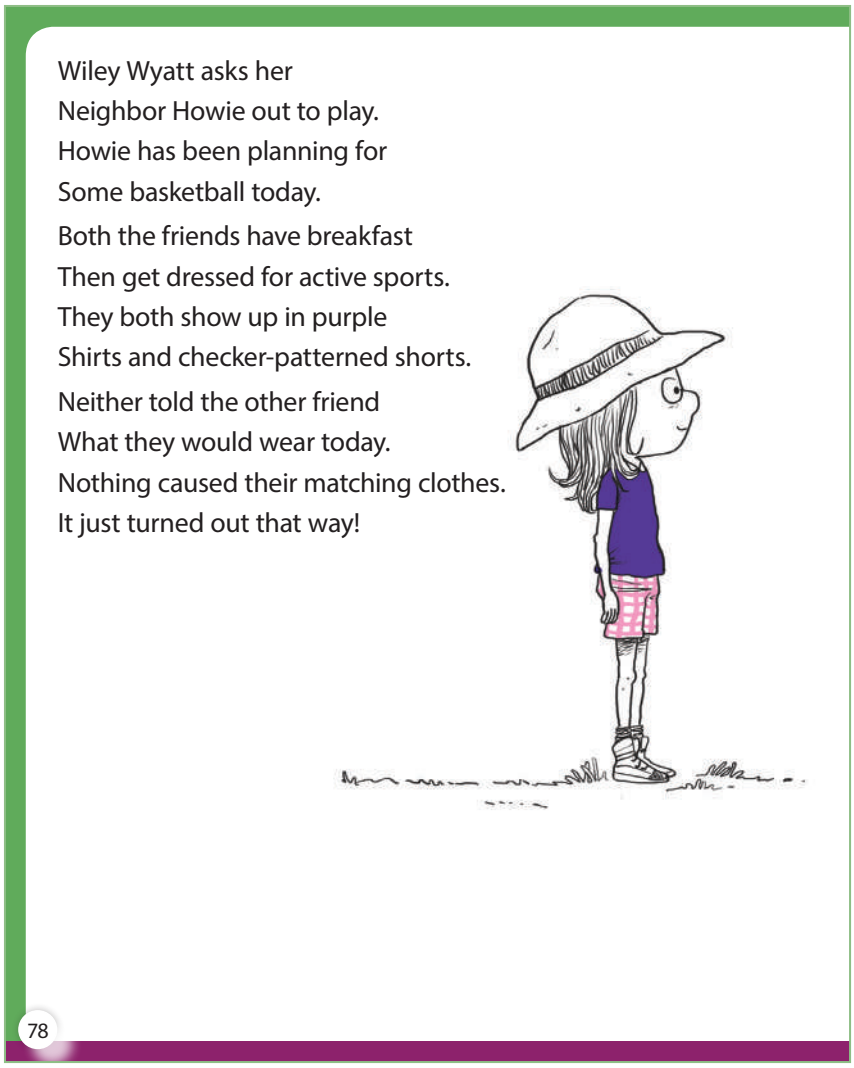
» Sample answer: They might dry up and die, or they would not grow very well if they did not die.

EVALUATIVE—Why is it good to understand the cause of an effect?

» Sample answer: If you understand what is causing a problem, you can fix it.

Page 78

Ask students to look at the image as you read aloud. Have them think about the relationship between cause and effect.



LITERAL—Describe what happened in the poem.

» Sample answer: Wiley and Howie wore very similar outfits.

INFERENTIAL—Does every effect have a cause?

» Sample answer: yes

INFERENTIAL—Did Wiley and Howie plan to wear very similar outfits?

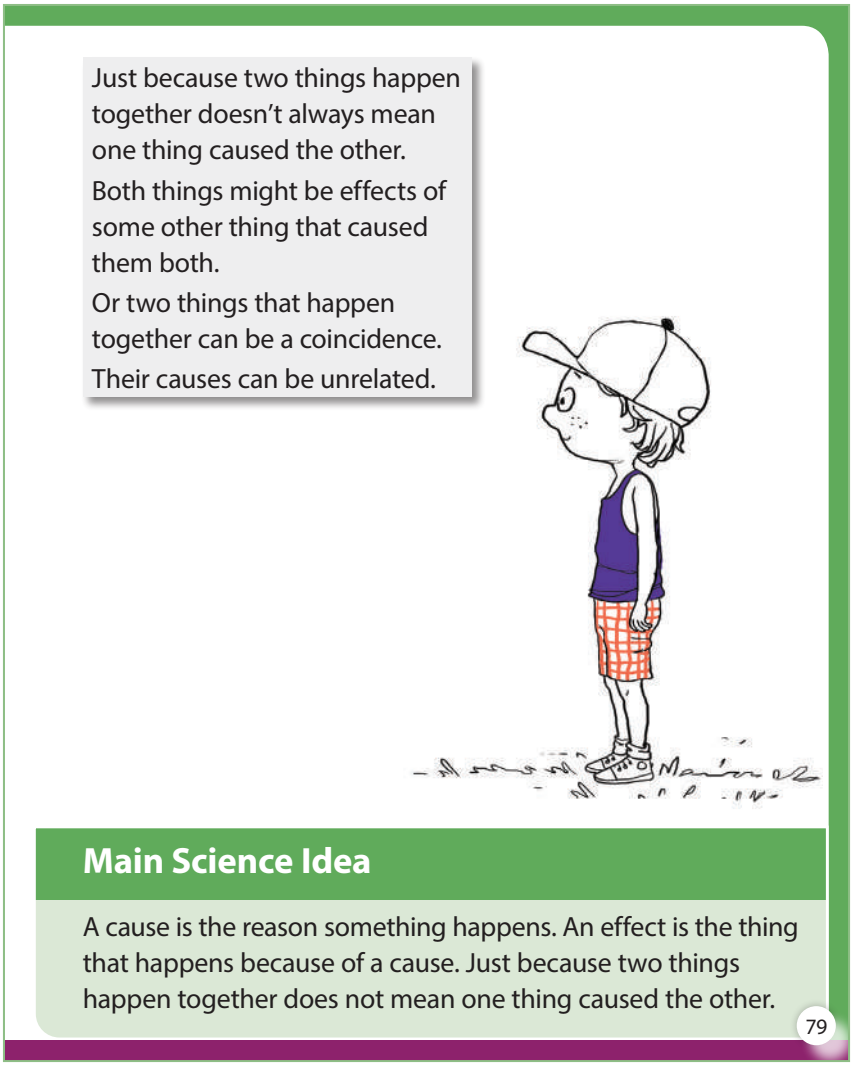
» Sample answer: No, they had different reasons.

INFERENTIAL—What might have been the cause of Wiley and Howie wearing very similar outfits on that day?

» Sample answers: It was what they had that was clean. They liked wearing that outfit. They wanted to dress for the same activity.

Page 79

Ask students to look at the images as you read aloud. Have them think about how causes and effects are related.



EVALUATIVE—How could knowing about cause and effect help in a situation in which all the trees in an area are dying?

» Sample answer: Looking for the cause of the tree illness would be the first step in saving the trees. When you know the cause, you can figure out what to do to fix the problem. The trees might need more water or protection from disease.

3. Check for understanding.

Activity Page

AP 13

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Facilitate students' completion of Activity Page 13, and discuss different causes and effects students have seen in nature.

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

LESSON 14

Soohyun's Nature Notes

At a Glance

Lesson Question

What are some scales we observe in science?

Learning Objectives

- ✓ Use descriptive and comparative terms to express a broad range of sizes of objects.
- ✓ Use descriptive and comparative terms to express a range of temperature observations.
- ✓ Use descriptive and comparative terms to express a range of distances and relative speeds.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- practice with examples

Main Science Idea

Science uses scales such as size, temperature, and speed to describe and compare phenomena.

NGSS and CCSS References

CCC3. Scale, Proportion, and Quantity: Students use relative scales (e.g., bigger and smaller; hotter and colder; faster and slower) to describe objects.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

R1.K.5. Integration of Knowledge and Ideas: With prompting and support, describe the relationship between illustrations and the text in which they appear

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

The 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.

distance **size** **speed** **temperature**

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.

compare **range** **scale**

Instructional Resources

Student Book

Ch. 14

Student Book, Chapter 14
"Soohyun's Nature Notes"

Activity Page

AP 14

Activity Page
Making Comparisons (AP 14)

Materials and Equipment

Collect or prepare the following items:

- reference books and other research materials
- variety of natural items of different sizes that can be found outside (for example, rocks of different sizes, acorns or nuts, or leaves of different shapes)

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 14 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Ask students if they have ever explored the outdoors. Invite them to describe what they have seen or felt during their explorations. Tell students you have recently been exploring the outdoors and would like to share a few things you found. Show students the natural items. Ask them how they would describe the items. How are they similar? How are they different?

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What are some scales we observe in science? (tiny to huge, slow to fast, cold to hot, and so on)

2. Read together: "Soohyun's Nature Notes."

Student Book

Ch. 14

While some advanced students may be able to read words on a given page of the Student Book, as a 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 14 on page 80. Point out that the bottom edges of the pages of this chapter are all orange. Tell students that the

title of this chapter is "Soohyun's Nature Notes," and remind them to pay special attention to words that describe and compare things as you read.

Read Aloud Support

Page 80

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

LITERAL—What are some words we can use to describe objects of different **sizes**?

» We can use the words *small*, *smaller*, *smallest*, or *tiny*.

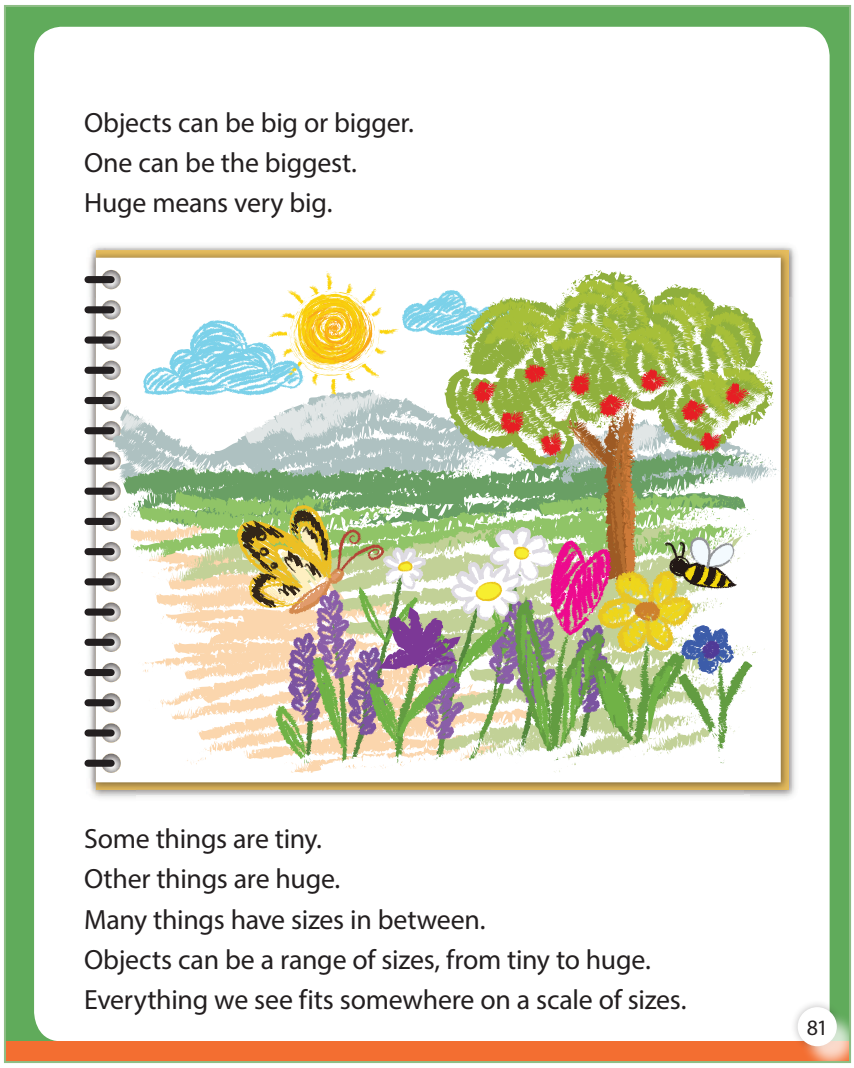
INFERENTIAL—Look around the room. Describe different objects using the words *small*, *smaller*, *smallest*, and *tiny*.

» Student answers will vary. Possible answers may describe a pencil as small, an eraser as smaller, and a broken crayon piece as smallest and tiny.

If students struggle with identifying items, hold up various items, and have students choose from the words *small*, *smaller*, *smallest*, and *tiny* to describe the objects.

Page 81

Ask students to look at the image as you read aloud. Talk about what they notice about the objects and their different sizes.



Tell students that this page is about the different sizes that things can be. *Size* means how big or small something is. Call attention to the different objects in the image.

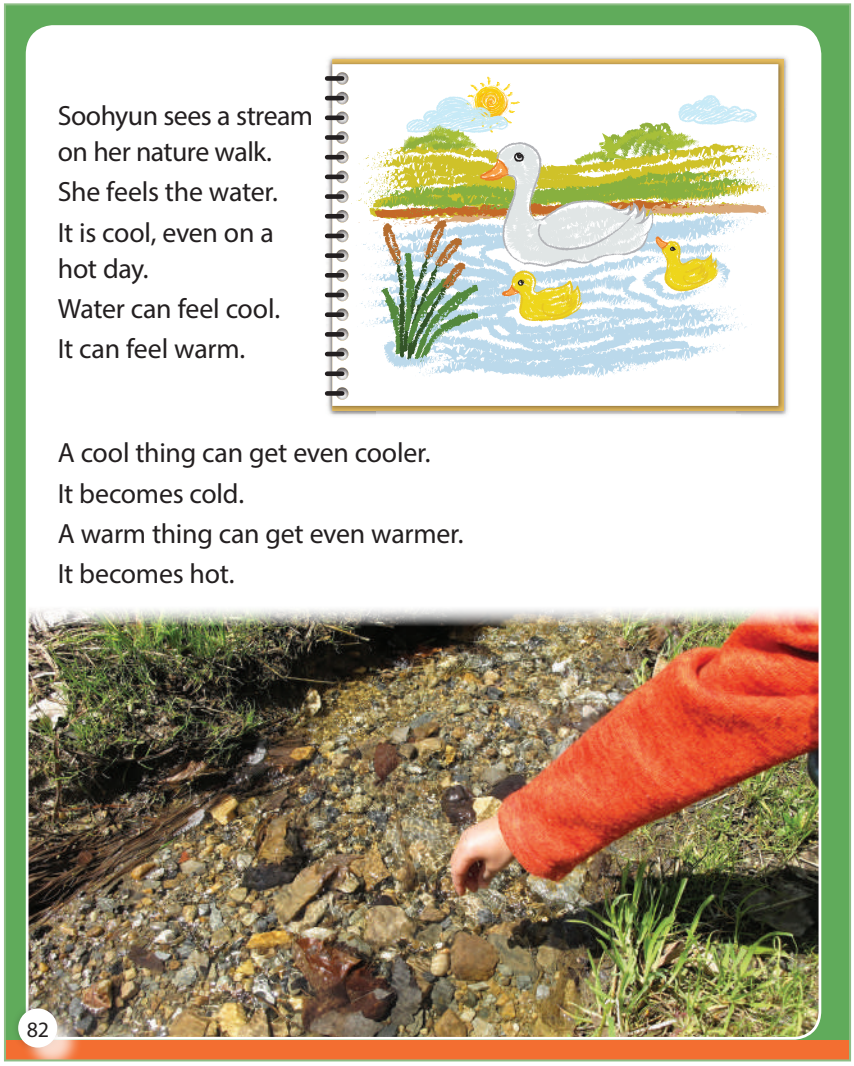
INFERENTIAL—Identify something that is tiny and something that is huge. Now, identify something in the image that is between tiny and huge.

» Possible answers could include a flower petal (tiny) and the sun (huge). Something between tiny and huge is the tree.

SUPPORT—Help students connect and visualize the terms *range* and *scale* by drawing a long line on the board. At one end, write the word *tiny*, and on the other end, write the word *huge*. Have students identify where on the line to write sizes that should come in between. Tell students that the words at the two ends are the *range* and all the describing words are the *scale* of sizes.

Page 82

Ask students to look at the images as you read aloud. Talk about what they notice that relates to the weather. Have them imagine what type of clothing they would be wearing on a day that is cool.



Tell students that the word **temperature** is used to describe how cold or hot something is.

EVALUATIVE—Think back to the word *range* on the previous page. What is the range of temperatures mentioned on this page?

» Temperatures range from cold to hot.

Know the Standards

CCC3. Scale, Proportion, and Quantity This Crosscutting Concept helps kindergarten students use observations to compare objects. These observations and comparisons lead students to ask "why" questions that help guide and motivate their scientific discoveries.

Page 83

Ask students to look at the images as you read aloud. Ask students to compare the clothes they are wearing today to the clothes they see in the pictures. Emphasize the word *compare*, and tell students this means to describe how things are similar to or different from each other.

Draw a long line on the board. Tell students you are making a scale for temperature. As they answer the questions below, complete the scale as they respond.

LITERAL—What words describe the range for the temperature scale?

» Temperature can range from very cold to very hot.

INFERENTIAL—What other words can I use to create the scale?

» *Cold*, *cool*, *warm*, and *hot* can be used.

SUPPORT—Support students by using the scale to compare other objects, like bathwater or ice water.

Page 84 **Ask students to look at the images as you read aloud.**

Tell students this page is about **distance**. *Distance* is how far one thing is from another thing.

LITERAL—What is the range used to describe distance?

