



Knowing
Science

3-DIMENSIONAL TEACHING & LEARNING

GRADE 1

Literacy Guide



GRADE 1

Literacy Guide

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Cover and Teachers Manual Design:

Page Designs Inc.

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Introduction

Introduction to the *Knowing Science*[®] Literacy Guide

Elementary science instruction today features teachers introducing students to the investigative practices of “real” scientists to answer their questions about the natural world. Why do objects move or stop moving? Why do earthquakes happen? Why do baby mammals look like smaller versions of their parents?

When students generate inquiries about the natural world, they embark on a journey to find the answers. They make observations, read books, or search the Internet for relevant information. They plan investigations, make predictions, and suggest answers. They perform experiments, accumulate and analyze data, and communicate their findings to others orally and/or in writing. Introducing students to these genuine scientific procedures during their formative years encourages critical thinking and excitement about science.

Evidence suggests that children learn science best in the context of an interdisciplinary approach. It is clear that mathematics and science are inextricably linked, but the important role literacy plays in the study of science has received less attention. When children engage in science content as one of the contexts for developing literacy skills, they not only become well informed about science; they also develop proficient reading, writing, and speaking skills. Student scientists, just like professional scientists, must possess good reading and communication skills in order to conduct research and share the results effectively.

The *Knowing Science* program employs both fiction and nonfiction to assist in developing students’ understanding of science. Most young children have a strong concept of story. In kindergarten, children’s literature (which sometimes adds fact to fiction) motivates students to follow a story line and at the same time acquire important information and concepts. In first and second grade, fiction still plays a role in understanding science concepts, but nonfiction science trade books (NOT textbooks) assume growing importance as sources of accurate information about various topics. Nonfiction titles help students learn facts about a topic through text, photographs, charts, maps, and the visual presentation of data.

Integrating literacy—reading, writing, and speaking—into the study of science is one of the strengths of the *Knowing Science* program. For those seeking to incorporate literacy into the teaching of science, the *Knowing Science Literacy Guide* suggests how to embed literacy into the content of *Knowing Science* units.

Guide to Lesson

Using the Knowing Science® Literacy Guide

At the K-3 levels, selected sessions in the *Knowing Science* Teacher's Manual have a corresponding entry in the *Knowing Science* Literacy Guide. The following elements are contained in each of the entries.

PURPOSE

Outlines the main concepts of the unit and describes the kinds of literature that can be used to complement the science themes and enhance students' understanding of the topic.

OBJECTIVES

Provides a list of the learning goals for a specific lesson.

RECOMMENDED LITERATURE

Provides a list of recommended titles, along with their authors and Lexile ratings. Also furnishes additional titles that you may wish to use because their Lexile levels are appropriate for specific individuals or small groups of students in your class. Titles that fall into this category carry a general rather than detailed suggestion for how to use them during the course of the lesson.

EMBEDDING LITERATURE

A detailed description of how to use the recommended titles during the course of a lesson.

BUILDING LANGUAGE FOR LITERACY

If applicable... Provides opportunities in some lessons to develop students' acquisition of vocabulary, as well as oral language structures to talk about scientific subject matter. For example, sentence frames guide students to communicate about aspects of the lesson in correct grammatical form. The repeated use of this approach fosters fluent expressive language skills around the content of the curriculum.

Tips & Tricks: Integrating Science with Literacy

There are many good reasons to include science literature as part of a balanced literacy program. The most important reason is that to teach science well, *science must be done and not just read about*. Effective science teaching requires students to actively engage in experiences that are relevant and applicable to their daily lives.

Reading and responding to quality science literature supports science learning. It leads to better comprehension and retention of science concepts. Students are able to transfer topic-specific information from one instructional setting to another (from science to literacy and literacy to science). Additionally, skills needed for understanding and responding to science texts (or any informational text) are applicable to other subject areas and not limited to use only during literacy time.

Comprehension skills required to read informational text are different from the skills required to read narrative text. This is because informational text tends to include many details in a small amount of writing, both at the sentence level and at the paragraph level. Therefore, to understand the author's message, informational text needs to be read more slowly. Repeated readings may be necessary in order to fully extract the meaning from the text.

Students benefit from actively reading nonfiction text. This requires frequent stops to ask questions (*What did I just read? What details were included? What do I want to know more about?*) and to react (*Wow – that just got my attention!*). Active reading also involves making connections – to self and personal experiences; to other texts, movies, or videos on the same topic; and to events in the world.

Text features may give as much if not more information than written text. If informational reading is new to students, they may have seen text features before but may not know why or how they are used. Arranging a “text feature hunt” is an easy way to introduce students to features such as:

- Table of contents, glossary, index
- Main heading (title) and subheadings or chapter titles
- Special print: **boldface**, *italics*, or **highlighted**
- Bulleted lists of information
- Diagrams: illustrations labeled to show parts
- Captions: usually a sentence or two that describes an image
- Text box, inset box, or call out: to define vocabulary or “fun facts”
- Illustrations such as photographs and drawings
- Other graphics: graphs, charts, tables, maps, timelines, Venn diagrams

Informational text is organized differently from narrative text. It may be structured in any of several ways, depending on the author's purpose. Here is a list of text structures, along with uses and examples of signal words featured in each type of text:

Description	Uses topic-specific vocabulary and details to create a mental image for the reader <i>first of all; an example is; such as; also</i>
Comparison	Discusses similarities and differences between two objects or ideas <i>same; both; different; unlike; similar to; also</i>
Sequence, Order, or Procedural	List of events that have occurred or should occur in a set order <i>first; next; then; last; finally; after that; before that; numbered list</i>
Cause and Effect (Before and After)	What causes an event and the resulting change <i>because of; before; after; since; as a result of; however</i>
Problem and Solution	A problem or task to be solved is described along with possible solutions <i>problem; task; issue; answer; possible; solution; try</i>
Fact and Opinion	The author states a claim and then gives detailed reasons to support the claim <i>one reason is; another reason is; finally</i>

When writing responses to informational text, have students answer questions in complete sentences, using topic-specific vocabulary from the question. This strategy is sometimes referred to as “TTQA” or **T**urn **T**he **Q**uestion **A**round. For example:

Question: How do *all food chains begin*?

Answer: *All food chains begin* with energy from the Sun.

Written responses should mirror the specific type of text structure (description, comparison, procedural, cause/effect, problem/solution or fact/opinion). Responses should include signal words that are characteristic to each type of text. For example:

Question: How are solids *different* than liquids?

Answer: Solids have their own shape, *but* liquids take the shape of their container. They *both* take up space and have mass.

Guided reading groups may take several forms, depending on the needs of your specific class and available resources. One approach is using *leveled readers*. When using leveled readers, the books will all cover the same topic but will be at different reading levels. Questions written specifically for each title may be used. If that is not possible, use a generalized graphic organizer for each title, such as the ones shown below:

Name _____

Directions: Make a bulleted list of details for each section under its subheading.

Name _____

Wow Facts! Outline

Directions: Read the text. List at least two key details or "Wow Facts" below. You may also add a sketch for your ideas. Then list any "Connect" ideas you have after reading these pages.

Wow Facts:	Quick Sketch
_____	_____
_____	_____
_____	_____
_____	_____

Connect: (This reminds me of.....)

Another approach is to use the *same book* and same set of questions. Different levels of support can be provided for each ability group. One group will need little support, one will need moderate support, and one will need a greater amount of direct support and instruction. Questions may be modified as needed to meet the needs of each group. The number of questions and required length of responses may be adjusted for each ability level. Challenge or bonus questions may be provided for groups or individuals that finish early.

A third approach is *parallel reading*. Each group reads a different subtopic of a main idea or topic. For example, when studying natural disasters, one group might read about volcanoes, another about earthquakes, and a third about tsunamis. A general graphic organizer or parallel questions may be used. Parallel questions ask for the same information, but specific answers vary. For example:

- What causes the natural disaster?
- What happens to surrounding areas during the disaster?

Integrating science literature into a balanced literacy program benefits students in many ways. It promotes better retention of knowledge, and it encourages development and transference of skills across subject areas. Any time a student finds a connection between multiple segments of learning, the result is always a better-quality learning experience.

PHYSICAL SCIENCE

UNIT 1: MEASUREMENT

Comparison is one of the “big ideas” of science. In kindergarten, students used direct comparison and nonstandard units of measure to develop an understanding of the concept of length (recognizing objects that are shorter, longer, or taller). As first graders, students continue to develop an understanding of linear measurement using direct comparison and nonstandard units. They review height and length and learn to measure width. They compare physiologically the weight of objects and explore the concept of gravity. They revisit the idea of capacity and learn that usually (but not always) it takes a greater number of smaller objects but a smaller number of bigger objects to fill a specific container. Finally, students are introduced to additional tools of measurement and to the inch and (optional) the centimeter as standard units of measurement.

Teachers can use literature to help students understand the concept and importance of measurement. Appropriate texts for this unit describe measurement, deal with objects being measured, and introduce students to both standard and nonstandard units of measurement.

