

GRADE 1 GARDENING & ANIMALS

First edition

8 units

32 lessons

A video for every lesson

FIRST EDITION

COURSE GUIDE

This is a first-grade course in real gardening, real animal care and real nature study. Over 32 weeks your child will sprout beans in a jar, find worms and roly-polies, build a tiny compost, set up a pretend fish tank and a real seed tray, follow a hen's egg to a chick, meet a sheep's wool and a honeybee's hive, transplant seedlings, plan a square-foot garden, and play "garden doctor" for thirsty plants and hungry aphids.

Each week has the same gentle rhythm: **observe, learn, tend and grow**. Your child looks closely at something real, watches a short video, hears a few plain ideas, studies one great painting or natural-history picture, and then does a hands-on project and a nature-journal page. Lessons are short and concrete, written for a parent to read aloud.

We begin from wonder and gratitude. God made the seed, the soil, the sun and every creature, and He gave people the happy work of tending His garden and caring for His animals (Genesis 2:15). Children who learn to water a plant faithfully, feed a pet on time and look carefully at a beetle are learning diligence, patience and kindness along with science. As the school motto says, *Fabricando fit faber*: by making, one becomes a maker.

Most videos come from SciShow Kids, university extension programs, agricultural education groups, nature museums, and experienced gardeners and animal keepers such as Mlgardener, Epic Gardening, Charles Dowding and The Ripe Tomato Farms. Every video was watched in preview and checked frame by frame. Some gardening channels mention their own seed shop or a sponsor in the first or last minute; you may skip those parts. Please watch with your child, pause often, and talk about what you see.

Start with Lesson 1.1 →

WHO IT IS FOR

Children of about six or seven who are beginning to read, working with a parent or teacher. No gardening experience is needed. No yard, pet or farm animal is required: every lesson works with a sunny windowsill and a few cups of soil, and the animal lessons can be done with a library book, a visit to a farm, a pet store or a neighbor's pet.

HOW TO USE THIS COURSE

1. **The weekly rhythm.** There are 32 lessons, one for each week of the school year. Do each lesson in two sessions of 30 to 40 minutes. Session 1: warm-up, core ideas, video and picture study. Session 2: the hands-on project and the nature-journal page.
2. **The calendar.** The units follow a school year that begins in late summer: harvest and wildlife in the fall, soil and pets in early winter, seeds indoors in late winter, farm animals and bees in early spring, planting in spring, and plant problems as the garden grows. Your frost dates may be earlier or later than ours. Shift the units to fit your own weather; for example, wait to transplant seedlings outdoors until after your last spring frost.
3. **Reading aloud.** First graders are just learning to read. Read the core ideas aloud, and let your child read the short key terms and “I can” sentences with you.
4. **Picture study.** Show the picture and look at it quietly together for about two minutes. Then put it away and ask your child to tell you everything they remember. Bring it back and use the “look” prompts and questions. Every picture is tied to the week's science or animal care.
5. **The nature journal.** Give your child a sturdy sketchbook just for this course. Each week they draw what they see, label it with a few words (you can write the words for them to copy), and record simple measurements, weather and dates. By spring this book will be a treasure.
6. **Unit reviews and portfolio projects.** Each unit ends with a friendly oral review and a portfolio project. Ask the review questions aloud; your child may answer by pointing, drawing or telling. Take photographs of projects and keep them with the journal pages in a portfolio folder.
7. **Safety and adult help.** Read each lesson's safety note first. Children always wash hands after touching soil, compost, animals and reptiles. An adult handles sharp

tools, hot water and any fertilizer. We look at wild animals but never touch or feed them, and we never eat wild mushrooms or berries.

8. **No yard? No pet? No problem.** Every project gives a windowsill, balcony, library or farm-visit option. Keep an eye out for county fairs, 4-H shows, pick-your-own orchards and farm days in your area; they make wonderful field trips for this course.
9. **4-H and the county fair.** Many counties have 4-H Cloverbud clubs for children about five to eight. Cloverbuds is non-competitive: young members make display-only exhibits and receive participation ribbons, and they usually do not keep animal projects yet. This course practices those first steps: a show-and-tell plate of vegetables and a one-minute show-and-tell talk (Unit 1), a soil poster (Unit 3), a picture record of a growing plant (Unit 5), labeling the parts of a hen and a sheep (Unit 6), and a labeled potted-plant display (Unit 7). Rules and ages vary, so check your county extension office or fair book.

SCOPE AND SEQUENCE

UNIT 1 • WEEKS 1–4

Seasons and Harvest

Why we have seasons, harvesting vegetables, apples and orchards, and saving seeds for next year.

- 1.1 The Sun and the Seasons
- 1.2 Harvesting Vegetables
- 1.3 Apples and Orchards
- 1.4 Saving Seeds

UNIT 2 • WEEKS 5–8

Wildlife Getting Ready for Winter

How animals get ready for winter: migrating, hibernating and storing food; squirrels and chipmunks; deer; and reading tracks in mud and snow.

- 2.1 Migrate, Hibernate or Store Food
- 2.2 Squirrels and Chipmunks
- 2.3 Deer in Fall and Winter
- 2.4 Tracks in Mud and Snow

UNIT 3 • WEEKS 9–12

Soil: The Living Ground

What soil is made of, layers in a jar, worms and roly-polies as recyclers, a little compost, and how rocks slowly become soil.

- 3.1 Soil Layers in a Jar
- 3.2 Worms and Roly-Polies: The Soil's Recyclers
- 3.3 A Little Compost
- 3.4 Rocks Become Soil

UNIT 5 • WEEKS 17–20

Seeds and What Plants Need

The parts of a seed, how a seed sprouts, how plants grow toward light, and how roots drink water.

- 5.1 What Is Inside a Seed?
- 5.2 A Seed Wakes Up
- 5.3 Plants Lean Toward the Light
- 5.4 Water and Roots

UNIT 7 • WEEKS 25–28

Let's Plant!

Potting soil and pots with holes, starting seeds indoors, transplanting seedlings outside, and planning a square-foot garden.

- 7.1 Potting Soil and Pots with Holes
- 7.2 Starting Seeds Indoors
- 7.3 Transplanting Seedlings
- 7.4 A Square-Foot Garden Plan

UNIT 4 • WEEKS 13–16

Pets

Choosing a pet that fits a family, keeping fish, caring for rabbits, and caring for dogs: food, walks and simple training.

- 4.1 Choosing a Pet That Fits Your Family
- 4.2 A Fish Tank
- 4.3 Rabbits
- 4.4 Dogs: Food, Walks and Training

UNIT 6 • WEEKS 21–24

Farm Animals and Bees

The chicken life cycle from egg to hen, sheep and wool, pigs and their care, and the honeybee family of queen, workers and drones.

- 6.1 The Chicken Life Cycle
- 6.2 Sheep and Wool
- 6.3 Pigs on the Farm
- 6.4 Honeybees: Queen, Workers and Drones

UNIT 8 • WEEKS 29–32

Plant Problems and Garden Helpers

Plant problems and how to help: too much and too little water, aphids and ladybugs, powdery mildew and mold, and weeds.

- 8.1 Too Much and Too Little Water
- 8.2 Aphids and Ladybugs
- 8.3 Powdery Mildew and Mold
- 8.4 Weeds

WEEKLY PACING CALENDAR

WEEK	PLAN
1	• Session 1: Lesson 1.1 The Sun and the Seasons: warm-up, video, teaching and picture study • Session 2: Lesson 1.1 hands-on project and nature journal <i>Two sessions a week is the usual rhythm. Younger children can split a long session in two; older students can do both sessions in one sitting.</i>
2	• Session 1: Lesson 1.2 Harvesting Vegetables: warm-up, video, teaching and picture study • Session 2: Lesson 1.2 hands-on project and nature journal
3	• Session 1: Lesson 1.3 Apples and Orchards: warm-up, video, teaching and picture study • Session 2: Lesson 1.3 hands-on project and nature journal
4	• Session 1: Lesson 1.4 Saving Seeds: warm-up, video, teaching and picture study • Session 2: Lesson 1.4 hands-on project and nature journal • Session 3: Unit 1 review and portfolio project
5	• Session 1: Lesson 2.1 Migrate, Hibernate or Store Food: warm-up, video, teaching and picture study • Session 2: Lesson 2.1 hands-on project and nature journal
6	• Session 1: Lesson 2.2 Squirrels and Chipmunks: warm-up, video, teaching and picture study • Session 2: Lesson 2.2 hands-on project and nature journal
7	• Session 1: Lesson 2.3 Deer in Fall and Winter: warm-up, video, teaching and picture study • Session 2: Lesson 2.3 hands-on project and nature journal
8	• Session 1: Lesson 2.4 Tracks in Mud and Snow: warm-up, video, teaching and picture study • Session 2: Lesson 2.4 hands-on project and nature journal • Session 3: Unit 2 review and portfolio project
9	• Session 1: Lesson 3.1 Soil Layers in a Jar: warm-up, video, teaching and picture study • Session 2: Lesson 3.1 hands-on project and nature journal

WEEK	PLAN
10	• Session 1: Lesson 3.2 Worms and Roly-Polies: The Soil's Recyclers: warm-up, video, teaching and picture study • Session 2: Lesson 3.2 hands-on project and nature journal
11	• Session 1: Lesson 3.3 A Little Compost: warm-up, video, teaching and picture study • Session 2: Lesson 3.3 hands-on project and nature journal
12	• Session 1: Lesson 3.4 Rocks Become Soil: warm-up, video, teaching and picture study • Session 2: Lesson 3.4 hands-on project and nature journal • Session 3: Unit 3 review and portfolio project
13	• Session 1: Lesson 4.1 Choosing a Pet That Fits Your Family: warm-up, video, teaching and picture study • Session 2: Lesson 4.1 hands-on project and nature journal
14	• Session 1: Lesson 4.2 A Fish Tank: warm-up, video, teaching and picture study • Session 2: Lesson 4.2 hands-on project and nature journal
15	• Session 1: Lesson 4.3 Rabbits: warm-up, video, teaching and picture study • Session 2: Lesson 4.3 hands-on project and nature journal
16	• Session 1: Lesson 4.4 Dogs: Food, Walks and Training: warm-up, video, teaching and picture study • Session 2: Lesson 4.4 hands-on project and nature journal • Session 3: Unit 4 review and portfolio project
17	• Session 1: Lesson 5.1 What Is Inside a Seed?: warm-up, video, teaching and picture study • Session 2: Lesson 5.1 hands-on project and nature journal
18	• Session 1: Lesson 5.2 A Seed Wakes Up: warm-up, video, teaching and picture study • Session 2: Lesson 5.2 hands-on project and nature journal
19	• Session 1: Lesson 5.3 Plants Lean Toward the Light: warm-up, video, teaching and picture study • Session 2: Lesson 5.3 hands-on project and nature journal
20	• Session 1: Lesson 5.4 Water and Roots: warm-up, video, teaching and picture study

WEEK	PLAN
	• Session 2: Lesson 5.4 hands-on project and nature journal • Session 3: Unit 5 review and portfolio project
21	• Session 1: Lesson 6.1 The Chicken Life Cycle: warm-up, video, teaching and picture study • Session 2: Lesson 6.1 hands-on project and nature journal
22	• Session 1: Lesson 6.2 Sheep and Wool: warm-up, video, teaching and picture study • Session 2: Lesson 6.2 hands-on project and nature journal
23	• Session 1: Lesson 6.3 Pigs on the Farm: warm-up, video, teaching and picture study • Session 2: Lesson 6.3 hands-on project and nature journal
24	• Session 1: Lesson 6.4 Honeybees: Queen, Workers and Drones: warm-up, video, teaching and picture study • Session 2: Lesson 6.4 hands-on project and nature journal • Session 3: Unit 6 review and portfolio project
25	• Session 1: Lesson 7.1 Potting Soil and Pots with Holes: warm-up, video, teaching and picture study • Session 2: Lesson 7.1 hands-on project and nature journal
26	• Session 1: Lesson 7.2 Starting Seeds Indoors: warm-up, video, teaching and picture study • Session 2: Lesson 7.2 hands-on project and nature journal
27	• Session 1: Lesson 7.3 Transplanting Seedlings: warm-up, video, teaching and picture study • Session 2: Lesson 7.3 hands-on project and nature journal
28	• Session 1: Lesson 7.4 A Square-Foot Garden Plan: warm-up, video, teaching and picture study • Session 2: Lesson 7.4 hands-on project and nature journal • Session 3: Unit 7 review and portfolio project
29	• Session 1: Lesson 8.1 Too Much and Too Little Water: warm-up, video, teaching and picture study • Session 2: Lesson 8.1 hands-on project and nature journal

WEEK	PLAN
30	• Session 1: Lesson 8.2 Aphids and Ladybugs: warm-up, video, teaching and picture study • Session 2: Lesson 8.2 hands-on project and nature journal
31	• Session 1: Lesson 8.3 Powdery Mildew and Mold: warm-up, video, teaching and picture study • Session 2: Lesson 8.3 hands-on project and nature journal
32	• Session 1: Lesson 8.4 Weeds: warm-up, video, teaching and picture study • Session 2: Lesson 8.4 hands-on project and nature journal • Session 3: Unit 8 review and portfolio project <i>Last week. Hold a family harvest fair: set out the best project from each unit (journal pages, plants, photos of animal care) and let the student show guests one of them.</i>

MATERIALS

Nature journal (sketchbook or bound notebook)

Used every week for drawings, labels, measurements and weather notes.

Colored pencils and a regular pencil

For careful, labeled drawings.

Magnifying glass

For seeds, soil, insects and leaves.

A ruler and an outdoor thermometer

For measuring seedlings and checking the weather.

Seeds: dry beans, peas, radishes, lettuce, sunflowers and marigolds

Inexpensive packets or dry beans from the grocery store.

Bagged potting mix

Not garden dirt. Potting mix drains well in pots.

Small pots or paper or plastic cups, plus a seed tray if you have one

Every container needs drainage holes; an adult can poke them.

Clear jars with lids, zip-top bags and paper towels

For the soil jar, the bean in a bag and the root window.

A spray bottle and a small watering can

For gentle watering of seeds and seedlings.

A child-size trowel and garden gloves

For digging, planting and handling compost.

A sunny windowsill, a balcony pot, or a small garden bed

Any of these will do. A 4-foot-by-4-foot bed is perfect for the square-foot garden.

Library books about farm animals, pets and bees (optional)

Helpful for families without animals at home.

A pet, a farm visit or a neighbor's animal (optional)

Never required; every animal lesson can be done by observing, planning or reading.

GRADING

There are no letter grades in first grade. Instead, keep a portfolio and give warm, specific feedback.

- After each project, tell your child one thing they did well (“You watered your bean every morning without being reminded”) and one thing to try next time.
- Keep a portfolio folder with nature-journal pages, photographs of projects and growing plants, and the portfolio project from each unit.
- Use each unit’s mastery checklist as a guide. Check off each “I can” statement when your child can show or tell it.
- At the end of the year, look back through the portfolio together. Children are often amazed at how much they have learned and grown.

A NOTE TO PARENTS

Young children learn about living things best by touching, watching, waiting and wondering. You do not need to be a gardener or an animal expert to teach this course. Read the lesson, gather a few simple supplies, and learn alongside your child. When a seed fails to sprout or a plant wilts, that is not a failure; it is the next lesson.

Some things in this course take patience: beans sprout in days, but radishes take weeks and compost takes months. Help your child keep at it, a few minutes each day. Faithful little chores, like watering a pot or filling a pet’s water dish, are some of the best character training there is. “He that is faithful in that which is least is faithful also in much.”

UNIT 1

SEASONS AND HARVEST

The school year begins at harvest time. In this unit your child learns why the sun makes our four seasons, how to tell when vegetables are ready to pick, how apples grow in an orchard, and how to save seeds from this year's garden to plant next spring.

We look at Monet's glowing wheat stacks, Millet's potato harvest, Pissarro's apple pickers and Van Gogh's big sunflower seed heads. Along the way your child begins a nature journal, keeps a short sunset and weather log, and fills a real seed envelope. God promised that "seedtime and harvest" would not cease; this unit helps your child see that promise kept.

PREREQUISITES

- Can hold a pencil and draw simple shapes
- Knows the names of the four seasons (helpful, not required)
- No gardening experience needed

MASTERY CHECKLIST

- ☐ I can name the four seasons in order and tell one thing about each.
- ☐ I can show with a ball and a flashlight why summer is warm and winter is cold.
- ☐ I can tell when a vegetable is ripe by its color, size or feel.
- ☐ I can tell how apples grow, from blossom to fruit.
- ☐ I can save dry seeds in a labeled envelope.

LESSONS IN THIS UNIT

1.1 The Sun and the Seasons

2 sessions of 30 minutes

1.2 Harvesting Vegetables

2 sessions of 30 minutes

1.3 Apples and Orchards

2 sessions of 30 minutes

1.4 Saving Seeds

2 sessions of 30 minutes

UNIT 1 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the flashlight, an apple, a few seeds and the four pictures from this unit ready.

1. Name the four seasons in order. What happens to plants in each one?
2. Use the flashlight to show me summer sun and winter sun.
3. How can you tell if a tomato or a bean pod is ripe?
4. Tell me how an apple grows, from the tree in winter to the ripe apple.
5. Point to the skin, flesh, core and seeds of this apple. What shape do the seeds make when you cut it across?
6. Look at Van Gogh's *Sunflowers*. Where are the seeds? How do we save seeds so they will grow next year?

ANSWER KEY

1. Spring (seeds are planted and plants sprout), summer (plants grow big), fall (harvest), winter (many plants rest).
2. Shining straight down makes a small bright spot (summer, strong). Shining at a slant makes a big dim spot (winter, weak).
3. A ripe tomato is red and a little soft. A ripe bean pod for eating is full and firm; for saving seed, it is brown and dry and rattles.
4. Bare tree in winter, blossoms in spring, bees pollinate them, petals fall and a little green apple grows, it grows all summer, it ripens in fall.
5. The child points to each part and says the seeds make a star.
6. In the big round middle (the seed head). Let them dry on the plant, dry them more indoors, then store them in a labeled paper envelope in a cool, dry place.

PORTFOLIO PIECE: MY HARVEST BOOK

Make a small book of four pages, one for each lesson. Page 1: the same tree drawn in all four seasons. Page 2: a drawing of your harvest basket with labels. Page 3: the apple cut across, showing the seed star. Page 4: tape or glue one of your seed envelopes to the page, with a drawing of the plant it came from. Make a cover and title it “My Harvest Book.” Then set your book out with your seed envelope as a little show-and-tell exhibit, the way 4-H Cloverbuds set out display-only projects at a county fair. Give a one-minute show-and-tell talk about it to your family: what you grew, what you saved, and one thing you learned.

LOOK FOR	WHAT IT MEANS
Four seasons	Drew the tree in all four seasons and labeled each one.
Careful looking	The apple and vegetable drawings show real details: seeds, stems, roots or leaves.
Seed saving	Saved real, dry seeds in an envelope labeled with the plant name and date.
Telling back	Can tell a parent about each page in their own words.
Show-and-tell talk	Gave a one-minute talk about the Harvest Book, speaking clearly and looking at the listeners.

1.1 THE SUN AND THE SEASONS

OBJECTIVES

- Name the four seasons in order and tell what plants and animals do in each.
- Show with a ball and a flashlight that the sun’s light is stronger in summer and weaker in winter.
- Notice that summer days are long and winter days are short.

Warm-up. Season sort. Lay out four sheets of paper labeled spring, summer, fall and winter. Name things one at a time and let your child place each one: a snowman, a baby bird, a red apple, a swimming pool, a falling leaf, a tulip, a pumpkin, a mitten. Talk about why each thing belongs where it does.