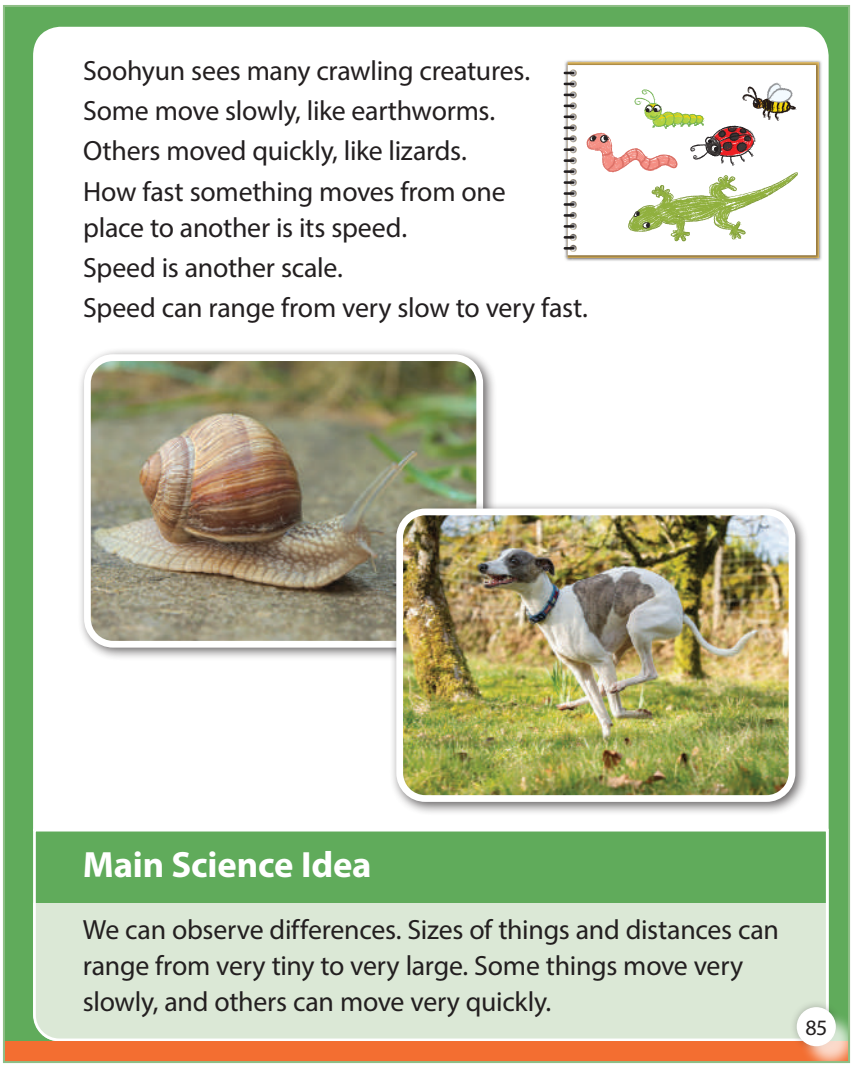
» Distances can range on a scale from near to far.

EVALUATIVE—Look at the pictures. What words can you use to describe the distance between the plants?

» Depending on the picture, students may say things like the distance is very small or the trees are far apart.

Page 85

Ask students to look at the images as you read aloud. Ask students to compare how fast they think the different creatures are moving.



Draw a long line as a scale for speed. Write the words *very slow* on one end and *very fast* on the other. Complete the scale as students respond.

INFERENTIAL—What words should we include on the scale to describe the **speed** of a dog? What about the speed of a human?

» Students may suggest including words like *fast* or *slower* on the scale. Accept all answers if students can explain their thinking.

3. Check for understanding.

Activity Page

AP 14

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Make sure students have Activity Page 14 and a pencil. Place in pairs if desired.

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

LESSON 15

Arnie Looks at Parts

At a Glance

Lesson Question

How do parts work together?

Learning Objectives

- ✓ Describe parts and how they work together in two natural systems.
- ✓ Describe parts and how they work together in a system designed through engineering.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- drawing

Main Science Idea

Parts that make up systems work together to support the function of the system. Parts and systems can be natural or engineered.

NGSS and CCSS References

CCC4. Systems and Systems Models: Students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details in a text.

RI.K.7. Integration of Knowledge and Ideas: With prompting and support, describe the relationship between illustrations and the text in which they appear.

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

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Core Vocabulary and Language of Instruction

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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.

parts **system**

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.

environment **living** **nonliving**

Instructional Resources

Student Book

Ch. 15

Student Book, Chapter 15
"Arnie Looks at Parts"

Activity Page

AP 15

Activity Page
Parts in a System (AP 15)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- drawing materials such as crayons or markers

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 15 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

As a class, watch the video of a Rube Goldberg machine. Ask students to notice and think about how all of the different parts work together. (See the Online Resources Guide for a link to a recommended video. **www.coreknowledge.org/cksci-online-resources**)

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How to parts work together? This can mean parts in nature as well as those designed by people.

2. Read together: "Arnie Looks at Parts."

Student Book

Ch. 15

While some advanced students may be able to read words on a given page of the Student Book, as a 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 15 on page 86. Point out that the top edges of the pages of this chapter are all light purple. Tell students that the title of this chapter is "Arnie Looks at Parts," and remind them to pay special attention to the different parts and how they work together in different ways as you read.

Read Aloud Support

Page 86

Ask students to look at the image as you read aloud. Talk about what they notice about what the boy is holding. This is called a hand lens or magnifying glass. Tell them that sometimes you must look closely at things to have a better understanding of how they work.

LITERAL—What are **parts**?

» Parts are smaller things that make up bigger things.

Call attention to the word *environment*. Ask for a few volunteers to share what they think this word means. Tell them it means all the living and nonliving things in an area.

INFERENTIAL—Is an environment made of parts? Why or why not?

» Yes, an environment is made up of parts because it has things like dirt, animals, plants, and water in it.

Page 87

Ask students to look at the image as you read aloud. Talk about what they notice about the flying examples and their parts.

INFERENTIAL—What might happen if the wings or propeller parts were removed from the plane?

» It wouldn't be able to fly anymore.

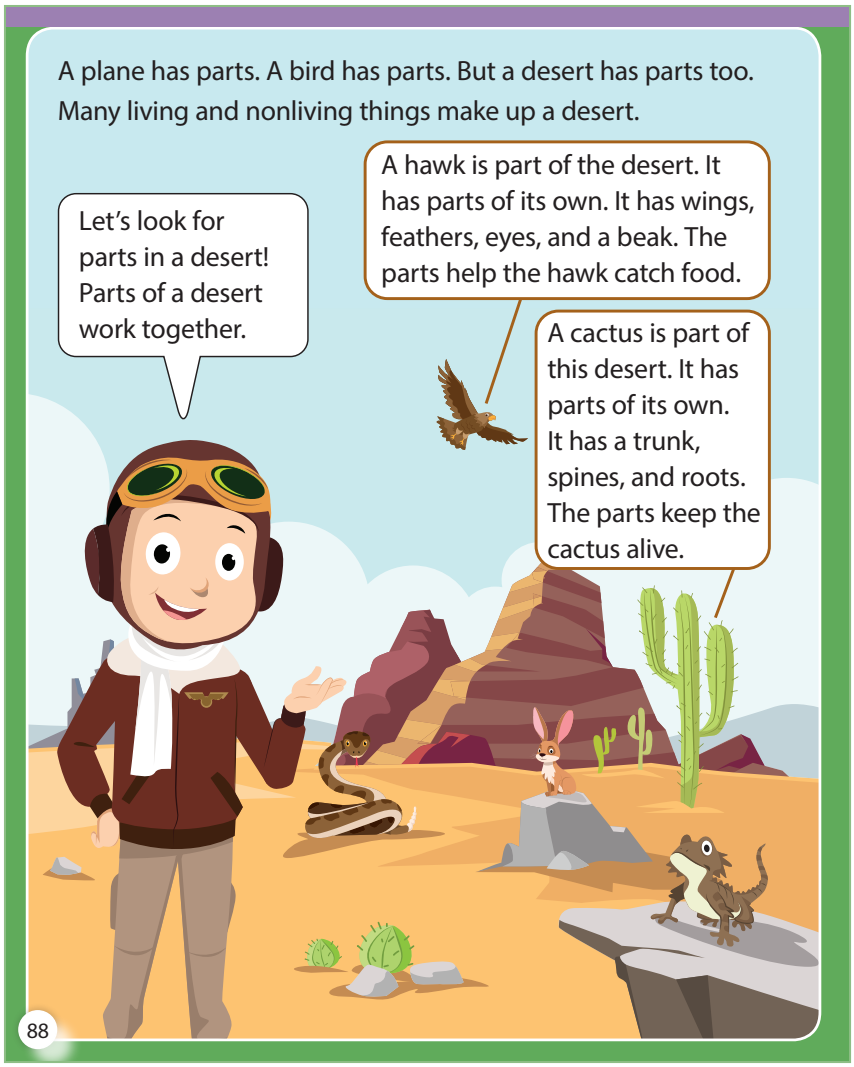
EVALUATIVE—How are birds and airplanes similar?

» They are both made of parts. These parts work together to help them fly.

SUPPORT—Help students understand that all things are made of parts by pointing out familiar objects, such as desks, in the classroom. As a group, point out and name the different parts of the desk (legs, top, screws, etc.). Check understanding by asking them to describe the different parts of a pencil (wood, lead, and eraser).

Page 88

Ask students to look at the image as you read aloud. Talk about what they notice about the desert environment and its parts.



Pair students so that they can discuss and pair-share ideas for the following questions.

LITERAL—Look at the picture of the desert environment. What parts of the desert can you name?

» Students should identify rocks, dirt, cactus, rabbit, mountains, lizard, hawk.

INFERENTIAL—Think about the two parts of a desert described in the text, a cactus and a hawk. How do you think these parts might work together in a desert?

» I think the hawk might live in a cactus. This is how the two parts might work together.

Page 89

Ask students to look at the image as you read aloud. Talk about what they notice about the ocean environment. What kinds of things do they see in the ocean? Ask if anyone has ever been to the ocean. Did they see additional parts that are not in the picture?

LITERAL—What parts of the ocean do you see in the picture?

» I see a starfish, water, sand, coral, fish, and seaweed.

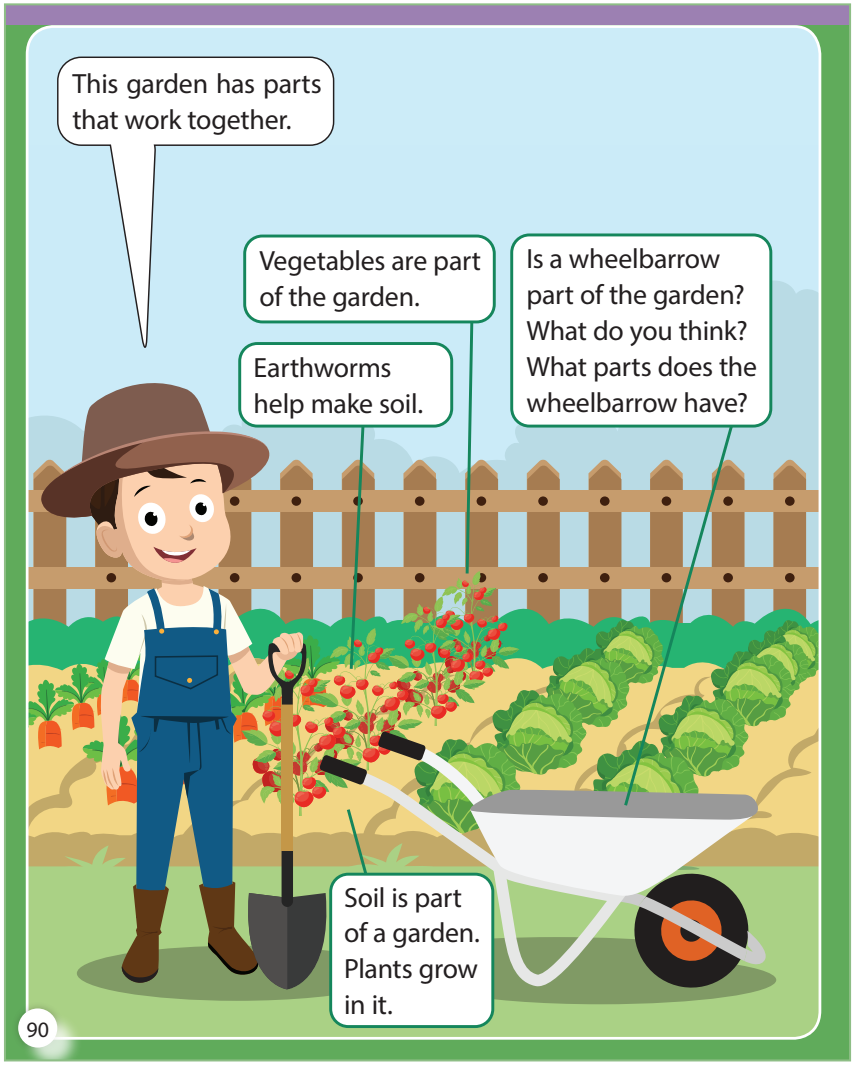
Tell students that a **system** is a group of things that work together. Point out that this doesn't always mean that all plants or animals benefit—they all do something that helps keep the entire system working.

INFERENTIAL—Think about the shark swimming into the picture. How does a shark work in an ocean system?

» I think the shark eats animals in the ocean system.

Page 90

Ask students to look at the image as you read aloud. Talk about what they notice about all the different parts of the garden. Ask if anyone has ever seen, grown, or visited a garden. Have a few students share things they saw in the garden.



Have students answer the text questions:

EVALUATIVE—Is a wheelbarrow part of the garden? What do you think? What parts does the wheelbarrow have?

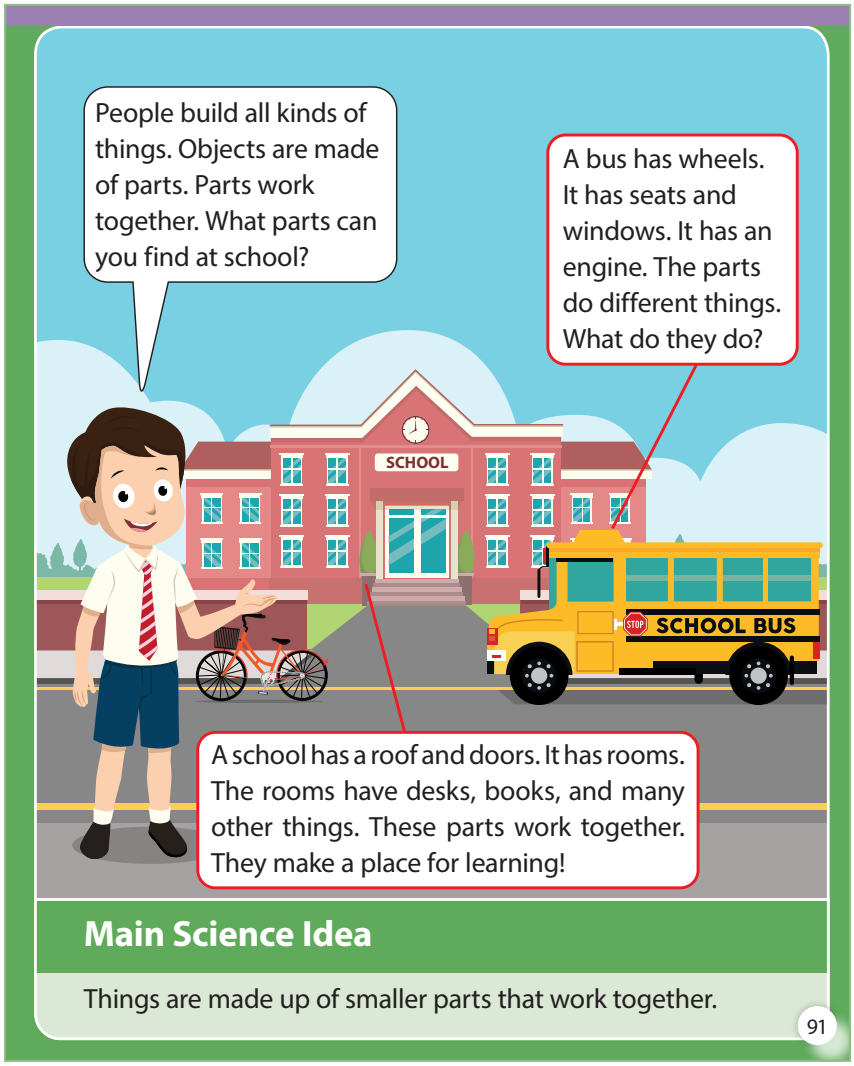
» Ensure that students talk about the wheelbarrow as a part that helps the whole system work. They may list handlebars, the bucket, and wheels as parts of the wheelbarrow.

LITERAL—What parts does the garden have?

» soil, plants, earthworms, vegetables

Remind students that a *system* is a group of parts that work together.

Page 91



Discuss the questions posed on the Student Book page.

EVALUATIVE—What parts can you find at school?

» Sample answers may include doors, desks, classrooms, the library, and offices.

SUPPORT—Remind students that a system is a group of parts that work together. Encourage them to think of the their shoes as a system, and identify the parts of a shoe that work together.

3. Check for understanding.

Activity Page

AP 15

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' understanding of the Core Vocabulary (*system* and *parts*). Ensure they understand that if a part is missing or broken, the system will not function correctly. Provide drawing materials such as pencils, markers, and crayons.

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

LESSON 16

Building with Smaller Parts

At a Glance

Lesson Question

What are the smaller parts of many familiar objects?

Learning Objectives

- ✓ Describe the smaller parts that make up several familiar objects.
- ✓ Propose multiple ways to use the same pieces in different whole assemblies.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- building challenge

Main Science Idea

Objects can be made up of many smaller parts. In some cases, those smaller parts can be reused to make a different object.

NGSS and CCSS References

CCC5. Energy and Matter: Students observe objects may break into smaller pieces, be put together into larger pieces, or change shapes.

RI.K.7. Integration of Knowledge and Ideas: With prompting and support, describe the relationship between illustrations and the text in which they appear

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pieces **rebuild**

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.

purpose **structure**

Instructional Resources

Student Book

Ch. 16

Student Book, Chapter 16
"Building with Smaller Parts"

Activity Page

AP 16

Activity Page
Old Parts, New Object (AP 16)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- images of various objects and structures, such as a log cabin, a catapult, and the side view of car with the door open
- building materials such as plastic bricks, blocks, sticks, or pattern blocks OR drawing materials such as pencils, markers, and crayons

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 16 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

Project images of various recommended objects: a log cabin, a catapult, and the side view of a car with an open door. (See the Online Resources guide for links to recommended images. **www.coreknowledge.org/cksci-online-resources**) Ask students to describe what they see. Guide students to name or describe the individual parts that the objects are made of. Tell students these objects are all similar because they are all made up of different parts. Today, they will be thinking about how many familiar objects around us are made up of many different parts.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What are the smaller parts of many familiar objects?