The titles listed below fit the criteria for inclusion in this unit.

RECOMMENDED LITERATURE

Recommended titles are listed below, along with their authors and Lexile ratings. The list is followed by suggested strategies for incorporating the books into the unit’s science lessons.

LESSON NUMBER	TITLE	AUTHOR	LEXILE LEVEL
1.1 Ready, Set, Measure	<i>How Big is a Foot?</i>	Rolf Myller	660L
	<i>How Do You Measure Length and Distance?</i>	Thomas K. and Heather Adamson	IG 510L
	<i>Inch by Inch</i>	Leo Lionni	210L
1.2 Comparing Weight to a Standard	<i>I Fall Down</i>	Vicki Cobb	570L
	<i>How Do You Measure Weight?</i>	Thomas K. and Heather Adamson	NC 680
	<i>How Heavy? Wacky Ways to Compare Weight</i>	Mark Weakland	790L
1.3 Comparing Capacity	<i>Drip, Drop</i>	Sarah Weeks	BR
	<i>How Do You Measure Liquids?</i>	Thomas K. and Heather Adamson	NC 680L

Lesson 1.1 Ready, Set, Measure!

PURPOSE

Comparison is one of the “big ideas” of science. In kindergarten, students used direct comparison and nonstandard units of measure to develop an understanding of the concept of height and length (recognizing objects that are shorter, longer, or taller). As first graders, students continue to develop an understanding of linear measurement through direct comparison and nonstandard units of measurement. Finally, students are introduced to additional tools of measurement and to the inch and (optional) the centimeter as standard units of measurement.

OBJECTIVES

By the end of the lesson, students will be able to:

- Use direct comparison and nonstandard units to measure the length of common objects
- Describe the length of different objects using appropriate vocabulary
- Explain why a standard unit of measurement is more reliable than nonstandard

EMBEDDING LITERACY

Session 1: *How big is a foot?*

After introducing the idea of comparing sizes of hands and feet, say to students, “**Here’s a story where different sizes of feet caused a big problem.**”

How Big is a Foot?

Rolf Myller

The King wants to give the Queen something special for her birthday. The Queen has everything—everything, that is, except a bed. The trouble is that no one in the kingdom knows the answer to a very important question: How Big is a Bed? (At that time, beds had not been invented.) The Queen's birthday is only a few days away. How can they figure out what size the bed should be?

Read ***How Big Is a Foot?*** to the class. Tell them that it follows a “once upon a time” format. Ask questions as you read so that students understand the narrative:

- Why did the King think a bed was a good present for the Queen?
- What process did the King use to find out how big to make the bed for the Queen? Show students the pages illustrating this process.
- What did the carpenter’s apprentice do to make sure the Queen’s bed had the right measurements?
- Why was the King disappointed in the beautiful new bed?
- After the apprentice was thrown in jail for making a too-small bed, what suddenly occurred to him as the way to solve the problem?

- Does the story have a happy ending? Explain your answer.
- Even though this story is written like a fairy tale, it does have some basis in fact. Before agreement about standardized measuring units, the unit of measure called a “foot” in England was modeled after an actual ruling king’s foot.
- What if this story took place today? Would it have been difficult to make the bed the correct size from the beginning? Explain your answer.

Proceed with the rest of the session.

Session 5: How does a ruler work?

Start the session by reading aloud to students the following book about measuring tools.

How Do You Measure Length and Distance?

Thomas K. and Heather Adamson

How tall will my sunflower grow? How long is Barney the dog? How far is it to Los Angeles? Photographs and simple text help students understand the importance of standardized measuring units and measuring tools.

- Ask students why Sue should not use her nose or hands or feet to measure her sunflower plant.
- What are some of the measuring tools we can use to measure things?
- Make a list of the units of measurement listed in the book.
- Why are units such as inches and feet and miles called “standard units?”

Proceed with the remainder of the session.

Session 6: Measurement Assessment

Inch by Inch

Leo Lionni

This is a charming story about a clever little inchworm that escapes being eaten by offering up his measuring skills to several representatives of the bird world.

Before administering the Measurement Assessment, read this entertaining story about an inchworm that used his measuring skills to escape a hungry robin only to be

challenged by a nightingale to measure his song. Children will enjoy the wily little inchworm's solution to this problem.

As is true of many read-aloud books for young children, many in the class will have heard this story before. However, this time the emphasis of the reading should be the importance of knowing how to measure!

BUILDING LANGUAGE FOR LITERACY

1. Referring back to the literature in the lesson (*How Big is a Foot?*), use the following sentence frames to model how to state a comparison. For example, "The King's foot was longer than the apprentice's foot." The goal is for students to state the comparison and to write it in a complete sentence.

_____ was shorter than _____.

_____ was longer than _____.

Lesson 1.2 Comparing Weight to a Standard

PURPOSE

Comparison is one of the “big ideas” of science. In kindergarten, students used direct comparison and nonstandard units of measure to develop an understanding of the concept of weight (recognizing objects as same, lighter, or heavier). The purpose of this lesson is to further develop students’ concept of weight (same or different, heavier or lighter) through direct comparison and nonstandard units of measurement. They engage in an initial exploration of the effects of gravity on weight. Finally, students use a balance to explore weight-related standard units of measurement.

OBJECTIVES

By the end of the lesson, students will be able to:

- Compare two objects according to their weight and describe them as *same* or *different*, *heavier* or *lighter*
- Use a balance, and nonstandard and standard units, to measure the weight of common objects
- Explain the connection between gravity and weight

EMBEDDING LITERACY

Session 2: *How does gravity affect weight?*

After the demonstration with the book and the wooden cubes, and the sponge and soap, tell students, “**Today we will read a book that will help explain why one object feels heavier than another.**” It is a book about falling down—and why we don’t fall up!

I Fall Down

Vicki Cobb

What happens when you trip or drop a ball? When something falls, which way does it fall? Why doesn’t it fall up? With entertaining illustrations and a light touch, Vicki Cobb addresses a serious scientific topic in ways kids can understand.

Start reading *I Fall Down* aloud to the class, showing students the pictures as you read.

- When you get to the first mention of gravity, stop and discuss with the students why things fall down.
- Look at the picture of the boy throwing a ball into the air and the molasses dripping from the spoon a few pages later. What do you notice about what happens to the text on those pages?

- Continue reading and stop at the page that asks, “Does everything land with the same force? Or do some things land harder than others?”

Proceed to the activities, which are based on experiments in the book.

Session 3: *How does a balance compare the weight of objects?*

Remind students that in the previous session they learned how to weigh objects with a pan balance. Today they will learn more about weighing, using a picture book as an introduction.

How Do You Measure Weight?

Thomas K. and Heather Adamson

This nonfiction, informational text is filled with eye-catching photos that document ways to measure the weight of objects. The text focuses on real world examples from which students will learn about balances and scales, and metric and customary measurement units.

Begin reading the book aloud to the students.

- Direct their attention to pages 2-3. What is the boy doing with the apples and oranges? Ask them to answer the question at the bottom of page 3.
- What does the balance do to indicate whether the apples or oranges are heavier?
- What does the picture of an apple and a pepper on page 7 tell you about size and weight?
- Look at page 8. A balance can tell us whether an apple or a pear is heavier, but it cannot by itself tell you what this means in standard units. What are the standard units of weight listed on p.8?
- How is Ross using the balance as a scale on pages 10-11?
- Look at the various scales on pages 12-13. Ask if anyone has used a scale like one pictured on those pages.
- Finish the book and entertain any questions students have. Then look at the “Cool Measuring Facts” on pages 28-29.

Proceed with the rest of the session.

Session 5: Assessment – How does a balance work?

Gather students in your meeting space. Before conducting the performance assessment on weight, read aloud *How Heavy? Wacky Ways to Compare Weight*.

How Heavy? Wacky Ways to Compare Weight
Mark Weakland

This book compares weight between familiar animals and objects in humorous ways.

Encourage students to briefly discuss their favorite comparison!

Proceed with the remainder of the session.

BUILDING LANGUAGE FOR LITERACY

1. Referring back to the literature in the lesson (*I Fall Down, How Do You Measure Weight?*), use the following sentence frames to model whether two objects are the same or different in size or weight. For example, “The soap was heavier than the sponge.” The goal is for students to speak and write in complete sentences.

_____ was the same as _____.

_____ was different than _____.

_____ was lighter than _____.

_____ was heavier than _____.

Lesson 1.3 Comparing Capacity

PURPOSE

Comparison is one of the “big ideas” of science. Developing an awareness and understanding of the concept of capacity is a simple form of classification essential to understanding measurement. In kindergarten, students explored capacity using familiar objects and nonstandard units of measurement. The purpose of this lesson is for students to explore and develop the concept of capacity through direct comparison, nonstandard units of measure, and standard customary units.

Literature can help students understand these concepts. Appropriate texts are those that focus on comparing and ordering different capacities, describing the capacities of containers using comparative language, and customary measuring containers and their relationship.