WATCH

Why Are There Seasons?

[SciShow Kids](#) · 2:20

<https://www.youtube.com/watch?v=UQjT5uKp2hg>

WHEN TO WATCH

After the core ideas, before the picture study. Pause when the Earth tips toward the sun and ask, “Is it summer or winter here now?”

BACKUP VIDEO

Why Do We Have Different Seasons? | California Academy of Sciences

[California Academy of Sciences](#) · 3:17

https://www.youtube.com/watch?v=WgHmqv_-UbQ

Any time this week. A clear, wordless-style model of the tilted Earth going around the sun; let your child narrate what is happening.

KEY TERMS

season

One of the four parts of the year: spring, summer, fall (autumn) and winter.

tilt

A lean. The Earth leans a little to one side as it goes around the sun.

harvest

The time when ripe food is gathered
from the garden and the field.

CORE IDEAS

God made the year with four **seasons**: spring, summer, fall and winter. They always come in the same order, again and again.

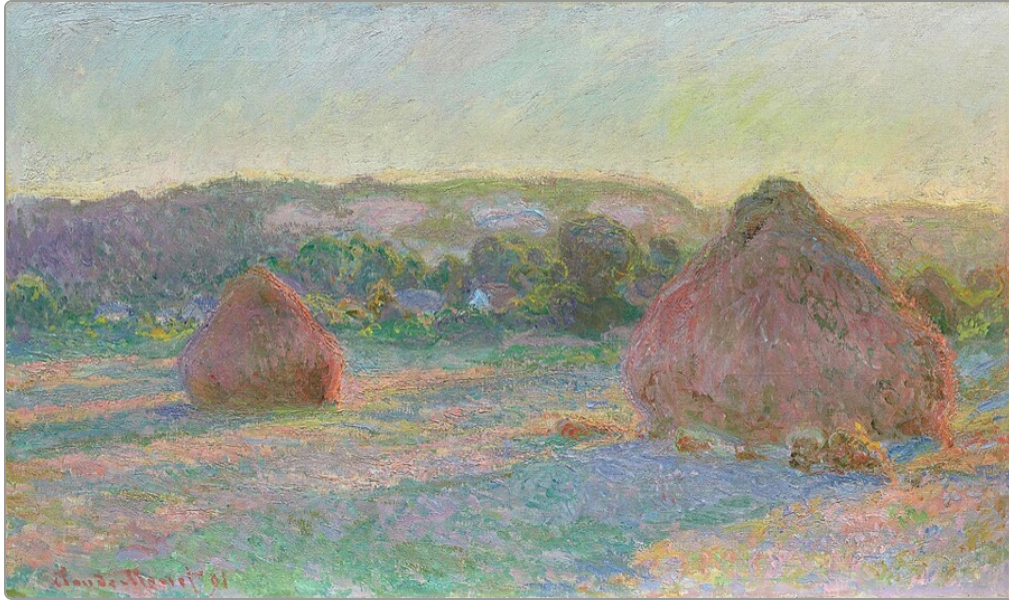
The Earth goes all the way around the sun once each year. The Earth also leans a little, like a top that is **tilted**. In summer, our part of the Earth leans toward the sun. The sunlight shines straight down on us, and the days are long and warm.

In winter, our part of the Earth leans away from the sun. The sunlight comes in low and slanted, so it is weaker. The days are short, and the air is cold.

Plants and animals follow the seasons. Seeds are planted in spring. Plants grow big in summer. Food is gathered at **harvest** in fall. In winter, many plants rest, and the farmer gets ready for spring.

Right now it is late summer and fall. It is harvest time! The days are getting shorter, and soon the leaves will change color.

PICTURE STUDY



Stacks of Wheat (End of Summer), Claude Monet, 1890–91 · Oil on canvas · Art Institute of Chicago

Image: [Wikimedia Commons](#), public domain

Claude Monet painted the same stacks of wheat near his home in France again and again: in summer, in fall, in winter snow, in the morning and at sunset. He wanted to show how the sun's light changes through the day and through the seasons. This one shows the end of summer, right at harvest time.

Look closely

- Find the two big wheat stacks. The farmer cut the wheat and piled it up to keep it dry.
- Find the shadows. Which way is the sun shining from?
- Look at the colors of the field and the sky. Do they feel warm or cold?
- Look at the trees and hills far away. Are they green, or are they starting to change?

Talk about it

1. What season is it in this picture? How can you tell?
2. If Monet came back and painted the same stacks in winter, what would be different?
3. Why do you think the farmer stacked the wheat instead of leaving it lying on the ground?

HANDS-ON PROJECT

Sun, Earth and Seasons

You will use a flashlight and a ball to see why summer sun is strong and winter sun is weak. Then you will begin a sunset log to watch the days grow shorter this fall.

You will need

- A flashlight
- A ball (an orange or a playground ball works)
- A marker or sticker
- A sheet of dark paper
- Nature journal and pencil
- A clock or a phone that shows the time

Steps

1. Make a dot or put a sticker on the ball. This is your home on the Earth.
2. Darken the room. A parent holds the flashlight; this is the sun.
3. Shine the flashlight straight down on the dark paper from about a foot above it. Look at the small, bright circle of light. This is like summer sun: strong and hot.
4. Now tip the flashlight so the light hits the paper at a slant. Look at the big, dim oval. This is like winter sun: the same light spread out, so it is weaker.
5. Hold the ball and tip it a little. Walk it slowly in a circle around the “sun.” Notice that your dot sometimes leans toward the sun (summer) and sometimes leans away (winter).
6. Start a sunset log. On the first page of your journal, write today’s date and the time the sun sets. A parent can look it up or you can watch for it.
7. Once a week this fall, write the sunset time again. Are the days getting longer or shorter?

Tips

- Keep the ball tipped the same way the whole time you walk around the sun. That is just how the real Earth does it.

- If it is cloudy, a weather app or a newspaper can tell you the sunset time.

Check your work

- ☐ I can show why straight sunlight is stronger than slanted sunlight.
- ☐ I can name the four seasons in order.
- ☐ I started my sunset log.

NATURE JOURNAL

1. Fold a journal page into four boxes. Draw the same tree in spring, summer, fall and winter. Label each season.
2. Go outside at noon and look at your shadow (never look at the sun). Draw yourself and your shadow, and write the date.
3. Write today's weather: sunny, cloudy, rainy or windy. Is it warm or cool?

From history. Long before clocks and calendars hung on every wall, farmers watched the sun to know when to plant and when to harvest. They noticed where the sun rose and set and how long the days were, and they planned their work by it.

COMMON MISTAKES

- Thinking summer comes because the Earth is closer to the sun. It is really the tilt that matters: the sun shines straighter on us in summer.
- Forgetting to keep the sunset log. Pick one day each week, such as Sunday evening, and make it a habit.

Make it a game • Sun, Ball and Seasons. Use a ball as Earth and a flashlight as the sun. Tilt the ball and shine the light on the top half, then the bottom half. Say which season is which. Then your grown-up names a season and you tell one thing plants do and one thing animals do. Name all four in order.

Scripture. “While the earth remaineth, seedtime and harvest, and cold and heat, and summer and winter, and day and night shall not cease.” (Genesis 8:22, KJV)

After the great flood, God promised Noah that the seasons would keep coming. Every spring and every harvest is God keeping His promise.

1.2 HARVESTING VEGETABLES

OBJECTIVES

- Tell when a vegetable is ready to pick by its color, size and feel.
- Name vegetables that grow above the ground and below the ground.
- Harvest (or buy and sort) vegetables and wash them for the table.

Warm-up. Mystery bag. Put three vegetables in a bag (a carrot, a potato and a tomato or pepper work well). Let your child reach in without looking, feel each one, and guess what it is. Then ask, “Which ones grew under the ground?”

WATCH

How to Tell When Your Fruits and Vegetables are Ready to Harvest

GrowVeg • 5:29

<https://www.youtube.com/watch?v=8gCt675555o>

WHEN TO WATCH

After the core ideas. Pause after each vegetable and ask, “What clue told the gardener it was ready?”

Note: The first few seconds mention the channel’s gardening book; you may skip them.

BACKUP VIDEO

3 Signs Your Carrots Are Ready - Garden Quickie Episode 167

The Ripe Tomato Farms • 3:11

<https://www.youtube.com/watch?v=HBw19-wAFzA>

Before the hands-on project, if you will pull carrots.

KEY TERMS

ripe

Fully grown and ready to eat.

root vegetable

A vegetable whose part we eat grows under the ground, like a carrot, a beet or a radish.

harvest

To pick or dig food when it is ready.

Harvest is also the name of the time of year when we do it.

CORE IDEAS

When a vegetable is fully grown and ready to eat, we say it is **ripe**. A good gardener checks the plants every day so nothing is picked too early or left too long.

Look for clues. **Color:** a tomato turns from green to red. **Size:** a cucumber or zucchini is ready when it is about as long as your hand and a little more; if it gets huge, it turns tough and seedy. **Feel:** a ripe tomato is a little soft, and a ripe pea pod is plump and full.

Some vegetables grow under the ground. They are **root vegetables**, like carrots, beets and radishes. Potatoes grow under the ground too. To check them, brush away a little soil and look at the top. When the leaves of potato plants turn yellow and fall over, the potatoes are ready to dig.

Pick gently. Hold the plant with one hand and pick with the other, so you don't pull up the whole plant. Put your harvest in a basket, not a deep pile, so nothing gets squashed.

Wash vegetables in cool water before you eat them. Then say thank you to God, who gave the sun and rain to make them grow.

PICTURE STUDY



The Potato Harvest, Jean-François Millet, 1855 · Oil on canvas · Walters Art Museum, Baltimore

Image: [Wikimedia Commons](#), public domain

Jean-François Millet grew up on a farm in France and loved to paint farm families at work. Here a family is digging potatoes in the fall. Potatoes grow under the ground, so the workers have to dig for them.

Look closely

- Find the people who are digging. What tools are they using?
- Find the baskets and the big sacks. Which one would be heaviest?
- Look at the ground. Can you see any potatoes lying in the soil?
- Look at the sky and the field. What season do you think it is?

Talk about it

1. Why do the workers have to dig to find potatoes?
2. How do you think they will carry all the sacks home?
3. Which job in this picture would you like to do?

Safety first. Pick only from your own garden or with permission. Wash your hands and the vegetables after harvesting. Never eat a plant or berry you do not know.

HANDS-ON PROJECT

My Harvest Basket

You will harvest vegetables from a garden or a farm stand, sort them into “above the ground” and “below the ground,” and wash them for a meal.

You will need

- A basket or a shallow box
- Vegetables from your garden, a pick-your-own farm, a farm stand or the store (try for carrots or potatoes, plus tomatoes, beans or squash)
- A bowl of cool water and a vegetable brush
- Two sheets of paper labeled “above” and “below”
- Nature journal and colored pencils

Steps

1. If you have a garden, walk through it with a parent. Look for ripe vegetables. Use the clues: color, size and feel.
2. Pick gently, holding the plant with one hand. If you have carrots, loosen the soil beside them with a trowel first, then pull straight up by the leafy tops.
3. No garden? Visit a farm stand or a pick-your-own farm, or choose vegetables at the store. Look for the ripest ones.
4. At home, sort your vegetables onto the two papers: “above” (grew above the ground) and “below” (grew below the ground).
5. Wash each vegetable in the bowl of cool water. Scrub the root vegetables with the brush to get the soil off.
6. Help a parent use them in a meal: carrot sticks, a salad, or roasted potatoes.
7. Make a show-and-tell plate: choose your three best carrots or tomatoes that look alike in size and color, wash them gently, set them on a paper plate, and add a card with the vegetable’s name and your name. Clean, matching and labeled is exactly what fair judges look for when older children enter vegetables.
8. Say a prayer of thanks for the harvest before you eat.

Tips

- Pick in the cool of the morning. Vegetables stay crisp longer.
- If the soil is hard, water the carrot row the night before. They will slide out more easily.
- Many county fairs have a youth vegetable class for older children. For children your age, 4-H Cloverbuds (about ages five to eight) is non-competitive: young members set out display-only exhibits and receive participation ribbons. Check your county fair book or extension office.

Check your work

- ☐ I can tell one clue that shows a vegetable is ripe.
- ☐ I sorted my harvest into above-ground and below-ground vegetables.
- ☐ I washed my vegetables before eating them.

NATURE JOURNAL

1. Draw one vegetable from your harvest, life size. Color it carefully and label it.
2. Draw a carrot plant: the leafy top above a line for the ground, and the orange root below. Label “leaves” and “root.”
3. Make a list of everything in your harvest basket.

COMMON MISTAKES

- Pulling a whole plant out when picking one bean or tomato. Use two hands: one to hold the plant, one to pick.
- Leaving zucchini too long. They grow fast and become giant and tough. Check them every day.

Make it a game • Above or Below?. Your grown-up names a vegetable, like carrot, tomato, potato or beans. Jump up high if it grows above the ground, or crouch low if it grows below. Then say how you know it is ripe: color, size or feel. Play ten in a row and try to beat your own score.

1.3 APPLES AND ORCHARDS

OBJECTIVES

- Tell how an apple grows, from blossom to ripe fruit.
- Name the parts of an apple: skin, flesh, core and seeds.
- Cut an apple across to find the star of seeds.

Warm-up. Apple taste test. Cut thin slices of two or three kinds of apples (for example a red, a green and a yellow one). Let your child taste each and decide: sweet or sour? crunchy or soft? Which is the favorite?

WATCH

The Life Cycle of an Apple

PA Apples • 11:06

<https://www.youtube.com/watch?v=wgEclDLSh9I>

WHEN TO WATCH

After the core ideas. Children ask a real apple grower their questions, and he answers in his orchard. Watch half in each session if your child is tired.

BACKUP VIDEO

APPLE | How Does it Grow?

TRUE FOOD TV • 5:32

<https://www.youtube.com/watch?v=UWLMeh1HIBw>

Any time this week, to see why orchard trees are grown from branches joined onto roots instead of from seeds.

KEY TERMS

orchard

A field of fruit trees planted in rows, such as apple, peach or cherry trees.

core

The middle of the apple, where the seeds are.

blossom

A flower on a fruit tree. Each apple begins as a blossom.

pollinate

To carry pollen from flower to flower. Bees pollinate apple blossoms so apples can grow.

CORE IDEAS

Apples grow on trees. Many apple trees planted together in rows make an **orchard**.

In winter the apple tree rests with bare branches. In spring it covers itself with pink and white **blossoms**. Bees visit the blossoms and carry pollen from flower to flower. This is called **pollinating**.

After the bees visit, the petals fall off. A tiny green apple starts to grow right where the flower was. All summer, the apple grows bigger. In the fall it turns red, yellow or green, and it is ripe.

An apple has **skin** on the outside, sweet **flesh** that we eat, and a **core** in the middle with the seeds. If you cut an apple across its middle, the seeds make a star!

To pick an apple, lift it up and give it a gentle twist. If it is ripe, it lets go of the branch easily. If you have to pull hard, it is not ready yet.

PICTURE STUDY



Apple Picking, Camille Pissarro, 1886 · Oil on canvas · Ohara Museum of Art, Kurashiki, Japan

Image: [Wikimedia Commons](#), public domain

Camille Pissarro lived in the French countryside and painted farm people at work in every season. Here women are harvesting apples in an orchard on a bright fall day. He painted with thousands of little dots of color.

Look closely

- Find the woman with the long pole. What is she doing with it?
- Find the woman bending over the basket. What is she gathering?
- Find the woman sitting down. What is she doing?
- Look closely at the grass and the trees. How did Pissarro paint them: with long strokes or little dabs of color?

Talk about it

1. Why might shaking the tree be a good way to harvest apples? What could go wrong?
2. What do you think the women will do with all those apples?
3. Have you ever picked an apple from a tree? How did it feel?

Safety first. An adult cuts the apples with a sharp knife. At a pick-your-own orchard, stay on the ground; never climb the trees or ladders without permission.

HANDS-ON PROJECT

The Star in the Apple

You will look closely at the inside of an apple, find its secret star, and plant a few apple seeds to watch them sprout.

You will need

- Two apples
- A cutting board and knife (for the adult)
- A magnifying glass
- A paper towel, a zip-top bag and a little water
- Nature journal and colored pencils

Steps

1. Look at the outside of an apple. Find the stem on top. Turn it over and find the little dry leftover blossom on the bottom.
2. Ask an adult to cut one apple from top to bottom. Find the skin, the flesh, the core and the seeds.
3. Ask the adult to cut the second apple across its middle, like a belt. Look! The seeds make a star.
4. Count the seeds. Use the magnifying glass to look at one. What color is it? What shape?
5. Fold a damp paper towel, put three apple seeds inside, and slide it into a zip-top bag. Put the bag in the refrigerator. Apple seeds need a long cold “winter” before they will sprout.
6. Check the bag once a week. Keep the towel damp. In about six to eight weeks, look for a tiny white root.
7. Eat the rest of the apples for a snack!

Tips

- If you go to an orchard, ask the grower what kinds of apples grow there. Many orchards grow ten or more kinds.
- Apple seeds in the refrigerator are a slow experiment. Write the start date in your journal so you remember.

Check your work

- ☐ I can name the skin, flesh, core and seeds.
- ☐ I found the star of seeds.
- ☐ I can tell how a blossom becomes an apple.

NATURE JOURNAL

1. Draw the apple cut across, showing the seed star. Label skin, flesh, core and seeds.
2. Draw four pictures in a row: blossom, little green apple, big green apple, ripe red apple.
3. Write how many seeds you counted in each apple.

From history. John Chapman, called Johnny Appleseed, walked across Ohio, Indiana and Pennsylvania about two hundred years ago planting apple nurseries for the settlers moving west. He was a Bible-reading man known for his kindness, and he often gave trees to families who could not pay.

COMMON MISTAKES

- Pulling hard on an apple that will not come off. A ripe apple lets go with a gentle lift and twist.
- Expecting apple seeds to sprout in a few days. They need weeks of cold first, just like a winter outdoors.

Make it a game • Apple Parts Draw-Off. Draw an apple on paper from memory, then label the skin, flesh, core and seeds with your finger. Cut a real apple across the middle and find the star. Tell the story from blossom to ripe apple in four steps, one finger for each step, while your grown-up listens.

1.4 SAVING SEEDS

OBJECTIVES

- Tell where seeds come from on a plant.
- Save dry seeds from beans, marigolds or sunflowers.
- Label and store seeds so they will grow next spring.

Warm-up. Seed hunt. Put out a bowl of things from the kitchen: a dry bean, a popcorn kernel, a sunflower seed, a pea, a grain of rice, a pumpkin seed and a raisin. Ask your child to find all the seeds. (The raisin is the only one that is not a seed!)

WATCH

How to Save Bean Seeds - The Most Simple Seed Saving tutorial EVER!

Mlgardener · 5:00

<https://www.youtube.com/watch?v=nZEsmHmBbMQ>

WHEN TO WATCH

Before the hands-on project. Pause when he cracks open a dry pod and count the beans together.

Note: The gardener mentions his own seed shop at the end; you may skip the last 30 seconds.

BACKUP VIDEO

How to Save Marigold Seeds - Seed Saving Guide

Mlgardener · 3:29

<https://www.youtube.com/watch?v=zXaa1R7Hc54>

Before the project, if you will save marigold seeds.

KEY TERMS

seed

A tiny baby plant packed with food and wrapped in a coat. Plant it, and it can grow into a new plant.

seed head

The part of a flower that holds the seeds after the petals fall, like the middle of a sunflower.

pod

The case that holds the seeds of a bean or pea plant.

CORE IDEAS

Every plant in the garden can make **seeds**. Each seed holds a tiny baby plant, a lunch box of food, and a tough seed coat. Plant it, and a new plant will grow, just like its parent.