2. Read together: "Building with Smaller Parts."

Student Book

Ch. 16

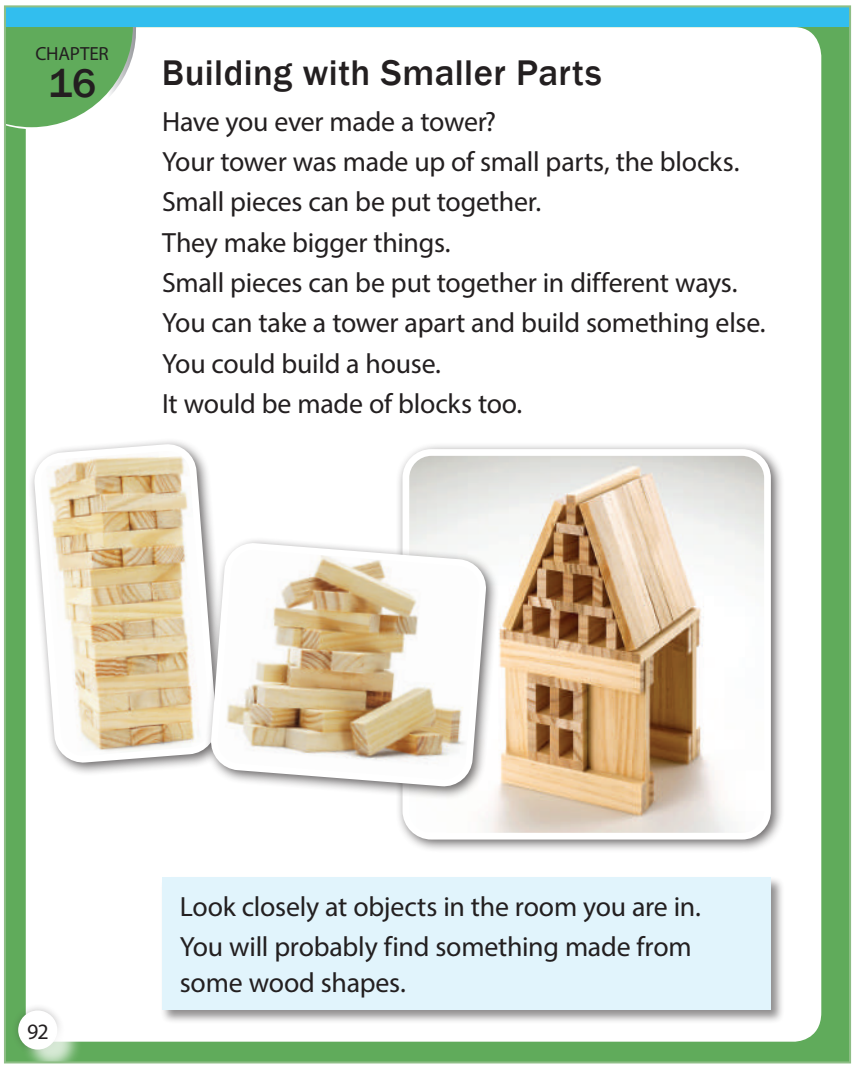
While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 16 on page 92. Point out that the top edges of the pages of this chapter are all light blue. Tell students that the title of this chapter is "Building with Smaller Parts," and remind them to pay special attention to the parts that things are made up of as you read.

Read Aloud Support

Page 92

Ask students to look at the images as you read aloud. Talk about what they notice about the buildings. What is the same, and what is different?



LITERAL—What was the tower made of?

» The tower was made up of small parts, the blocks.

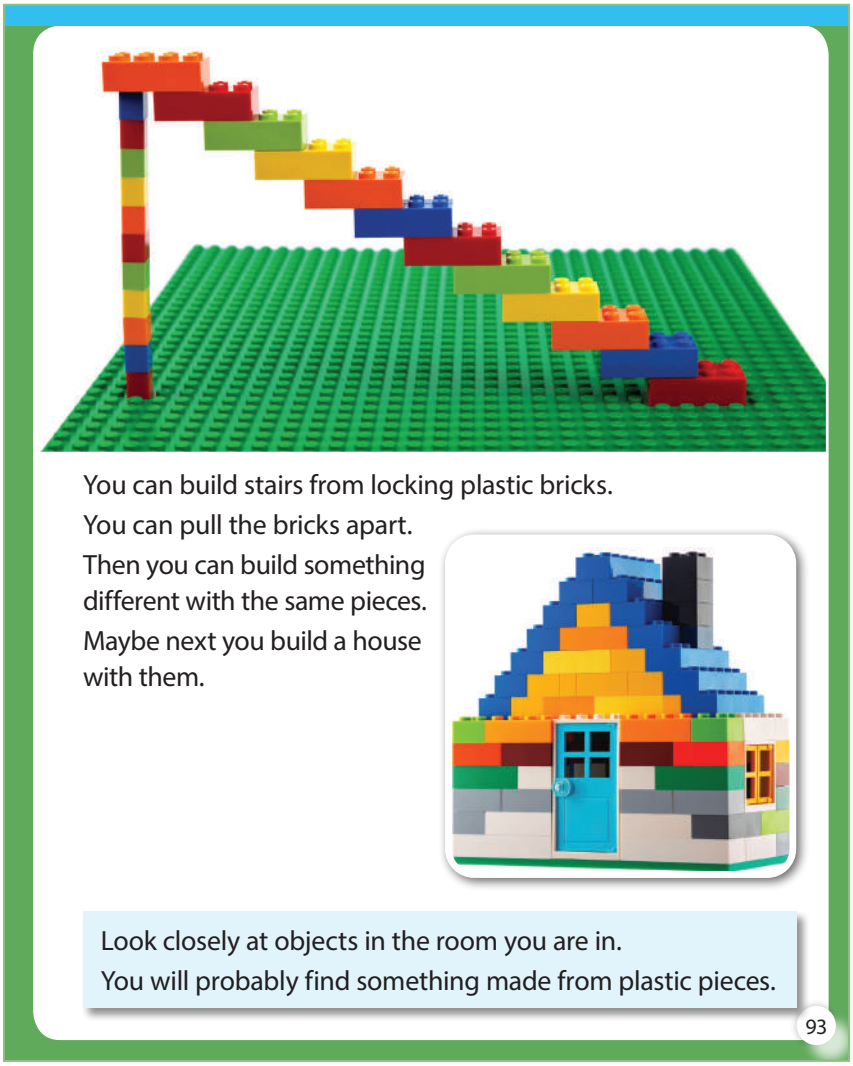
EVALUATIVE—Look at the picture of the tower and the house. What other objects could you build using the same **pieces** (the blocks)?

» Student answers will vary. Answers might include objects such as castles, parking lots, rocket ships, etc.

Point out that all objects in the room are made up of smaller parts and that these smaller pieces are put together to make bigger objects. Many of the parts are made up of things other than wood. If time allows, ask students to share objects that are made up of smaller parts.

Page 93

Ask students to look at the images as you read aloud. Talk about the similarities and differences they notice between the images. How is this similar to or different from the images on the previous page? Students may mention that the images on this page show different types of pieces or parts.



INFERENTIAL—After looking around the room you are in, what objects can you find that are made from plastic pieces?

» Student answers will vary. They may mention things like projection screen or board, dry-erase board, or plastic bins.

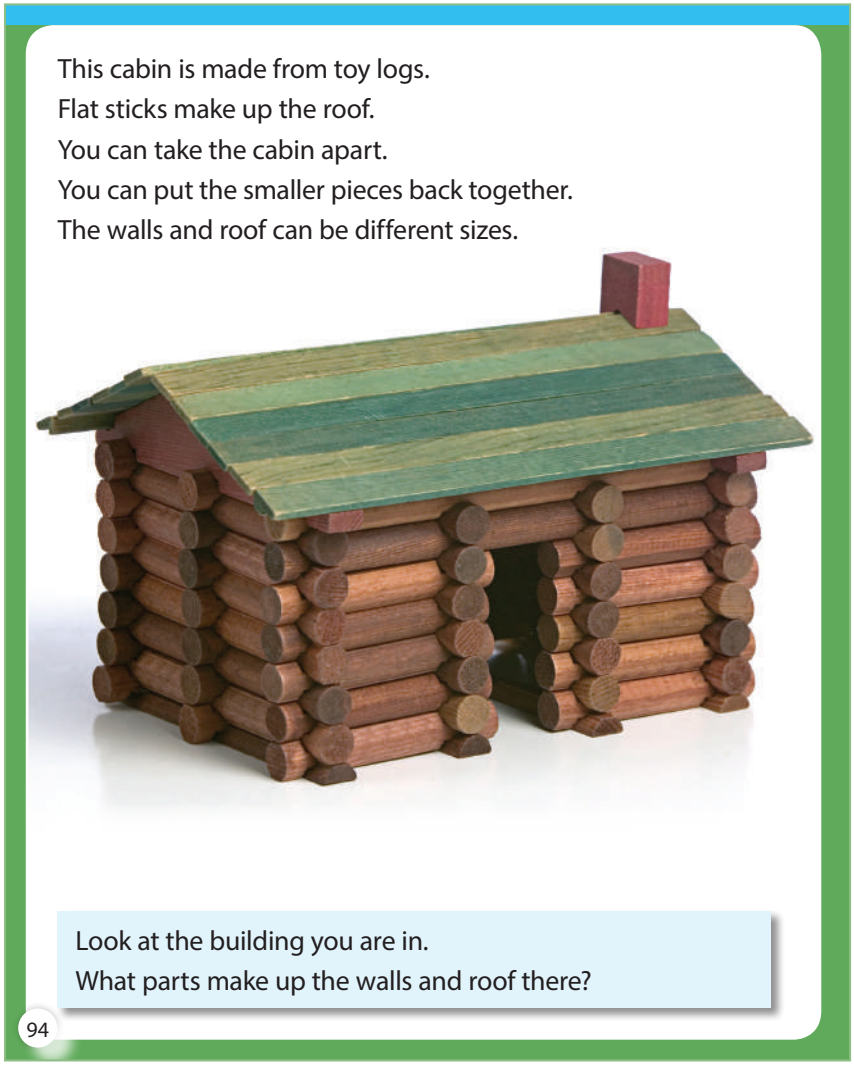
Ask students to share what they would make if they were to take the interlocking bricks apart and **rebuild** them into a new structure.

LITERAL—Look at the pictures on the page. The house and stairs are structures made up of different pieces. Name the pieces that make up the structures.

» The pieces are plastic bricks.

Page 94

Ask students to look at the image as you read aloud. Talk about what they notice about the log cabin. Ask if they have ever built a cabin from toy logs before. Have a few students share their experiences.



Reread the last two sentences to students. Have students pair-share ideas with their partner.

INFERENTIAL—What parts make up the walls and roof of the building we are in?

» Answers will vary, but students may mention that the walls and roof are made of concrete or brick or wood.

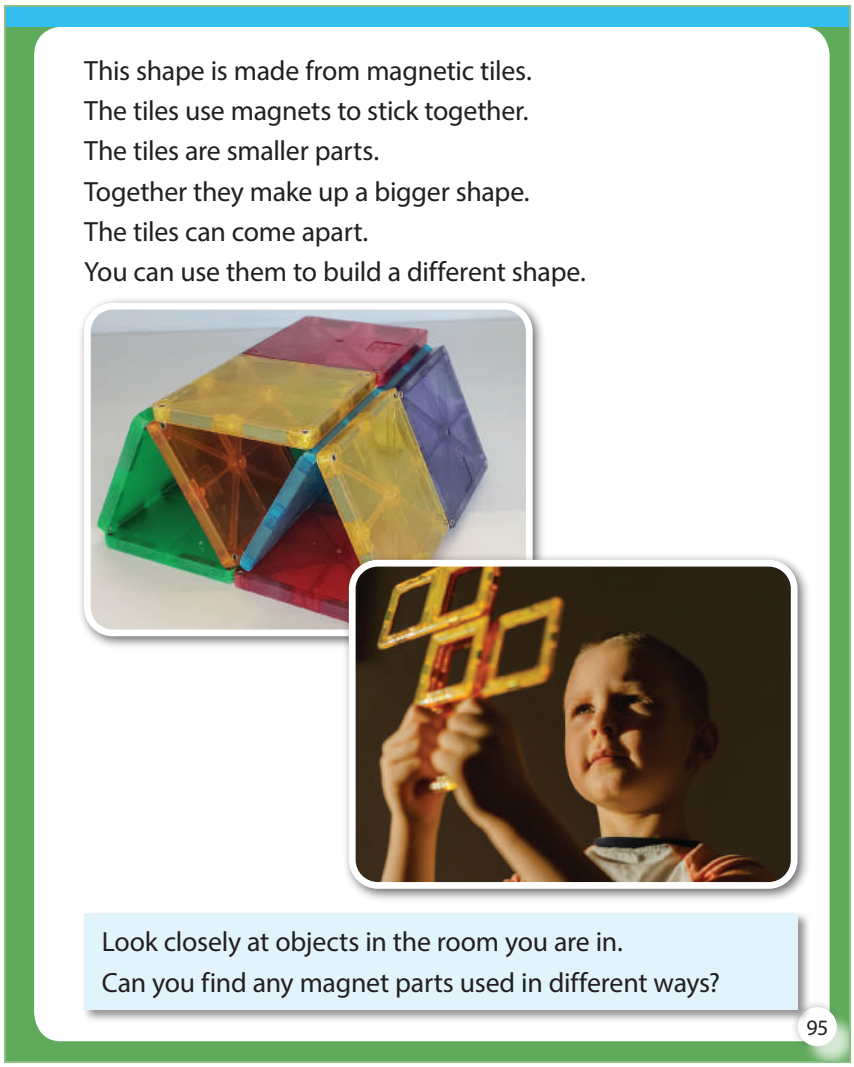
LITERAL—What is the structure in the picture? What are the pieces?

» The structure is a log cabin, and the pieces are toy logs.

Remind students that the word *rebuild* means to build again from the same pieces. If you take pieces apart, you can either rebuild the same thing or build something new.

Page 95

Ask students to look at the images as you read aloud. Talk about what they notice about the magnetic building tiles.



EVALUATIVE—Can you find any magnet parts used in different ways in the room?

» Student answers may mention magnets on a display board or magnets used in science kits.

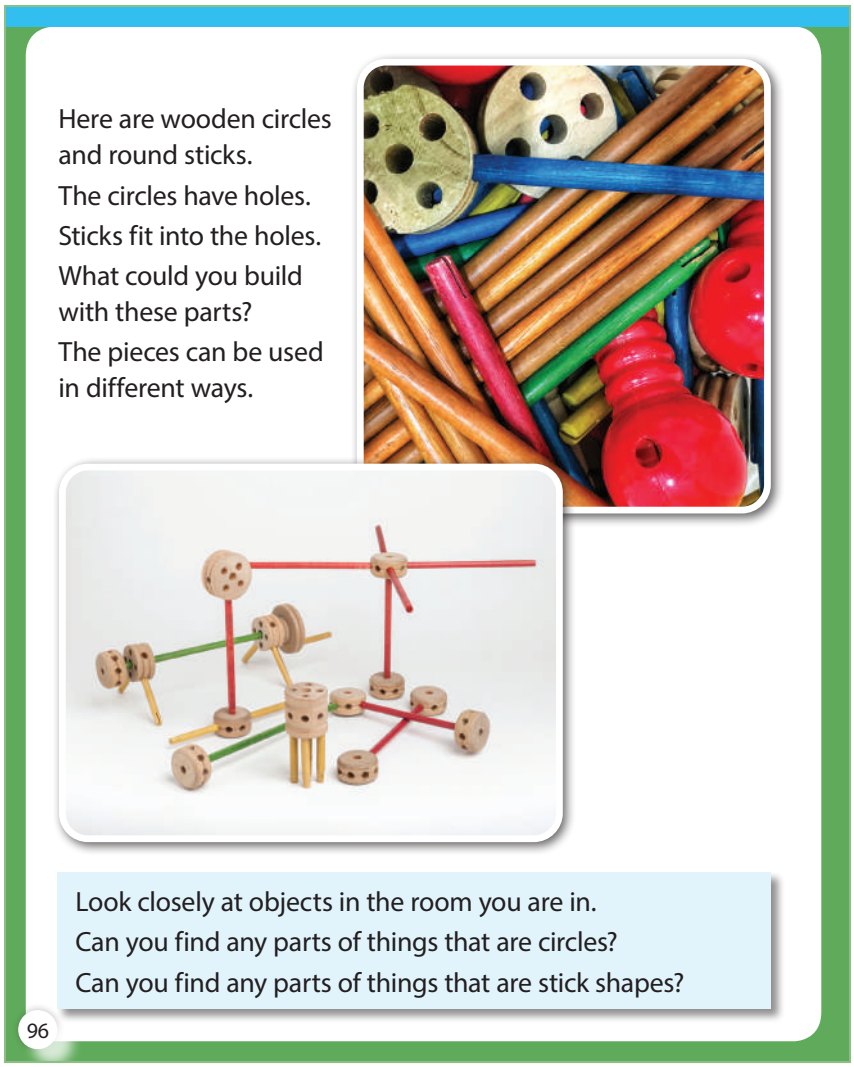
SUPPORT—Ask students to name different shapes they are familiar with. If possible, point out different shapes that they can see in the classroom. For instance, a dry-erase board may be in the shape of a rectangle, and a window may be in the shape of a square.

LITERAL—Look at the pictures. What shapes do you see?

» Answers will vary. They should identify common shapes such as squares, rectangles, and triangles.

Page 96

Ask students to look at the images as you read aloud. Talk about what they notice about the change between the first and second images.



EVALUATIVE—Think about the wooden circles and round sticks in the pictures. What kind of structure or shape could you make using these parts?

» Students may mention that they could build car shapes, wagons, houses, or other structures using the toys.

Know the Standards

CCC5. Energy and Matter This Crosscutting Concept begins to develop an understanding of systems and systems-thinking that will permeate the rest of their science education. Students begin to understand that many things are made up of many different parts. This will support future learning and critical thinking about natural and designed systems.

Page 97

Ask students to look at the images as you read aloud. Talk about the different sizes of parts. Are they all the same or different? Why?

This toy building set has small metal parts.
The pieces can make up many types of fun machines.
Screws hold these pieces together.

Look closely at objects in the room you are in.
You will probably find screws holding things together.

Main Science Idea

Some small parts can be used to build many different objects.

97

EVALUATIVE—Think about or look through the images in this chapter. Describe what you learned using the words *pieces*, *parts*, or *rebuild*.

» Sample answer: A log cabin is made up of pieces of wood.

3. Check for understanding.

Activity Page

AP 16

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' understanding of the Core Vocabulary (*pieces*, *rebuild*). Provide building materials such as plastic bricks, blocks, sticks, or pattern blocks OR drawing materials such as pencils, markers, and crayons. Use materials to build or draw a chair like one in the "Goldilocks and the Three Bears" story, or project images from Activity Page 16.

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

LESSON 17

Shapes at a School Fair

At a Glance

Lesson Question

How does something's shape determine what it can do?

Learning Objectives

- ✓ Identify features of provided naturally occurring objects that make the objects suited to given purposes.
- ✓ Describe characteristics of a human-built object to meet a specific need.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- simple design challenge

Main Science Idea

The shape of an object, whether natural or engineered, determines what the object can and cannot do.

NGSS and CCSS References

CCC6. Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s)

RI.K.1. Key Ideas and Details: With prompting and support, ask and answer questions about key details 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

The 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.

job

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.

object **structure**

Instructional Resources

Student Book

Ch. 17

Student Book, Chapter 17
"Shapes at a School Fair"

Activity Page

AP 17

Activity Page
New Shape, Different Job (AP 17)

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 17 is visible.

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- digital image of schoolyard or an area well known by students
- drawing materials such as pencils, markers, and crayons
- images of a shark mouth and a hummingbird and flower
- pattern blocks or interlocking plastic building blocks

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

Show students a short video on shapes in nature. (See the Online Resources Guide for a link to a recommended video. **www.coreknowledge.org/cksci-online-resources**)

Tell students to watch and look for shapes they are familiar with. Project the digital image of the schoolyard or area students are familiar with. Ask for volunteers to name shapes they see in the image. Tell students that while they are reading this chapter, they will be thinking about shapes all around us.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: How does something's shape determine what it can do?