OBJECTIVES

By the end of the lesson, students will be able to:

- Use nonstandard units to compare and order the relative capacities of various containers
- Describe the capacity of the containers using comparative language such as *some*, *more*, and *most*
- Understand and explain the relationship between customary measuring containers

EMBEDDING LITERACY

Session 2: *How much will it hold?*

Remind students that in the previous session they measured the capacity of their hands. Tell students that today they will learn more about capacity, using a story as an introduction.

Drip, Drop

Sarah Weeks

A nighttime rainstorm sends Pip Squeak scrambling to catch the drips pouring through his leaky roof. But the drops just won't stop, and soon it's wetter inside the house than out!

- Tell the class that they are going to hear a story about a mouse who had a problem with capacity. He tried to solve his problem with different sizes of containers. Then read ***Drip, Drop*** to the students. After reading the story, ask the students, “**What was Pip Squeak’s problem? How did he try to solve it?**”

- If time allows, have students make a list of all the containers Pip Squeak used and put them in order from those that hold the least amount to those that hold the greatest amount.
- Then say, **“Today we do not have to find ways to fix a leaky roof, but we are going to compare the capacity of different sizes of containers.”**

Proceed with the remainder of the session.

Session 4: *How do eyedroppers work? / Introducing graduated cylinders*

After introducing the students to the concept of standard units of measurement for liquids, read the following book to them.

How Do You Measure Liquids?
Thomas K. and Heather Adamson

How much water does it take to fill a fish tank? How much milk do you need for hot chocolate? With clear, colorful photographs and simple text, the Adamsons introduce young children to a variety of liquid measures.

This informational text presents familiar experiences and measurement tools used for liquid. The text features both customary and metric measurement systems. As you read along, have brief discussions based on student interest and questions.

Proceed with the rest of the session.

BUILDING LANGUAGE FOR LITERACY

1. Referring back to the literature in the lesson (***Drip, Drop***), use the following sentence frames to model how to state a comparison. For example, “The pot held more than the teacup.” The goal is for students to state the comparison in a complete sentence.

_____ held more than _____.

_____ held the most.

_____ held the least.

UNIT 2: LIGHT AND SOUND

Light is central to our lives. Without light, our universe wouldn't have formed the way it did. Life on Earth could not exist without the energy from the Sun's light. Light warms our planet; enables us to see our surroundings; and provides food for plants and other autotrophs, which are the basis of every food chain on Earth.

"Silence is golden" is a common saying. So you might be surprised to know that there's really no such thing as silence, at least here on Earth. We are constantly surrounded by sounds – even when it's "quiet," we can actually hear the sound of the molecules in the air vibrating. And contrary to popular wisdom, sound is actually a good thing.

When learning about light and sound, students begin by becoming aware of the importance of light in their everyday lives and move to examining the formal characteristics of light. Next, they study the importance of vibration in producing sound and sound in producing vibrations. Finally, they design a messaging system based on sound and light.

Children's literature can help students understand concepts related to light and sound. Appropriate choices include books that focus on the properties of light (travels in a straight line, bends, bounces) and sound (vibrations and their centrality to sound) and emphasize the importance of each in our everyday lives.

The titles listed below fit the criteria for inclusion in this unit.

RECOMMENDED LITERATURE

Recommended titles are listed below, along with their authors and Lexile ratings. The list is followed by suggested strategies for incorporating the books into the unit's science lessons.

LESSON	TITLE	AUTHOR	LEXILE LEVEL
2.1 Light All Around	<i>What are Shadows and Reflections?</i>	Robin Johnson	NC 630L
2.2 Vibrations and Sound	<i>The Listening Walk</i>	Paul Showers	480L
	<i>How Does Sound Change?</i>	Robin Johnson	NC 750L
2.3 Sound and Vibrations	<i>How Does Sound Change?</i>	Robin Johnson	NC 750L
2.4 Communication Design Challenge	<i>Sending Messages with Light and Sound</i>	Jennifer Boothroyd	230L

Additional Title

You may want to use [What are Light Waves? by Robin Johnson](#) (NC 570L) with individual or small groups of students who need more time and repetition to feel comfortable with the concepts associated with light.

Lesson 2.1: Light All Around

PURPOSE

Light is all around us. It is the principal way that we know about our world and everything in it—and it is necessary for our survival. In this lesson, students will learn some basic properties of light and how it interacts with matter.

OBJECTIVES

By the end of the lesson, students will be able to:

- Identify light as a form of energy that helps us to see objects
- Demonstrate that light travels in a straight line called a ray or beam
- Explain that light bounces (reflects) and bends (refracts)
- Give examples of objects or materials that are opaque, transparent, and translucent, and explain how this relates to shadows

EMBEDDING LITERACY

Session 1: *How does light help us see? Where does light come from?*

At the conclusion of the session, review what students have learned by sharing this nonfiction book about light.

What are Shadows and Reflections?

Robin Johnson

What is light? Where does it come from? What are some of the properties of light? This book has the answers! “What do you think?” sections prompt students to realize how light permeates their world, even when it is dark outside.

- Read pages 4-5 and ask students if they have learned anything from these pages that they have not discussed earlier in the session. If so, what is new information? Show students the picture on page 5 and ask them what time of day it appears to be. What are the clues?
- Show the class pages 6-7. How many sources of light are there in the pictures?

Session 2: *How does light travel?*

- Read pages 8-9 in ***What are Shadows and Reflections?*** to begin the session. Page 8, in particular, is dense with concepts (light rays, energy, matter) and merits some careful discussion. The experiment with light in this session will give students concrete evidence that light travels in a straight line.

Proceed with the rest of the session.

Session 3: *How does light bounce?*

- Read pages 10-11 of ***What are Shadows and Reflections?*** to begin the session and introduce another characteristic of light: it bounces. Make sure to discuss the note at the bottom of page 10 that explains why the moon is not a source of light.

Proceed with the rest of the session.

Session 4: *How does light bend?*

- Introduce the session by reading pages 12-13 of ***What are Shadows and Reflections?***. The central idea is that light bends in different ways when it encounters different types of matter. The photos on pages 12-13 illustrate this concept.

Proceed with the rest of the session.

Session 5: *Can you see through it?*

- Introduce the session by reading pages 14-16 in ***What are Shadows and Reflections?***. These pages outline the concepts of *transparent*, *translucent*, and *opaque*. Tell students they will directly observe the way light interacts with various kinds of matter and see examples of each.

Proceed with the rest of the session, ending with the “Talk it Out” section of the lesson.

- Preview the discussion of shadows by reading pages 16-19 of ***What are Shadows and Reflections?***.

Lesson 2.2 Vibrations and Sound

PURPOSE

Sounds are all around us, giving us information about our world. Vibrating matter produces sound. Sound waves spread out in all directions from the source. Sound travels to our ears, which work with our brains to analyze and identify the sound. In this lesson, students will learn some basic properties of sound and how it interacts with matter.

OBJECTIVES

By the end of the lesson, students will be able to:

- Explain that sound is produced when matter vibrates
- Explain how sound waves produced by one object may cause another object to vibrate

EMBEDDING LITERACY

Session 1: *What sounds are all around us?*

After the opening “I Hear” activity, read *The Listening Walk* to students and tell them that they will soon take their own “listening walk.”

The Listening Walk
Paul Showers

A young girl and her father take a walk through their town and a park, all the while listening for whatever they can hear, such as a dog’s toenails on the sidewalk, lawn mowers, and so on.

Begin reading the book to the class. As you read, entertain any questions students have and prompt them to think with the following questions:

- Why don’t the little girl or her father talk on their walk?
- Try to imitate some of the sounds the girl and her father hear, or ask a student to give it a try.
- What kind of noise bothers the little girl? Ask students what kinds of sounds hurt their ears.

Proceed with the rest of the session.

Session 2: *What are vibrations?*

After students have felt the vibrations from their own vocal chords, read aloud the following book that discusses vibrations.

How Does Sound Change?

Robin Johnson

Sounds help us understand the world around us. This engaging title provides a close-up look at the science behind different sounds. Readers discover how sound waves travel through different matter and learn about concepts such as echoes, volume, and pitch.

- Share with students that this book is nonfiction (informational) rather than a story. Show them the table of contents on page 3, and point out that the words in white are chapter titles. Indicate that the “words to know” in the back of the book are important to the topic of sound and that the index tells what page information can be found on a specific topic related to sound.
- Then begin to read pages 4-5. Ask students to listen for the answer to “What is Sound” and discuss what they have learned.
- Read pages 6-7, which discuss vibrations as the source of sound.

Proceed with the string activity.

- After discussing the follow-up questions for the string activity, close the lesson by reading pages 8-9 in ***How Does Sound Change?***. These pages raise the idea that sounds are vibrations that travel in waves.

Session 3: *How do vibrations cause sound?*

Begin the session with a brief review of vibrations from the previous session by rereading pages 6-9 in ***How Does Sound Change?***. Then say, “**Today we are going to further explore the idea of feeling, seeing, and hearing sound caused by vibrations.**”

Proceed with the rest of the session...