Seeds grow after the flower. When a flower is done blooming, its petals fall off, and seeds begin to grow where the flower was. Beans and peas grow their seeds in **pods**. Sunflowers grow hundreds of seeds in their big **seed heads**. Marigolds hide their seeds inside the dry, brown flower.

To save seeds, wait until they are completely ripe and dry on the plant. Bean pods turn brown and crispy and rattle when you shake them. Then pick them and let them dry indoors for another week.

Store seeds in a paper envelope, not plastic, so they stay dry. Write the plant's name and the date on it. Keep it in a cool, dry, dark place until spring.

Saving seeds is an old and wise habit. Farmers have done it for thousands of years. One bean seed planted in spring can give you a whole handful of beans by fall!

PICTURE STUDY



Sunflowers, Vincent van Gogh, 1887 · Oil on canvas · Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

Vincent van Gogh loved sunflowers. He painted these two big flowers after they had been cut and were drying. Look how he shows the middle of the flower, where the seeds grow.

Look closely

- Find the flower that is facing you. Look at its big round middle. That is the seed head, packed with seeds.
- Find the yellow petals around the edge. Are they fresh and straight, or curling and drying?
- Find the second sunflower. Which side of it are we seeing?
- Look at the lines and swirls in the seed head. How do they make it look bumpy?

Talk about it

1. How many seeds do you think are in one sunflower head?
2. Why are sunflowers good flowers for saving seeds?
3. What animals might like to eat sunflower seeds?

HANDS-ON PROJECT

My Seed Envelopes

You will save real seeds, dry them, and make labeled envelopes to keep until spring. In Unit 5 you will plant some of them!

You will need

- Dry bean pods, dry marigold flowers or a dry sunflower head (from your garden, a neighbor's, or a farmers' market). Dry beans from the grocery store can stand in.
- A paper plate or tray
- Small paper envelopes (or fold your own from paper)
- Crayons or markers
- A magnifying glass

Steps

1. Gather your dry plants. Bean pods should be brown and crackly. Marigold flowers should be brown and dry. A sunflower head should be dry with plump seeds.
2. Open a bean pod over the paper plate and let the beans fall out. Pull apart a marigold flower and find the long, thin black-and-white seeds. Rub a sunflower head with your thumb to loosen the seeds.
3. Look at the seeds with your magnifying glass. Pick out any broken, moldy or tiny ones.
4. Spread the good seeds on the plate and let them dry for one week in a dry spot indoors.
5. Make an envelope for each kind of seed. Write the name of the plant and today's date. Draw a picture of the plant on the front.
6. Put the seeds in their envelopes and close them. Store them in a box in a cool, dry closet.
7. Save a few extra seeds to share with a friend or a neighbor.

Tips

- If you have no garden, ask at a farmers' market or a friend's garden for a few dry pods or flower heads. Gardeners love to share seeds.
- Never save seeds in a closed plastic bag. They can get damp and moldy.

Check your work

- ☐ I saved dry seeds.
- ☐ I made envelopes with the plant name and date.
- ☐ I put my seeds in a cool, dry place.

NATURE JOURNAL

1. Draw a bean pod, open, with the beans inside. Count the beans and write the number.
2. Draw three different seeds side by side, large. Label each one.
3. Draw the life of a bean: seed, sprout, plant, flower, pod, and back to seed. Connect them with arrows in a circle.

From history. The Pilgrims who came to Plymouth in 1620 learned from Squanto, a native man who spoke English, how to plant corn. Every fall they saved the best corn seed for the next spring, because without seed there would be no harvest.

COMMON MISTAKES

- Picking seeds while they are still green and soft. Wait until they are dry and hard on the plant.
- Forgetting to label the envelopes. In spring, all seeds look alike in a drawer!

Make it a game • Seed Source Showdown. Your grown-up names a plant and you say where its seeds hide: in a pod, in a seed head, or inside fruit. Get a point for each correct answer. Then try to name three plants whose dry seeds you could save. A wrong answer from your grown-up must be caught for a bonus point.

Scripture. “And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so.” (Genesis 1:11, KJV)

On the third day of creation God made plants with their seed “in itself.” When we save seeds, we are using the wonderful plan God built into every plant.

UNIT 1

SEASONS AND HARVEST

The school year begins at harvest time. In this unit your child learns why the sun makes our four seasons, how to tell when vegetables are ready to pick, how apples grow in an orchard, and how to save seeds from this year's garden to plant next spring.

We look at Monet's glowing wheat stacks, Millet's potato harvest, Pissarro's apple pickers and Van Gogh's big sunflower seed heads. Along the way your child begins a nature journal, keeps a short sunset and weather log, and fills a real seed envelope. God promised that "seedtime and harvest" would not cease; this unit helps your child see that promise kept.

PREREQUISITES

- Can hold a pencil and draw simple shapes
- Knows the names of the four seasons (helpful, not required)
- No gardening experience needed

MASTERY CHECKLIST

- ☐ I can name the four seasons in order and tell one thing about each.
- ☐ I can show with a ball and a flashlight why summer is warm and winter is cold.
- ☐ I can tell when a vegetable is ripe by its color, size or feel.
- ☐ I can tell how apples grow, from blossom to fruit.
- ☐ I can save dry seeds in a labeled envelope.

LESSONS IN THIS UNIT

1.1 The Sun and the Seasons

2 sessions of 30 minutes

1.2 Harvesting Vegetables

2 sessions of 30 minutes

1.3 Apples and Orchards

2 sessions of 30 minutes

1.4 Saving Seeds

2 sessions of 30 minutes

UNIT 1 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the flashlight, an apple, a few seeds and the four pictures from this unit ready.

1. Name the four seasons in order. What happens to plants in each one?
2. Use the flashlight to show me summer sun and winter sun.
3. How can you tell if a tomato or a bean pod is ripe?
4. Tell me how an apple grows, from the tree in winter to the ripe apple.
5. Point to the skin, flesh, core and seeds of this apple. What shape do the seeds make when you cut it across?
6. Look at Van Gogh's *Sunflowers*. Where are the seeds? How do we save seeds so they will grow next year?

ANSWER KEY

1. Spring (seeds are planted and plants sprout), summer (plants grow big), fall (harvest), winter (many plants rest).
2. Shining straight down makes a small bright spot (summer, strong). Shining at a slant makes a big dim spot (winter, weak).
3. A ripe tomato is red and a little soft. A ripe bean pod for eating is full and firm; for saving seed, it is brown and dry and rattles.
4. Bare tree in winter, blossoms in spring, bees pollinate them, petals fall and a little green apple grows, it grows all summer, it ripens in fall.
5. The child points to each part and says the seeds make a star.
6. In the big round middle (the seed head). Let them dry on the plant, dry them more indoors, then store them in a labeled paper envelope in a cool, dry place.

PORTFOLIO PIECE: MY HARVEST BOOK

Make a small book of four pages, one for each lesson. Page 1: the same tree drawn in all four seasons. Page 2: a drawing of your harvest basket with labels. Page 3: the apple cut across, showing the seed star. Page 4: tape or glue one of your seed envelopes to the page, with a drawing of the plant it came from. Make a cover and title it “My Harvest Book.” Then set your book out with your seed envelope as a little show-and-tell exhibit, the way 4-H Cloverbuds set out display-only projects at a county fair. Give a one-minute show-and-tell talk about it to your family: what you grew, what you saved, and one thing you learned.

LOOK FOR	WHAT IT MEANS
Four seasons	Drew the tree in all four seasons and labeled each one.
Careful looking	The apple and vegetable drawings show real details: seeds, stems, roots or leaves.
Seed saving	Saved real, dry seeds in an envelope labeled with the plant name and date.
Telling back	Can tell a parent about each page in their own words.
Show-and-tell talk	Gave a one-minute talk about the Harvest Book, speaking clearly and looking at the listeners.

UNIT 2

WILDLIFE GETTING READY FOR WINTER

As the days grow shorter, the animals around us get busy. In this unit your child learns the three ways animals get ready for winter: some travel away (migrate), some sleep deeply (hibernate), and some stay awake and store food. We watch squirrels and chipmunks hide nuts, learn how deer grow thick winter coats and new antlers, and become track detectives in mud and snow.

Picture study includes Audubon's Canada goose, Dürer's squirrels, Landseer's great stag and Monet's snowy magpie. The rule for the whole unit is simple: **look, don't touch**. We watch wild animals from a distance and never feed or handle them.

PREREQUISITES

- Lesson 1.1 (the seasons)
- Can sit quietly and watch for a few minutes
- No special equipment needed; binoculars are a bonus

MASTERY CHECKLIST

- ☐ I can tell three ways animals get ready for winter: migrate, hibernate and store food.
- ☐ I can tell how a squirrel or chipmunk stores food for winter.
- ☐ I can tell how deer stay warm and find food in winter.
- ☐ I can match a few animal tracks to the animals that made them.
- ☐ I know to look at wild animals but never touch or feed them.

LESSONS IN THIS UNIT

2.1 Migrate, Hibernate or Store Food

2 sessions of 30 minutes

2.2 Squirrels and Chipmunks

2 sessions of 30 minutes

2.3 Deer in Fall and Winter

2 sessions of 30 minutes

2.4 Tracks in Mud and Snow

2 sessions of 30 minutes

UNIT 2 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the track cards and the four pictures from this unit ready.

1. What does migrate mean? Name an animal that migrates.
2. What does hibernate mean? Name an animal that hibernates.
3. How does a squirrel get ready for winter?
4. Look at *The Monarch of the Glen*. Point to the antlers. What happens to antlers every year?
5. Here are some track cards. Which one is the deer? Which one is the dog? How can you tell a dog from a cat?
6. You see a raccoon walking around in the daytime and it is not afraid of you. What should you do?

ANSWER KEY

1. To travel far to a warmer place for winter and come back in spring. Canada geese, hummingbirds and monarch butterflies migrate.
2. To sleep very deeply all winter with a slow heartbeat. Groundhogs, some bats and chipmunks.
3. It buries nuts in many little hiding places (caches), finds them later by memory and smell, and sleeps in a leafy nest wrapped in its tail.
4. The buck drops them in winter and grows new ones in spring and summer.
5. The deer track has two pointed toes. A dog track shows claw marks; a cat track usually does not.
6. Stay away, do not touch or feed it, and tell an adult right away.

PORTFOLIO PIECE: MY WINTER WILDLIFE JOURNAL

Make a four-page wildlife journal. Draw one animal that migrates, one that hibernates and one that stores food, each with a sentence about what it does. On the last page, put your best track: a plaster cast photo, a track you drew in the snow, or your favorite track card. Add the date and place for every real animal or sign you saw.

LOOK FOR	WHAT IT MEANS
Three winter ways	Shows an animal that migrates, one that hibernates and one that stores food, each correctly.
Real observation	Includes at least one animal or sign your child really saw, with the date and place.
Tracks	Includes a real or drawn track with the animal named.
Safe and kind	Can explain why we look at wild animals but never touch or feed them.

2.1 MIGRATE, HIBERNATE OR STORE FOOD

OBJECTIVES

- Tell the meaning of migrate and hibernate.
- Sort animals by how they get ready for winter.
- Watch for geese or other birds flying south.

Warm-up. Winter coat game. Ask your child to pretend it is a cold winter day. What do you do? (Put on a coat, eat a warm meal, stay inside, maybe even take a long nap!) Tell your child that animals have their own ways to get ready for winter, and this week we will learn them.

WATCH

Why Do Some Animals Hibernate? | Winter Science | SciShow Kids

SciShow Kids · 3:46

<https://www.youtube.com/watch?v=OhrhcsICrE8>

WHEN TO WATCH

After the core ideas. Pause when the animal's heartbeat slows down and ask your child to breathe very slowly, like a sleeping groundhog.

KEY TERMS

migrate

To travel a long way to a warmer place for the winter, and come back in spring.

hibernate

To go into a very deep sleep for the winter. The animal's heart beats slowly and its body gets cool.

store

To gather food and hide it away to eat later.

CORE IDEAS

Winter is hard for wild animals. It is cold, and food is hard to find. God made animals with three good ways to get ready.

Some animals **migrate**. They travel far away to a warmer place and come back in spring. Many birds migrate: geese fly south in a big V, and hummingbirds fly all the

way to Mexico. Monarch butterflies migrate too.

Some animals **hibernate**. They eat a lot in the fall and get fat. Then they curl up in a safe den and sleep very deeply all winter. Their hearts beat slowly and their bodies get cool, so they use very little energy. Groundhogs (woodchucks), some bats and chipmunks hibernate. Bears sleep most of the winter in a den too.

Some animals stay awake and **store** food. Squirrels bury nuts. Beavers sink branches in their pond. Many animals also grow a thicker coat of fur or feathers.

When you see geese flying south or a squirrel busy with acorns, you are watching animals get ready for winter, just the way God designed them to.

PICTURE STUDY



Canada Goose, John James Audubon (engraved by Robert Havell), 1834 · Hand-colored engraving from *The Birds of America* · National Gallery of Art, Washington

Image: [Wikimedia Commons](#), public domain

John James Audubon traveled all over America to paint every bird he could find, life size. Canada geese are some of the best-known migrating birds. In fall, they fly south in big V shapes, honking as they go.

Look closely

- Find the white “chin strap” on the goose’s black head and neck.
- Look at the feathers on the goose’s back. How are they arranged?
- Find the goose’s feet. What kind of feet does it have, and why are they good for a water bird?
- Look for a second goose. What is it doing?

Talk about it

1. Why do you think geese fly south in the fall?
2. How does a goose know when it is time to come back in the spring?
3. Have you ever heard geese honking overhead?

Safety first. Watch wild geese from a distance. Geese protect their nests and young and can bite or chase people. Never feed wild animals; bread and crackers make them sick.

Getting Ready for Winter Sort

You will make a chart of animals that migrate, hibernate and store food, and then go on a short walk to look for animals getting ready for winter.

You will need

- A large sheet of paper divided into three columns: Migrate, Hibernate, Store Food
- Old nature magazines to cut up, or crayons to draw
- Scissors and a glue stick
- Nature journal
- Binoculars (optional)

Steps

1. Write the three words at the top of the columns. Draw a little picture beside each: a bird flying for migrate, a sleeping animal for hibernate, a nut for store food.
2. Draw or cut out pictures of these animals: Canada goose, groundhog, squirrel, monarch butterfly, bear, chipmunk, hummingbird, bat, beaver.
3. Decide which column each animal belongs in and glue or draw it there. (Chipmunks both store food and take long winter sleeps, so they can go in two columns!)
4. Go for a walk outside. Look up for flocks of birds flying south. Look down for squirrels burying nuts. Look for holes and dens.
5. When you see a sign of an animal getting ready for winter, stop and watch quietly.
6. Come home and add anything new you saw to your chart.

Tips

- Early morning and late afternoon are good times to see animals.
- If you live in a city, parks and ponds are great places to watch geese and squirrels.

Check your work

- ☐ I can tell what migrate means.
- ☐ I can tell what hibernate means.
- ☐ I sorted the animals into the right columns.

NATURE JOURNAL

1. Draw a flock of geese flying in a V shape across the sky.
2. Draw a groundhog curled up asleep in its underground den. Show the tunnel going up to the ground.
3. Write the date and what animals you saw on your walk.

From history. Long ago, people wondered where the birds went every winter. Some even thought swallows slept in the mud at the bottom of ponds! Careful watchers, like Audubon, who tied threads to the legs of young birds, helped show that birds really do travel and come back.

COMMON MISTAKES

- Thinking that all animals hibernate. Most animals stay awake all winter.
- Getting too close to geese or other animals. Wild animals need their space.

Make it a game • Winter Plan Sort. Make three piles on the floor labeled migrate, hibernate and store food. Your grown-up names an animal and you slide a card into the right pile and say what the animal does. Try geese, bears, squirrels, chipmunks and bats. Then explain the words migrate and hibernate in your own voice.

2.2 SQUIRRELS AND CHIPMUNKS

OBJECTIVES

- Tell how squirrels and chipmunks store food for winter.
- Tell the difference between a squirrel and a chipmunk.
- Watch a squirrel or chipmunk and record what it does.

Warm-up. Hide-and-find. Give your child five peanuts in the shell (or five buttons if anyone has a nut allergy) to hide around a room while you close your eyes. Then ask them to find all five. Did they remember every spot? Squirrels play this game every winter!

WATCH

How Do Squirrels Find the Food they Hide? | How Animals Prepare for Winter | SciShow Kids

SciShow Kids · 3:36

<https://www.youtube.com/watch?v=6ckDOcVvz-k>

WHEN TO WATCH

After the warm-up and the core ideas. Ask, “How did you find your hidden peanuts? How does a squirrel find its nuts?”

BACKUP VIDEO

Discover Chipmunk Burrows

Project Noah Nature School · 3:25

https://www.youtube.com/watch?v=4xRH_OuNr5k

In session 2, before looking for chipmunk holes outdoors.

KEY TERMS

cache

(Say it like “cash.”) A hidden store of food.

burrow

A tunnel and nest that an animal digs under the ground.

cheek pouch

A stretchy pocket inside a chipmunk's cheek for carrying food.

CORE IDEAS

Squirrels and chipmunks do not hibernate like groundhogs. They need food all winter, so in the fall they work hard to gather nuts and seeds and hide them. A hidden store of food is called a **cache**.

A gray squirrel buries nuts one at a time in hundreds of little holes all over the yard. It finds many of them again by remembering where they are and by smelling them, even under snow. The nuts it forgets can sprout into new oak and walnut trees! Squirrels help plant the forest.

Squirrels build leafy nests, called dreys, high in the trees. In winter they curl up in the nest and wrap their big bushy tails around themselves like a blanket.

A chipmunk is smaller than a squirrel, with stripes down its back and face. It stuffs seeds into its stretchy **cheek pouches** and carries them to its **burrow** under the ground. In winter it sleeps in the burrow and wakes up now and then to eat from its pantry.

God made squirrels and chipmunks diligent. They do not wait until the snow falls to gather their food. They work while there is food to find.

PICTURE STUDY



Two Squirrels, Albrecht Dürer, 1512 · Watercolor and gouache on parchment · Private collection

Image: [Wikimedia Commons](#), public domain

Albrecht Dürer was a German artist who looked at animals so carefully that you can almost count the hairs on their fur. He painted these two red squirrels more than five hundred years ago.

Look closely

- Find the nut. How does the squirrel hold it?
- Find the bits of nutshell on the ground. What happened to them?
- Look at the tails. How did Dürer show that they are soft and bushy?
- Look at the ears and claws. What do the claws help a squirrel do?

Talk about it

1. How might a squirrel use its tail in winter?
2. Why does a squirrel need such strong front teeth?
3. How are these squirrels like the ones in your yard? How are they different?

Safety first. Never try to touch, feed or catch a squirrel or chipmunk. They can bite and scratch, and wild animals can carry diseases. If an animal acts strange or is out in the open and not afraid of people, tell an adult. Anyone with a nut allergy should use buttons for the warm-up.

HANDS-ON PROJECT

Squirrel Watch

You will be a nature scientist and watch a squirrel or chipmunk for ten minutes, writing down everything it does.

You will need

- A window or a quiet spot outdoors where squirrels visit (a park works well)
- Nature journal and pencil
- A watch or timer
- Binoculars (optional)

Steps

1. Find a spot where you can see squirrels: a window, a porch or a park bench.
2. Sit very still and quiet. Set a timer for ten minutes.
3. When you see a squirrel or chipmunk, watch what it does. Is it eating? Digging? Carrying something? Running up a tree?
4. Each time it does something new, make a quick tally mark or a small drawing in your journal.
5. If you see it bury something, notice the spot. Come back tomorrow and look: is it dug up?
6. Look up in the trees for squirrel nests: round balls of leaves high in the branches. Count how many you see.
7. When the timer rings, tell a parent what you saw.