2. Read together: "Shapes at a School Fair."

Student Book

Ch. 17

While some advanced students may be able to read words on a given page of the Student Book, as a 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 17 on page 98. Point out that the top edges of the pages of this chapter are all red. Tell students that the title of this chapter is "Shapes at a School Fair," and remind them to pay special attention to how shapes help things work as you read.

Read Aloud Support

Page 98

Ask students to look at the image as you read aloud. Ask if anyone has ever been to a school fair or other festival. Probe responses to have students focus on the structures and objects they saw.

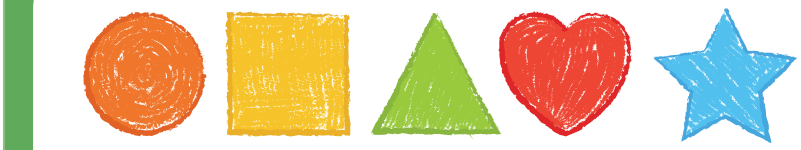
Probe student responses to encourage them to describe why these structures help provide shade. Accept all ideas and thoughts, telling students that they will continue thinking about this throughout the chapter.

Know the Standards

CCC6. Structure and Function This Crosscutting Concept focuses on how the structure of objects relates to and impacts how objects function. This builds on the development of systems-focused thinking, encouraging students to notice the shape of different objects and structures and how these shapes help the objects fulfill their various purposes.

Page 99

Ask students to look at the images as you read aloud. Talk about what they notice that is familiar or new to them.



All things you see on this page have a shape.
In fact, every object has a shape.
Shape is the form of an object.
Circles, squares, and triangles are some familiar shapes.
Hearts and stars are shapes, too.

The shape of something determines what it looks like.
Shape also affects what an object can do.
You can play a ring toss game because of the shapes of the rings and the pegs.

99

LITERAL—What is a shape?

» Shape is the form of an object.

LITERAL—What shapes can you name or describe?

» Circles, squares, triangles, and stars are shapes.

EVALUATIVE—Look around the classroom. Pick one object, and describe its shape to a classmate seated next to you.

» My desk is a flat rectangle with cylinder legs holding the rectangle up. It has an open rectangle under the top that holds papers and pencils.

CHALLENGE—Encourage students to think about natural objects they have seen outdoors. Ask students to describe the shapes they have seen in nature.

Page 100

Ask students to look at the images as you read aloud. Talk about what they think the **job** of each of these structures is.

A tent top is called a canopy.
You can see canopies at a fair.
People use canopies to block sunlight.
A canopy has a wide top.
Tall legs hold the top up.
Its shape lets us walk underneath it to find shade.
Its downward slope lets rain run off.

Umbrellas have long poles with small canopies on top.
That shape lets us stand underneath.
It can help on both sunny and rainy days.
The wide shape provides shade from the sun.
The sloping shape lets rain run off.

100

Point out that canopies and umbrellas both have special jobs and that their shapes help them do their job.

LITERAL—Describe the shape of the tent and umbrella.

» The tent has a canopy shape with a wide top and tall legs, and the umbrella has a canopy shape with a long pole.

INFERENTIAL—What is the job of the tent and umbrella?

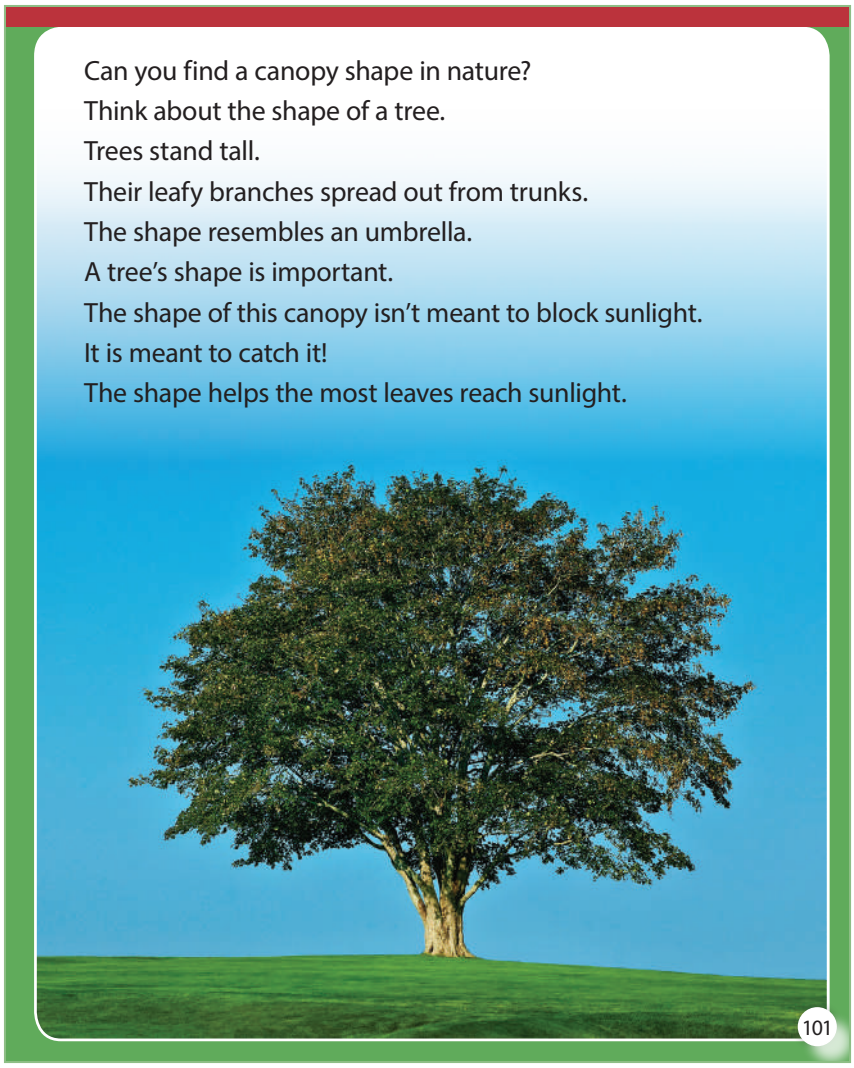
» Their job is to protect things underneath.

Reinforce the idea that the shape allows the structure to do its job. Ask students to look at or think about a pencil.

SUPPORT—Describe its shape. Describe its job. Could it do its job if it were another shape? What about a piece of paper? Could it do its job if it were another shape?

Page 101

Ask students to look at the image as you read aloud. Talk about what they notice about the shape of the tree.



Point out that plants need sunlight to help create energy through a process called photosynthesis. Most plants need sunlight to make food or they will die, so the canopy is very important to forest trees and plants.

INFERENTIAL—The shape of a tree is like an umbrella that humans use. How do you think animals use the canopy shape of the tree?

» Animals might use the shape the same way we use umbrellas for shade and protection from the rain.

Online Resources

Project the image of a hummingbird drinking nectar from a flower. (See the Online Resources Guide for links to recommended images. **www.coreknowledge.org/cksci-online-resources**)

INFERENTIAL—What shape do you see? How does the shape help the hummingbird?

» The beak of the hummingbird is a long line. The long, skinny beak helps the hummingbird get into flowers.

Page 102

Ask students to look at the images as you read aloud. Ask students to point out any shapes they see.

Have students turn to a peer or partner. First, model making your mouth into a straight line shape, then have students do the same.

LITERAL—Make a funny face at each other, changing your mouth into different shapes. What shapes can you make?

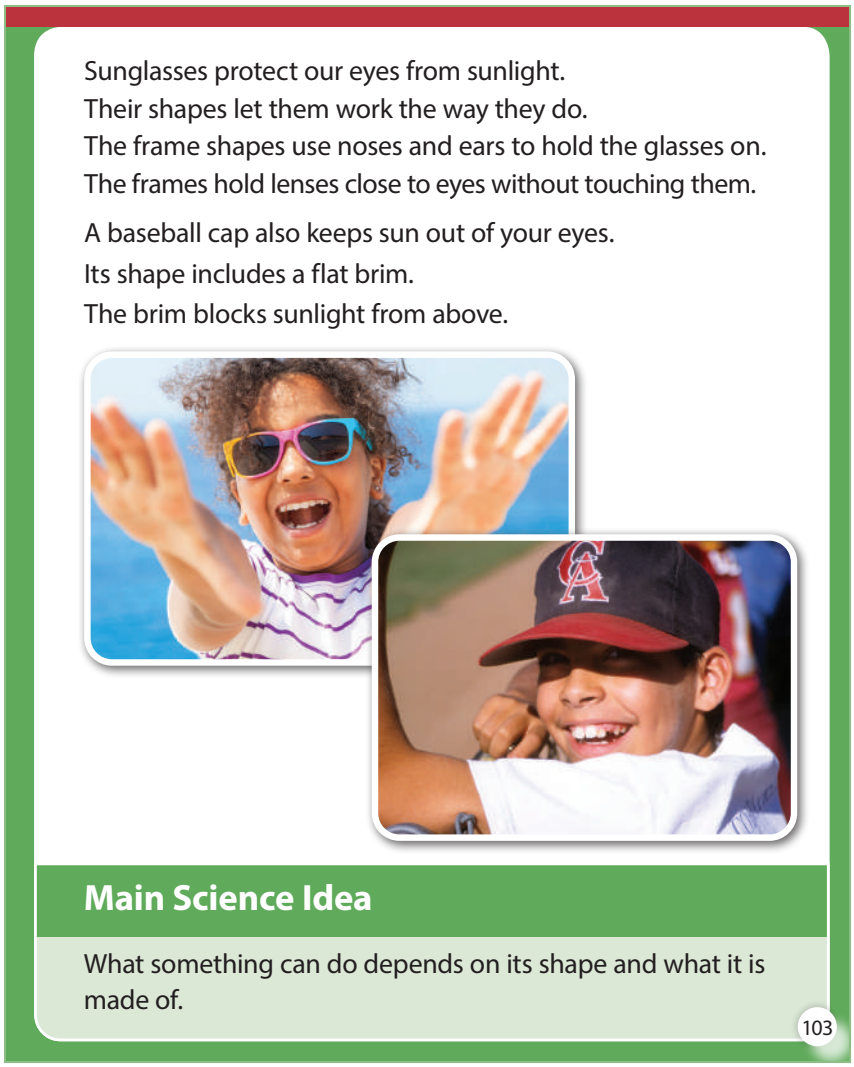
» Students will easily make circles and ovals but may say they make triangles or rectangles or squares.

INFERENTIAL—Why do you think we can change our mouth into so many different shapes?

» We need to change our mouths into different shapes so we can smile, frown, eat, and talk.

Page 103

Ask students to look at the images as you read aloud. Talk about why we might wear sunglasses and baseball caps.



LITERAL—What is the job of the sunglasses and hat?

» to help protect our eyes

3. Check for understanding.

Activity Page

AP 17

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess student understanding of the Core Vocabulary (*job*) and the main idea that the shape of an object relates to its function.

Tell students that their task is to use the blocks to create an object or structure. As they do so, they should think about the shapes they are using, the structure or object they are making, its job, and how the shapes help the object work the way it does.

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

LESSON 18

Changes All Around Us

At a Glance

Lesson Question

What things stay the same, and what things change?

Learning Objectives

- ✓ Explain that *change* means to become different.
- ✓ Differentiate among things that change and things that do not.
- ✓ Identify many examples of changes.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- comic strip design

Main Science Idea

A change is something that happens that results in a different thing or process. Changes can be slow or fast.

NGSS and CCSS References

CCC7. Stability and Change: Stability and change are ways of describing how a system functions. The question is often to determine how the system is changing over time, and which factors are causing the system to become unstable.

RI.K.3. Key Ideas and Details: With prompting and support, describe the connection between two individual events, ideas, or pieces of information 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

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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.

change

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.

faster **science** **season** **slower**

Instructional Resources

Student Book

Ch. 18

Student Book, Chapter 18
"Changes All Around Us"

Activity Page

AP 18

Activity Page
Compare Changes (AP 18)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- plastic straw
- sand in a large flat tray
- scissors and glue or glue sticks

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 18 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

Have students watch the two timelapse videos. (See the Online Resources Guide for links to recommended resources. **www.coreknowledge.org/cksci-online-resources**)

Tell them they are watching two videos: one shows a mountain, and the other shows a city. They should pay close attention to things that change and things that stay the same in each. After students watch each video, ask them what they noticed and wondered. After viewing both, ask what the two videos have in common, guiding them to recognize that both videos are about change.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What things stay the same, and what things change?

2. Read together: "Changes All Around Us."

Student Book

Ch. 18

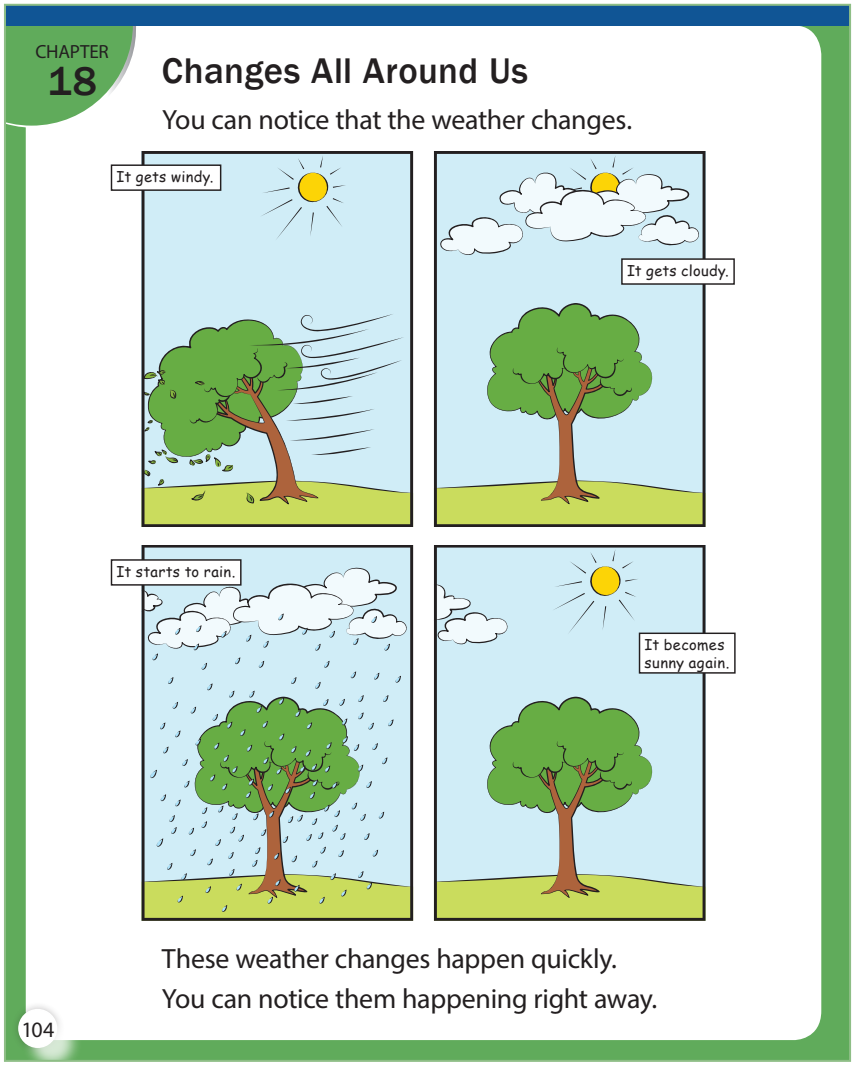
While some advanced students may be able to read words on a given page of the Student Book, as a rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that adults can read it when sharing the Student Book with students.

Guide students to open their books to Chapter 18 on page 104. Point out that the top edges of the pages of this chapter are all dark blue. Tell students that the title of this chapter is "Changes All Around Us," and remind them to pay special attention to things that change and things that stay the same as you read.

Read Aloud Support

Page 104

Ask students to look at the images on pages 104 and 105 as you read aloud. Ask students to describe the scene and what they think is happening. Look for students using the word **change** in their responses.



Tell students that weather is what the sky and air are like outside.

LITERAL—What does the word *change* mean?

» The word *change* means to become different.

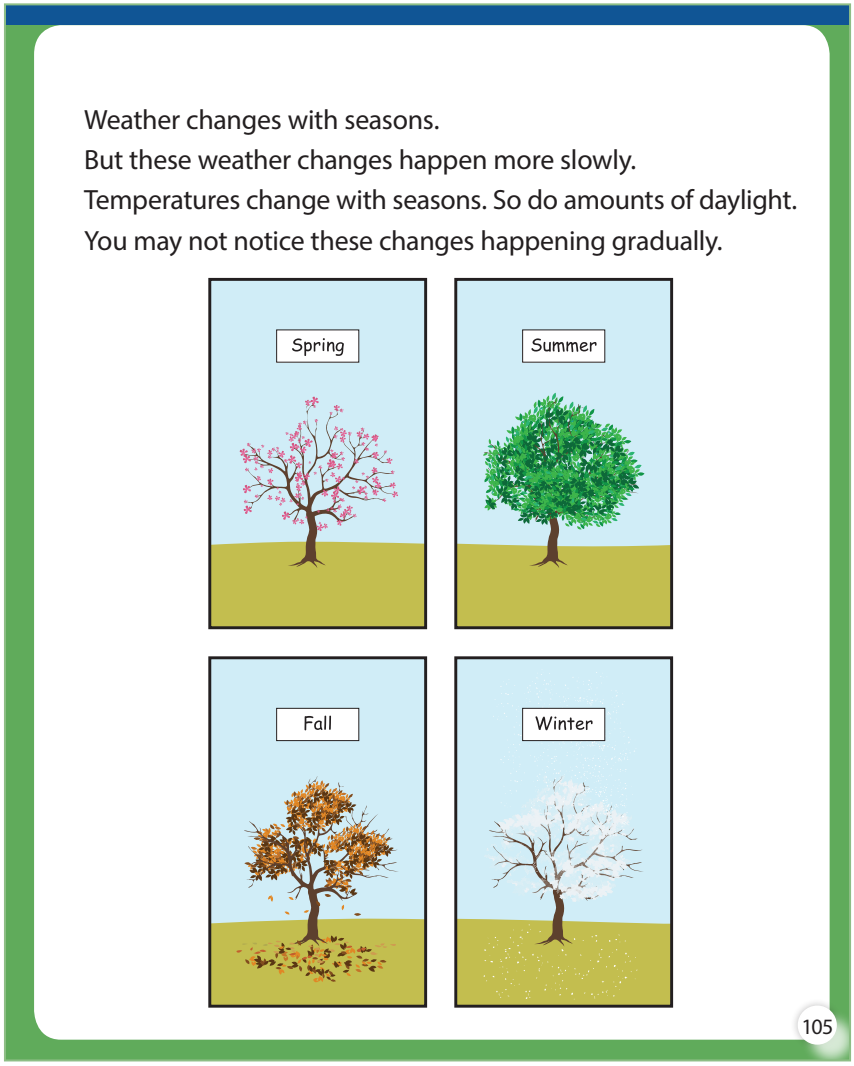
Reread the last sentence to the students. Tell them that some changes are fast and happen over the course of seconds, minutes, hours, or days. Other changes are slow and happen over long periods of time, like years, decades, or centuries.