Session 4: *What have we learned?*

Close the session by rereading pages 6-9 in ***How Does Sound Change?*** to review the connection between sound waves and vibrations.

BUILDING LANGUAGE FOR LITERACY

Challenge students to think of as many words as they can to describe various sounds (e.g., *screechy*, *thunderous*, *whispery*, *startling*) and help them write the words on index cards. Try to collect at least 30 words that describe sound. Divide the class in half and give each group half of the cards. Ask them to find ways to categorize the sounds on the cards (e.g., soft sounds, loud sounds, animal sounds, people sounds, and so on).

Lesson 2.3 Sound and Vibrations

PURPOSE

In the previous lesson students learned that when an object vibrates, sound waves are produced that carry sound energy through the air. In this lesson students will learn that sound waves travel in all directions from one object (called a source). The sound waves may cause another object to vibrate. These vibrations are carried through all three states of matter, but are more observable in solids and liquids.

OBJECTIVES

By the end of the lesson, students will be able to:

- Observe how sound waves travel through solids, liquids, and gases
- Explain how sound waves produced by one object may cause another object to vibrate
- Design an investigation to demonstrate that sound causes other objects to vibrate

EMBEDDING LITERACY

Session 2: *How does matter conduct sound?*

Tell students that today they will learn more about how sound travels. Begin the session by reading parts of the following book to them.

How Does Sound Change?

Robin Johnson

Sounds help us understand the world around us. This engaging book with its mix of text and photographs introduces young children to the basics of sounds such as vibrations, sound waves, the ability of sound to travel through liquids, solids, and gases, and more.

- Read aloud page 14, which speaks to sound’s ability to travel. Ask students to look carefully at the picture on that page. How is sound like the Frisbee the boys are playing with?
- Read page 15 to the students. Make sure they understand why sound cannot travel through space, and ask them to answer the “*What do You Think?*” question at the bottom of the page.
- Read page 16 about how sound travels through water. Why is it hard to clearly understand what someone says to you underwater?

Proceed with the remainder of the session.

Lesson 2.4 Communication Design Challenge

PURPOSE

People depend on technology to help with various tasks in their daily lives. The technology of communication has been important for thousands of years. Humans have used a variety of devices featuring light, sound, and a combination of the two to communicate (send and receive information) over distances. In this lesson students will create their own code to communicate using light, as well as design and build a device that uses sound to solve the problem of communicating over a distance. To do this, students will engage in a structured inquiry. The problem task and materials are provided. Students complete the task, make observations, and come to their own conclusions. Understanding how to set up and conduct an inquiry will prepare them for guided and open inquiry in later grades.

OBJECTIVES

By the end of the lesson, students will be able to:

- Give examples of communication technology using light
- Give examples of communication technology using sound
- Explain what a code is
- Create a code to send information to a recipient; decode a coded message from a sender
- Understand how communication technology has changed
- Use the engineering design process and provided materials to build and test different designs for cup and string phones

EMBEDDING LITERACY

Session 1: *How can we communicate without talking?*

After introducing the class to the idea of communicating without talking, use the following book to prompt their thinking about other wordless ways to communicate.

Sending Messages with Light and Sound

Jennifer Boothroyd

With paragraphs and simple text, the author explains what a message is and describes how humans send messages using light, sound, or a combination of the two.

- Share pages 4-7 with the students, showing the class the pictures and reading the text. Then ask them to come up with a one-sentence definition of what a *message* is.

- Read pages 8-11. These pages offer examples of sending messages with light. Ask students what people should do in response to each of the light messages. (If students have never seen a lighthouse, you may have to explain the purpose of that light.)
- Read pages 12-17, which give examples of messaging with sound.
- Read the final pages, 18-21. They give examples of messaging with both light and sound.

Proceed with the remainder of the session by having students think of other examples of messaging with sound, light, or a combination of the two. Have students complete [Activity Sheet 1: Communication](#).

LIFE SCIENCE

UNIT 1: PARENTS AND OFFSPRING

Organisms have characteristics that can be similar or different. Plants and animals have predictable characteristics at different stages of development. They both grow and change. Adult plants and animals can have offspring who are very much, but not exactly, like their parents. These offspring also resemble other plants and animals of the same kind. In many kinds of animals, parents engage in behaviors that help the offspring to survive. In kindergarten, students learned about the basic needs of plants and animals. They also learned that some parent animals take care of their offspring and some do not.

The “big idea” of basic needs, growth, and development continues with the next series of lessons. When these needs cannot be met the organisms must change behaviors in order to survive. Seasonal changes, particularly in winter, affect the basic needs of organisms. Animals engage in different types of winter behaviors, also called adaptations. Some hibernate, some migrate in groups to places where food is more plentiful and temperatures are warmer, and some remain active in their local environment.

In this unit, teachers can use literature to help students understand the concept of life cycles, parenting, and seasonal behaviors. The titles listed below fit the criteria for inclusion in this unit.

RECOMMENDED LITERATURE

Recommended titles are listed below, along with their authors and Lexile ratings. The list is followed by suggested strategies for incorporating the books into the unit’s science lessons. You may wish to select additional books that help students understand the concepts.

LESSON NUMBER	TITLE	AUTHOR	LEXILE LEVEL
1.1 The Circle of Life – Animal Life Cycles	<i>Me and My Family Tree</i>	Joan Sweeney	400L
	<i>A Chicken’s Life</i>	Nancy Dickmann	320L (GRL F)
	<i>A Butterfly’s Life</i>	Nancy Dickmann	310L (GRL F)
	<i>A Frog’s Life</i>	Nancy Dickmann	300L (GRL F)
	<i>An Apple’s Life</i>	Nancy Dickmann	280L (GRL F)
	<i>A Sunflower’s Life</i>	Nancy Dickmann	360L (GRL F)
	<i>A Butterfly is</i>	Melvin Berger / Newbridge	

	Born (Big Book)	Educational	300L
1.2 Getting Together – Animals That Live in Groups	Animal Families: Life in an Elephant Herd	Jennifer Baxter	875L
	Elephants of Africa	Gail Gibbons	920L
	Animal Families: Life in a Wolf Pack	Jennifer Baxter	675L
	Wolves	Gail Gibbons	670L
	Animal Families: Life in a Dolphin Pod	Jennifer Baxter	725L
	A Day in the Life: Sea Animals Dolphins	Louise Spilsbury	540L
	Animal Families: Life in a Honeybee Colony	Jennifer Baxter	725L
	Honey in a Hive	Anne Rockwell	880L
1.3 Ready? Set? Snow! Winter Survival Behaviors	Animals That Live in Groups	Kelsi Turner Tjernagle	640L
	What Do You Do in Winter?	Jennifer Baxter	660L
	All About Winter Weather	Kathryn Clay	100L
	Animal Migration	Jeanie Mebane	720L
	Animal Hibernation	Jeanie Mebane	780L
	Animals in Winter	Henrietta Bancroft and Richard Van Gelder	480L
What Do Critters Do in Winter?	Julie Lundgren	650L	

Lesson 1.1 The Circle of Life – Animal Life Cycles

PURPOSE

All living things have life cycles that include birth, growth, reproduction, and death. Animals have predictable characteristics at different stages of development. Animals are born in two main ways: live birth and eggs. Although the young of many animals are born resembling their parents, some animals go through life cycle stages which include metamorphosis. Some animal parents engage in behaviors that help their offspring to survive; others do not. The purpose of this lesson is for students to understand the concept of a life cycle, its stages, and how the stages repeat from one generation to the next. They will relate the idea of generations to their own lives.

OBJECTIVES

By the end of this lesson, students will be able to:

- Identify life cycle stages common to all living things (birth, growth, reproduction, death)
- Describe, sequence, and compare life cycle stages of various animals
- Give examples of animals that grow from eggs or live birth
- Explain the relationship of parents and offspring of various animals

EMBEDDING LITERACY

Session 1: *What are generations?*

In this session, students are introduced to the concept of a life cycle by relating it to their own experiences with family generations. *Me and My Family Tree* may be used to introduce the session or may be read as a follow-up at another time.

Me and My Family Tree
Joan Sweeney

This read-aloud uses a family tree to explain how members of a family are related.

Before you read or as you read, ask students the following questions (use your discretion in case some students have delicate family situations):

- Who has a baby brother or sister living with you? How is the baby different from you?
- Who has a grandparent living with you or close by? How is the grandparent different from the baby or you?
- How is your mother or father different from the baby or you or the grandparent?
- Have you ever been told that you look like a family member—parent, grandparent, aunt, uncle?
- What special names do you have for a grandparent, aunt, or uncle?

Session 2: *What are the stages in a bird's (chicken's) life cycle?*

Begin the session by having students brainstorm several animals for each side on the *Egg Animals/Live Birth Animals* T-chart, as shown in the teacher's manual. **A *Chicken's Life*** may be used to introduce the rest of the session or may be read as a follow-up at another time. This text is at 320L/Guided Reading Level F. You may have readers that can read it independently or with a partner.