Tips

- Squirrels are busiest in the morning.
- If you move slowly and stay quiet, the animals will forget you are there.

Check your work

- ☐ I watched a squirrel or chipmunk for ten minutes.
- ☐ I recorded at least three things it did.

- ☐ I can tell the difference between a squirrel and a chipmunk.

NATURE JOURNAL

1. Draw a squirrel and a chipmunk side by side. Show the chipmunk's stripes and the squirrel's big tail.
2. Draw a chipmunk burrow under the ground: a tunnel, a bedroom and a pantry full of seeds.
3. Draw a squirrel's leafy nest high in a tree.

COMMON MISTAKES

- Making noise or moving quickly while watching. The animal will run away.
- Leaving food out for squirrels. It brings them too close to houses and can make them unhealthy.

Make it a game • Squirrel or Chipmunk?. Your grown-up reads clues: stripes on the back, cheek pouches, a big bushy tail, a burrow under ground. Shout squirrel or chipmunk. Then be a squirrel: hide ten buttons around the room as your cache, and see how many you can remember when winter comes and your grown-up says go.

Scripture. “Go to the ant, thou sluggard; consider her ways, and be wise: Which having no guide, overseer, or ruler, Provideth her meat in the summer, and gathereth her food in the harvest.” (Proverbs 6:6-8, KJV)

Solomon told lazy people to watch the ant, who gathers food before winter. The squirrel teaches the same lesson: work hard while there is work to do.

2.3 DEER IN FALL AND WINTER

OBJECTIVES

- Tell how deer get ready for winter.
- Tell what antlers are and that bucks grow new ones every year.
- Look for signs of deer: tracks, beds and nibbled twigs.

Warm-up. Deer ears. Have your child cup their hands behind their ears and listen for one minute with eyes closed. What can they hear? Now take the hands away. Is it quieter? Deer have big ears that turn toward sounds, so they can hear danger coming.

WATCH

Creature Feature: White-tailed Deer

Texas Parks and Wildlife Foundation • 2:33

<https://www.youtube.com/watch?v=o3FdUW0f4hA>

WHEN TO WATCH

After the core ideas. Watch for the white tail lifting up like a flag.

Note: From the Texas Parks and Wildlife Foundation, with a state deer biologist. Footage shows bucks, does and fawns in fields and woods; as with any wildlife film, a parent may wish to preview the narration.

BACKUP VIDEO

Deer Habitat in Winter

PA Game Commission • 5:33

https://www.youtube.com/watch?v=DYg_ytdlhtI

For a parent and child together. Two wildlife biologists walk through a winter forest and show the twigs and shelter deer need.

KEY TERMS

buck

A male deer. A female deer is a doe, and a baby is a fawn.

antlers

Bony branches that grow on a buck's head. He drops them every winter and grows new ones every spring.

browse

To nibble twigs, buds and leaves from bushes and young trees.

CORE IDEAS

White-tailed deer live in woods and fields all over our country, and they often come into yards and gardens. When a deer is frightened, it lifts its tail and shows the white underside like a flag, warning other deer.

Deer do not migrate or hibernate. They stay all winter. In the fall, they eat lots of acorns and apples to get fat. Their reddish summer coat changes to a thick gray-brown winter coat. Each hair is hollow, which holds in warmth, like a puffy jacket.

In winter there is no grass or garden to eat, so deer **browse**. They nibble twigs and buds from bushes and young trees. In deep snow, many deer gather in a sheltered place under evergreen trees.

A male deer, called a **buck**, grows **antlers**. Antlers are made of bone. They grow in spring and summer, covered in soft fuzzy skin called velvet. In winter the buck drops them, and new ones grow the next spring. Mice and squirrels nibble the dropped antlers for the calcium in them.

Deer are beautiful, but they are wild. We watch them quietly from far away. Gardeners and farmers sometimes need tall fences to keep hungry deer from eating their vegetables.

PICTURE STUDY



The Monarch of the Glen, Sir Edwin Landseer, 1851 · Oil on canvas · National Galleries of Scotland, Edinburgh

Image: [Wikimedia Commons](#), public domain

Edwin Landseer was a British painter famous for his animals. This is a red deer stag in the Highlands of Scotland. It is a cousin of our white-tailed deer, and a little bigger. Look at his great antlers and his thick coat.

Look closely

- Count the points on the stag's antlers. Can you count them all?
- Look at the fur on his neck. Is it smooth or shaggy? Why might it be thick?
- Find the mist and the mountains. What kind of weather do you think it is?
- Look at the stag's ears and eyes. Is he resting, or is he listening and watching?

Talk about it

1. What will happen to these antlers in winter?
2. How does a deer's coat help it in cold weather?
3. Why do you think Landseer called this painting "The Monarch of the Glen"? (A monarch is a king, and a glen is a valley.)

Safety first. Never walk up to a deer or a fawn, even one that seems to be alone; its mother is close by. After walking in tall grass or woods, check for ticks on your skin and in your hair, and tell an adult if you find one.

HANDS-ON PROJECT

Deer Detective Walk

Deer are shy, but they leave clues. You will go on a walk and look for signs that deer have been there.

You will need

- Long pants, closed shoes and a hat for the woods or a field edge
- Nature journal and pencil
- A ruler
- A magnifying glass

Steps

1. With an adult, walk along the edge of a woods, a park trail or a field. Deer like edges where the woods meet open land.
2. Look on the ground for heart-shaped tracks with two pointed toes. Measure one with your ruler.
3. Look at the bushes and young trees. Do any twigs look chewed off with a rough, torn end? Deer have no top front teeth, so they tear twigs instead of cutting them neatly.
4. Look for a flattened oval in tall grass or snow. That could be a deer bed, where a deer lay down to rest.
5. Look for rubbed bark on small trees, about as high as your waist. Bucks rub their antlers on trees in the fall.
6. Draw each clue you find in your journal and write where you found it.
7. At home, check for ticks and wash your hands.

Tips

- No woods nearby? Look at a nature center, a large park, or a library book about deer signs.
- Walk slowly and quietly. You might see a real deer!

Check your work

- ☐ I can tell how deer stay warm in winter.

- ☐ I can tell what happens to a buck's antlers each year.
- ☐ I found or drew at least two deer signs.

NATURE JOURNAL

1. Draw a deer track: two pointed toes like an upside-down heart. Write how long it was.
2. Draw a buck with antlers and a doe without. Label buck, doe and antlers.
3. Draw a twig that a deer nibbled, with its rough, torn tip.

COMMON MISTAKES

- Thinking a fawn alone is lost. Its mother hides it on purpose and comes back. Leave it be.
- Forgetting the tick check after a walk in the woods.

Make it a game • Deer Winter Prep. Pretend you are a deer in fall. Walk slowly and nibble leaves, bark and twigs from a pretend woods, because deer browse. Put your hands on your head as antlers and tell why a buck grows new ones every year. Your grown-up asks one question after each turn.

2.4 TRACKS IN MUD AND SNOW

OBJECTIVES

- Tell what an animal track is and where to find one.
- Match tracks to a dog, a cat, a deer, a rabbit, a squirrel and a bird.
- Make a track cast or a track drawing.

Warm-up. Footprint fun. Press your child's bare foot or shoe into a tray of damp sand or play dough, then press your own beside it. Ask, "Whose print is bigger? Which way was each of us walking? How can you tell?"

WATCH

Animal Track Detective! | Science for Kids

SciShow Kids · 4:52

<https://www.youtube.com/watch?v=Xz02S-CizAU>

WHEN TO WATCH

After the warm-up. Pause on each track and let your child guess the animal before Jessi tells.

BACKUP VIDEO

Animal Tracks (Tracking Animals in the Snow!)

Peggy Notebaert Nature Museum · 3:41

<https://www.youtube.com/watch?v=854O9tRCvMU>

On a snowy day, before you go out tracking.

KEY TERMS

track

A footprint an animal leaves in mud, sand or snow.

trail

A line of tracks that shows where an animal went.

claw marks

Little dots or lines in front of the toes, made by an animal's claws.

CORE IDEAS

Many animals come out at night or hide during the day. But when they walk through mud, sand or snow, they leave **tracks**. Reading tracks is like reading a story of where an animal went.

Count the toes. A dog, a cat and a fox each leave four toe prints and a pad. A dog's track usually shows claw marks; a cat pulls its claws in, so its track has none. A deer leaves two pointed toes, like a heart.

Look at the pattern. A rabbit hops, so its back feet land in front of its little front feet, making a pattern like a "Y" or an exclamation point. A squirrel's tracks look similar, with its front feet side by side. A bird that hops leaves pairs of tiny prints; a bird that walks leaves a line of them.

Snow and mud are the best places to find tracks. Fresh snow after a quiet night is like a clean page where the animals have written.

Job said, "Ask now the beasts, and they shall teach thee." When we look carefully at tracks, the animals teach us about their lives.

PICTURE STUDY



The Magpie, Claude Monet, 1868–69 · Oil on canvas · Musée d'Orsay, Paris

Image: [Wikimedia Commons](#), public domain

Claude Monet went out in the snow to paint this quiet winter morning in France. All is white and still, except for one small black-and-white bird perched on a gate. Look closely at the snow: it is not only white!

Look closely

- Find the magpie. Where is it sitting?
- Look at the shadows on the snow. What colors did Monet use for them?
- Find the fence and the gate. What do you think is on the other side?
- Look at the snow in front of the fence. Is it smooth? If an animal walked across, what would you see?

Talk about it

1. What tracks might the magpie leave if it hopped down onto the snow?
2. What animals might have walked through this field during the night?
3. Why is snow a good place to look for tracks?

Safety first. Dress warmly for snow and wear boots. Never touch animal droppings. Wash your hands after handling plaster or mud.

HANDS-ON PROJECT

Track Casts and Track Cards

You will make your own set of animal track cards, and, if you find a real track in mud, you can make a plaster cast of it to keep.

You will need

- Index cards or heavy paper cut into cards
- Pencil and colored pencils
- A small bag of plaster of Paris and a cup of water (optional, for a real track)
- A strip of cardboard and a paper clip (optional)
- A plastic spoon and an old cup for mixing

Steps

1. Make six track cards. On each card, draw one track large: dog, cat, deer, rabbit, squirrel and bird. Write the animal's name on the back.
2. Play a matching game: mix up the cards, look at a track, and guess the animal before you turn it over.
3. Go outside after a rain or a snow. Look near puddles, muddy paths, sandboxes and fence lines for real tracks.
4. When you find a clear track in mud, bend a strip of cardboard into a ring around it and clip the ends.
5. An adult mixes plaster with water until it is like thick pancake batter. Pour it gently into the ring until the track is covered.
6. Wait about 30 minutes until it is hard. Lift it out carefully and brush off the mud. Now you have a track to keep!
7. In snow, just draw the track in your journal and measure it.

Tips

- Your own dog or cat can make practice tracks in a tray of damp sand.
- Tracks are easiest to see in the early morning when the sun is low and makes shadows in them.

Check your work

- ☐ I can match tracks to six animals.
- ☐ I can tell a dog track from a cat track.
- ☐ I found and recorded a real track.

NATURE JOURNAL

1. Draw a real track you found. Measure it and write how long it is. Guess who made it.
2. Draw a trail: a line of rabbit tracks going across a page of snow.
3. Write a short track story: "A rabbit hopped across the yard, then ran under the bush."

COMMON MISTAKES

- Mixing up dog and cat tracks. Look for claw marks: dogs show them, cats usually don't.
- Stepping on the tracks before looking at them. Walk beside a trail, not on it.

Make it a game • Track Match Memory. Draw six tracks on index cards: dog, cat, deer, rabbit, squirrel and bird. Draw the animal names on six others. Flip cards over and find matching pairs by memory. Say what clue helped you, like claw marks or hooves. Then press a hand in play dough and see who can guess it.

Scripture. "But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee:" (Job 12:7, KJV)

God's creatures can teach us if we watch them carefully. Tracks in the snow are one way the animals "tell" us about themselves.

UNIT 2

WILDLIFE GETTING READY FOR WINTER

As the days grow shorter, the animals around us get busy. In this unit your child learns the three ways animals get ready for winter: some travel away (migrate), some sleep deeply (hibernate), and some stay awake and store food. We watch squirrels and chipmunks hide nuts, learn how deer grow thick winter coats and new antlers, and become track detectives in mud and snow.

Picture study includes Audubon's Canada goose, Dürer's squirrels, Landseer's great stag and Monet's snowy magpie. The rule for the whole unit is simple: **look, don't touch**. We watch wild animals from a distance and never feed or handle them.

PREREQUISITES

- Lesson 1.1 (the seasons)
- Can sit quietly and watch for a few minutes
- No special equipment needed; binoculars are a bonus

MASTERY CHECKLIST

- ☐ I can tell three ways animals get ready for winter: migrate, hibernate and store food.
- ☐ I can tell how a squirrel or chipmunk stores food for winter.
- ☐ I can tell how deer stay warm and find food in winter.
- ☐ I can match a few animal tracks to the animals that made them.
- ☐ I know to look at wild animals but never touch or feed them.

LESSONS IN THIS UNIT

2.1 Migrate, Hibernate or Store Food

2 sessions of 30 minutes

2.2 Squirrels and Chipmunks

2 sessions of 30 minutes

2.3 Deer in Fall and Winter

2 sessions of 30 minutes

2.4 Tracks in Mud and Snow

2 sessions of 30 minutes

UNIT 2 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the track cards and the four pictures from this unit ready.

1. What does migrate mean? Name an animal that migrates.
2. What does hibernate mean? Name an animal that hibernates.
3. How does a squirrel get ready for winter?
4. Look at *The Monarch of the Glen*. Point to the antlers. What happens to antlers every year?
5. Here are some track cards. Which one is the deer? Which one is the dog? How can you tell a dog from a cat?
6. You see a raccoon walking around in the daytime and it is not afraid of you. What should you do?

ANSWER KEY

1. To travel far to a warmer place for winter and come back in spring. Canada geese, hummingbirds and monarch butterflies migrate.
2. To sleep very deeply all winter with a slow heartbeat. Groundhogs, some bats and chipmunks.
3. It buries nuts in many little hiding places (caches), finds them later by memory and smell, and sleeps in a leafy nest wrapped in its tail.
4. The buck drops them in winter and grows new ones in spring and summer.
5. The deer track has two pointed toes. A dog track shows claw marks; a cat track usually does not.
6. Stay away, do not touch or feed it, and tell an adult right away.

PORTFOLIO PIECE: MY WINTER WILDLIFE JOURNAL

Make a four-page wildlife journal. Draw one animal that migrates, one that hibernates and one that stores food, each with a sentence about what it does. On the last page, put your best track: a plaster cast photo, a track you drew in the snow, or your favorite track card. Add the date and place for every real animal or sign you saw.

LOOK FOR	WHAT IT MEANS
Three winter ways	Shows an animal that migrates, one that hibernates and one that stores food, each correctly.
Real observation	Includes at least one animal or sign your child really saw, with the date and place.
Tracks	Includes a real or drawn track with the animal named.
Safe and kind	Can explain why we look at wild animals but never touch or feed them.

UNIT 3

SOIL: THE LIVING GROUND

Soil is not just dirt. It is a mix of tiny bits of rock, old leaves turned dark and crumbly, water, air and millions of living helpers. In this unit your child shakes soil in a jar to see its layers, meets earthworms and roly-polies, builds a little compost in a bottle, and finds out how hard rock slowly breaks down into soil.

Picture study takes us to Van Gogh's plowed field, Dürer's stag beetle, Millais' pile of autumn leaves and Courbet's great rocks. Soil work is messy and wonderful. Have gloves ready, and always wash hands after digging.

PREREQUISITES

- Unit 1 (seasons and harvest)
- Willing to get hands a little dirty (gloves are fine)
- No special equipment needed

MASTERY CHECKLIST

- ☐ I can name what soil is made of: rock bits, humus, water, air and living things.
- ☐ I can show the layers that form when soil settles in a jar of water.
- ☐ I can tell how earthworms and roly-polies help the soil.
- ☐ I can tell what goes into compost and what stays out.
- ☐ I can tell how rocks slowly break down into soil.

LESSONS IN THIS UNIT

3.1 Soil Layers in a Jar

2 sessions of 30 minutes

3.2 Worms and Roly-Polies: The Soil's Recyclers

2 sessions of 30 minutes

3.3 A Little Compost

2 sessions of 30 minutes

3.4 Rocks Become Soil

2 sessions of 30 minutes

UNIT 3 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the soil jar, the compost bottle and the four pictures from this unit ready.

1. What is soil made of?
2. Point to the layers in your soil jar. Which one sank first, and why?
3. Tell me two ways earthworms help a garden.
4. Here are a banana peel, a dry leaf, a piece of cheese and a plastic spoon. Which go in compost? Which is a green and which is a brown?
5. How can ice break a rock?
6. Look at Dürer's *Stag Beetle*. How is a beetle grub like a worm and a roly-poly?

ANSWER KEY

1. Bits of rock (sand, silt and clay), humus (old rotted plants), water, air and living things.
2. Sand is at the bottom; it sank first because its pieces are the biggest and heaviest. Clay settled last on top, and bits of leaves floated.
3. They eat dead leaves and make castings that feed plants, and their tunnels let air and water into the soil.
4. The banana peel (green) and the dry leaf (brown) go in. Cheese and plastic stay out.
5. Water gets into a crack, freezes and gets bigger, and pushes the crack wider until the rock splits.
6. They all help break down dead plants (wood and leaves) and turn them back into soil. They are recyclers.

PORTFOLIO PIECE: MY SOIL STORY

Make a poster or a fold-out book that tells the story of soil. Show rock breaking into sand, plants growing and dropping leaves, worms and roly-polies eating them, and compost turning into rich soil. Add a drawing or photo of your soil jar and your compost bottle. Tell the whole story to someone in your family.

LOOK FOR	WHAT IT MEANS
Soil parts	Shows and names rock bits, humus and living things.
Recyclers	Includes worms and roly-polies and tells how they help.
Real projects	Includes a drawing or photo of the soil jar and the compost bottle, with dates.
Telling	Told the soil story in order, from rock to rich soil.

3.1 SOIL LAYERS IN A JAR

OBJECTIVES

- Name the parts of soil: bits of rock, humus, water, air and living things.
- Shake soil in a jar of water and watch it settle into layers.
- Tell which layer is sand, which is silt and clay, and what floats.

Warm-up. Soil sniff and squeeze. Put a spoonful of garden soil (or potting mix) on a paper plate. Let your child look at it with a magnifying glass, smell it and squeeze a pinch. What do they see? Bits of roots? Tiny stones? Is it damp or dry? Does it stick together?

WATCH

What's the Dirt on ... Dirt?

SciShow Kids · 3:43

<https://www.youtube.com/watch?v=if29mjcd5bc>

WHEN TO WATCH

After the warm-up, before the core ideas. Then ask, “What were the four things soil is made of?”

BACKUP VIDEO

The Jar Test - Decoding your Soil's Texture | Milkwood

Milkwood · 5:33

https://www.youtube.com/watch?v=PvN_oWoechg

Before the hands-on project, to see a gardener make the soil jar step by step.

KEY TERMS

soil

The top layer of the ground where plants grow. It is made of bits of rock, humus, water, air and living things.

humus

(Say it “HYOO-mus.”) The dark, crumbly part of soil made from old leaves, roots and other things that have rotted.

sand

The biggest bits of rock in soil. Sand feels gritty.

clay

The tiniest bits of rock in soil. Clay feels sticky and smooth when wet.

CORE IDEAS

Soil is the thin top layer of the ground where plants grow their roots. Without soil, there would be no gardens, no fields and no forests.