EVALUATIVE—*Quick* is another word for *fast*. Why was this a fast change?

» This was a fast change because it happened in a day or so. I know this because the tree is the same.

Page 105

Ask students to look at the images as you read aloud. Talk about what they notice about changes in the trees. What do they think the pictures are showing? Ask students to describe what a season is.



Tell students that seasons are different times of the year when the weather is usually different.

INFERENTIAL—What are some things that change when seasons change?

» Some things that change are temperature, rain or snow, colors of plants.

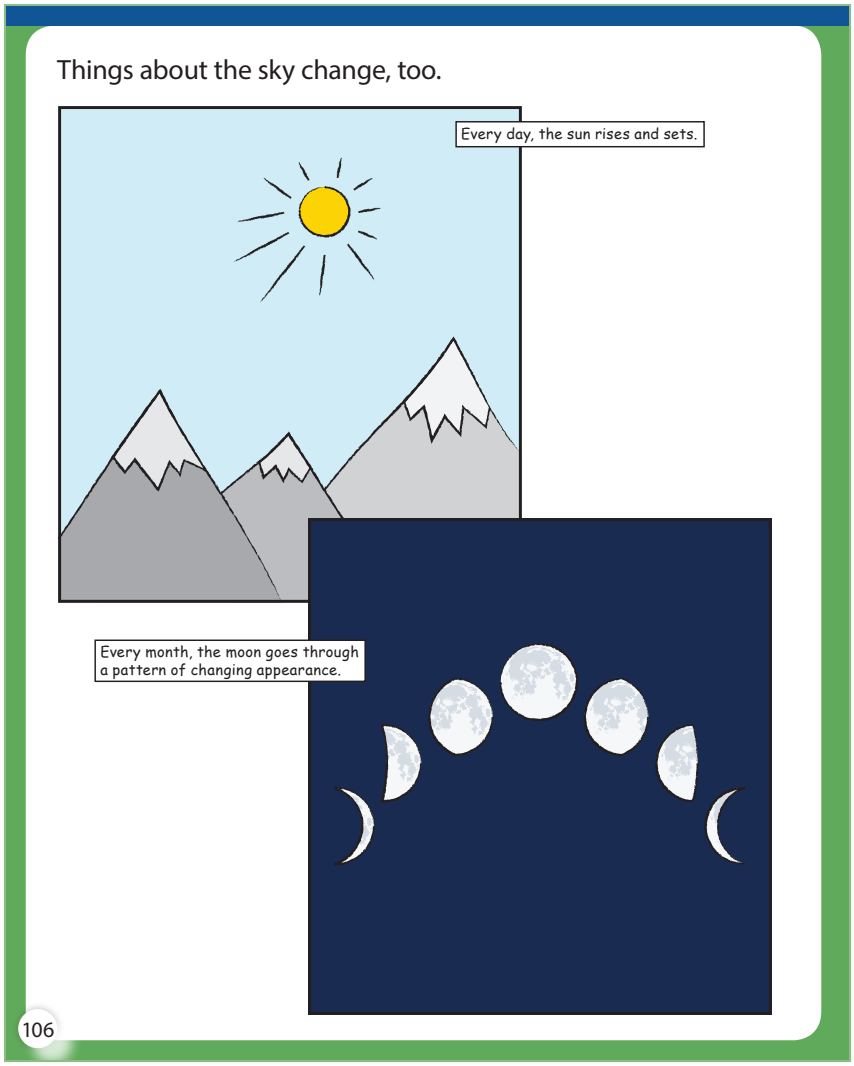
EVALUATIVE—Is this a fast or a slow change compared to daily weather?

» The seasons changing is a slower change.

Point out to students that a season may last a few months but that a slow change happens over hundreds of years.

Page 106

Ask students to look at the images as you read aloud. Ask students if they have ever seen anything similar to the pictures before.



LITERAL—What stayed the same in the pictures?

» The sun is always in the sky, and the moon is always in the sky.

LITERAL—How does our view of the moon change?

» The moon changes shape. It starts off small and gets big and then small again.

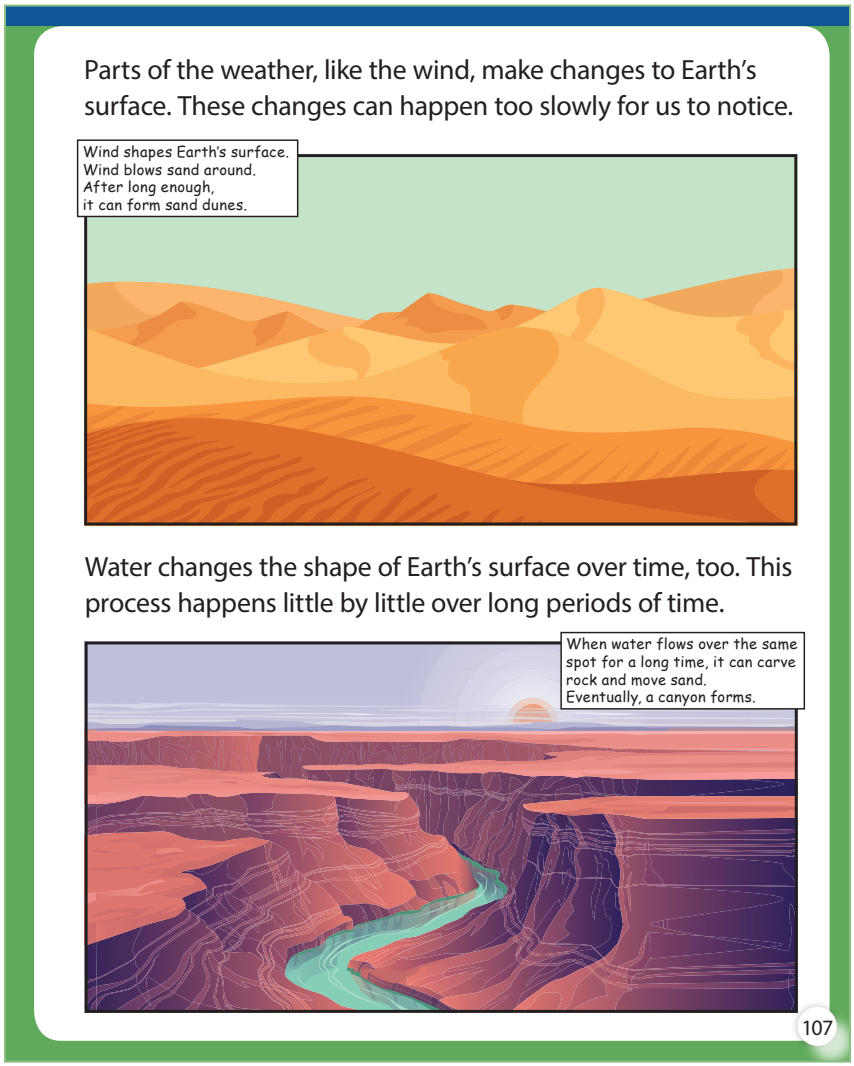
INFERENTIAL—Look at the picture of the sun. Does our view of the sun change?

» Yes, our view of the sun changes. It is always in the sky, but we don't see it at nighttime.

Page 107

Prepare a tray filled with sand and a straw to perform a simple demonstration for students to observe.

Ask students to look at the top image. Blow air through the straw to move the sand. Have students compare the picture to what they just saw. Would it take a fast or slow change to move enough sand to create a sand dune?



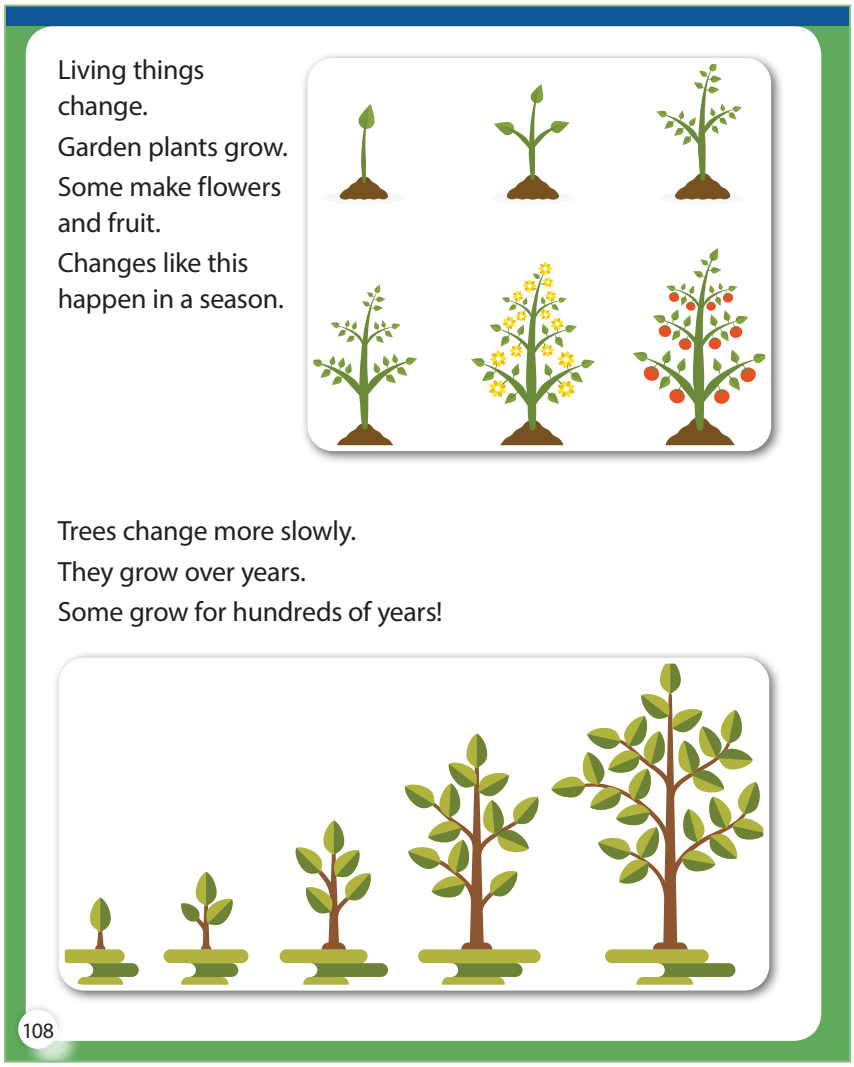
Place a rock in the middle of the tray. Direct students to look at the bottom image. Pour water over the rock. Explain that water can carve into rock like the canyon that the picture shows but that it happens too slowly to see.

Ask students the following questions:

EVALUATIVE—How does the bottom picture show a change?

» This is a change because the rock (Earth's surface) has a canyon that was made by the river.

Page 108 **Ask students to look at the images as you read aloud.**



LITERAL—What are some other changes that happen with living things?

» People and animals sleep and wake up and sleep again. People, animals, and plants all grow older. Children get taller until they are adults.

EVALUATIVE—What changes in living things that we have talked about are slowest and take a long time?

» trees growing large, children becoming adults

Page 109 **Ask students to look at the image.**

People change, too.
How do you think you will change in the next year?
How will you change over eighty years?

Main Science Idea

Change happens all around us.
Some changes happen fast.
Some changes happen slowly.
Science studies all kinds of changes.

109

Discuss their answers to the questions posed on the page.

3. Check for understanding.

Activity Page

AP 18

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use the activity page to assess students' understanding of change. Provide scissors and glue or glue sticks.

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

LESSON 19

Solving Art Problems

At a Glance

Lesson Question

What is a problem?

Learning Objectives

- ✓ Define *problem* as a situation that people want to change.
- ✓ Identify problems in provided scenarios.
- ✓ Match provided solutions to problems.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- matching activity

Main Science Idea

A problem is a situation that is harmful or otherwise unwelcome. People develop solutions to reduce or eliminate problems.

NGSS and CCSS References

ED.A. Defining and Delimiting Engineering Problems: This involves stating the problem to be solved as clearly as possible in terms of criteria for success, and constraints or limits.

ED.B. Developing Possible Solutions: Students practice generating a number of different possible solutions, then evaluating potential solutions.

ED.C. Optimizing Design Solutions: A process in which solutions are systematically tested and refined.

RI.K.1. Key Ideas and Details: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.K.3. Key Ideas and Details: Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

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

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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.

problem **solution**

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.

art **portable** **tool**

Instructional Resources

Student Book

Ch. 19

Student Book, Chapter 19
"Solving Art Problems"

Activity Page

AP 19

Activity Page
Problems and Solutions (AP 19)

Materials and Equipment

Collect or prepare the following items:

- premade mud
- large white butcher paper
- various art materials such as drawing paper, markers, chalk, paints, crayons, colored pencils, etc.
- natural items such as sticks, rocks, and dirt

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 19 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Tell students you would like them to make a drawing—it can be about anything! Have students choose from any of the available materials. Allow students to choose from the art materials and natural items. Have students draw anything of their choosing for a few minutes. Ask students to share why they chose certain materials instead of others. What makes that material better for their art project than others?

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What is a problem?

2. Read together: "Solving Art Problems."

Student Book

Ch. 19

While some advanced students may be able to read words on a given page of the Student Book, as a 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 19 on page 110. Point out that the top edges of the pages of this chapter are all dark purple. Tell students that the title

of this chapter is "Solving Art Problems," and remind them to pay special attention to how the different art tools each solve problems as you read.

Read Aloud Support

Page 110

Ask students to look at the image as you read aloud. Talk about what they notice about what the kids are doing and what they are using. How do you think they are feeling about the art they are making?

LITERAL—What is a **problem**?

» A problem is any situation we want to change.

Ask students if they have ever had a problem using a tool before. Invite students to share stories and how they fixed these problems. Tell them that a **solution** is the answer to a problem.

INFERENTIAL—What problems do you think people have had with drawing or art?

» I think some problems with drawing or art may be that it can be messy or they don't have the right things to work with.

Page 111

Ask students to look at the image as you read aloud. Talk about what they notice and wonder about the drawings. Tell students that for the rest of the chapter, they will be thinking about problems and solutions in art. Can they see any problems with the image of art on this page?

LITERAL—What did people use to draw and paint long ago?

» They used burnt sticks to draw or painted with mud using their hands. They drew on cave walls.

LITERAL—What were some problems they had with their art?

» Some problems were that they didn't have many colors to work with and they couldn't take their artwork from place to place.

Tell students that for the rest of this chapter, they will be focusing on these two problems: 1) not being portable, or able to move from place to place, and 2) no colors.

Page 112

Ask students to look at the images as you read aloud. Talk about what they think these pictures are of. Ask students how they would use these items to make art.

Tell students that a *tool* is anything you use to do a job or accomplish a task. Ask students to describe any tools they have used before and what jobs they used these tools for.

LITERAL—People used to have a problem of not being able to move their art from place to place. What tool was their solution?

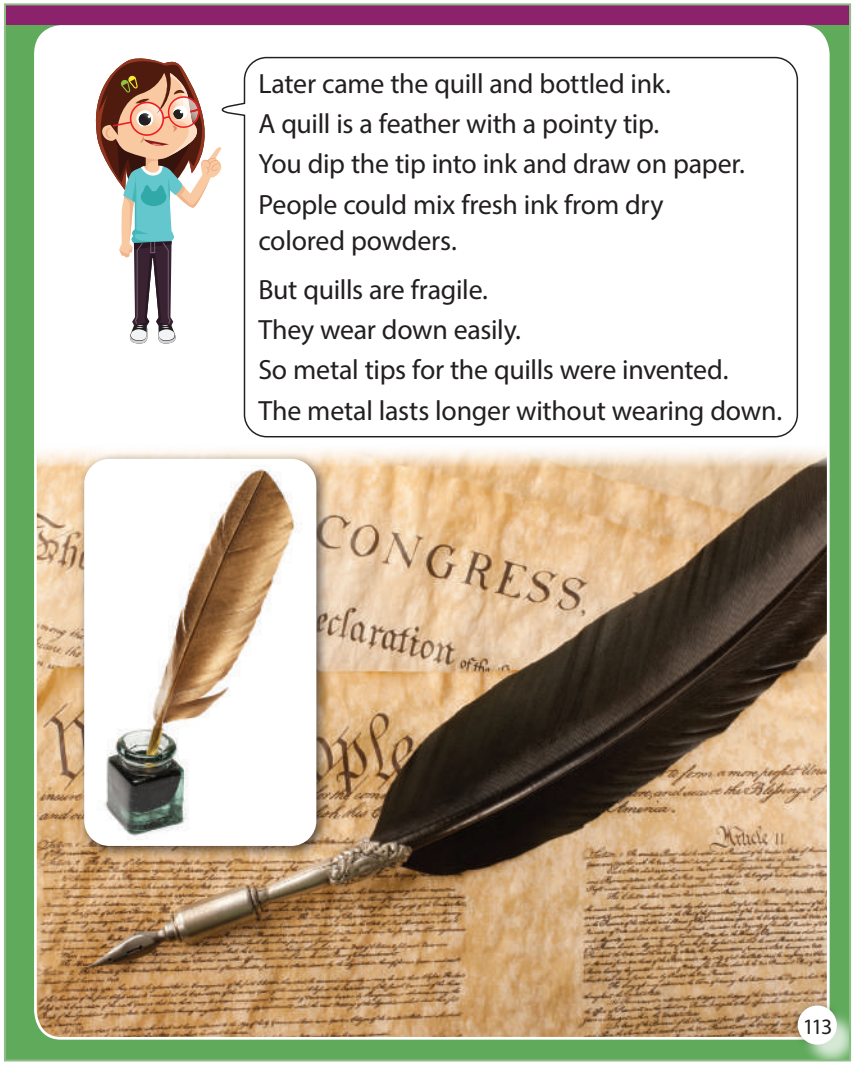
» Leather was used to draw on so they could take it to new places.

LITERAL—Another problem people had was not having color in their art. What was their solution?

» They used plants and clay to make colors and made brushes out of plant leaves or animal hair.

Page 113

Ask students to look at the images as you read aloud. Have students talk about how this new tool might have been a solution to the problems of no color and not being portable.



LITERAL—What were the problems with the quill?