A Chicken's Life
Nancy Dickmann

Find out how an egg is formed and incubated, what nutrients it contains for the embryo, and how a chick hatches, grows, and reproduces. This informational text uses predictable and repetitive language, as well as detailed photographs and labels.

- Reading through the text multiple times will allow students opportunities to understand not only the concept of a life cycle and its stages, but also various text features such as table of contents, labelled photographs, a simple glossary, and an index.
- As you read, point out that the chick looks somewhat like the hen, but is not exactly alike. As the chick grows, it looks more and more like the hen, until it reaches its adult stage.

Session 3: *What are the stages in a butterfly's life cycle?*

A *Butterfly's Life* may be used to introduce the session or may be read as a follow-up at another time. This text is at 310L/Guided Reading Level F. You may have readers that can read it independently or with a partner.

A Butterfly's Life
Nancy Dickmann

From egg to larva to pupa to adult, a butterfly goes through many stages before it reaches adulthood. Read about how a butterfly's life begins and how the butterfly grows and reproduces. This informational text uses predictable and repetitive language, as well as detailed photographs and labels.

- Reading through the text multiple times will allow students opportunities to understand not only the concept of a life cycle and its stages, but also various text features such as table of contents, labelled photographs, a simple glossary, and an index.
- As you read, point out that the caterpillar larva looks nothing like the adult butterfly. As it grows, it passes through yet another stage where it completely changes, before finally looking like its parent.

Session 4: *What are the stages in a frog's life cycle?*

A Frog's Life may be used to introduce the session or may be read as a follow-up at another time. This text is at 300L/Guided Reading Level F. You may have readers that can read it independently or with a partner.

A Frog's Life
Nancy Dickmann

From egg to tadpole to froglet to adult, a frog goes through many stages before hopping out of the water onto land. Read about how a frog's life begins and how the frog grows and reproduces. This informational text uses predictable and repetitive language, as well as detailed photographs and labels.

- Reading through the text multiple times will allow students opportunities to understand not only the concept of a life cycle and its stages, but also various text features such as table of contents, labelled photographs, a simple glossary, and an index.
- As you read, point out that the tadpole looks nothing like the adult frog. As it grows, it passes through yet another stage where it completely changes, before finally looking like its parent.

Additional Texts: The following additional texts reinforce the concept of life cycles. Although the focus of the standards is animal life cycles, these titles show how plant offspring look somewhat like, but not exactly like their parents. These informational texts may also be used to informally compare plant life cycles and animal life cycles, which will be explored further in Grade 3. Students may remember ***A Sunflower's Life*** from Kindergarten.

An Apple's Life
Nancy Dickmann

Before you go apple picking, read this book to find out how apples grow. This text follows an apple from seed to seedling, seedling to tree, tree to blossom, and flower to fruit. This title shows the reader how an apple begins life, grows, and reproduces.

A Sunflower's Life
Nancy Dickmann

This title explores the different parts of a sunflower, and follows the stages of the flower's development from seed to growth to reproduction. The farming of sunflowers is also discussed.

- Reading through the text multiple times will allow students opportunities to understand not only the concept of a life cycle and its stages, but also various text features such as table of contents, labelled photographs, a simple glossary, and an index.

- As you read, point out that the young apple or sunflower only somewhat resembles its parent, until it reaches maturity or its adult stage.

Additional Texts: This big book may be used as a supplementary text. **Note:** An additional teacher’s guide is included with this title which includes activity and assessment sheets.

A Butterfly is Born
Melvin Berger

Follow the life cycle of a butterfly from a tiny egg to a hungry caterpillar to a pupa to a butterfly—and observe the activities of each life form.

BUILDING LANGUAGE FOR LITERACY

1. Use the Alphabox strategy to list topic-specific vocabulary words. In order for a word to be included, it must have some relationship to the stages of life cycles. A sample Alphabox is shown in the teacher manual.
2. Have students construct a personal timeline using photographs or drawings that depict significant events in their lives. Ask them to write a caption for each picture.
3. Invite parents and grandparents to the classroom for inter-generational interviews so that students can practice their speaking and listening skills. Students can prepare and ask open-ended questions about pre-selected topics such as school, games, sports, entertainment, music, food, or other activities. To illustrate differences between generations, they can then compare their parents’ and grandparents’ responses to their own.
4. Write, or have students write, a “Who am I?” riddle book using clues and specific vocabulary about animals studied in the lesson.
5. Fill a medium- to large-sized round balloon with water and put it in the freezer (adding food coloring is optional). After it is frozen, peel off the balloon. The result will be an “ice egg.” Students can work in groups, pairs, or individually to decide what kind of animal (real or imaginary) might hatch from the egg and what its life cycle would be. They might create a paper plate life cycle for the mystery egg creature or write a little book about it and the stages of its life cycle.

Lesson 1.2 Animals That Live in Groups

PURPOSE

Young students know what it is like to live in a family group, even though the specific members vary from family to family. Many species of animals live in groups. Being part of a group helps animals obtain food, protect and raise offspring, defend themselves from predators, move from one place to another, communicate, and adjust to changes in habitat as well as changes within the group itself.

The purpose of this lesson is for students to understand why certain types of animals live in groups. Students will examine and compare group functions of familiar animals such as elephants, wolves, dolphins, and honeybees. During the course of the lesson, they will relate the concept of animal groups to their own families.

OBJECTIVES

By the end of the lesson, students will be able to:

- Identify general reasons for living in a group
- Describe the basic group structure and function of wolves, elephants, dolphins and other fish, and honeybees, including roles, communication, and caring for offspring

EMBEDDING LITERACY

Literature can help students understand the concepts in this lesson. Appropriate texts will focus on the structure of representative animal groups and how those groups benefit individual animals within the group.

Note: The informational texts in this lesson are intended for use as read-alouds. This lesson also uses original publications (*Knowing Science Little Readers: Animal Families Series*) to introduce each session. The additional titles that are provided can be used in place of or in addition to the Little Readers.

Session 2: *How is a herd of elephants like a family?*

Begin the session with an **ENGAGE** question, “**How much do you know about elephants? What do you know or want to know about elephant families?**” Accept reasonable answers.

Then read, *Life in an Elephant Herd* or *Elephants of Africa*.

Life in an Elephant Herd
Jennifer Baxter

What would it like to live in an elephant herd? Who takes care of you? Who teaches you how to meet your basic needs? How does living in a herd protect you? Read about the benefits of living in an elephant herd.

Elephants of Africa
Gail Gibbons

Elephants are very intelligent and social, with a trunk that serves as nose, foot, hand, and tool. This text presents important facts about the largest land animal, describing elephant behavior, habitats, diet, and more.

As you read, stop to discuss how illustrations, captions, labels, and call-outs support the text.

Continue with the rest of the session. Close the session with a summary discussion about how an elephant herd is like a family. To encourage students to speak in complete sentences, use the following sentence starter:

***“An elephant herd is like a human family when _____ /
or because _____.”***

Session 3: *How is a pack of wolves like a family?*

Begin the session with an **ENGAGE** question, **“How much do you know about wolves and their families?”** Accept reasonable answers.

Then read, ***Life in a Wolf Pack*** or ***Wolves***.

Life in a Wolf Pack
Jennifer Baxter

What would it really be like to live in a wolf pack? Who is in charge? Who takes care of you and teaches you how to hunt? How does living in a pack protect you? Read about this often misunderstood, but very social animal.

Wolves
Gail Gibbons

This book discusses the main types of wolves, where wolves live, how the wolf pack functions, how wolves communicate, the relationship between wolves and humans, and briefly touches on wolves in folklore.

As you read, stop to discuss how illustrations, captions, labels, and call-outs support the text.

Continue with the rest of the session. Close the session with a summary discussion about how a wolf pack is like a family. To encourage speaking in complete sentences, use the following sentence starter:

**“A wolfpack is like a human family when _____ /
or because _____.”**

Session 4: *How is a school (or pod) of dolphins like a family?*

Begin the session with an **ENGAGE** question, **“What do you already know or want to know about dolphins?”** Accept reasonable answers.

Then read, *Life in a Dolphin Pod* or *A Day in the Life: Sea Animals Dolphins*.

Life in a Dolphin Pod
Jennifer Baxter

Who wouldn't want to live in a dolphin pod? Dolphins are extremely social animals, and have a good relationship with humans. Learn how dolphins work together to meet all of their basic needs (and have fun while doing it).

A Day in the Life: Sea Animals Dolphins
Louise Spilsbury

Take an underwater journey to learn how sea animals their day. Readers will discover details of dolphin anatomy, behavior, including sleeping, eating, and hunting habits.

As you read, stop to discuss how illustrations, captions, labels, and call-outs support the text.

Continue with the rest of the session. Close the session with a summary discussion about how a dolphin pod is like a family. To encourage speaking in complete sentences, use the following sentence starter:

**“A dolphin pod is like a human family when _____ /
or because _____.”**

Session 5: *How is a colony of bees like a family?*

Begin the session with the **ENGAGE** question, **“What do you already know or want to know about honeybees?”** Accept reasonable answers. There are many misconceptions about what a “bee” is. The word “bee” can be used as a general term to describe any stinging insect. This session centers on the insect known as the honeybee.