Soil is a mix. It has tiny bits of rock: big gritty **sand**, smaller smooth silt, and very tiny sticky **clay**. It has **humus**, the dark, crumbly part made from old leaves and roots. It has water and air in the little spaces between the bits. And it is full of living things, from earthworms to helpers too small to see.

When you shake soil in a jar of water and let it sit, the pieces settle by size. The heavy sand sinks first, to the bottom. Silt settles on top of the sand. The tiny clay settles last, very slowly, and the water stays cloudy for a long time. Bits of old leaves and roots float on top.

Good garden soil has some of each. Sand lets water drain. Clay holds water and plant food. Humus makes the soil soft, dark and rich. Gardeners call this good mix **loam**.

God made the ground to bring forth food. When we take care of the soil, the soil takes care of our plants.

PICTURE STUDY



Ploughed Fields ("The Furrows"), Vincent van Gogh, 1888 · Oil on canvas · Van Gogh Museum, Amsterdam

Image: [Wikimedia Commons](#), public domain

In the fall, farmers plow their fields, turning the soil over in long rows called furrows. Van Gogh painted this freshly plowed field in the south of France. He loved the colors of the turned-over earth.

Look closely

- Find the long rows, the furrows. Which way do they run?
- Count the colors Van Gogh used for the soil. Is the soil all brown?
- Find the trees and farm buildings far away. How much of the picture is sky, and how much is soil?
- Look at the thick brushstrokes. Do they follow the rows?

Talk about it

1. Why does a farmer turn over the soil before planting?
2. What do you think will grow in this field next spring?
3. If you could pick up a handful of this soil, how might it feel and smell?

Safety first. Wear gloves or wash your hands well after handling soil. Ask an adult before digging, and dig only where you have permission. Keep soil away from your mouth and eyes.

HANDS-ON PROJECT

The Soil Jar

You will shake soil and water together in a jar and watch it settle into layers, like a layer cake made by the soil itself.

You will need

- A clear jar with a tight lid (a quart canning jar or a large peanut butter jar)
- A trowel and garden soil (or soil from a park, with permission)
- Water
- A teaspoon of dish soap (helps the clay separate)
- A marker and a ruler
- Nature journal and colored pencils

Steps

1. Dig a few trowels of soil from about a hand's depth down. Pick out sticks, rocks and worms (put the worms back!).
2. Fill the jar about one-third full of soil.
3. Add water until the jar is almost full. Add the teaspoon of dish soap.
4. Screw the lid on tightly. Shake the jar hard for two minutes. Take turns!
5. Set the jar on a table and watch. After one minute, the sand has already sunk to the bottom. Mark the top of the sand layer with the marker.
6. Look again in two hours. A new layer, silt, sits on top of the sand. Mark it.
7. Leave the jar for a whole day without moving it. The clay settles last, and the water clears. Mark the clay layer. Look for bits of leaves floating on top.
8. Measure each layer with the ruler and draw your jar in your journal.

Tips

- No yard? Try soil from a friend's garden, a schoolyard (with permission), or compare two bags of soil from a garden center.
- If you can, make two jars with soil from two different places and compare them.

Check your work

- ☐ I made a soil jar and saw the layers.
- ☐ I can tell which layer is sand and why it sank first.
- ☐ I can name the parts of soil.

NATURE JOURNAL

1. Draw your soil jar with its layers. Color each layer and label it: sand, silt, clay, floating bits.
2. Draw what you saw in your spoonful of soil through the magnifying glass.
3. Write one word for how sand feels and one word for how clay feels.

COMMON MISTAKES

- Moving the jar before the layers settle. Leave it still for a full day.
- Using potting mix for the jar. It is mostly bark and peat and will float. Use real soil from the ground.

Make it a game • Soil Parts Speed Round. Set a one-minute timer. Name as many parts of soil as you can: rock bits, humus, water, air and living things. Your grown-up counts. Then shake your soil jar and predict which layer will sit on the bottom, sand or clay. Compare it to what you see after it settles.

3.2 WORMS AND ROLY-POLIES: THE SOIL'S RECYCLERS

OBJECTIVES

- Tell how earthworms help the soil.
- Tell how roly-polies help break down dead leaves.
- Observe a worm or roly-poly gently and return it to its home.

Warm-up. Wiggle like a worm. Have your child lie on the floor and move forward without using arms or legs, only by stretching and squeezing their body. It is hard! Tell them that a worm has thousands of tiny muscles and little bristles that grip the soil to help it move.

WATCH

[Worms Are Wonderful](#) | [Amazing Animals](#) | [Backyard Science](#) | [SciShow Kids](#)

[SciShow Kids](#) · 4:34

https://www.youtube.com/watch?v=l-zc_1vjLnI

WHEN TO WATCH

After the warm-up and core ideas, before you go worm hunting.

BACKUP VIDEO

[Wild at Home: Pillbugs & Sowbugs](#)

[Harris Center](#) · 2:05

<https://www.youtube.com/watch?v=lbtY-Kz5bQ0>

In session 2, before you look for roly-polies under a log or board.

KEY TERMS

earthworm

A long, soft animal with no legs or eyes that lives in the soil and eats dead leaves and bits of soil.

castings

Worm droppings. They are a rich plant food.

roly-poly

A small gray creature with a hard, curved back and fourteen legs that rolls into a ball. It is also called a pill bug.

recycler

A living thing that breaks down dead plants and animals so they become part of the soil again.

CORE IDEAS

God gave the garden a clean-up crew. **Recyclers** eat dead leaves, old roots and fallen fruit and turn them back into soil. Without them, the world would be piled high with old leaves!

Earthworms are some of the best recyclers. A worm has no eyes, but it can feel light through its skin. It breathes through its skin, too, so it must stay damp. Worms swallow soil and bits of leaves, and what comes out the other end, called **castings**, is rich food for plants.

Worms also dig tunnels. The tunnels let air and rainwater into the ground and make room for roots. A garden full of worms is a healthy garden.

Roly-polies, also called pill bugs, are not insects. They have fourteen legs and are cousins of crabs and shrimp! They need damp places and hide under logs, rocks and leaves. They eat dead leaves and rotting wood. When frightened, they roll into a tight ball to protect themselves.

These little creatures are God's helpers in the garden. We treat them gently: look closely, then put them back where we found them.

PICTURE STUDY



Stag Beetle, Albrecht Dürer, 1505 • Watercolor and gouache • J. Paul Getty Museum, Los Angeles

Image: [Wikimedia Commons](#), public domain

Albrecht Dürer painted this stag beetle so carefully that it looks as if it could walk right off the paper. Stag beetle young, called grubs, live for years inside old rotting logs and help turn dead wood back into soil. They are recyclers too!

Look closely

- Find the beetle's big jaws. What do they look like? (That is how it got its name!)
- Count the legs. How many does the beetle have? How many does a roly-poly have?
- Find the shadow under the beetle. How does it make the beetle look real?
- Look at the beetle's shell. Is it shiny or dull?

Talk about it

1. Why do you think a beetle has a hard shell?
2. Where might you find a stag beetle grub living?
3. How is a beetle like a roly-poly? How is it different?

Safety first. Wash your hands after handling soil and creatures. Hold worms and roly-polies gently on a flat, damp hand; never squeeze them. Keep worms damp and out of the sun, and return every creature to where you found it within half an hour.

HANDS-ON PROJECT

Worm and Roly-Poly Watch

You will find earthworms and roly-polies, watch them for a short time in a damp tray, and then return them to their homes.

You will need

- A shallow tray or pie pan
- Damp paper towels
- A spray bottle of water
- A magnifying glass
- A flashlight
- A trowel
- Nature journal and pencil

Steps

1. Go out after a rain or in the early morning. Lift a log, a board or a flat rock, or dig a trowelful of damp soil, and look for worms and roly-polies.
2. Gently move one or two into the tray lined with damp paper towels. Mist them with water.
3. Watch a worm with your magnifying glass. Find the front end (it moves forward and has a smooth band called a saddle closer to it). Watch how it stretches and squeezes to move.
4. Shine the flashlight on one end of the tray. Where does the worm go? Worms do not like bright light.
5. Touch a roly-poly very gently with a fingertip. Does it roll up? Count to see how long it takes to unroll.
6. Count a roly-poly's legs with the magnifying glass (if it will hold still!).
7. After 20 to 30 minutes, put every creature back exactly where you found it and cover it again.
8. Wash your hands.

Tips

- No yard? Look in a park flower bed, or under leaves at the edge of a sidewalk after rain.
- In cold weather, worms go deep. If you cannot find any, watch the video again and draw from it, or visit a garden center that sells composting worms.

Check your work

- ☐ I can tell two ways worms help the soil.
- ☐ I can tell what roly-polies eat.
- ☐ I handled the creatures gently and put them back.

NATURE JOURNAL

1. Draw an earthworm, long and wiggly. Label its saddle and its front end.
2. Draw a roly-poly opened up and rolled into a ball.
3. Draw worm tunnels under the ground, with roots growing down through them.

COMMON MISTAKES

- Letting worms dry out in the sun. They breathe through damp skin, so keep them moist and shaded.
- Keeping creatures in a jar too long. A short visit, then home again.

Make it a game • Recycler Reporters. You are a news reporter. Your grown-up is an earthworm, then a roly-poly. Ask each one how it helps the soil. The worm should say castings and tunnels, and the roly-poly should say it eats dead leaves. Switch roles and answer in character. Rate each other with one to three clapping hands.

3.3 A LITTLE COMPOST

OBJECTIVES

- Tell what compost is and why gardeners make it.
- Sort “greens” and “browns” and things that do not belong in compost.
- Build a small compost in a bottle or a bin and watch it change.

Warm-up. Compost or not? Set out a few kitchen and yard things: a banana peel, an apple core, a dry leaf, a bit of newspaper, a plastic spoon, a bottle cap, a few coffee grounds and an eggshell. Ask your child to put things that once grew from the ground in one pile, and things that never grew in another.

WATCH

Make the Most of Compost!

SciShow Kids · 5:20

<https://www.youtube.com/watch?v=Q5s4n9r-JGU>

WHEN TO WATCH

After the warm-up and core ideas, before building the compost.

BACKUP VIDEO

How does composting work?

Mystery Science · 7:49

<https://www.youtube.com/watch?v=aH2FI5FJsV0>

Any time this week, for a closer look at what happens inside a compost pile.

KEY TERMS

compost

Old plant scraps and leaves that have rotted into dark, crumbly, rich soil.

greens

Wet, fresh scraps for compost, like fruit and vegetable peels, coffee grounds and grass clippings.

browns

Dry, brown things for compost, like dead leaves, straw and shredded paper.

rot

To slowly break down and fall apart.

CORE IDEAS

In the forest, nobody rakes the leaves. They fall, they **rot**, and they become new soil. A gardener can help this happen faster in a pile or bin. The dark, crumbly soil that results is called **compost**.

A good compost needs **greens** and **browns**. Greens are wet, fresh scraps: fruit and vegetable peels, apple cores, coffee grounds, crushed eggshells and grass clippings. Browns are dry: dead leaves, straw, and shredded paper or cardboard.

Compost also needs a little water, like a squeezed-out sponge, and air. Turning the pile with a fork lets air in. Tiny living things, too small to see, along with worms and roly-polies, eat the scraps and turn them into compost.

Some things stay out of compost: meat, bones, cheese, milk, oil and pet droppings. They smell bad and bring pests. Plastic, glass and metal never rot, so they never go in.

In a few months, the scraps turn dark and smell like a forest floor. Gardeners mix compost into their beds and pots, and plants grow strong. Nothing is wasted!

PICTURE STUDY



Autumn Leaves, Sir John Everett Millais, 1856 · Oil on canvas · Manchester Art Gallery, England

Image: [Wikimedia Commons](#), public domain

John Everett Millais painted four girls raking a big heap of fallen leaves in a garden at sunset. In his day, people often burned leaf piles. Today many gardeners save their leaves to make rich compost instead.

Look closely

- Find the big pile of leaves. What colors are the leaves?
- Find the girl adding more leaves to the pile. What is she carrying them in?
- Find the youngest girl. What is she holding? Could it go into compost too?
- Look at the sky. What time of day is it? What season?

Talk about it

1. If these girls made compost with their leaves, what “greens” could they add?
2. Why are leaves called “browns” in compost?
3. What would happen to this leaf pile if it stayed in the garden all winter?

Safety first. Wear gloves when handling compost and wash your hands afterward. Never put meat, dairy or pet waste in compost. An adult cuts the bottle.

HANDS-ON PROJECT

Compost in a Bottle

You will build a small see-through compost in a bottle and watch it change week by week. If your family has room, you can start a real compost pile or bin outdoors too.

You will need

- A large clear plastic bottle (2-liter), with the top cut off by an adult and small holes poked in the sides for air
- A few handfuls of garden soil
- Greens: fruit and vegetable scraps chopped small, coffee grounds, crushed eggshells
- Browns: dry leaves crumbled, shredded newspaper
- A spray bottle of water
- Plastic wrap and a rubber band
- Tape and a marker

Steps

1. Put a layer of soil in the bottom of the bottle, about two fingers deep.
2. Add a layer of browns (crumbled leaves or shredded paper).
3. Add a layer of greens (chopped scraps). Small pieces rot faster.
4. Add a thin layer of soil. The soil brings in the tiny helpers.
5. Repeat the layers until the bottle is about three-quarters full.
6. Spray with water until it is damp but not soggy. Cover the top with plastic wrap and poke a few holes in it.
7. Put a strip of tape down the side. Mark the top of the pile and write the date.
8. Keep the bottle out of direct sun. Each week, mark the height again, mist if dry, and draw what you see. Watch the pile shrink and darken!

Tips

- If it smells bad, it needs more browns and more air. If nothing happens, it may need a little water.

- For a real compost pile, choose a shady corner of the yard and use the same greens-and-browns layers. A pile about three feet wide works well.

Check your work

- ☐ I can name three greens and three browns.
- ☐ I can name things that do not belong in compost.
- ☐ I built a compost bottle and marked the date.

NATURE JOURNAL

1. Draw your compost bottle on day one, showing every layer. Label greens, browns and soil.
2. Each week, draw it again. Write the date and how much it shrank.
3. Make two lists: “Yes, compost it!” and “No, keep it out!”

COMMON MISTAKES

- Adding meat or cheese. It smells and brings pests.
- Making it too wet. Compost should feel like a squeezed-out sponge.

Make it a game • Greens, Browns, Never. Label three bowls greens, browns and does not belong. Your grown-up calls out items like banana peel, dry leaves, grass clippings, plastic and meat. Drop a scrap of paper into the right bowl, fast. Get a point for each right answer and see if you can reach ten before the timer rings.

Scripture. “And he answering said unto him, Lord, let it alone this year also, till I shall dig about it, and dung it:” (Luke 13:8, KJV)

In Jesus’ story, a patient gardener asks for one more year to feed a fig tree’s soil so it can bear fruit. Good gardeners feed the soil, and they are patient.

3.4 ROCKS BECOME SOIL

OBJECTIVES

- Tell that soil's sand, silt and clay began as rock.
- Name ways rocks are broken down: water, ice, roots and rubbing.
- Make “soil” by rubbing rocks together and watch ice crack a container.

Warm-up. Rock rub. Give your child two rough rocks (or two pieces of sidewalk chalk). Rub them together hard over a dark sheet of paper for one minute. What collects on the paper? Look at it with the magnifying glass. That powder is the beginning of soil!

WATCH

Where Does Soil Come From?

SciShow Kids · 5:29

<https://www.youtube.com/watch?v=5b9o7yM7YGE>

WHEN TO WATCH

After the warm-up. Pause when the water freezes in a crack and ask, “What happens to water when it freezes?”

KEY TERMS

rock

Hard, solid stone that makes up mountains, cliffs and the ground deep under our feet.

weathering

The slow breaking of rock into smaller and smaller pieces by water, ice, wind and roots.

pebble

A small, smooth stone, often rounded by water.

CORE IDEAS

Deep under the soil is solid **rock**. The sand, silt and clay in soil were once part of big rocks. How did hard rock turn into soft soil?

Rock is broken down very slowly. This is called **weathering**. Water gets into cracks. When it freezes, ice takes up more room than water, so it pushes the crack wider.

Freeze, melt, freeze, melt, and the rock splits!

Plant roots grow into cracks and push them apart, too. Rain and rivers tumble rocks against each other, rubbing off corners and making round **pebbles** and grains of sand. Little mosses and crusty lichens grow on bare rock and slowly crumble its surface.

Once the rock is broken into tiny bits, plants can grow there. When they die and rot, they add humus. Bit by bit, a thin layer of soil builds up. It takes a long, long time to make even an inch of soil, so we must take good care of the soil we have.

God laid the foundations of the earth. Even the rocks are part of His plan for growing food.

PICTURE STUDY



Rocks at Mouthier, Gustave Courbet, about 1855 · Oil on canvas · The Phillips Collection, Washington

Image: [Wikimedia Commons](#), public domain

Gustave Courbet grew up in a valley in France surrounded by great limestone cliffs, and he painted them many times. Look closely: the rocks are cracked and broken, and plants are growing right on them.

Look closely

- Find the cracks in the rock. Which way do they run?
- Find plants and trees growing on the rock ledges. How did their roots find soil there?
- Look at the bottom of the cliffs. Can you find loose stones that have fallen down?
- Find the green valley. Where do you think its soil came from?

Talk about it

1. How could ice and water break these rocks a little at a time?
2. Why do you think the plants grow in the cracks and on the ledges?
3. What would this valley look like if there were no soil at all?

Safety first. Rub rocks over paper on a table, not near your face. An adult fills and freezes the container. Do not throw rocks.

HANDS-ON PROJECT

Ice Breaks Rock

You will see how freezing water pushes things apart, just as it does in the cracks of rocks, and you will make your own sand by shaking rocks.

You will need

- A small plastic container with a snap-on lid (like a film canister or a small spice jar with a plastic lid)
- Water
- A freezer
- A few sharp-cornered rocks or pieces of brick, and a plastic jar with a lid
- A dark sheet of paper and a magnifying glass
- Nature journal

Steps

1. Fill the small container to the very top with water and snap the lid on.
2. Put it in the freezer overnight.
3. The next day, look at it. Did the ice push the lid off or bulge the sides? Ice takes up more room than water.
4. Now put a few sharp-cornered rocks into the plastic jar with a little water. Close the lid tightly.
5. Shake the jar hard for five minutes (take turns!). This is like a river tumbling rocks.
6. Pour the water out onto the dark paper. Look at the grit with your magnifying glass. You made sand and silt!
7. Look at the rocks. Are the corners rounder than before?
8. Go outside and look for rocks with cracks, moss or lichen growing on them, or a plant growing in a sidewalk crack. Draw what you find.

Tips

- A sidewalk crack with a little plant pushing up through it is a good example of roots breaking stone.

- Compare a sharp new rock from a driveway with a smooth stone from a creek.

Check your work

- ☐ I can tell how ice breaks rock.
- ☐ I can tell how roots and water break rock.
- ☐ I made sand by shaking rocks.

NATURE JOURNAL

1. Draw a rock with a crack. Draw water in the crack, then ice pushing it wider, then the rock in two pieces. Use arrows.
2. Draw a plant growing out of a sidewalk crack or a rock.
3. Draw a sharp rock and a smooth pebble side by side.
4. Make a soil poster: one big, bright picture (for example, rock breaking into soil with a plant growing on top) and just a few words, like “Soil Takes a Long Time. Take Care of It!” Conservation districts hold soil and water poster contests for children of all ages; ask your local soil and water conservation district.

COMMON MISTAKES

- Thinking soil is made quickly. It takes a very long time, which is why we protect it.
- Using a glass container in the freezer. Glass can crack and break; use plastic.