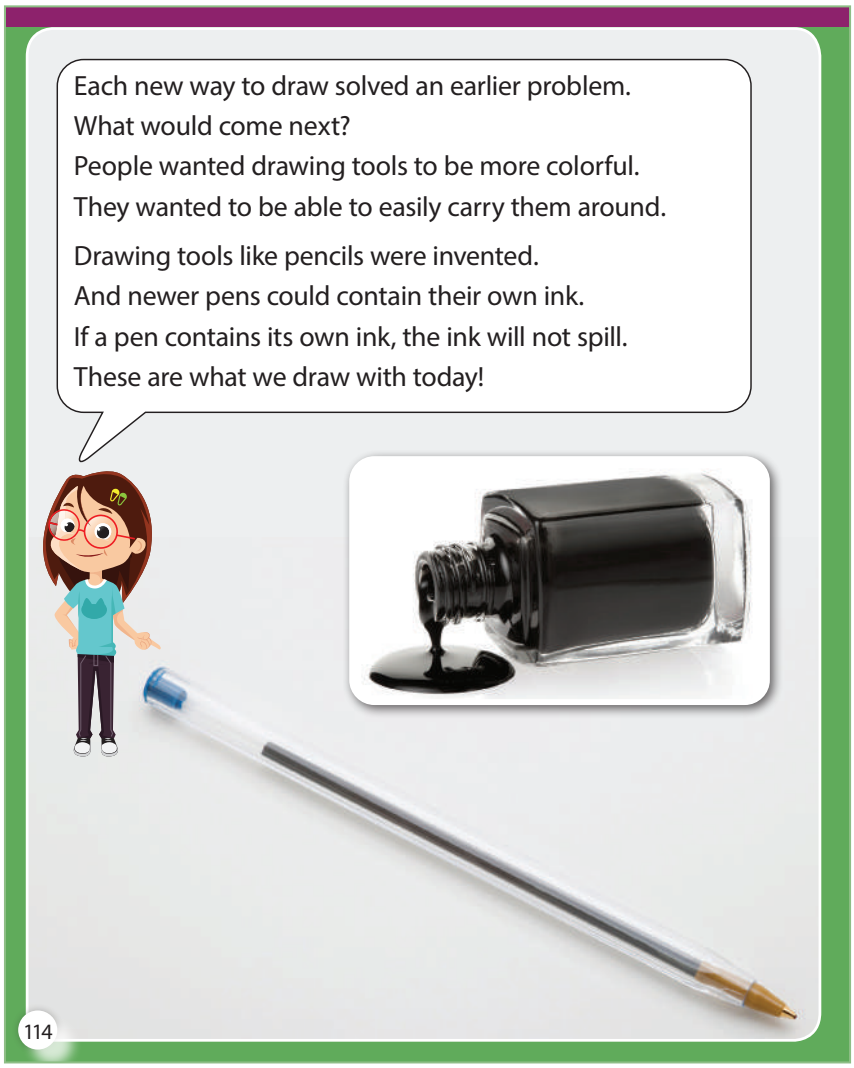
» The problems with the quill are that they are fragile and wear down easily.

Know the Standards

ED.A. Defining and Delimiting Engineering Problems and ED.B. Developing Possible Solutions
These engineering- and design-focused standards introduce students to problems and ask them to consider the questions, "What are problems, and how can they be solved?" As students practice identifying problems and possible solutions, they are engaging in the engineering design process of defining problems, designing solutions, and optimizing solutions.

Page 114

Ask students to look at the images as you read aloud. Talk about what they notice about what has happened in the top photo. Do they think this is showing a problem or a solution? Why?



EVALUATIVE—People continued to want tools to be portable and colorful. How were tools like pencils and pens solutions to these problems?

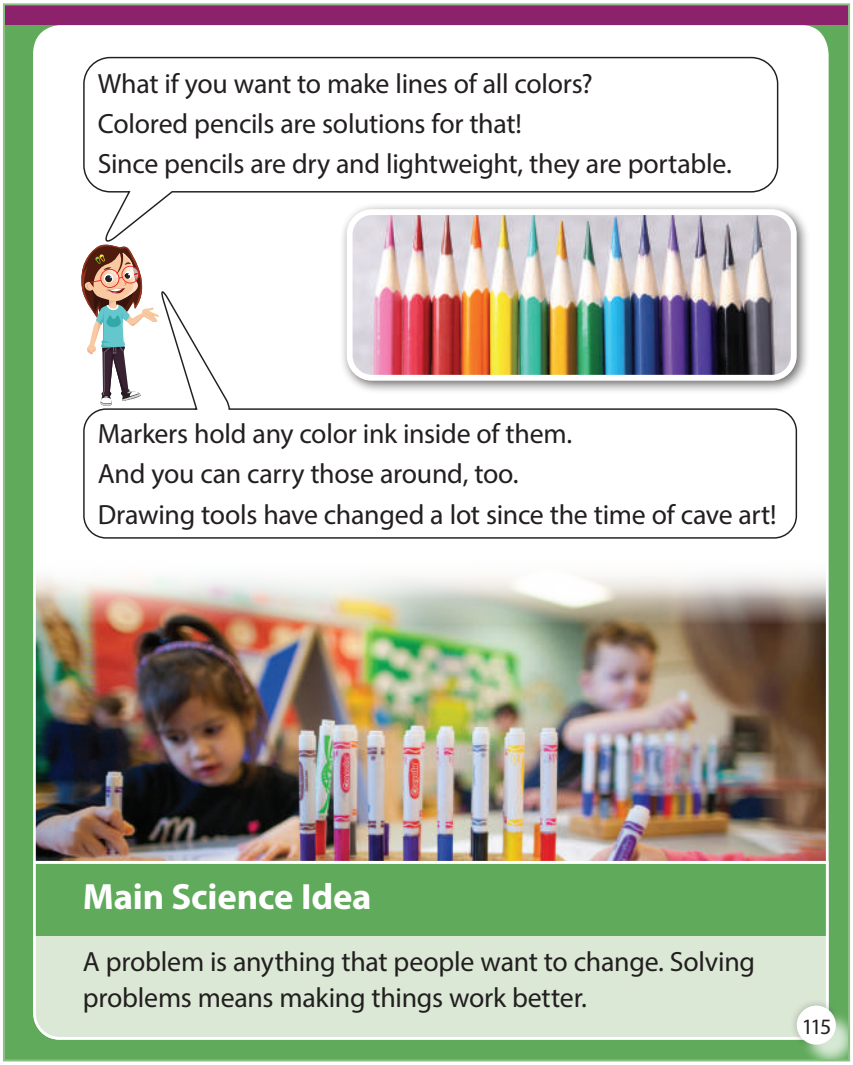
» These tools are small and so easy to carry. They also hold their own ink or lead and come in many different colors.

INFERENTIAL—Can you think of any possible problems with pens or pencils?

» Possible answers may include that pencils break, the lead needs to be sharpened, or the ink in pens runs dry.

Page 115

Ask students to look at the images as you read aloud. Talk about what they notice about these tools. How do they compare with the mud and burnt sticks that were used long ago?



Remind students of the two problems with art tools: 1) not being portable and 2) no colors.

Ask students the following questions:

LITERAL—How are markers and pencils solutions to these problems?

» They are solutions because they are colorful and because they are small and light and therefore portable.

3. Check for understanding.

Activity Page

AP 19

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use Activity Page 19 to assess students' understanding of the Core Vocabulary words *problem* and *solution*.

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

LESSON 20

Science and Technology

At a Glance

Lesson Question

What's the difference between science and technology?

Learning Objectives

- ✓ Express that people build things to solve problems and meet needs (technology).
- ✓ Recognize that science (studying) and building technology (engineering) both use tools for observation and measurement.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary exploration
- examination of examples

Main Science Idea

Science is a process for finding out. Technology is a tool or method for carrying out a procedure.

NGSS and CCSS References

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.

RI.K.4. Craft and Structure: Ask and answer questions about unknown words in a text.

RI.K.10. Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.

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

The 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.

science **technology**

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.

measurement **observation** **problem** **tool**

Instructional Resources

Student Book

Ch. 20

Student Book, Chapter 20
"Science and Technology"

Activity Page

AP 20

Activity Page
Spotting Technology (AP 20)

Materials and Equipment

Collect or prepare the following items:

- internet access and the means to project images/video for whole-class viewing
- variety of scientific tools, such as microscope, binoculars, beaker, hand lens, ruler, scale, tweezer, dropper, measuring cup, stirrer, petri dish
- images from James Webb Space Telescope

Advance Preparation: Where page numbers exceed the numbers to which younger students can count, students may be challenged to locate the correct chapter in their Student Books. Before distributing the books to students, it might be helpful to place paper strips as bookmarks or open all books so that the first page of Chapter 20 is visible.

The Core Lesson

1. Focus attention on the Lesson Question.

Online Resources

Ask students if they have ever heard of NASA before. Tell them that NASA studies and learns about space. Ask students for ideas about how they think scientists research space. Tell them that scientists learn about space by using things like rockets, cameras, telescopes, and computers. One tool that they have been using lately is the James Webb Space Telescope. Watch the video with students, asking them to focus on the pictures taken by the telescope. (See the Online Resources Guide for links to recommended resources. **www.coreknowledge.org/cksci-online-resources**) Stop periodically to read captions, and explain to students that the pictures are of parts of the universe that scientists have never seen before. When they are done, ask students what they noticed and what they wondered about the video.

Pose a question for everyone to keep in the back of their minds as you move forward to read the chapter: What's the difference between science and technology?

2. Read together: "Science and Technology."

Student Book

Ch. 20

While some advanced students may be able to read words on a given page of the Student Book, as a 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 20 on page 116. Point out that the top edges of the pages of this chapter are all orange. Tell students that the title of this

chapter is "Science and Technology," and remind them to pay special attention to what science is being done and what tools are being used as you read.

Read Aloud Support

Page 116

Ask students to look at the images as you read aloud. Talk about what they notice about the tools that are in the pictures. Ask students to describe what they think is happening and what makes it an example of **science**.

CHAPTER 20

Science and Technology

A storm clears.
A student wonders how much rain her garden got.
Her process of finding out is science.

The student uses a rain gauge.
Rain enters the rain gauge.
Numbered lines show how much water is inside.
The student sees how much rain fell.
The rain gauge is an example of technology.
This tool helps the student measure rainfall.

116

LITERAL—What is the student wondering about?

» She wants to know how much rain her garden got.

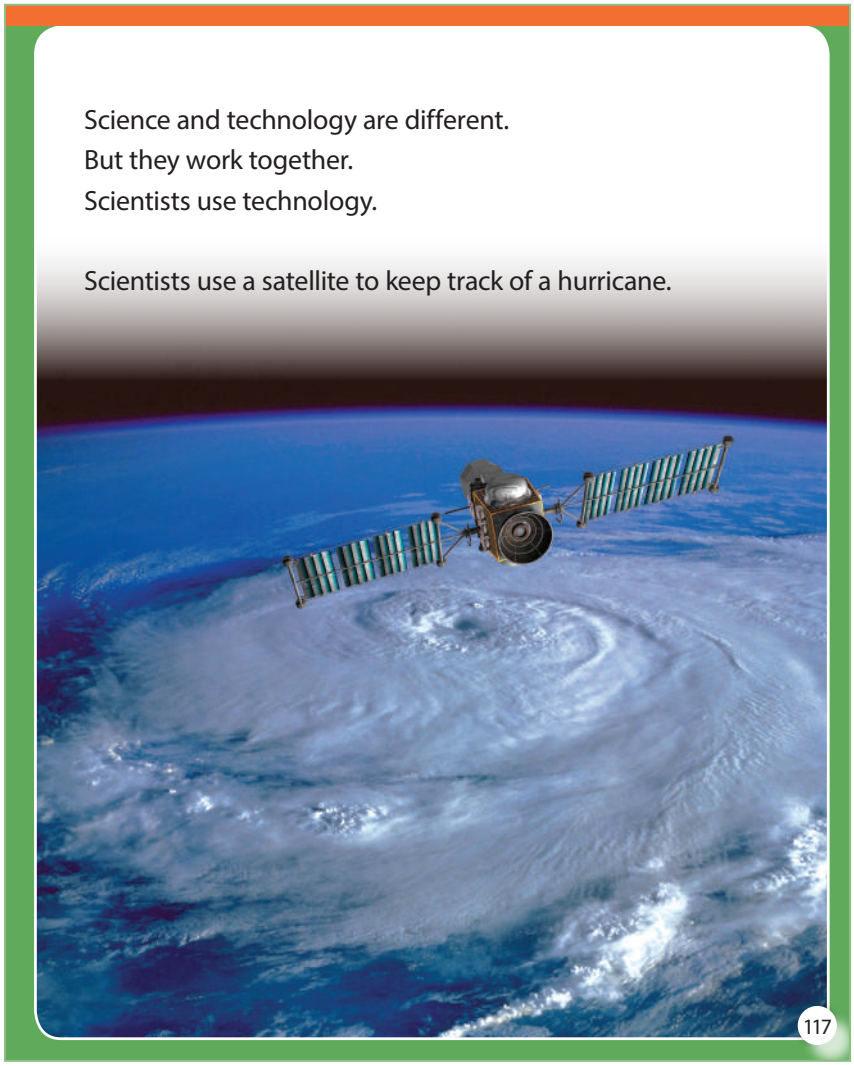
Ask if students have heard the word **technology** before. Ask for some ideas and examples of technology. Tell them that technology includes all the tools and procedures that people use to do science.

LITERAL—The rain gauge in the pictures is an example of technology. What information does the rain gauge help the student find out?

» The rain gauge helps the student because it shows how much rain fell in the garden.

Page 117

Ask students to look at the image as you read aloud. Talk about what they notice about the two objects in the picture, the satellite and Earth. Where do they think the two objects are located related to each other? What do you think the scientist was trying to study?



INFERENTIAL—What do you think technology is?

» I think technology is something that scientists use to help them study things.

Talk about the image on the page. Tell students that hurricanes are giant storms that form over the ocean. They have really strong winds and lots of rain and can be so strong they destroy buildings.

INFERENTIAL—Why do you think scientists need special tools, or technology, to study hurricanes?

» Scientists need special tools to study hurricanes because it is hard and dangerous for them to get close enough to the storm.

Page 118

Ask students to look at the image as you read aloud. Ask them how they would describe the rain gauge to someone. Guide them to talk about the type of material the rain gauge is made of.

INFERENTIAL—What does the rain gauge have to look like? What materials would work to build this tool?

» The rain gauge has to be open on top and closed on the bottom and hold the water without spilling. It must have markings and be clear so that you can see through it.

INFERENTIAL—What do you think scientists were trying to study when they decided to invent the tools we have read about so far?

» Student answers may focus on a device such as a microscopes and describe how scientists need to look at things that are too small for unaided eyes to see.

Page 119

Ask students to look at the images as you read aloud. Talk about what they notice about the weather in the images. How do you think the tools in the pictures help scientists study and describe the weather?

Notice which way the wind is blowing.

You are observing the weather.

Record what you observe to learn from it.

That is doing science.

You can use technology to study wind.

A wind vane can spin around.

Wind pushes it.

It tells you which direction the wind is coming from.

The wind vane is an example of technology.

But science learning helped someone make a wind vane work.

119

EVALUATIVE—Why is a wind vane an example of technology?

» It is technology because it is used by scientists and helps them to do their work.

Review the order in which science and technology work together, using the wind vane as an example:

1) Scientists observe, notice, and make records.
2) They learn from their observations, noticings, and records.
3) They notice that they need tools to help them do more science.
4) They make the tool (technology).
5) They learn more about science.

Page 120

Ask students to look at the images as you read aloud. Talk about what they notice and observe in the images. What tools might help them learn more?

EVALUATIVE—Why is a thermometer an example of technology?

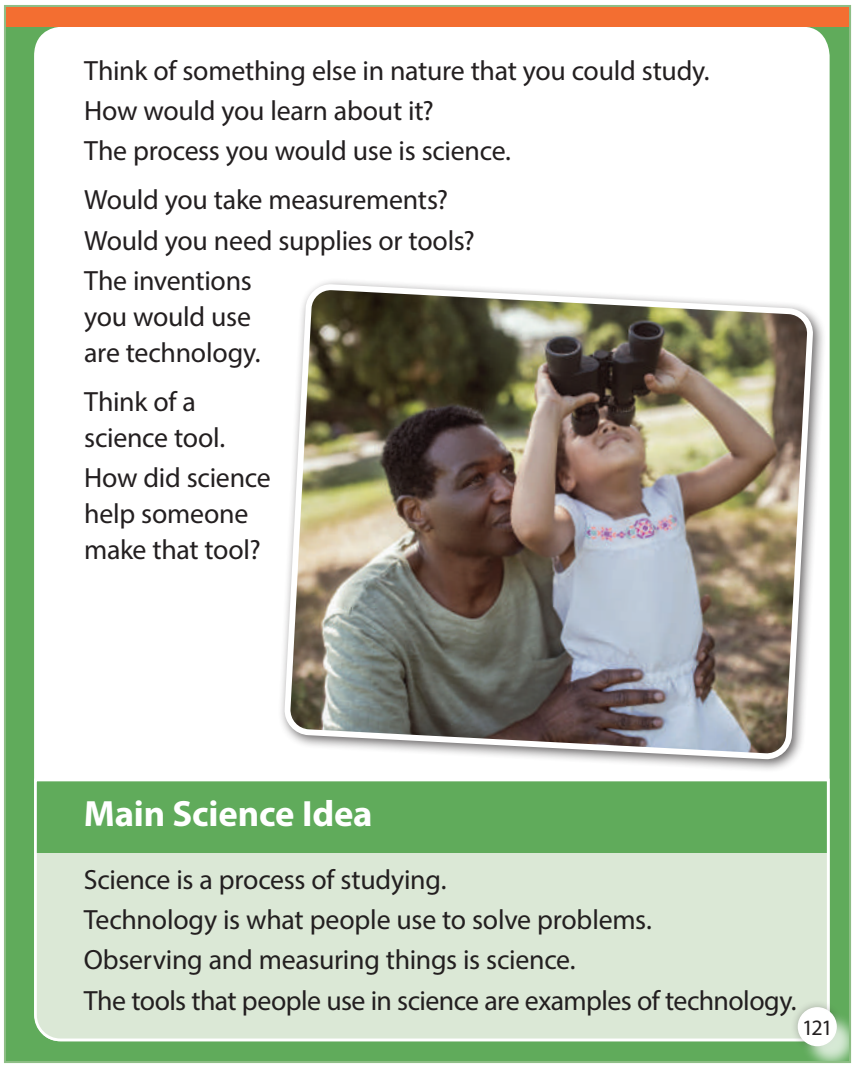
» A thermometer is technology because it measures temperature. It is used by scientists to learn more about the weather.

Again, review the order in which science and technology work together:

1) Scientists observe, notice, and make records.
2) They learn from their observations, noticings, and records.
3) They notice that they need tools to help them do more science.
4) They make the tool (technology).
5) They learn more about science.

Page 121

Ask students to look at the image as you read aloud. Talk about what they notice and about how the child is being a scientist and using technology.



INFERENTIAL—What would you study, and how would you learn about this topic?

» Sample answer: We would study the trees and learn how they change throughout the year.

3. Check for understanding.

Activity Page

AP 20

Main Science Idea: Reiterate the main idea of the chapter in plain and simple terms.

Use Activity Page 20 to assess students' understanding of the Core Vocabulary words (*science* and *technology*) as well as the relationship between the two.