Then read, *Life in a Honeybee Colony* or *Honey in a Hive*.

Life in a Honeybee Colony

Jennifer Baxter

How would you like to work all day long, cleaning and feeding little ones? Or maybe standing guard over your hive? How about flying around in search of the most delicious pollen and nectar? Life in a honeybee colony is that busy and more. These animals are some of the most organized that you will ever meet!

Honey in a Hive

Anne Rockwell

In spring and summer, honeybees gather nectar to make into honey. These fascinating insects live and work together in complicated societies, complete with queen bees and workers. Read and find out about honeybees and their creation -- honey!

As you read, stop to discuss how illustrations, captions, labels, and call-outs support the text.

Continue with the rest of the session. Close the session with a summary discussion about how a honeybee colony is like a family. To encourage speaking in complete sentences, use the following sentence starter:

***“A honeybee colony is like a human family when _____ /
or because _____.”***

Session 6: *What animal family would you like to be a part of?*

This session is a culminating activity for the lesson. It may be included as part of either a science lesson or an ELA lesson. Ask students to choose an animal family that was studied, and then share one or two things they would do if they were a member of that family. Students may then illustrate themselves as part of that family, either as a human or by transforming themselves into that animal.

Additional Text: ***Animals That Live in Groups***

Animals That Live in Groups

Kelsi Turner Tjernagle

Why do millions of flamingoes flock together in Africa? Why do meerkats live in colonies? Animal groups have some fascinating behaviors. Discover the amazing bonds that keep animal groups together and the benefits of living in a group.

- Reading through the text multiple times will allow students opportunities to understand not only the concept of a life cycle and its stages, but also various text features such as table of contents, labelled photographs, a simple glossary, and an index.

BUILDING LANGUAGE FOR LITERACY

1. Invite students to research more about an animal studied during the lesson or another animal of their choosing that lives in a group.
2. Have students create a slideshow to tell about each type of animal studied. This may be done as a whole group or in small groups, depending on computer access and students' familiarity with the software.
3. Students can create a poster that depicts one of the animals studied and lists the traits of that animal's group.
4. Many students may be familiar with dogs as family pets. Divide the students into groups of three and provide each group with a large, blank Venn diagram. Ask the groups to list characteristics that belong only to pet dogs on one side and only to wolves on the other side. In the center, where the circles overlap, ask them to list characteristics that apply to both wolves and dogs. When groups have completed the work, have them share their diagram with the rest of the class.
5. Reproduce a two-page spread from one of the books used in the lesson, and make copies for the students. Divide the students into small groups and have them underline all the words they think are plural. Ask groups to report out to the class and explain *why* they think each word they selected is plural.
6. Write, or have students write, a "Who am I?" riddle book using clues and specific vocabulary about one of the animals studied during the lesson.

Lesson 1.3 Ready? Set? Snow! Winter Survival Behaviors

PURPOSE

The purpose of this lesson is for students to understand ways in which animals adjust their behaviors (adapt) to meet their basic needs during seasonal changes. They will learn what happens to an animal, physically and behaviorally, during hibernation, migration, and active behaviors.

OBJECTIVES

By the end of the lesson, students will be able to:

- Associate basic needs with winter behaviors
- Explain what happens to animals during: hibernation (and winter sleep), migration, and remaining active during winter months
- Give examples of animals that engage in each type of winter behavior

EMBEDDING LITERACY

Note: Most of the informational texts in this lesson are intended for use as read-alouds. This lesson also uses an original publication (*Knowing Science Little Readers: What Do You Do in Winter?*). Additional titles are provided, which can be used in place of or in addition to the Little Reader.

Session 1: *How do people get ready for winter?*

Begin the session with an **ENGAGE** question, “**How do people get ready for winter?**” The amount of prompting students may need to answer this question depends on the time of year when the lesson is taught; the sooner it is to when winter starts, the easier it will be for students to respond meaningfully. Accept reasonable answers. Some examples might be: changing to warmer clothing, closing the pool, bringing in lawn furniture or toys, stocking up on fuel for wood- or pellet-stoves, or canning or freezing food. Responses may also include getting ready for various winter activities, such as finding sleds, getting skis ready, or even snowmobiles, depending on where students live.

Then read the section “People’s Habits During Winter” from *What Do You Do in Winter?*. Depending on the level of student engagement, another option is to read the entire book once through, and refer back to specific sections in following sessions. You may also read *All About Winter Weather*.

What Do You Do in Winter?

Jennifer Baxter

In this narrative text, Sarah is learning about winter behaviors in her first-grade class in school. As she watches her family preparing for winter, she has a dream where various animals describe how they prepare for winter.

All About Winter Weather

Kathryn Clay

This simple text and detailed photographs describe the characteristics of winter, including changes in weather, people, plants, and animals.

As you read, stop to discuss the story as needed and to point out how the photographs support the text.

Continue with the rest of the session. Students will have the opportunity to share how they get ready for winter.

Session 2: *Why do animals migrate?*

In this session students will learn why animals migrate. They will also begin to fill out their own *Winter Behaviors* booklet.

Begin by reviewing the list of winter preparations from the previous session, and then identify behaviors common to humans and animals. Then pose an **ENGAGE** question, **“How do animals meet their basic needs in winter if the weather becomes colder and food is scarce?”** Assess students’ answers to determine how much experience students have with winter behaviors of animals. It is more than likely that they will at least know about migrating birds.

Then read (or reread) the section “Migrating Animals” from ***What Do You Do in Winter?*** You may also read ***Animal Migration***.

Animal Migration

Jeanie Mebane

This text explains migration and gives examples of animals that migrate on land, by air, and in water. It also describes how animals prepare for their long trip and what happens along the way. It includes bolded vocabulary and fun ‘Animal Facts.’

Continue with the rest of the session. Students will begin working on their own *Winter Behaviors* little book.

Session 3: *What happens when animals hibernate?*

In this session, students will learn why animals hibernate and what happens when they do. They will continue their *Winter Behaviors* booklet.

Begin the session by rereading the section “Hibernating Animals” from *What Do You Do in Winter?*. You may also read *Animal Hibernation*.

Animal Hibernation

Jeanie Mebane

This text explains what happens during hibernation how familiar animals prepare for hibernation. It includes bolded vocabulary and fun Animal Facts.

As you read, stop to discuss the story as needed and to point out how the photographs support the text.

Continue with the rest of the session. Students will participate in simulation activities to give them an idea about what happens to an animal during hibernation, and will continue working on their own *Winter Behaviors* little book.

Session 4: *What is the difference between winter sleep and hibernation?*

In this session, students learn the difference between hibernation and winter sleep. Although there are many interpretations of these differences, this session will focus on the difference between true hibernators (whose sleep lasts all winter) and animals who sleep only through the coldest periods of winter and wake up on warmer days to find food. They will continue their *Winter Behaviors* booklet.

Begin the session by reading (or rereading) the section “Animals Sleeping During Winter” from *What Do You Do in Winter?*.

Continue with the rest of the session. Students will continue working on their own *Winter Behaviors* little book.

Session 5: *Which animals remain active in winter?*

In this session, students will learn which animals remain active during the winter and how they survive. They will complete their *Winter Behaviors* booklet.

Begin the session with a brief discussion to determine prior experience with familiar animals that students have observed as being active in winter. Continue by reading (or rereading) the section “Animals Active During Winter” from *What Do You Do in Winter?*.

Continue with the rest of the session. Students will participate in simulation activities to give them an idea about what happens to an animal during hibernation and will finish working on their own *Winter Behaviors* little book.

BUILDING LANGUAGE FOR LITERACY

1. Select students to recreate the interview from *What Do You Do in Winter?*. Students may include the same animals or create responses from other animals learned about during the lesson. Each animal must tell about their specific winter behaviors, including why they need to engage in that behavior, what they do to get ready for that behavior, and what they actually do during the winter.
2. Write a short class play about an animal that is “active” during the winter. This animal would call (or text) other animal friends to arrange a playdate. The other animals, however, are not available because they are preparing to either migrate, hibernate, or fall into winter sleep. The animal finally reaches another “active” animal that is able to “play.”

UNIT 2: INSPIRED BY NATURE

Plants and animals have unique and specialized structures for meeting their basic needs for survival. For years, humans have looked to nature to help with ideas for solving tasks and problems, asking themselves “What would nature do?” This is known as **biomimicry** – copying nature’s solutions and applying them to human problems by designing and producing materials, structures, and systems that are modeled on living things, substances, or processes from nature.

The engineering design process begins with the identification of a problem to solve. Students may have had previous experiences with engineering design. Once a problem is identified, sometimes first step is to brainstorm several possible solutions. Possible solutions are designed and tested to see if they solve the problem. While some solutions are original, others are the result improving on an existing idea.