Make it a game · Rocks to Soil Story. Tell a story chain about one big rock turning into soil. Each of you adds one sentence, using the ways rocks break: water, ice, roots and rubbing. Your grown-up starts with Once there was a mountain. Keep going until you have used all four and say that sand, silt and clay began as rock.

UNIT 3

SOIL: THE LIVING GROUND

Soil is not just dirt. It is a mix of tiny bits of rock, old leaves turned dark and crumbly, water, air and millions of living helpers. In this unit your child shakes soil in a jar to see its layers, meets earthworms and roly-polies, builds a little compost in a bottle, and finds out how hard rock slowly breaks down into soil.

Picture study takes us to Van Gogh's plowed field, Dürer's stag beetle, Millais' pile of autumn leaves and Courbet's great rocks. Soil work is messy and wonderful. Have gloves ready, and always wash hands after digging.

PREREQUISITES

- Unit 1 (seasons and harvest)
- Willing to get hands a little dirty (gloves are fine)
- No special equipment needed

MASTERY CHECKLIST

- ☐ I can name what soil is made of: rock bits, humus, water, air and living things.
- ☐ I can show the layers that form when soil settles in a jar of water.
- ☐ I can tell how earthworms and roly-polies help the soil.
- ☐ I can tell what goes into compost and what stays out.
- ☐ I can tell how rocks slowly break down into soil.

LESSONS IN THIS UNIT

3.1 Soil Layers in a Jar

2 sessions of 30 minutes

3.2 Worms and Roly-Polies: The Soil's Recyclers

2 sessions of 30 minutes

3.3 A Little Compost

2 sessions of 30 minutes

3.4 Rocks Become Soil

2 sessions of 30 minutes

UNIT 3 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the soil jar, the compost bottle and the four pictures from this unit ready.

1. What is soil made of?
2. Point to the layers in your soil jar. Which one sank first, and why?
3. Tell me two ways earthworms help a garden.
4. Here are a banana peel, a dry leaf, a piece of cheese and a plastic spoon. Which go in compost? Which is a green and which is a brown?
5. How can ice break a rock?
6. Look at Dürer's *Stag Beetle*. How is a beetle grub like a worm and a roly-poly?

ANSWER KEY

1. Bits of rock (sand, silt and clay), humus (old rotted plants), water, air and living things.
2. Sand is at the bottom; it sank first because its pieces are the biggest and heaviest. Clay settled last on top, and bits of leaves floated.
3. They eat dead leaves and make castings that feed plants, and their tunnels let air and water into the soil.
4. The banana peel (green) and the dry leaf (brown) go in. Cheese and plastic stay out.
5. Water gets into a crack, freezes and gets bigger, and pushes the crack wider until the rock splits.
6. They all help break down dead plants (wood and leaves) and turn them back into soil. They are recyclers.

PORTFOLIO PIECE: MY SOIL STORY

Make a poster or a fold-out book that tells the story of soil. Show rock breaking into sand, plants growing and dropping leaves, worms and roly-polies eating them, and compost turning into rich soil. Add a drawing or photo of your soil jar and your compost bottle. Tell the whole story to someone in your family.

LOOK FOR	WHAT IT MEANS
Soil parts	Shows and names rock bits, humus and living things.
Recyclers	Includes worms and roly-polies and tells how they help.
Real projects	Includes a drawing or photo of the soil jar and the compost bottle, with dates.
Telling	Told the soil story in order, from rock to rich soil.

UNIT 4

PETS

A pet is a gift and a responsibility. In this unit your child learns what every pet needs, how to choose a pet that fits a family, how to keep fish healthy in a tank, how to care for a rabbit, and how to feed, walk and train a dog. We practice the rules of kindness and safety around animals: gentle hands, quiet voices, and always asking before we pet.

Picture study includes Morland's guinea-pig seller at a cottage door, Marcus Bloch's shining goldfish, Dürer's famous young hare, and Landseer's two dogs. No pet is needed. Families without a pet can plan one on paper, visit a pet store or shelter, or help care for a neighbor's animal.

PREREQUISITES

- Unit 2 (wild animals and the rule "look, don't touch")
- No pet needed at home
- A trip to a pet store, a shelter or a friend's home with a pet is helpful but optional

MASTERY CHECKLIST

- ☐ I can name the things every pet needs: food, water, shelter, cleaning, exercise, a vet and love.
- ☐ I can tell how to keep a fish tank clean and feed fish the right amount.
- ☐ I can tell what rabbits eat most (hay!) and how to hold one safely.
- ☐ I can tell what a dog needs each day and how to meet a dog safely.
- ☐ I can help choose a pet that fits a family.

LESSONS IN THIS UNIT

4.1 Choosing a Pet That Fits Your Family

2 sessions of 30 minutes

4.2 A Fish Tank

2 sessions of 30 minutes

4.3 Rabbits

2 sessions of 30 minutes

4.4 Dogs: Food, Walks and Training

2 sessions of 30 minutes

UNIT 4 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the pet plan, the rabbit food plate and the four pictures from this unit ready.

1. Name four things every pet needs.
2. How much should you feed a fish? What happens if you feed too much?
3. Point to the part of the rabbit plate that is biggest. Why does a rabbit need so much hay?
4. Show me with this stuffed animal how to hold a rabbit.
5. You see a dog you do not know. What do you do before petting it?
6. Look at *Selling Guinea Pigs*. What should the family think about before buying a pet?

ANSWER KEY

1. Any four: the right food, fresh water, a safe home, cleaning, exercise and play, a vet when sick, and love and time.
2. A small pinch, only what it can eat in about two minutes. Extra food rots and makes the water dirty, which can make fish sick.
3. The hay part. Hay keeps a rabbit's always-growing teeth worn down and keeps its tummy healthy.
4. Sitting low, one hand under the chest and one under the bottom, held close to the body. Never by the ears.
5. Ask the owner, "May I pet your dog?" If yes, hold a hand low for the dog to sniff, then pet its side gently.
6. Whether they have time, space and money for food and the vet, whether anyone is allergic, how long the pet lives, and who will care for it every day.

PORTFOLIO PIECE: MY PET CARE BOOK

Make a pet care book for one pet, real or planned. Include a drawing of the pet and its home, a daily care chart with pictures, a list of foods it eats (and treats it can have only a little of), and a page of safety rules for being kind and careful around animals. If you have a real pet, do your chart jobs for one whole week and check them off.

LOOK FOR	WHAT IT MEANS
Needs	Shows the pet’s food, water, home, cleaning and exercise correctly.
Daily chart	Has a clear daily care chart a child could follow.
Safety and kindness	Includes at least three safety or kindness rules.
Faithfulness	Did real pet chores (or neighbor pet chores) for a week without reminders, or explained the plan clearly.

4.1 CHOOSING A PET THAT FITS YOUR FAMILY

OBJECTIVES

- Name the needs every pet has.
- Compare a few pets by size, cost, space, time and how long they live.
- Choose a pet that would fit your family and make a care plan for it.

Warm-up. Pet needs, people needs. Ask your child, “What do you need every day to be healthy and happy?” (food, water, a home, a bath, exercise, a doctor sometimes, people who love you). Write the list. Then ask, “Do you think a pet needs these things too?”

WATCH

What do pets need?

RSPCAEducation · 3:38

<https://www.youtube.com/watch?v=FOLP8p0jSoA>

WHEN TO WATCH

After the warm-up. Compare the video’s list of pet needs with the list you made.

BACKUP VIDEO

How to Take Care of Pets | KS1 | STEM and Beyond

Explore Planet English · 4:23

https://www.youtube.com/watch?v=x2X4vRUb_y0

Any time this week, as a review of what different pets need.

KEY TERMS

pet

An animal that lives with a family and is cared for by them.

responsibility

A job that someone counts on you to do, every time.

veterinarian

An animal doctor. People often say “vet” for short.

CORE IDEAS

God gave people the job of caring for the animals. A **pet** depends on its family for everything. That is a big **responsibility**, and also a great joy.

Every pet needs the same things: the right food, fresh water every day, a safe home of the right size, a clean place to live, exercise and play, a visit to the **veterinarian** when it is sick, and kind people who spend time with it.

Different pets need different amounts of time, space and money. A goldfish needs a tank and a few minutes a day. A guinea pig or rabbit needs a big cage or pen, lots of hay and daily cleaning. A dog needs walks every day, training, and a lot of time with its people. A cat needs a litter box cleaned every day.

Pets live a long time. A hamster lives about two or three years, a rabbit eight to twelve years, and a dog or cat often more than twelve years. Choosing a pet is a promise to care for it all its life.

Before getting a pet, a wise family asks: Do we have the time? The space? The money for food and the vet? Is anyone allergic? Who will feed it every day? The best pet is the one your family can care for well.

PICTURE STUDY



Selling Guinea Pigs, George Morland, 1789 · Oil on canvas

Image: [Wikimedia Commons](#), public domain

George Morland was an English painter who loved to paint animals and country life. Here a man has come to a cottage door selling guinea pigs, and the children are eager to choose one. Guinea pigs have been family pets for hundreds of years.

Look closely

- Find the guinea pigs. Where are they?
- Find the child who wants a guinea pig the most. How can you tell?
- Look at the mother. What do you think she is thinking about?
- Look at the man who is selling. How did he carry the guinea pigs to the door?

Talk about it

1. What questions should this family ask before they buy a guinea pig?
2. What will the guinea pig need in its new home?
3. If you could choose one pet, what would it be, and could your family care for it well?

Safety first. When visiting pets in a store, shelter or friend's home, always ask before touching an animal. Wash your hands after touching any animal or its cage.

HANDS-ON PROJECT

My Pet Plan

You will compare a few pets and then make a plan for the pet that would fit your family best, whether you get one now, someday, or never.

You will need

- A large sheet of paper and a ruler
- Crayons or markers
- Library books or a visit to a pet store or animal shelter (optional)
- Nature journal

Steps

1. Make a chart with five rows: fish, hamster, rabbit, cat and dog.
2. Make four columns: “How much space?”, “How much time each day?”, “How long does it live?”, and “Who will care for it?”
3. Fill in the chart with a parent. Use what you learned in the core ideas, or ask at a pet store or shelter.
4. Talk together: Which pets would fit our home? Which would not? Why?
5. Choose one pet that could fit your family. Draw it and give it a name.
6. Make a daily care list for your pet: what to feed it, when to give water, what to clean, and how it will play.
7. If you already have a pet, make the care list for your real pet and hang it near its home.

Tips

- Many animal shelters let families visit and learn about the animals. Ask about a children’s visit.
- If your family is not ready for a pet, you can help care for a neighbor’s pet with an adult.

Check your work

- ☐ I can name what every pet needs.
- ☐ I compared different pets.

- ☐ I made a daily care list.

NATURE JOURNAL

1. Draw a pet in its home. Show its food, water, bed and a toy.
2. Watch a real pet (yours or a friend's) for five minutes. Draw it and write two things it did.
3. Write a promise: "If I have a pet, I will..."

COMMON MISTAKES

- Choosing a pet only because it is cute. Think about the work and the years of care.
- Thinking the grown-ups will do all the work. A child can feed, water and help clean every day.

Make it a game • Pet Fit Challenge. Your grown-up names a family, like a small apartment with a busy schedule. You pick a pet from fish, rabbit or dog and explain why it fits, using size, cost, space, time and how long it lives. Name the needs every pet has before you answer. Switch and let your grown-up try.

Scripture. "A righteous man regardeth the life of his beast:" (Proverbs 12:10, KJV)

A good person pays attention to what his animals need. Caring well for a pet is one way to do what is right.

4.2 A FISH TANK

OBJECTIVES

- Name what a fish needs: clean water, room to swim, the right food and the right temperature.
- Tell how much to feed a fish and why overfeeding is harmful.
- Observe fish and record how they swim, eat and breathe.

Warm-up. Breathe like a fish. Have your child open and close their mouth slowly while watching a fish (in person, or a picture). Explain that fish take water in through their mouths and push it out through their gills. The gills take the air hidden in the water. That is why clean water matters so much.

WATCH

How does a Fish Tank work? Maddie's Do You Know

Maddie's Do You Know? · 5:02

<https://www.youtube.com/watch?v=J1KoHyyS0ao>

WHEN TO WATCH

After the core ideas. Maddie visits an aquarium shop and shows how a filter and its helpful bacteria keep the water clean. Ask, “Why is a little bowl not a good home for a goldfish?”

BACKUP VIDEO

Beginner Goldfish Care Guide

Luke's Goldies · 12:42

<https://www.youtube.com/watch?v=5Ff4wOiRBIM>

For a parent planning a real goldfish tank: tank size, filters, water conditioner and feeding.

KEY TERMS

gills

The parts on the sides of a fish's head that take air out of the water so the fish can breathe.

aquarium

A glass or plastic tank of water where fish and water plants live.

filter

A machine that pulls water through a sponge to keep the tank water clean.

CORE IDEAS

A fish breathes with its **gills**. Water flows in through its mouth and out past the gills, which take the air that is mixed into the water. Fish also make waste in the water. So the most important thing a fish needs is clean water.

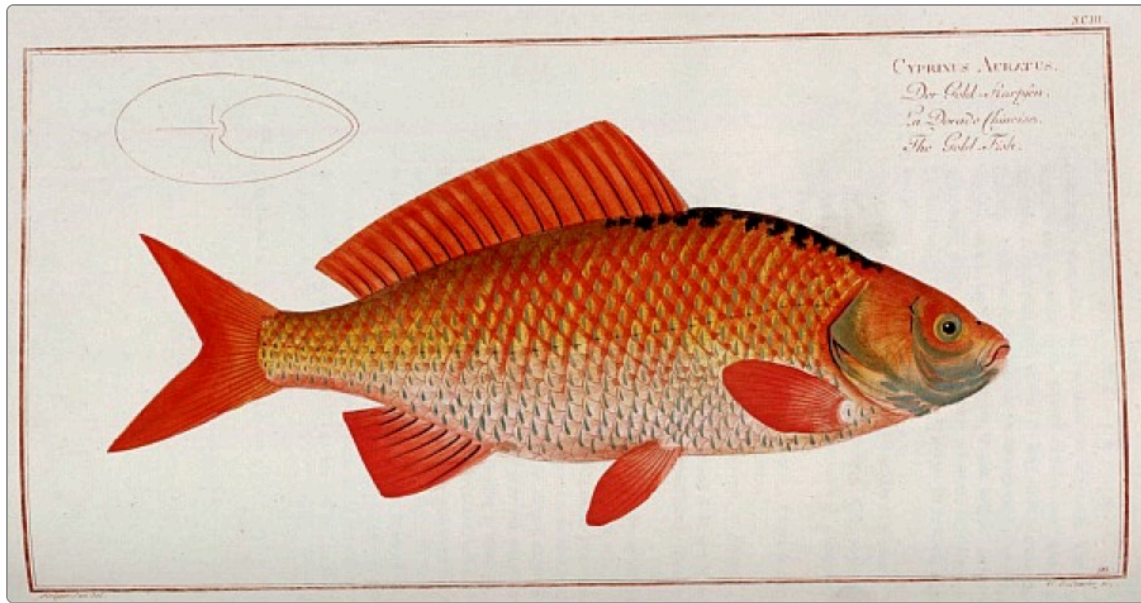
Goldfish grow bigger than most people think and live a long time, often ten years or more. A little bowl is too small. A goldfish needs a large **aquarium** with a **filter** that keeps the water moving and clean.

Tap water has chlorine in it, which hurts fish. A grown-up adds a water conditioner from the pet store to make it safe.

Feed fish a small pinch of fish food once or twice a day: only what they can eat in about two minutes. Extra food sinks, rots and makes the water dirty. Too much food is more dangerous than too little.

Once a week, a grown-up and child change some of the water (about one bucket out of every four) and wipe the glass. Watch your fish each day. A healthy fish swims easily, eats well and has bright eyes and fins spread open.

PICTURE STUDY



The Goldfish, Marcus Elieser Bloch, 1782–84 · Hand-colored engraving from *Allgemeine Naturgeschichte der Fische* (Natural History of Fishes) · From Bloch's fish books, Berlin

Image: [Wikimedia Commons](#), public domain

Marcus Bloch was a doctor in Berlin who loved fish. He collected and studied fish from all over the world and had them painted for a great set of books. This page shows the goldfish, a fish that people in China first kept as a pet long ago.

Look closely

- Find the goldfish's fins. How many can you count? What color are they?
- Look at the scales. How did the artist make them look shiny?
- Find the gill cover behind the eye. That is where water flows out after the fish breathes.
- Find the little drawing in the top corner. What does it show?

Talk about it

1. How does this goldfish use its fins and tail to swim?
2. How big do you think a goldfish can grow? Would it fit in a little bowl?
3. Why do you think the artist drew the fish so carefully, scale by scale?

Safety first. Wash your hands before and after putting your hands in a fish tank. Fish tanks have electric filters and heaters; an adult unplugs them before anyone reaches in. Never pour soap or cleaners into a tank.

HANDS-ON PROJECT

Fish Watch and Fish Tank Plan

You will watch real fish closely and then plan a healthy fish tank, with everything it needs.

You will need

- Fish to watch: your own tank, a friend's, a pet store, a doctor's office tank or a public aquarium
- A shoebox (optional, for a model tank)
- Blue paper, colored paper, scissors, glue, and a little gravel or sand (optional)
- Nature journal and colored pencils
- A timer

Steps

1. Find a tank of fish to watch. Sit quietly in front of it for five minutes.
2. Count the fish. How many kinds are there? What colors?
3. Watch one fish's mouth and gills. Count how many times it opens its mouth in 15 seconds.
4. Watch how fish use their fins. Which fin pushes them forward? Which fins help them turn and stop?
5. If you have fish, help feed them: one small pinch. Watch for two minutes. Did they eat it all?
6. Make a model of a healthy tank in a shoebox, or draw one. Include water, gravel, plants, a filter, a thermometer and a lid.
7. Make a fish care calendar: feed every day, check the temperature every day, change some water every week.

Tips

- Watching fish is calm and quiet. It is a good thing to do after a busy day.
- If you are planning a real tank, a grown-up should read about "cycling" a tank before adding fish. A new tank needs a few weeks to grow its helpful bacteria.

Check your work

- ☐ I can name what fish need: clean water, room, the right food and temperature.
- ☐ I know to feed only what fish eat in two minutes.
- ☐ I watched fish and recorded what I saw.

NATURE JOURNAL

1. Draw one fish large. Label its eye, mouth, gills, fins and tail.
2. Write how many times the fish opened its mouth in 15 seconds.
3. Draw your plan for a healthy fish tank.

COMMON MISTAKES

- Overfeeding. Fish always act hungry, but extra food dirties the water.
- Putting a goldfish in a small bowl. It needs a large tank and a filter.

Make it a game • Feed the Fish Just Right. Drop a few pinches of rice into a bowl, one pinch for a fish meal. Your grown-up asks how much food to feed. Pick a tiny amount and say why too much is harmful. Then list what a fish needs: clean water, room to swim, the right food and the right temperature.

4.3 RABBITS

OBJECTIVES

- Tell what a pet rabbit eats: mostly hay, plus greens and a few pellets.
- Tell what a rabbit needs for a home and for exercise.
- Show how to hold a rabbit safely (with a toy or a real rabbit and an adult).

Warm-up. Hay or not? Show your child a handful of hay or dry grass (from a pet store or a field) and some carrots, lettuce and an apple slice. Ask, “Which one do you think a rabbit should eat the most?” Most people guess carrots. The answer is hay!

WATCH

Daily Rabbit Care

Training Through Life · 4:17

https://www.youtube.com/watch?v=JSx_309wLBs

WHEN TO WATCH

After the core ideas. Ask your child to count the jobs the rabbit keeper does each day.