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

GRADE K

Teacher Resources

Activity Pages

Name _____ Date _____

Activity Page 1 Use with Lesson 1

My Nature Notebook

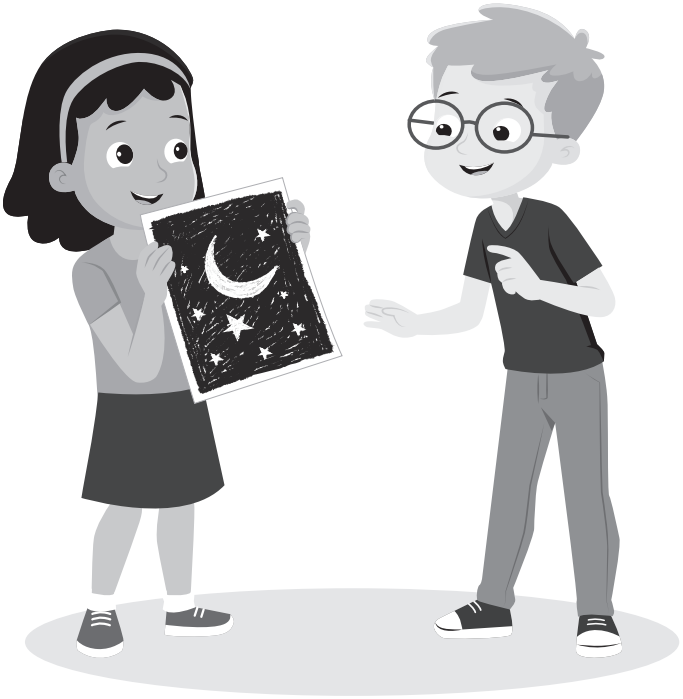
You can be a scientist! Cut and staple to make a nature notebook. On each page, draw one thing you notice outdoors. Then share a question about each page with your class.

Name _____ Date _____

Activity Page 2 Use with Lesson 2

Communicating Science

You can communicate about science. Draw something you discovered about plants, animals, rocks, the sky, or a tool. Share it with someone.

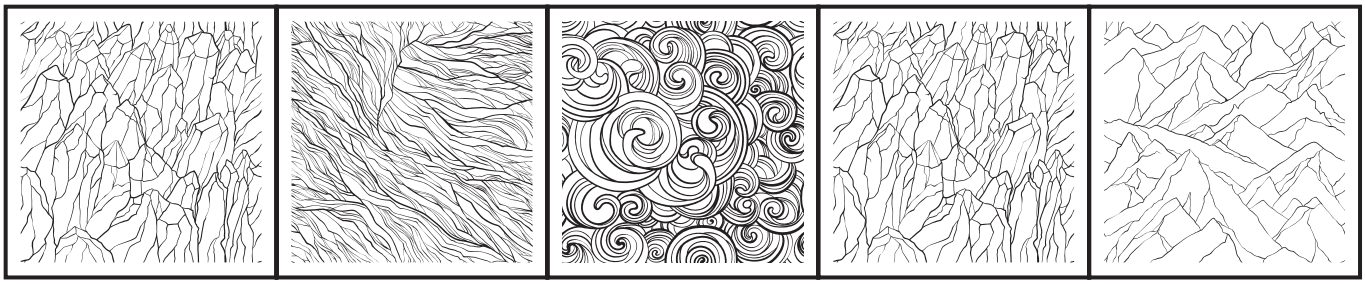


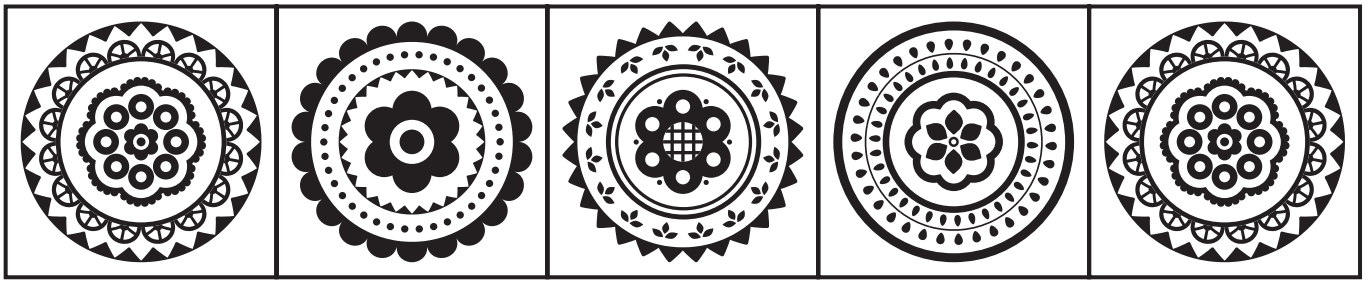
Name _____ Date _____

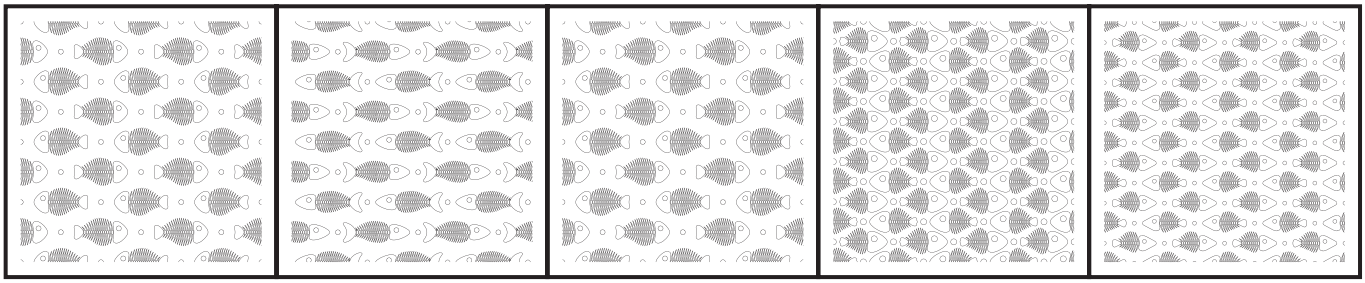
Activity Page 3 Use with Lesson 3

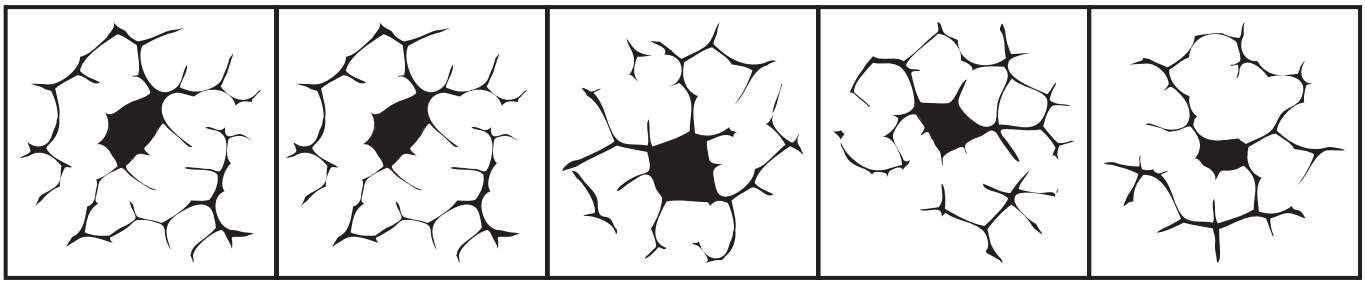
Observing Patterns

Look at the first pattern in each row. Circle the pattern to the right that matches.









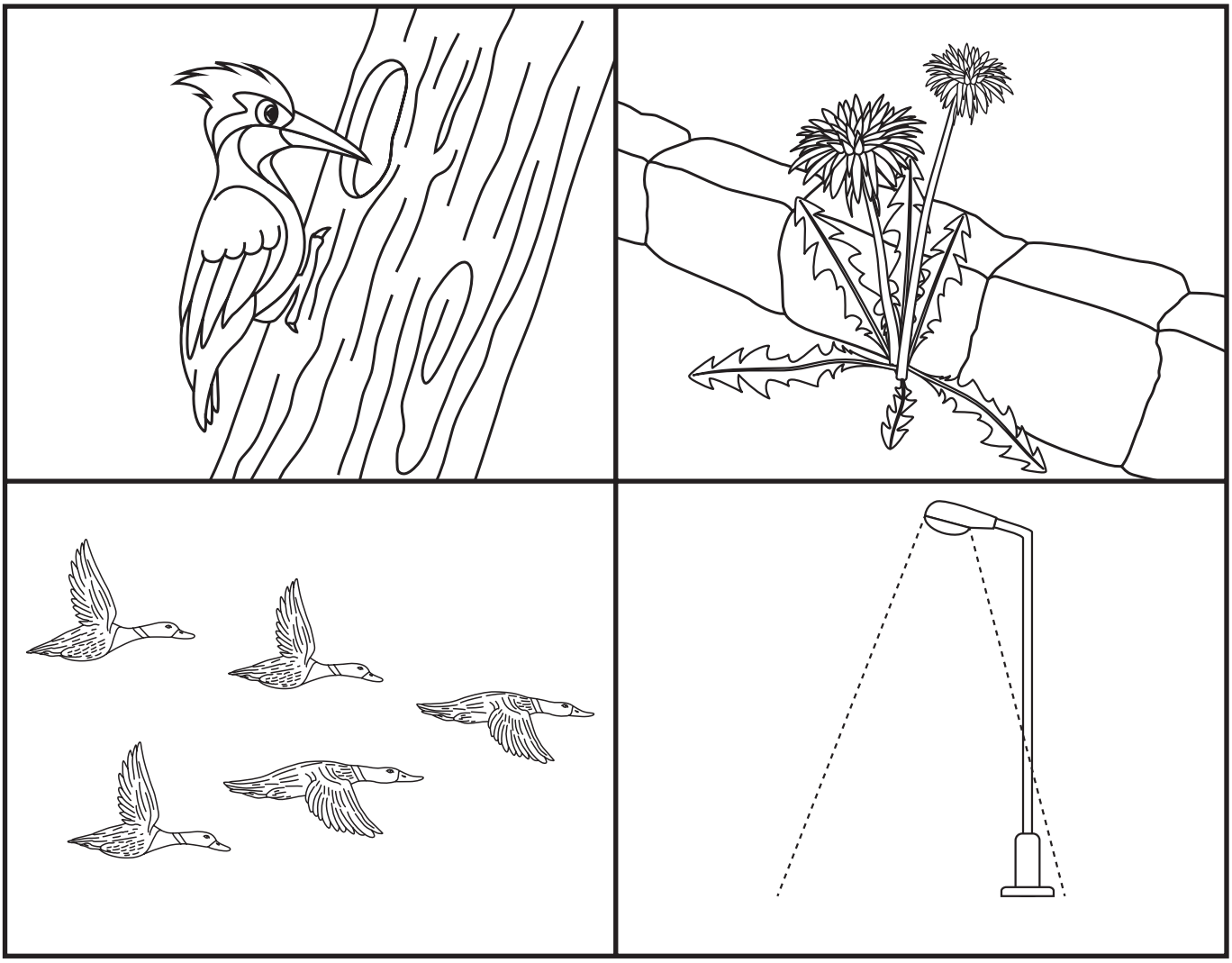
Name _____ Date _____

Activity Page 4 Use with Lesson 4

Use Question Words

Circle one of the question words. Circle one of the pictures. Make up a question about the picture that uses the question word you chose.

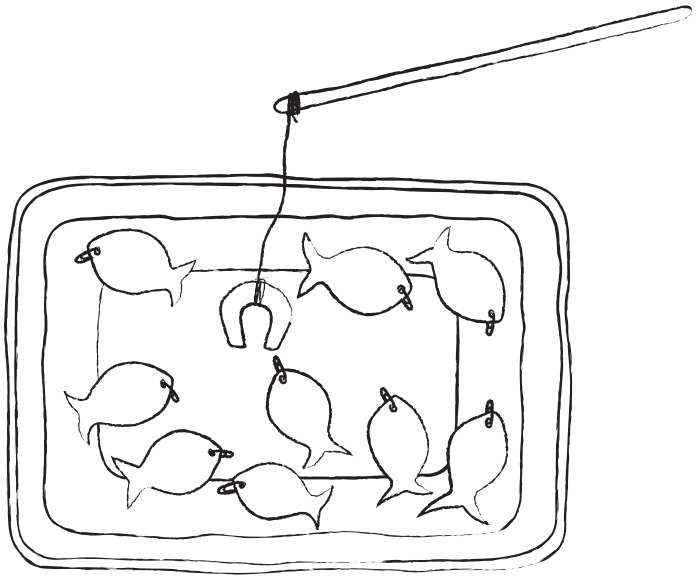
What? **Why?** **How?** **Where?** **When?**



Name _____ Date _____

Activity Page 5 Use with Lesson 5

Putting Away Luna's Party Game



Luna's birthday party has ended. How can she save the fishing game she made with Uncle Elvio to use again? Draw two steps to show a solution to her problem.

Drying the cut-out fish	Dumping out the water in the pan

Name _____ Date _____

Activity Page 6 Use with Lesson 6

Make a Prediction!

Cut apart the cards. Answer the questions to predict what will happen.

Predict!

What will happen to pebbles thrown in the water?

Predict!

How will it feel when the rider touches the ground?

Predict!

How will the wagon move when there is no wind?

Predict!

Where will the bubble move?

Name _____ Date _____

Activity Page 7 Use with Lesson 7

Recording Observations

You can record observations like a scientist. In the boxes with thick lines, draw three things you could look for in your classroom. In the boxes next to your drawings, place an X for each time you find one of those objects.

Name _____ Date _____

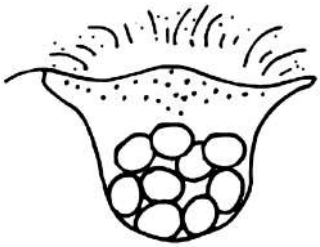
Activity Page 8 Use with Lesson 8

Practice Counting

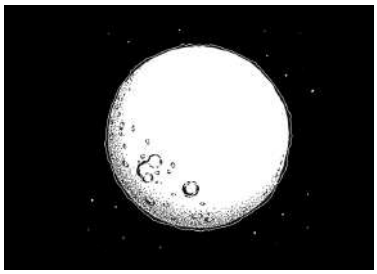
You can count like a scientist.

Draw lines from the pictures to the correct numbers. Draw the number of items for the number that is left over. You decide what items to draw!

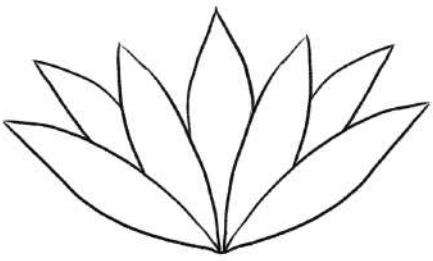
1



3



5



7

9

Name _____ Date _____

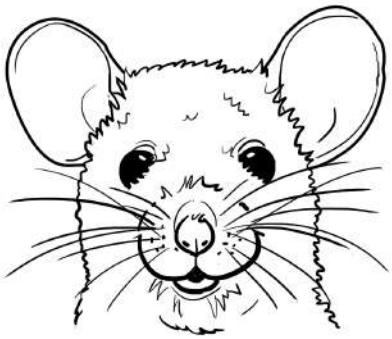
Activity Page 9 Use with Lesson 9

Facts About Mice

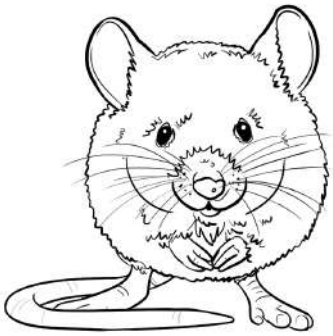
Circle the number in the box that is not a fact about mice.

1. Mice are tidy nest builders.

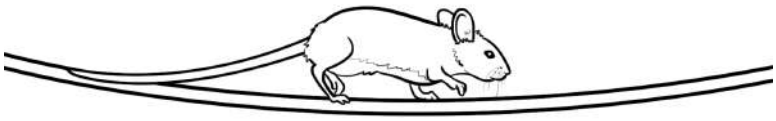
2. Mouse whiskers help mice sense textures and weather.



3. Mice are very cute.



4. Mice have great balance.



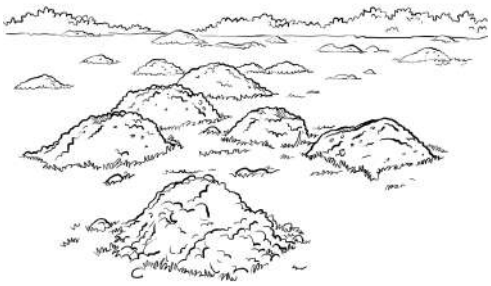
Name _____ Date _____

Activity Page 10 Use with Lesson 10

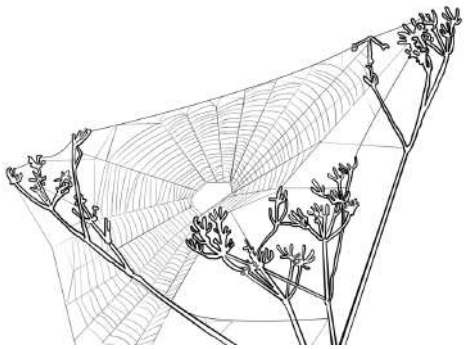
Mole Evidence

Circle the numbers of the pictures that could provide evidence of moles.

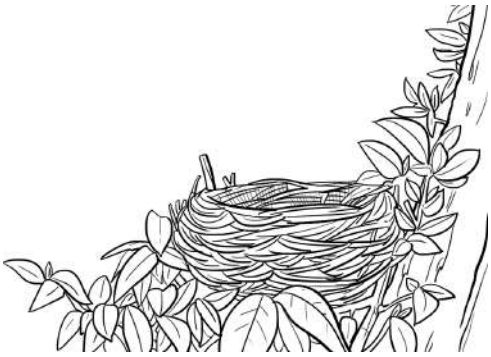
1. Dirt Hills



2. Web



3. Nest



4. Tracks

Name _____ Date _____

Activity Page 11 Use with Lesson 11

Sunrise Sunset

Complete two more drawings to show how the sun rises and sets during a sunny day.

Sunrise Sunset

1. Sunrise

2. Middle of the Day

3. Sunset

Name _____ Date _____

Activity Page 12 Use with Lesson 12

Nature Pattern

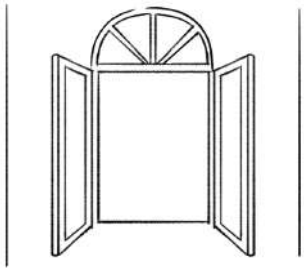
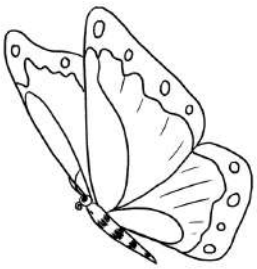
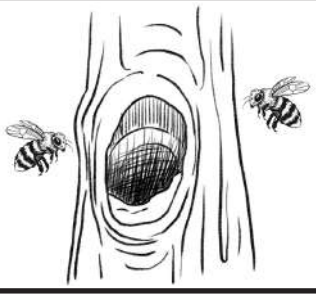
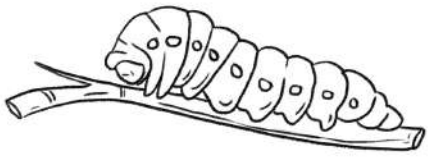
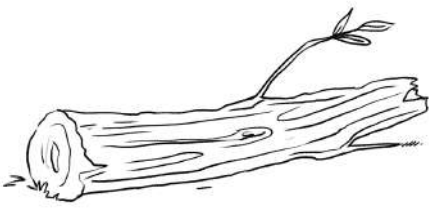
Draw one or more pictures of a pattern you have seen in nature.