Students will take this approach in this lesson. As they explore the concept of biomimicry, students examine physical structures of common plants and animals.

They are not given a specific problem to solve; rather, they are given examples of plant and animal structures found in nature and must decide how to apply them for a practical purpose in the human world. This exploratory task designed to be a more creative and open-ended approach to the engineering process.

The titles listed below fit the criteria for inclusion in this unit.

RECOMMENDED LITERATURE

Recommended titles are listed below, along with their authors and Lexile ratings. The list is followed by suggested strategies for incorporating the books into the unit’s science lessons. You may wish to select additional books that help students understand the concepts.

LESSON NUMBER	TITLE	AUTHOR	LEXILE LEVEL
2.1 Inspired by Nature	<i>How and Why Do People Copy Animals?</i>	Bobbie Kalman	590L
	<i>Biomimicry: Inventions Inspired by Nature</i>	Dora Lee	1110L

Lesson 2.1 Inspired by Nature

PURPOSE

The purpose of this lesson is for students to examine physical structures of common plants and animals, to learn the role those structures have played in inspiring common human products, and to create their own nature-inspired original product to solve a human problem.

OBJECTIVES

By the end of this lesson, students will be able to:

- Identify unique and specialized external structures that help plants and animals meet their basic needs for survival in their own particular habitat
- Understand the concept of biomimicry and give examples of nature-inspired human technology
- Use the engineering design process to create an original product, based on nature, to solve a human problem

EMBEDDING LITERACY

Literature can help students understand the concepts in this lesson. Appropriate texts will focus on how humans have taken ideas from nature to help solve their human problems.

Session 1: *How does nature help humans solve problems?*

In this session, students are introduced to the idea that many human inventions were inspired by, or copied from, ideas in nature. They begin with something very familiar, Velcro, and continue discovering other nature-inspired technology by matching inventions with what inspired them.

Teach the session as outlined in the teacher manual. Before closing the session, read pages 4-9 in *How and Why Do People Copy Animals?*

How and Why Do People Copy Animals?

Bobbie Kalman

Learn how nature, specifically animals, has inspired some common human inventions, or technology. This text gives just enough information using student-friendly examples and language.

Before you read, preview the cover and ask students what connection there might be between the turtle's shell and the football player's helmet. (The shape of the shell and hardness of the material in the shell inspired the idea for the helmet.)

As you read, point out the many text features that help support the main idea; illustrations as photographs or drawings, bolded vocabulary, italicized captions, and inset "challenge" questions.

Session 2: *How do water striders walk on water?*

In this session, students explore how nature inspired the pontoon boat by learning about an insect called a water strider and participating in an activity to simulate how a water strider is able to “walk” on water without sinking.

Teach the session as outlined in the teacher manual. Before closing the session, read pages 10-13, and then 18-19 in *How and Why Do People Copy Animals?* (The pages in between cover the idea of animal/human groups and the benefits of each. It is a good review from Lesson 1.2. The pages may be read now, or at another time.)

As you read, point out the many text features that help support the main idea; illustrations as photographs or drawings, bolded vocabulary, italicized captions, and inset “challenge” questions.

Session 3: *How can nature give humans ideas?*

In this session students examine features found in common plants and animals. Then they brainstorm a new idea or use for that particular feature. Selected passages may be read from *Biomimicry: Inventions Inspired by Nature*.

Biomimicry: Inventions Inspired by Nature

Dora Lee

Humans have a lot to learn from nature. This book shares examples of inventions that were developed by copying what is already found in nature.

This text is at an advanced reading level, so many passages may need to be paraphrased for understanding by first grade students. A few pages and suggested selections are listed below:

- Page 5 *Introduction: Learning from Mother Nature*
Paragraphs 1, 4, and 5 (with some paraphrasing)
- Pages 6-7 *Nature thought of it first*
Snapping Turtle and Velcro
- Page 11 *Shaped for Survival*
Honeybee honeycomb
- Pages 12-14 *Smart Structures*
Shark skin swimsuits, pine cones, corpse lily, blue mussels
- Pages 16-17 *Creative Communications*
Squids, dolphins
- Page 18 *Medical Marvels*
Medicine from plants
- Pages 30-31 *Machines that Move Like Animals*
Grasshoppers, bug wings, robotic hand

Session 4+: *Let's make our own biomimicry design!*

In the following sessions students brainstorm, design, and create a product that can solve a human “problem” using a design inspired by nature. Continue to read selected passages from ***Biomimicry: Inventions Inspired by Nature*** or reread passages that students found especially interesting from ***How and Why Do People Copy Animals?***

BUILDING LANGUAGE FOR LITERACY

1. Help students develop skills for brainstorming. Encourage students not to give up during the brainstorming process. Talking through ideas (a.k.a. rehearsal) lays the groundwork for metacognition. Students need to be able to monitor their own thinking and adjust it as needed to continue with or discard an idea. Perseverance in taking ideas through the brainstorming part of the process is essential to task completion.
2. Help students develop discussion skills. Students need to be able to talk through ideas with each other. Model how to be a good listener and how to take turns talking.
3. Help students develop the skill of engaging through argument. Students need to be able to articulate their ideas and the reasons behind their ideas. They need to understand their own ideas completely and have confidence in explaining them and answering questions about them.

EARTH AND SPACE SCIENCE

UNIT 1: EARTH'S PATTERNS

In first grade, students begin to grasp Earth's place in the universe. They become aware of natural and predictable patterns: sunrise and sunset; the apparent movement of sun, moon, and stars across the sky; and the cycle of the seasons.

Children's literature plays a role in engaging students in the study of earth sciences. Various titles introduce, summarize, supplement, or reinforce earth science concepts. Books that work well for this unit include those that focus on the patterns of the sun, moon, and stars, as well as the repetitive nature of the seasons. First graders are beginning readers, so the books should be richly illustrated to help give meaning to the text.

The titles listed below fit the criteria for inclusion in this unit.

RECOMMENDED LITERATURE

Recommended titles are listed below, along with their authors and Lexile ratings. The list is followed by suggested strategies for incorporating the books into the unit's science lessons. You may wish to select additional books that help students understand the concepts.

LESSON NUMBER	TITLE	AUTHOR	LEXILE LEVEL
1.1 Sun and Moon	<i>What Makes Day and Night</i>	Franklyn M. Branley	230L
	<i>Where Does the Sun Go at Night?</i>	Amy S. Hanson	GN440L
	<i>The Moon Seems to Change</i>	Franklyn M. Branley	470L
1.2 The Seasons	<i>Exploring Fall</i>	Terri DeGezelle	450L (GRL L)
	<i>Exploring Spring</i>	Terri DeGezelle	570L (GRL L)
	<i>Exploring Summer</i>	Terri DeGezelle	520L (GRL L)
	<i>Exploring Winter</i>	Terri DeGezelle	560L (GRL L)
	<i>The Reasons for Seasons</i>	Gail Gibbons	620L
	<i>Where Does the Sun Go at Night?</i>	Amy S. Hanson	GN440L
1.3 Star Patterns	<i>Jump into Science: Stars</i>	Steve Tomecek	AD 700L
	<i>The Big Dipper</i>	Franklyn M. Branley	460L

Lesson 1.1 Sun and Moon

PURPOSE

Our solar system is made up of our Earth, the Sun, and the Moon, as well as other planets and their moons. The orbits of Earth around the Sun and the Moon around Earth, together with Earth's rotation, produce observable and predictable patterns. These patterns include day and night, shadows, Moon phases, constellations, and seasons. In this lesson, students make observations of the Sun and Moon to begin to understand and describe these predictable patterns.

OBJECTIVES

By the end of the lesson, students will be able to:

- Model the rotation of Earth to explain day and night
- Represent and explain the daily apparent motion of the sun
- Create models to understand length and direction of shadows in daily patterns
- Identify the cyclical phases of the moon

EMBEDDING LITERACY

Session 1: *What makes day and night?*

What Makes Day and Night
Franklyn M. Branley

Did you know that if we lived on the moon, we would have two straight weeks of daylight followed by two straight weeks of night? Thanks to the Earth's quick rotation, that is not the case where we live. Diagrams and colorful pictures help explain what we on this planet experience as a pattern of day and night.

This session begins by challenging students to think first about activities they do during the day, and second, activities they do at night. After the responses have been charted and discussed, read ***What Makes Day and Night***. Stop frequently to check students' understanding of the text. Guide the students closely through the illustrations of sunrise and sunset on pages 18-19.

Additional Text: You may also read ***Where Does the Sun go at Night: An Earth Science Mystery***.

Where Does the Sun go at Night? An Earth Science Mystery
Amy S. Hanson

This book is in beginning graphic novel format. The text and illustrations explain how Earth's movement causes day, night, and changes in the seasons.

This book is written in beginning graphic novel format. Due to the physical size of the book, read it under a document camera, if possible. Pages 4-9 explain the concept of day and night. Demonstrate to students that directionality rules apply even with graphic novels; read top to bottom, and left page to right page. Point out how the drawings (illustrations) support the simple text.