BACKUP VIDEO

Facts about Bunnies for Kids

Homeschool Pop · 6:22

https://www.youtube.com/watch?v=XxSS1QGC_S0

In session 1, before the core ideas, as an introduction to rabbits.

KEY TERMS

hay

Dried grass. It is the main food of a pet rabbit.

hutch

A wooden house for a rabbit. A pet rabbit also needs a big pen to run and hop.

gnaw

To chew and chew with front teeth. A rabbit's front teeth never stop growing, so it must gnaw.

CORE IDEAS

A rabbit's front teeth never stop growing. To wear them down, the rabbit must chew and **gnaw** all day. That is why the main food for a pet rabbit is **hay**, lots of it, every day. Hay keeps the teeth short and the tummy healthy.

Besides hay, a rabbit eats a handful of fresh leafy greens each day (like romaine lettuce, parsley and cilantro) and a small spoonful of rabbit pellets. Carrots and fruit are sweet treats, only a tiny bit. And a rabbit always needs fresh water.

Rabbits love to hop, run and jump. A small cage is not enough. A rabbit needs a large pen or a safe, rabbit-proofed room to exercise every day. It also likes a hiding box, toys to chew, and a litter box, which it can learn to use like a cat.

Rabbits are prey animals, so they are easily frightened. Never pick a rabbit up by its ears. Sit on the floor and let it come to you. If a grown-up helps you hold one, put one hand under its chest and the other under its bottom, and hold it close to your body, low to the ground.

Rabbits can live ten years or more. A well-cared-for rabbit is a gentle, curious friend.

PICTURE STUDY



Young Hare, Albrecht Dürer, 1502 · Watercolor and gouache · Albertina, Vienna

Image: [Wikimedia Commons](#), public domain

This is one of the most famous animal pictures in the world. Albrecht Dürer painted this young hare more than five hundred years ago, hair by hair. A hare is a wild cousin of the rabbit, with longer ears and longer legs.

Look closely

- Look at the fur. How did Dürer make it look so soft?
- Find the long whiskers. What do you think they help a hare do?
- Find the eye. Can you see a tiny window reflected in it?
- Look at the back feet. Why are they so big?

Talk about it

1. How is this wild hare like a pet rabbit? How is it different?
2. Why do you think the hare is sitting so still?
3. How should you act around a rabbit so it does not get scared?

Safety first. Only hold a rabbit with an adult's help, sitting on the floor. Never lift a rabbit by its ears or scruff. Rabbits can scratch with their strong back feet. Wash your hands after touching a rabbit or cleaning its pen.

HANDS-ON PROJECT

A Rabbit's Day

You will make a rabbit's daily menu and care chart, and, if you can, visit a real rabbit.

You will need

- A paper plate
- A little hay or dry grass, a few greens, and some rabbit pellets or dried beans to stand for pellets
- Glue
- Paper and crayons
- A stuffed animal for practicing holding
- A real rabbit to visit, at home, at a friend's, a pet store or a 4-H show (optional)

Steps

1. Make a rabbit food plate. Draw a line to divide the plate: a big part for hay, a smaller part for greens and a tiny part for pellets.
2. Glue hay on the big part, greens (or drawn ones) on the smaller part and a few pellets on the tiny part. Draw a little carrot slice off to the side and label it "treat."
3. Make a care chart with pictures: fill the hay, give greens, fresh water, clean the litter box, playtime in the pen.
4. Practice holding a rabbit with a stuffed animal: sit on the floor, one hand under the chest, one under the bottom, close to your body.
5. If you can visit a real rabbit, sit quietly on the floor and let it sniff your hand first. Watch how it moves its nose and ears.
6. Tell a parent three things a rabbit needs every day.

Tips

- County fairs often have 4-H rabbit shows, where young people show rabbits they have raised. Many will be happy to talk to you.
- Rabbits are most active in the early morning and evening.

Check your work

- ☐ I know a rabbit eats mostly hay.
- ☐ I can show how to hold a rabbit safely.
- ☐ I made a rabbit care chart.

NATURE JOURNAL

1. Draw a rabbit sitting up. Label its ears, whiskers, nose, front teeth and big back feet.
2. Draw a rabbit's pen with a hiding box, hay, water, a litter box and a chew toy.
3. If you saw a real rabbit, write three things it did.

COMMON MISTAKES

- Feeding mostly carrots. Hay is the main food; carrots are a small treat.
- Keeping a rabbit in a small cage all day. Rabbits need room to hop and run.

Make it a game • Rabbit Menu Sort. Draw a rabbit's food bowl on paper. Your grown-up names foods: hay, leafy greens, pellets, candy and bread. Place each in the bowl, or say no. The bowl should be mostly hay. Then act out what a rabbit does with exercise: hop twenty times, gnaw a cardboard roll and nap in its hutch.

4.4 DOGS: FOOD, WALKS AND TRAINING

OBJECTIVES

- Tell what a dog needs each day: food, water, walks, play, training and rest.
- Show how to meet a dog safely.
- Practice simple, kind training with treats (with your own or a friend's dog, or a pretend dog).

Warm-up. Be a tree. Teach your child what to do if a strange dog runs up: stand still like a tree, fold your hands like branches, look at your feet and stay calm and quiet until the dog goes away or a grown-up comes. Practice it twice while you pretend to be the dog.

WATCH

Basic Pet Care: Dogs

[NParksSG](#) · 2:59

<https://www.youtube.com/watch?v=Zb3Wzs2FcFE>

WHEN TO WATCH

After the core ideas. Ask your child to name each thing the dog needs as it appears.

BACKUP VIDEO

What to Train Your Puppy First

[Kikopup](#) · 2:49

<https://www.youtube.com/watch?v=YF7boyICV7M>

Before the training project, to see a trainer reward a puppy with treats.

KEY TERMS

leash

A strap that clips to a dog's collar to keep it safe and close on a walk.

training

Teaching a dog what we want it to do, with patience and rewards.

reward

Something a dog likes, such as a small treat or praise, given right after it does the right thing.

CORE IDEAS

Dogs have lived with people for a very long time. They herd sheep, guard farms, guide people who cannot see, and keep families company. A dog is a loyal friend, and it needs a lot from its family.

Every day a dog needs measured meals of dog food (most grown dogs eat twice a day), a bowl of fresh water, a walk on a **leash**, play time, a cozy bed and time with its people. Dogs also need brushing, nail trims and checkups with the vet.

Dogs learn by **training**. When the dog does the right thing, like sitting, give a small treat or happy praise right away. That is a **reward**. Short, happy lessons every day work best. We never hit or yell at a dog.

Meeting a dog safely: always ask the owner first, “May I pet your dog?” If they say yes, hold your hand low and let the dog sniff it. Pet the dog gently on its side or back, not on top of its head. Never bother a dog that is eating, sleeping or chewing a toy.

If a dog growls, shows its teeth or stiffens, back away slowly. If a strange dog runs up, “be a tree”: stand still and quiet, and look at your feet.

PICTURE STUDY



Dignity and Impudence, Sir Edwin Landseer, 1839 · Oil on canvas · Tate Britain, London

Image: [Wikimedia Commons](#), public domain

Edwin Landseer loved dogs and painted them as if they had their own personalities. Here a big, serious bloodhound and a small, cheeky terrier share a kennel. “Dignity” means calm and serious; “impudence” means bold and a little cheeky.

Look closely

- Find the big dog. What kind of ears does he have?
- Find the little dog. How is it different from the big one?
- Find the kennel. What is it made of?
- Look at each dog’s eyes. Which one looks calm, and which one looks ready to play?

Talk about it

1. Which dog is “Dignity” and which is “Impudence”? How can you tell?
2. Would a big dog and a small dog need the same amount of food and exercise? Why or why not?
3. What would you need to do every day to care for these two dogs?

Safety first. Always ask an owner before touching a dog. Never pet a dog through a fence or in a car, or a dog that is eating, sleeping or tied up. Do not hug dogs around the neck or put your face close to theirs. Tell an adult right away about any bite or scratch, and wash it with soap and water.

HANDS-ON PROJECT

Dog Care Day

You will help care for a dog for a day, or plan a dog's day, and practice a short, kind training lesson.

You will need

- Your dog, a friend's or neighbor's dog with an adult, or a stuffed dog for practice
- Dog food and a measuring cup, a water bowl, a leash
- Small soft dog treats, broken into tiny pieces
- Paper and crayons for a care chart

Steps

1. With a grown-up, measure the dog's food with a cup. Read the bag or ask the owner how much. Set it down and step away while the dog eats.
2. Wash and fill the water bowl with fresh water.
3. Go for a walk with a grown-up holding the leash too. Notice what the dog likes to sniff.
4. Training time: hold a tiny treat near the dog's nose and slowly move it up and back over its head. As the dog's bottom goes down, say "Sit!" and give the treat. Practice five times, then stop while it is fun.
5. Brush the dog gently if it likes to be brushed.
6. Make a dog care chart with pictures: breakfast, water, walk, play, training, dinner, bedtime.
7. No dog? Do the steps with a stuffed dog and make the chart for a dog you would like someday.

Tips

- Keep training lessons short: two or three minutes is plenty for a puppy.
- Always end training on something the dog can do well, so it ends happy.

Check your work

- ☐ I can name what a dog needs every day.

- ☐ I can show how to meet a dog safely.
- ☐ I know to reward a dog right after it does the right thing.

NATURE JOURNAL

1. Draw a dog on a walk with its leash. Label leash, collar and tag.
2. Draw the steps for meeting a dog: ask, let it sniff, pet its side.
3. If you worked with a real dog, write how many times it sat for a treat.

COMMON MISTAKES

- Running up to a dog you do not know. Always stop and ask first.
- Giving too many treats. Use tiny pieces and count them as part of the dog's food.

Make it a game • Dog Day Acting. Your grown-up is the dog and you are the owner. Act out one dog day in order: food, water, a walk on a leash, play, training with a reward, and rest. Then practice meeting a new dog safely by asking first. The dog gives a tail wag if you did every step right.

UNIT 4

PETS

A pet is a gift and a responsibility. In this unit your child learns what every pet needs, how to choose a pet that fits a family, how to keep fish healthy in a tank, how to care for a rabbit, and how to feed, walk and train a dog. We practice the rules of kindness and safety around animals: gentle hands, quiet voices, and always asking before we pet.

Picture study includes Morland's guinea-pig seller at a cottage door, Marcus Bloch's shining goldfish, Dürer's famous young hare, and Landseer's two dogs. No pet is needed. Families without a pet can plan one on paper, visit a pet store or shelter, or help care for a neighbor's animal.

PREREQUISITES

- Unit 2 (wild animals and the rule "look, don't touch")
- No pet needed at home
- A trip to a pet store, a shelter or a friend's home with a pet is helpful but optional

MASTERY CHECKLIST

- ☐ I can name the things every pet needs: food, water, shelter, cleaning, exercise, a vet and love.
- ☐ I can tell how to keep a fish tank clean and feed fish the right amount.
- ☐ I can tell what rabbits eat most (hay!) and how to hold one safely.
- ☐ I can tell what a dog needs each day and how to meet a dog safely.
- ☐ I can help choose a pet that fits a family.

LESSONS IN THIS UNIT

4.1 Choosing a Pet That Fits Your Family

2 sessions of 30 minutes

4.2 A Fish Tank

2 sessions of 30 minutes

4.3 Rabbits

2 sessions of 30 minutes

4.4 Dogs: Food, Walks and Training

2 sessions of 30 minutes

UNIT 4 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the pet plan, the rabbit food plate and the four pictures from this unit ready.

1. Name four things every pet needs.
2. How much should you feed a fish? What happens if you feed too much?
3. Point to the part of the rabbit plate that is biggest. Why does a rabbit need so much hay?
4. Show me with this stuffed animal how to hold a rabbit.
5. You see a dog you do not know. What do you do before petting it?
6. Look at *Selling Guinea Pigs*. What should the family think about before buying a pet?

ANSWER KEY

1. Any four: the right food, fresh water, a safe home, cleaning, exercise and play, a vet when sick, and love and time.
2. A small pinch, only what it can eat in about two minutes. Extra food rots and makes the water dirty, which can make fish sick.
3. The hay part. Hay keeps a rabbit's always-growing teeth worn down and keeps its tummy healthy.
4. Sitting low, one hand under the chest and one under the bottom, held close to the body. Never by the ears.
5. Ask the owner, "May I pet your dog?" If yes, hold a hand low for the dog to sniff, then pet its side gently.
6. Whether they have time, space and money for food and the vet, whether anyone is allergic, how long the pet lives, and who will care for it every day.

PORTFOLIO PIECE: MY PET CARE BOOK

Make a pet care book for one pet, real or planned. Include a drawing of the pet and its home, a daily care chart with pictures, a list of foods it eats (and treats it can have only a little of), and a page of safety rules for being kind and careful around animals. If you have a real pet, do your chart jobs for one whole week and check them off.

LOOK FOR	WHAT IT MEANS
Needs	Shows the pet’s food, water, home, cleaning and exercise correctly.
Daily chart	Has a clear daily care chart a child could follow.
Safety and kindness	Includes at least three safety or kindness rules.
Faithfulness	Did real pet chores (or neighbor pet chores) for a week without reminders, or explained the plan clearly.

UNIT 5

SEEDS AND WHAT PLANTS NEED

Late winter is seed time indoors. In this unit your child opens a soaked bean to find the baby plant inside, watches beans sprout in a bag on the window, grows a plant that bends toward the light, and makes a root window to see how roots drink water. These are the same seeds and the same simple science that every farmer depends on.

Picture study includes a beautiful old seed-catalog painting of beans, Millet's great *Sower*, Carl Larsson's sunny windowsill full of plants, and Caillebotte's gardeners with their watering cans. Your child will keep a growth log, measuring and drawing their plants every few days.

PREREQUISITES

- Unit 1, Lesson 1.4 (saving seeds); the saved seeds can be planted now
- Unit 3 (soil)
- Can use a ruler with help

MASTERY CHECKLIST

- ☐ I can name the parts of a bean seed: seed coat, baby plant and food store.
- ☐ I can tell what a seed needs to sprout: water, air and warmth.
- ☐ I can show that a plant grows toward the light.
- ☐ I can tell how roots drink water and hold a plant in place.
- ☐ I kept a growth log with dates, measurements and drawings.

LESSONS IN THIS UNIT

5.1 What Is Inside a Seed?

2 sessions of 30 minutes

5.2 A Seed Wakes Up

2 sessions of 30 minutes

5.3 Plants Lean Toward the Light

2 sessions of 30 minutes

5.4 Water and Roots

2 sessions of 30 minutes

UNIT 5 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have a soaked bean, the growth log, the plant maze and the four pictures from this unit ready.

1. Open this soaked bean. Point to the seed coat, the food store and the baby plant.
2. What three things does a seed need to wake up and sprout?
3. When a bean sprouts, what comes out first, the root or the shoot? Which way does it grow?
4. Tell me what happened in your plant maze. Why?
5. What are two jobs of roots?
6. Look at Caillebotte's *The Gardeners*. Where should you pour water, and how do you know when to water?

ANSWER KEY

1. The child peels off the thin seed coat, splits the bean, and points to the two halves (food) and the tiny root and leaves (baby plant).
2. Water, air and warmth.
3. The root comes out first and grows down.
4. The bean grew around the shelves and out the hole toward the light, because plants need light and grow toward it.
5. To drink water from the soil and to hold the plant in the ground.
6. On the soil around the roots, not on the leaves. Water when the top of the soil feels dry to your fingertip.

PORTFOLIO PIECE: MY BEAN PLANT AND GROWTH LOG

Grow one bean plant from seed in a pot of potting mix for at least three weeks. Keep a growth log: every few days, write the date, measure the plant with a ruler, and draw it. Turn the pot every few days so it grows straight, and water it only when the soil is dry on top. At the end, show the plant and tell its story from seed to leaves. Take a photo of your plant every week and glue the photos in order to make a picture record, like the record books 4-H members keep.

LOOK FOR	WHAT IT MEANS
A living plant	Grew a bean plant from seed that is healthy and green.
Faithful care	Checked and watered the plant without reminders, about every day or two.
Growth log	Has at least six dated entries with measurements and drawings.
Telling the story	Can tell what the seed needed, what came out first, and why the plant needs light and water.

5.1 WHAT IS INSIDE A SEED?

OBJECTIVES

- Name the parts of a bean seed: seed coat, baby plant and food store.
- Open a soaked bean and find each part with a magnifying glass.
- Compare several kinds of seeds by size, shape and color.

Warm-up. Seed sort. Pour a small handful of mixed dry seeds onto a plate: beans, peas, popcorn, sunflower seeds, pumpkin seeds. Let your child sort them any way they like (by size, by color, by shape). Then ask them to tell you their sorting rule.

WATCH

What's Inside a Bean? - #sciencegoals

SciShow Kids · 3:35

<https://www.youtube.com/watch?v=UFmBKpQxf-U>

WHEN TO WATCH

After the core ideas, just before you open your own soaked beans.

BACKUP VIDEO

Look Inside a Seed at Home (PK - 2nd Grade)

Fort Worth Museum of Science and History · 5:37

<https://www.youtube.com/watch?v=IRXnfx4x3vY>

Any time this week. A museum teacher opens a seed step by step; pause and copy each step.

KEY TERMS

seed coat

The tough outer skin of a seed that protects it, like a jacket.

embryo

The tiny baby plant inside a seed. (Say it “EM-bree-oh.”)

cotyledon

The big food store inside a bean seed. A bean has two of them, like the two halves of a peanut. (Say it “cot-ee-LEE-dun.”)

CORE IDEAS

A seed looks like a little pebble, but it is alive! Inside each seed, God packed everything needed to start a new plant.

On the outside is the **seed coat**. It is tough and keeps the seed safe and dry until it is planted.

Inside is a tiny baby plant, called the **embryo**. If you look closely, you can see a little root and two tiny folded leaves.

Most of the inside of a bean is food. A bean has two big halves called **cotyledons**. They feed the baby plant until it grows leaves and can make its own food from sunlight.

Seeds come in all sizes: a poppy seed is smaller than a dot, and a coconut is a seed as big as your head! But they all have a coat, a baby plant and food.

PICTURE STUDY



Early Dwarf Flageolet Bean, Vilmorin-Andrieux & Cie (seed company artists), 1904 · Engraving from a seed catalog · From the Vilmorin-Andrieux seed albums, Paris

Image: [Wikimedia Commons](#), public domain

Long ago, the great French seed company Vilmorin-Andrieux had artists draw every kind of vegetable they sold, so gardeners could see what they were buying. This picture shows a bush bean plant loaded with pods. Every pod is full of seeds.

Look closely

- Find the bean pods. How many can you count?
- Look at the leaves. What shape are they? Are they smooth or wrinkled?
- Find the ground at the bottom. How tall do you think this plant is?
- Look at how the artist used only black lines and white paper. How did he show light and shadow?

Talk about it

1. What is inside each of these pods?
2. If you planted one of the beans from this plant, what would happen?
3. Why would a seed company want such careful pictures of its plants?

Safety first. Some dry beans (such as red kidney beans) are not safe to eat raw. These seeds are for looking and planting, not for eating. Keep small seeds away from little brothers and sisters, who may put them in their mouths.

HANDS-ON PROJECT

Open a Bean

You will soak dry beans overnight to soften them, then gently open one to find the baby plant hiding inside.