Name _____ Date _____

Activity Page 13 Use with Lesson 13

Cause and Effect

Draw a line between each cause and its effect.

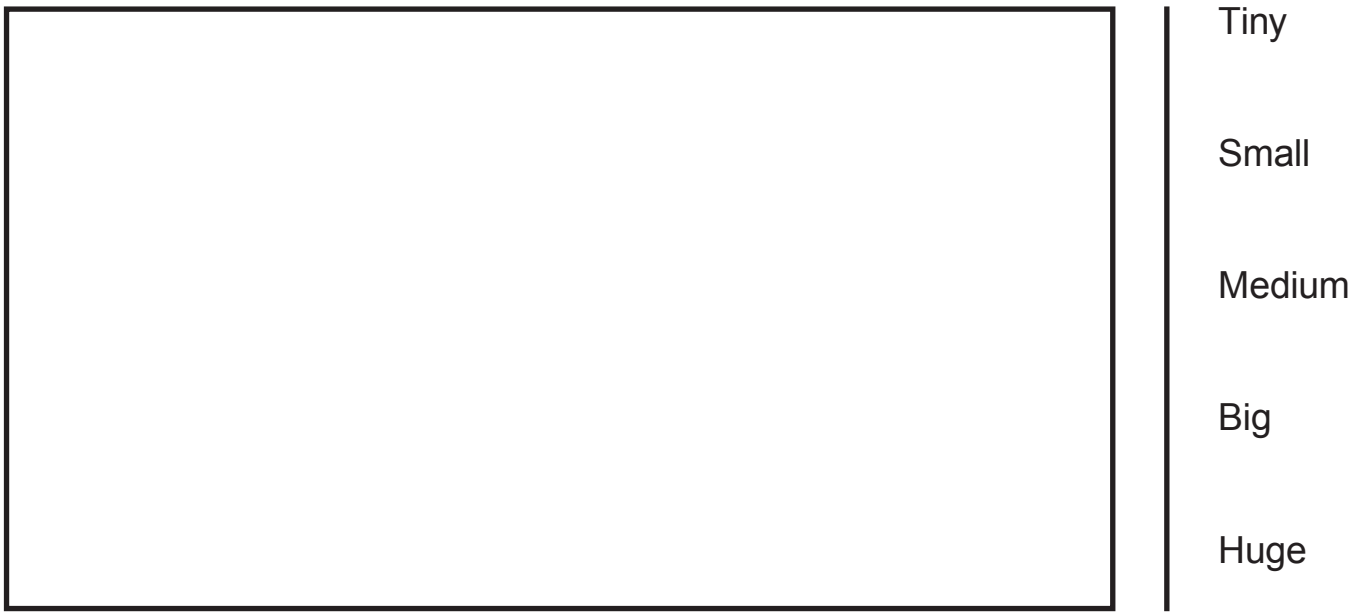
Cause	Effect
	
	
	
	
	

Name _____ Date _____

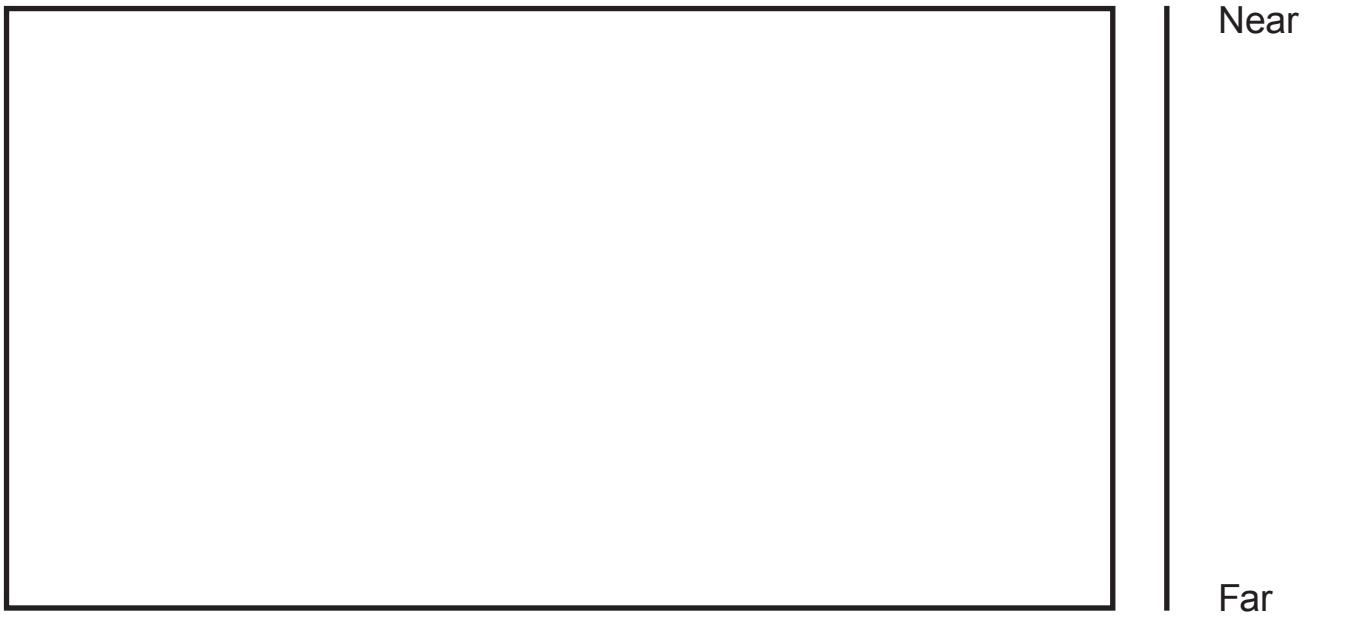
Activity Page 14 Use with Lesson 14

Making Comparisons

Draw an object you see. Then mark on the scale to describe its size.



Draw two objects you see. Then mark on the scale to describe the distance between them.

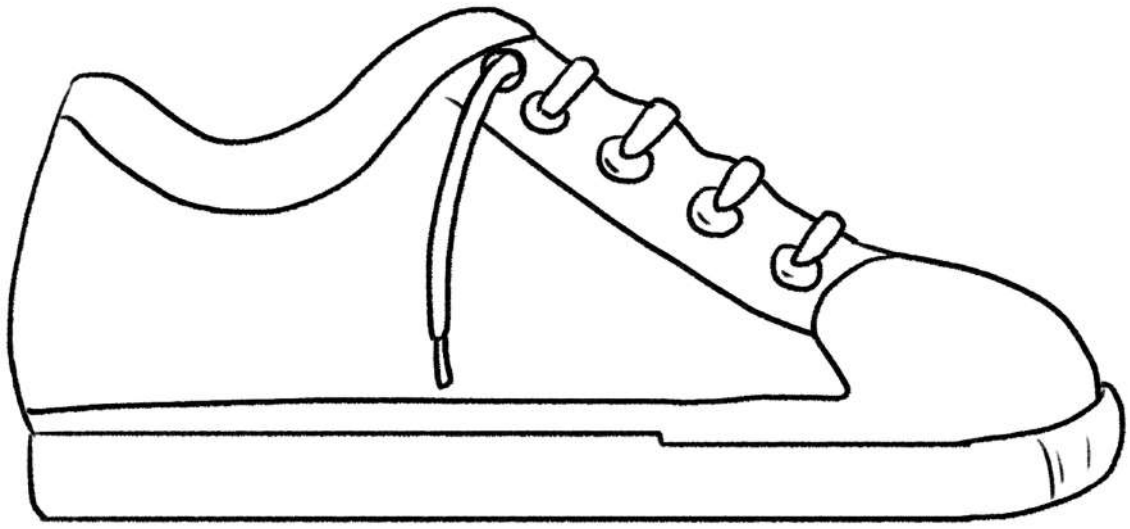


Name _____ Date _____

Activity Page 15 Use with Lesson 15

Parts in a System

The parts of a shoe work together. Color the part that makes the shoe stay snugly on a foot.



Now draw a shoe that has a different kind of part to make the shoe stay snugly on a foot.

Name _____ Date _____

Activity Page 16 Use with Lesson 16

Old Parts, New Object

In the story "Goldilocks and the Three Bears," when Goldilocks sits in the smallest chair, it breaks into pieces! Help Baby Bear by building a new object from the parts.

Your teacher will give or show you parts from the broken chair. Think of something different you could build with the parts. Draw your new structure, and describe it to a friend or your teacher.

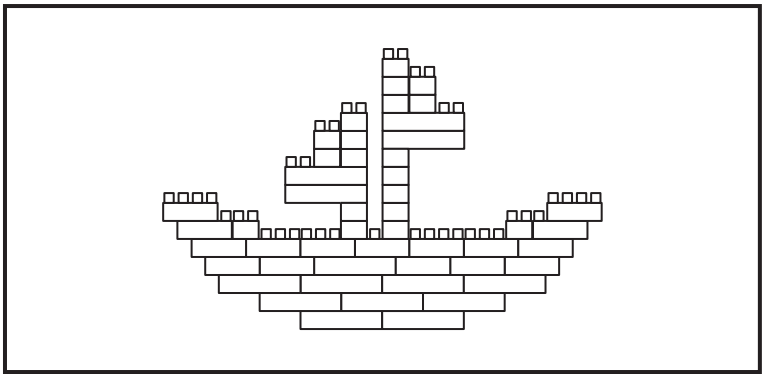
Make sure to use the words *piece, part,* and *rebuild*.

Name _____ Date _____

Activity Page 17 Use with Lesson 17

New Shape, Different Job

You could take these blocks apart and rebuild them into something different. Draw what you would build.



Name _____ Date _____

Activity Page 18 Use with Lesson 18

Compare Changes

Draw a way that a plant could change. Draw the plant before the change in Box 1. Draw the plant after the change in Box 2.

1.	2.

Now draw another change to the plant. Circle the pair of pictures that shows the faster change.

3.	4.

Name _____ Date _____

Activity Page 19 Use with Lesson 19

Problems and Solutions

Below, draw a line from the problem to the solution.

PROBLEMS	SOLUTIONS
	
	
	
	

Name _____ Date _____

Activity Page 20 Use with Lesson 20

Spotting Technology

How are these scientists using technology? Circle the technology that is being used. Hint: There's more than one in each picture!

Answer Key: *Science All Around Us*

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.

My Nature Notebook (AP 1) (page 176)

In allowing students time to make outdoor observations on school grounds, help steer students to natural objects as opposed to human-made objects or phenomena. Remind them to select things they will be able to share a question about.

Communicating Science (AP 2) (page 177)

Coach students to draw a picture representing something they have observed or noticed themselves, and provide opportunities for students to describe what they have drawn to either the whole class or a partner.

Observing Patterns (AP 3) (page 178)

The first pattern in each row is on the far left. The patterns match as follows:

In Row 1, second from the right; in Row 2, far right; in row 3, middle; in Row 4, second from left

Use Question Words (AP 4) (page 179)

Assess each student's verbal articulation of a question that pairs their selected question word with the pictures of their choosing.

Putting Away Luna's Party Game (AP 5) (page 180)

The drawing on the left should show a cloth being used to dry the parts. The drawing on the right should show the water being poured from the container.

Make a Prediction! (AP 6) (page 181)

Student responses should approximate the following: The pebbles thrown into the water move away from the girl throwing them. They might skip a few times on the surface, but then they will sink to the bottom of the water. When the parasail rider touches the ground, they will feel the weight of their body press down on their feet. When there is no wind, the sail will not cause the wagon to move at all. The bubbles will move away from the girl blowing them and then sail in the direction the wind is blowing.

Recording Observations (AP 7) (page 182)

Students should represent objects directly observable in the classroom. Look for approximate quantities, but do not require precision for objects that might be abundant and distributed around the room, such as books, for example.

Practice Counting (AP 8) (page 183)

1, moon; 3, birds in nest; 9, eggs; 7, flower petals. Students should supply the drawing showing 5 objects of their choosing.

Facts About Mice (AP 9) (page 184)

3. Mice are very cute. This sentence is an opinion. The others are facts.

Mole Evidence (AP 10) (page 185)

1. Dirt Hills

Sunrise Sunset (AP 11) (page 186)

In the picture for the middle of the day, students should show the sun high in the sky and near the middle of the rectangle. For the sunset picture, the sun should appear lower in the sky and to the right of the house.

Nature Pattern (AP 12) (page 187)

Look for evidence of anything that predictably repeats. The pattern may be visible, or students may choose to depict something that *happens* in a pattern by showing one instance of the occurrence.

Cause and Effect (AP 13) (page 188)

Students should match the image pairs as follows: rain cloud, growing plants; open window, bird in the bedroom; wind, fallen tree; beehive, honeycomb; caterpillar, butterfly

Making Comparisons (AP 14) (page 189)

Students' images and descriptors will vary. Further assess their understanding by inviting them to share and then ask for examples that are larger, smaller, nearer, or farther than the examples they drew.

Parts in a System (AP 15) (page 190)

Students should color the shoestring. Their drawing of a part that functions the same way might show a shoe with a buckle, a hook-and-loop fastener, or a zipper

Old Parts, New Object (AP 16) (page 191)

Students' ideas about what to build will vary. Encourage creativity balanced with practicality that considers how the parts can realistically function.

New Shape, Different Job (AP 17) (page 192)

Students' ideas about what to build will vary. Encourage creativity balanced with practicality that considers how the parts can realistically function.

Compare Changes (AP 18) (page 193)

Students' images will vary. They could show plants growing, wilting, and/or developing fruit or flowers. Look for evidence that they have selected the change from among the pairs they show that would likely occur the most quickly.

Problems and Solutions (AP 19) (page 194)

Students should pair the pictures as follows: the muddy road with a paved road; the river with the bridge across a river; the horse-drawn hay wagon with the pickup truck; the person in the rain with the person under an umbrella

Spotting Technology (AP 20) (page 195)

The microscope, the slide, the goggles, the gloves, the scuba gear, the wetsuit, and the underwater writing apparatus are all examples of technology.

Appendix A

Glossary

Green words and phrases are Core Vocabulary in the lessons, though in Kindergarten 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.

A

art, n. a creative way of telling a story or expressing a feeling

asteroid, n. a rocky object orbiting the sun, smaller than a planet

C

cause, v. to make something happen (also n. the reason something occurs)

change, v. to become different (also n. the outcome of a process of alteration)

chart, n. a graphical representation of information

claim, v. to assert something (also n. the assertion of an idea)

communicate, v. to convey information

count, v. to quantify a number of items

cubby, n. a small, partially enclosed storage space

D

desert, n. a notably dry environment

detail, n. a small piece of information that describes something

diagram, n. a picture that relates how something functions

distance, n. the space between two designated points

drawing, n. a rendered illustration of something

E

effect, n. the outcome produced by a cause

engineer, n. a person who uses science knowledge to develop solutions in the form of technological devices or processes

environment, n. the living and nonliving elements in an area that affect the things that live there

evidence, n. details that furnish proof of an idea

explanation, n. the stated reason for something or about how something happens

F

false, adj. describing something that is not correct

faster, adj. taking less time than something by comparison

H

hand lens, n. a handheld magnifying device

I

investigate, v. to systematically observe, examine, or study

investigation, n. an instance of investigating

J

job, n. purposeful work

L

lightning, n. a flash of discharged electricity in the atmosphere

living, adj. alive

M

machine, n. a device that makes work easier

malaria, n. an illness caused by parasites, often transmitted to humans by mosquitoes

material, n. the physical matter something is made of

measure, v. to quantify by time, distance, volume, or mass

measurement, n. the amount determined by measuring

N

nest, n. the resting place for an animal, especially for young

nonliving, adj. not alive

number, n. a unit that expresses how many

O

object, n. a physically observable, tangible thing

observation, n. a noted detail

observe, v. to notice details about something

P

part, n. an essential portion of a larger whole

pattern, n. a reliable sample that enables predictability of characteristics or occurrences

photograph, n. a picture made by capturing an image with a camera

piece, n. a part

planet, n. a large body that revolves around the sun in the solar system, or a similar object orbiting a different star

portable, adj. able to be moved easily from place to place

predict, v. to state in advance what one thinks will happen

prediction, n. a declaration in advance of what one thinks will happen

problem, n. a want or a need that a person or people want to resolve

purpose, n. the reason for something

Q

question, n. an expression for the purpose of inquiring or looking for a reason or explanation

R

range, n. a series of values in progressive order

rebuild, v. to make a structure over again

record, n. to document for future reference.

repeat, v. to do over again

right, adj. correct

S

sand dune, n. a pile of sand collected over time by wind

scale, n. an instrument for weighing; *or* a range of comparisons

science, n. a system of knowledge and investigation to determine the truth and physical laws governing phenomena

scientist, n. a person who investigates using scientific methodology

season, n. a period of the year associated with weather trends affected by Earth's orbit and axial tilt

shadow, n. the darker area cast by an object relative to a light source

shelter, n. a place providing protection from the elements

size, n. the relative amount of space something takes up or distances between points on its physical structure

slower, adj. taking more time relative to another occurrence

soil nutrients, n. materials in soil that are useful for plant health

solution, n. the remedy to a problem

speed, n. distance moved per unit of time

structure, n. the pattern of organization of the materials that make something up

sunrise, n. the process of the sun becoming visible above the horizon in the morning

sunset, n. the process of the sun disappearing below the horizon at the beginning of night

support, v. to suggest the truth of something

system, n. a set of parts that work together and affect each other

T

table, n. an arrangement of rows and columns for organizing data

technology, n. the use of science in devices or processes to solve problems

telescope, n. a magnification device for viewing objects that are too far away to see well with the unaided eye

temperature, n. the measure of thermal energy in a material

test, n. to systematically observe outcomes from the manipulation of variables

thunder, n. the crashing or rumbling sound that results from lightning strikes

tool, n. an object used to make a task easier

true, adj. describing something that is accurate or correct

W

wrong, adj. incorrect

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 Literacy 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 Literacy 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

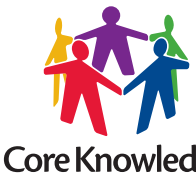
Ways to Engage with Your Community

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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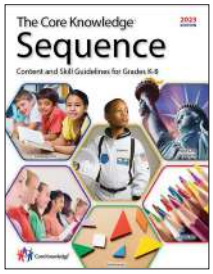

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