Proceed with the remainder of the session.

Session 2: *Why does the sun appear to move across the daytime sky?*

In the previous session, students made two lists: things they do when it is light outside, and things they do when it is dark. In this session, they have divided the first list into three sections: what they do before school, what they do during school, and what they do after school.

Introduce the session by rereading pages 24-27 in ***What Makes Day and Night***. These pages discuss the sun's apparent motion across the sky at various times of the day. Pay particular attention to pages 26-27, with the illustrations of the various positions of the sun during the day.

Proceed with the remainder of the session.

Session 3: *How can we tell time with shadows?*

After you have introduced the session, read pages 10-13 in ***Where Does the Sun go at Night? An Earth Science Mystery***. These pages explain how shadow length changes throughout the day and lead directly into the *Shadow Clock* activity.

Proceed with the remainder of the session.

Session 4: *How does the moon move in the sky?*

The Moon Seems to Change
Franklyn M. Branley

Did you ever wonder why the moon appears large and bright in the night sky sometimes, and other times it appears as a tiny sliver of a crescent? The answer is that it goes through phases because it rotates around the Earth. In pictures and diagrams, this book takes the reader through the process.

After brainstorming with students how much they already know about the moon, introduce the class to the book ***The Moon Seems to Change***. Begin reading the book, stopping at each page as students are introduced to the concept of the moon orbiting the Earth about every four weeks. Point out that the moon seems to rise in the east and set in the west, just as the sun does. Sometimes we can find the moon in the daytime sky.

On page 20-27, there is an optional experiment to model the phases of the moon. If you choose not to do the simulation with the orange, continue directly to page 28.

Proceed with the remainder of the session.

BUILDING LANGUAGE FOR LITERACY

- Use complete sentences to explain where the sun and moon rise and set. For example: *The sun rises in the east.*
- Write a class paragraph that describes how people long ago used shadows to keep track of time.
- Create a center in the classroom that contains a collection of age-appropriate books about the sun, moon, and planets.
- Divide students into groups of 3-4. Ask them to list ways their lives would be different if they could not predict that we always move from day to night and night to day on a regular schedule. Then ask the groups to share their ideas with the whole class.

Lesson 1.2 The Seasons

PURPOSE

Seasons on Earth follow a predictable pattern based on Earth's orbit around the Sun. Each season has its own distinctive weather patterns, characterized by changes in overall temperature, precipitation, and amount of daylight hours. Specific features of each season vary with latitude, but still follow a generalized and predictable pattern. In this lesson, students will develop a basic understanding of how the different positions of Earth in its yearly orbit correspond to each season. They will describe general characteristics of each season and how these characteristics influence their daily activities. They will design and complete an investigation to compare the relative amounts of daylight during each season.

OBJECTIVES

By the end of the lesson, students will be able to:

- Describe general characteristics of each season specific to their region
- Relate how seasonal weather patterns affect their daily lives
- Model how the Earth orbits the sun
- Explain that Earth's orbit around the sun causes seasons
- Carry out an investigation to compare relative amounts of daylight during each season

EMBEDDING LITERACY

Session 1: *What are the characteristics of each season?*

This session introduces an ongoing observation of the characteristics of each season. The following texts may be used to introduce each season as it is observed, or read aloud as a follow-up at another time. These texts are at an approximate at Guided Reading Level L. You may have readers that can read them independently or with a partner.

Before you pass out the *Season to Season* booklets, read the book from the list below that corresponds to the season in which you begin your observations. The text and illustrations support ideas for sketching that follows.

Exploring Fall
Terri DeGezelle

Crunch! Put on a sweater and jump in some dry fall leaves. Cheer your favorite football team. Watch squirrels gather nuts. See how fall brings changes for weather, people, plants, and animals.

Exploring Spring

Terri DeGezelle

Splash! Get out your raincoat because spring showers are here. Watch plants sprout and baby animals take their first steps. See how spring brings changes for weather, people, plants, and animals.

Exploring Summer

Terri DeGezelle

Sizzle! Put on some shorts and try to stay cool in the hot summer season. Watch fruit ripen and baby animals grow up. See how summer brings changes for weather, people, plants, and animals.

Exploring Winter

Terri DeGezelle

Brrr! Even if it doesn't snow where you live, winter is the coldest season. Trees rest and wait for spring. People get out their heavy coats. See how winter brings changes for weather, people, plants, and animals.

Proceed with the remainder of the session.

Session 2: *What makes the seasons?*

In this session, students participate in a simulation activity to demonstrate the position of the Earth in relation to the sun during each season. Two books are provided that support this session: ***The Reasons for Seasons*** and ***Where Does the Sun go at Night? An Earth Science Mystery***. Suggestions are given for each.

The Reasons for Seasons

Gail Gibbons

During the Earth's yearly orbit around the sun, the climate shows distinctive patterns we refer to as seasons. In *The Reasons for Seasons*, Gibbons uses colorful illustrations to depict the activities and phenomena that characterize each of the seasons.

After reviewing the Earth's rotation around the sun and discussing the graphic on *Activity Sheet 2: Earth's Orbit*, read aloud to the class ***The Reasons for Seasons***. The book discusses characteristics of each season and explains the scientific reasons for the season, which has to do with Earth's tilt and position in its orbit around the sun.

- Focus on pages 4-5. These pages depict the entire orbit of the Earth around the sun and how light hits the Earth during different seasons.

- The rest of the book is organized by season, starting with spring. As you read the text, stop frequently to check that students understand that in its yearly path around the sun, some parts of Earth are closer to the sun than others and this affects the amount of sun and heat different parts of our planet receive.

You may also read (or re-read) *Where Does the Sun go at Night? An Earth Science Mystery*.

Proceed with the remainder of the session.

Session 3: *What are our final seasonal observations?*

Before going over students’ seasonal observations for the year, remind them about Earth’s position in relation to the sun during each season. Read the corresponding pages at each seasonal position:

- Pages 14-15: Summer
- Pages 16-17: Winter
- Page 18: Spring
- Page 19: Fall (autumn)

Proceed with the remainder of the session.

BUILDING LANGUAGE FOR LITERACY

1. Use the following sentence frames to model how to state a comparison between characteristics of the seasons. The goal is for students to practice describing their observations in complete sentences.

_____ is (warmer/colder) than _____.
 _____ has (longer days/shorter days) than _____.
 In (season) I like to _____, but in (season) I like to _____.
 In (season) I wear _____, but in (season) I wear _____.

2. As each page is filled out in the *Season to Season* booklet, invite student volunteers to explain their sketch in one of the panels, describing clothing or their tree. Encourage students to speak in complete sentences:

I drew _____ to show _____ (or because _____).

Lesson 1.3 Star Patterns

PURPOSE

While seasonal weather patterns are subject to change, the apparent motion of the stars in the sky is predictable and cyclical. Stars move very little with respect to each other. Grouping the stars into constellations was one method humans devised in order to identify them in the night sky. This made it possible to measure the motion of stars in terms of months and years. In this lesson, students will learn that stars are visible only in the night sky, and will be able to explain that constellations are predictable star patterns.

OBJECTIVES

By the end of the lesson, students will be able to:

- Explain why we cannot see the stars during the day
- Describe a constellation as a predictable star pattern
- Identify common constellations

EMBEDDING LITERACY

Session 1: *How do we see the stars?*

Jump into Science: Stars
Steve Tomecek

Why don't we see stars in the daytime? What are stars made of? What are constellations? This colorfully illustrated book will answer those questions!

- After introducing the topic of stars, show the class the cover of ***Jump into Science: Stars***. Invite students to predict whether this book will feature a story with characters or will give information about stars. Ask students to give reasons for their predictions. (After you have read a few pages, ask students whether their predictions were accurate.)
- Start reading pages 4-13 aloud to the class. Ask students to look at the telescope on page 10. What is it used for? Tell students that huge, powerful telescopes help scientists discover more about the universe. Small telescopes like the one in the illustration allow people to view more of the sky than they could with their unaided eyes.

Proceed with the remainder of the session.

Session 2: What are star patterns?

The Big Dipper Franklyn M. Branley

People long ago used to imagine that stars formed patterns that looked like things that inhabited their mythology or their everyday world. Leo the Lion and Orion the Hunter are two examples. One of the most famous constellations is the Big Dipper. This book tells the story of the Big Dipper and how to find it in the night sky.

- Tell students that one of the easiest-to-find constellations is the Big Dipper. Read *The Big Dipper* to the class.
- When you reach pages 15-16, have students compare the orientation of the Big Dipper in winter and in summer.
- On page 23, invite volunteers to point out the Big Dipper, The North Star, and the Little Dipper.

Proceed with the remainder of the session.

BUILDING LANGUAGE FOR LITERACY

For each of the vocabulary words below, help the class develop a complete sentence that relates the word to the content of this lesson. The following is an example:

“The Big Dipper is a **constellation** we can see almost every night.”

Develop sentences for the remaining vocabulary words: **earth, orbit, revolution, rotation, season, star, sun.**