You will need

- Large dry beans, such as lima beans or butter beans (about 10)
- A cup of water
- A paper towel
- A magnifying glass
- Toothpicks
- Nature journal and colored pencils

Steps

1. The night before, put the dry beans in a cup of water to soak.
2. In the morning, compare a soaked bean with a dry one. Which is bigger? Which is softer? The bean drank water!
3. Rub a soaked bean gently between your fingers. The seed coat will wrinkle and slide off. Feel how thin it is.
4. Use your thumbnail to gently split the bean into its two halves along the seam.
5. Look with the magnifying glass. On one half, find the tiny baby plant at the edge: a little root and two small folded leaves.
6. Use a toothpick to point to the seed coat, the food store and the baby plant.
7. Open two more beans. Is there a baby plant in every one?
8. Save the rest of the soaked beans for next week's sprouting bag.

Tips

- Big lima beans are easiest to open and see.
- If the bean won't split, let it soak a few more hours.

Check your work

- ☐ I found the seed coat, the food store and the baby plant.

- ☐ I can tell what each part does.
- ☐ I compared a dry bean and a soaked bean.

NATURE JOURNAL

1. Draw your opened bean very large. Label the seed coat, the food store (cotyledon) and the baby plant (embryo).
2. Draw a dry bean and a soaked bean side by side. Measure each one.
3. Draw three other seeds and write their names.

COMMON MISTAKES

- Squeezing too hard and breaking the tiny baby plant. Split the bean gently.
- Thinking a seed is not alive because it does not move. It is resting, waiting for water and warmth.

Make it a game • Seed Parts Quiz Me. Be the teacher. Draw a bean seed on paper and label seed coat, baby plant and food store. Ask your grown-up to name each part and say its job. Your grown-up will sneak in one wrong answer. Catch it for a point! Then swap and let your grown-up be the teacher.

5.2 A SEED WAKES UP

OBJECTIVES

- Tell what a seed needs to sprout: water, air and warmth.
- Sprout beans in a bag and watch the root and shoot appear.
- Keep a growth log with dates and drawings.

Warm-up. Wake-up stretch. Have your child curl up tight on the floor like a sleeping seed. Sprinkle a few drops of pretend rain. Slowly, the seed pushes out one foot (a root) and then stretches up its arms (the shoot) and stands tall to reach the sun.

WATCH

How Does A Seed Become A Plant? | Backyard Science | SciShow Kids

SciShow Kids • 3:47

<https://www.youtube.com/watch?v=tkFPyue5X3Q>

WHEN TO WATCH

After the core ideas, before you set up the bean bags.

BACKUP VIDEO

Bean Time-Lapse - 25 days | Soil cross section

GPhase • 3:10

<https://www.youtube.com/watch?v=w77zPAatVTuI>

Any time this week. A time-lapse with no talking: 25 days of a bean's life in three minutes. Watch for the root first, then the hook-shaped stem.

KEY TERMS

germinate

To sprout. When a seed germinates, the baby plant wakes up and begins to grow.

root

The part of a plant that grows down into the soil. It is the first thing to come out of a seed.

shoot

The new stem and leaves that grow up toward the light.

CORE IDEAS

A seed can rest for months, even years, in a dry envelope. But when it gets **water**, **air** and **warmth**, it wakes up. This waking up is called **germinating**.

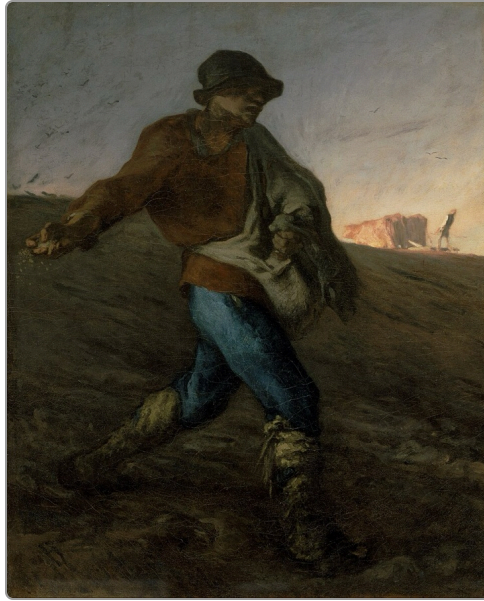
First the seed drinks water and swells. Its seed coat splits open.

The **root** always comes out first and grows down, no matter which way the seed is lying. God designed it this way so the root can find water and hold the plant in place.

Next the **shoot** grows up toward the light. A bean shoot comes up bent like a hook, pulling its two food halves up out of the soil. Then it straightens up, and its first green leaves open.

Seeds do not need sunlight to sprout; they sprout in the dark soil. But as soon as the green leaves come up, the young plant needs light to grow.

PICTURE STUDY



The Sower, Jean-François Millet, 1850 · Oil on canvas · Museum of Fine Arts, Boston

Image: [Wikimedia Commons](#), public domain

Before there were planting machines, farmers sowed grain by hand. They carried seed in a bag and threw it in wide sweeps as they walked across the plowed field. Millet painted this sower striding down a hill as the sun goes down.

Look closely

- Find the seed bag. How does the sower carry it?
- Find his right hand. What is he doing with it?
- Look at how he walks. Is he going slowly or with big steps?
- Find the other farmer far away. What animals is he working with?

Talk about it

1. What will happen to the seeds after they fall on the soil?
2. What do the seeds need to wake up and grow?
3. Why do you think the sower works so late, while the sun is setting?

HANDS-ON PROJECT

Beans in a Bag

You will sprout beans in a clear bag taped to a window, so you can watch every step of germination and keep a growth log.

You will need

- Three or four soaked beans (lima, pinto or pole beans)
- Two zip-top sandwich bags
- Paper towels
- Water
- Tape
- A ruler
- Nature journal (start a “Growth Log” page)

Steps

1. Fold a paper towel to fit inside a zip-top bag. Wet it, then squeeze out the extra water so it is damp, not dripping.
2. Slide the paper towel into the bag. Staple or tape a line across the bag about one-third of the way up so the beans have something to rest on, or just lay the beans on the towel.
3. Put three beans in the bag against the towel, so you can see them. Leave the bag a little open for air.
4. Tape the bag to a window that gets light but not hot afternoon sun.
5. Make a second bag with a dry paper towel. Which bag will sprout?
6. Each day, look at your beans. On your Growth Log page, write the date and draw what you see.
7. When the roots appear, measure them with your ruler. Keep the towel damp with a few drops of water.
8. When the shoots have two leaves, plant the best seedling in a cup of potting mix. Keep it for next week!

Tips

- Beans sprout fastest in a warm room. They often show roots in two to five days.
- Try turning one bag upside down after the roots show. Which way do the roots grow now?

Check your work

- ☐ I can tell what a seed needs to sprout.
- ☐ I saw the root come out first.
- ☐ I kept a growth log with dates and drawings.

NATURE JOURNAL

1. Growth Log: draw your beans every day for a week. Write the date and the root length.
2. Draw the bean's hook-shaped stem coming up out of the ground.
3. Write which bag sprouted, the wet one or the dry one, and why.

COMMON MISTAKES

- Keeping the towel soaking wet. Seeds need air too, and too much water can make them rot.
- Putting the bag in hot, direct sun. It will cook the seeds. Bright, not hot.

Make it a game • Sprout Race Pretend. Curl up like a seed. Your grown-up says water, air or warmth and you add each one by taking a sip, a deep breath, and a warm hug. When all three arrive, germinate: push a root down first, then lift your shoot up. Count how many seconds it takes to grow tall.

Scripture. “For the earth bringeth forth fruit of herself; first the blade, then the ear, after that the full corn in the ear.” (Mark 4:28, KJV)

Jesus said the seed grows little by little, while the farmer sleeps, in the order God planned. Your beans grow the same way: first the root, then the shoot, then leaves.

5.3 PLANTS LEAN TOWARD THE LIGHT

OBJECTIVES

- Tell why plants need light.
- Show that a plant bends to grow toward light.
- Build a plant maze and predict which way the plant will grow.

Warm-up. Shadow and light. Put two small houseplants (or two seedlings) side by side: one on a sunny windowsill, one in a dark closet, for a few minutes while you talk. Ask, “Which plant do you think would be happier after a week? Why?” Then put both back in the light.

WATCH

Light Mazes for Plants!

OklahomaGardening · 7:01

<https://www.youtube.com/watch?v=jX3qj99MRwk>

WHEN TO WATCH

Before the hands-on project. An Oklahoma State University extension educator shows how to build a light maze; pause after each step.

BACKUP VIDEO

Make a Plant Maze!

Potomac Valley Audubon Society · 2:07

<https://www.youtube.com/watch?v=X-4vUXMMPTU>

Any time this week, as a short reminder of the steps.

KEY TERMS

light

Sunshine or lamplight. Green leaves use it to make food for the plant.

leaf

The flat green part of a plant that catches light and makes food.

lean

To bend toward one side. Plants lean toward the light.

CORE IDEAS

Plants cannot eat the way animals do. Instead, their green **leaves** catch **light** and use it, with air and water, to make their own food. That is why plants need light to grow.

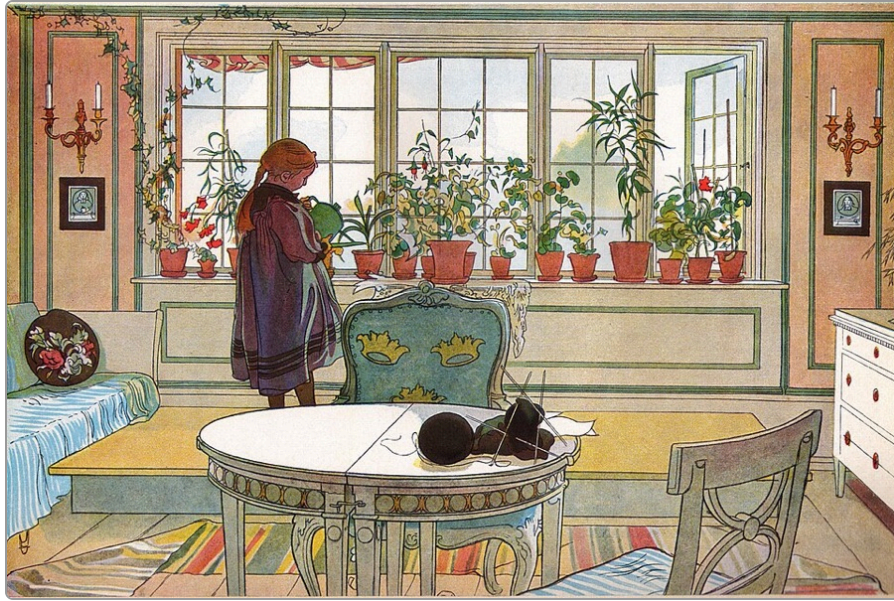
Plants grow toward the light. If a plant sits on a windowsill, it will slowly **lean** toward the window. The side of the stem away from the light grows a little faster, which bends the plant toward the light.

A plant kept in the dark grows tall, thin and pale yellow, stretching to find light. When it reaches light, it turns green again.

Gardeners turn their windowsill pots every few days so the plants grow straight instead of all leaning one way.

God gave the sun “to rule the day.” Every green leaf in the world is a little food factory powered by sunlight.

PICTURE STUDY



Flowers on the Windowsill, Carl Larsson, 1894 · Watercolor · Nationalmuseum, Stockholm

Image: [Wikimedia Commons](#), public domain

Carl Larsson was a Swedish artist who painted his family's cheerful home. In the long, dark Swedish winters, his family grew flowers on the windowsill, where they could catch every bit of light.

Look closely

- Find the girl. What is she doing?
- Count the pots on the windowsill.
- Look at the window. Where is the light coming from?
- Look at the plants closely. Are any leaning toward the glass?

Talk about it

1. Why did the family put their plants by the window instead of in a corner?
2. What would happen to these plants if the curtains were closed for a month?
3. Where in your home is the best place for plants?

HANDS-ON PROJECT

The Plant Maze

You will build a dark maze in a shoebox with a hole at one end and watch a bean plant wind its way through to reach the light.

You will need

- A shoebox with a lid
- Two pieces of cardboard about as wide as the box
- Tape and scissors (an adult cuts the hole)
- A sprouted bean seedling in a small cup of potting mix (from Lesson 5.2), or a fresh bean planted a few days before
- A second bean seedling in a cup on a windowsill (to compare)
- Nature journal

Steps

1. Ask an adult to cut a hole about the size of a quarter in one short end of the shoebox, near the top.
2. Stand the box on its end with the hole at the top. Tape two cardboard shelves inside, sticking out from opposite sides, so a path zigzags up toward the hole.
3. Put your bean seedling cup on the bottom of the box.
4. Close the lid and tape it so no light gets in except through the hole. Set the box so the hole faces a bright window.
5. Guess which way your bean will grow. Draw your guess.
6. Open the lid quickly once every two or three days to water the bean a little and peek. Close it again right away.
7. In one to two weeks, the bean should wind around the shelves and poke out of the hole! Compare it with the bean on the windowsill. Which is greener? Which is taller and thinner?

Tips

- Beans and peas grow fast and work well in a maze.

- If your seedling is too short to start, wait a few days until it has its first leaves.

Check your work

- ☐ I can tell why plants need light.
- ☐ I built a plant maze and guessed what would happen.
- ☐ My bean grew toward the light.

NATURE JOURNAL

1. Draw your guess of how the bean will grow through the maze. Then, when it pokes out, draw what really happened.
2. Draw a windowsill plant leaning toward the window. Draw an arrow showing where the light comes from.
3. Compare the maze bean and the windowsill bean. Write two differences.

COMMON MISTAKES

- Opening the box too often. Every bit of light at the wrong place confuses the plant. Peek quickly.
- Forgetting to water the maze bean. It still needs water, a little at a time.

Make it a game • Plant Maze Memory. Draw a box with a window and walls inside, as a plant maze. Without peeking, tell your grown-up where the plant starts, where the light comes in and how the plant will bend around each wall. Then lean like a plant toward a flashlight and explain why light matters to leaves.

5.4 WATER AND ROOTS

OBJECTIVES

- Tell two jobs of roots: drinking water and holding the plant in place.
- Make a root window to watch roots grow.
- Tell what happens to a plant that gets no water.

Warm-up. Tug-of-war with a weed. Go outside (or use a potted plant that needs thinning) and let your child try to pull up a small weed or grass clump. Is it easy or hard? Look at the roots that come up. Ask, “What were these roots doing under the ground?”

WATCH

Watch a Seed Sprout! | Squeaks Grows a Garden! | SciShow Kids

SciShow Kids · 5:33

<https://www.youtube.com/watch?v=-rJdVQNY6TY>

WHEN TO WATCH

After the core ideas. Watch for the roots and their tiny root hairs, then set up your own root window.

BACKUP VIDEO

Root Growth Timelapse | Soil Cross Section

Temponaut Timelapse · 3:16

<https://www.youtube.com/watch?v=Y6vgAnMhGxs>

Any time this week. A melon seedling’s roots spread through the soil while its leaves grow above.

KEY TERMS

roots

The part of a plant under the ground.
Roots drink water and hold the plant in place.

root hairs

Tiny, fuzzy hairs on roots that soak up water like a sponge.

wilt

To droop and go limp because the plant does not have enough water.

CORE IDEAS

Roots have two big jobs. First, they drink water from the soil, along with plant food mixed in the water. Second, they hold the plant tight in the ground so wind and rain cannot knock it over.

Look closely at a young root and you will see fuzzy **root hairs**. They are very tiny, and there are thousands of them. They soak up water like a sponge.

Water travels from the roots up through the stem, like a drink through a straw, all the way to the leaves. The leaves use the water to make food.

If a plant does not get enough water, it **wilts**: its leaves droop and hang down. Give it a good drink at the roots, and it will often stand up again in a few hours. But if it stays dry too long, it dies.

Water the soil, not the leaves. Water deeply, until the soil is wet all the way down, and then wait until the top of the soil feels dry before watering again.

PICTURE STUDY



The Gardeners, Gustave Caillebotte, 1875–77 • Oil on canvas • Private collection

Image: [Wikimedia Commons](#), public domain

Gustave Caillebotte painted the kitchen garden at his family's country house in France. Two gardeners are watering long rows of vegetables. There were no garden hoses then, so every drop was carried in a can!

Look closely

- Find the two gardeners. What are they carrying?
- Look at where they pour the water: on the leaves, or on the soil around the plants?
- Find the rows of plants. Are they straight or wavy?
- Find the glass bell jars on the ground. What do you think they are for?

Talk about it

1. How many trips with full watering cans do you think it takes to water this garden?
2. Why do the gardeners water the soil around the roots?
3. What time of day do you think is best for watering? Why?

HANDS-ON PROJECT

The Root Window

You will plant beans against the side of a clear cup so you can watch their roots grow, and you will see what happens when a plant goes thirsty.

You will need

- A clear plastic cup with three small drainage holes poked in the bottom (an adult pokes them)
- Potting mix
- Three bean seeds (soaked overnight)
- A dark sheet of paper and tape
- A saucer under the cup
- A ruler and a magnifying glass
- A wilted plant to rescue (optional: a bunch of celery, lettuce or a droopy flower works)

Steps

1. Fill the clear cup with damp potting mix.
2. Push the three beans down about an inch deep, right against the side of the cup, so you can see them through the plastic.
3. Wrap the outside of the cup with the dark paper and tape it. Roots grow best in the dark. You can lift the paper to peek.
4. Set the cup on a saucer in a warm, bright place. Water when the top of the soil feels dry.
5. Every two days, lift the paper and look. Draw the roots in your journal. Can you see root hairs with the magnifying glass?
6. Rescue a wilted plant: take a limp stalk of celery or a droopy lettuce leaf. Trim the bottom and stand it in a glass of water. Look again in a few hours. Did it stand up?
7. Talk about it: what did the roots and stems do with the water?

Tips

- Push your finger into the soil up to the first knuckle. If it feels dry, it is time to water. If it feels damp, wait.
- A saucer under each pot keeps water off your windowsill.

Check your work

- ☐ I can tell two jobs of roots.
- ☐ I saw roots and root hairs growing in my root window.
- ☐ I know to water the soil, not the leaves.

NATURE JOURNAL

1. Draw your root window every two days. Label roots, root hairs and the shoot.
2. Draw a wilted plant and the same plant after a drink of water.
3. Draw a plant with arrows showing water going up from the roots, through the stem, to the leaves.

COMMON MISTAKES

- Watering a little bit every hour. Water deeply, then let the top of the soil dry.
- Forgetting drainage holes. Without holes, water sits at the bottom and the roots rot.

Make it a game • Root Jobs Showdown. Stand with your feet apart like roots. Your grown-up calls out a job: drinking water or holding the plant in place. Do the matching action: slurp or plant your feet and resist a gentle push. Name the two jobs from memory, then say what root hairs do and what a wilting plant looks like.

Scripture. “And he shall be like a tree planted by the rivers of water, that bringeth forth his fruit in his season; his leaf also shall not wither;” (Psalms 1:3, KJV)

A tree by the river always has water for its roots, so it does not wilt. The Bible says a person who loves God’s Word is like that tree: strong, green and fruitful.

UNIT 5

SEEDS AND WHAT PLANTS NEED

Late winter is seed time indoors. In this unit your child opens a soaked bean to find the baby plant inside, watches beans sprout in a bag on the window, grows a plant that bends toward the light, and makes a root window to see how roots drink water. These are the same seeds and the same simple science that every farmer depends on.

Picture study includes a beautiful old seed-catalog painting of beans, Millet's great *Sower*, Carl Larsson's sunny windowsill full of plants, and Caillebotte's gardeners with their watering cans. Your child will keep a growth log, measuring and drawing their plants every few days.

PREREQUISITES

- Unit 1, Lesson 1.4 (saving seeds); the saved seeds can be planted now
- Unit 3 (soil)
- Can use a ruler with help

MASTERY CHECKLIST

- ☐ I can name the parts of a bean seed: seed coat, baby plant and food store.
- ☐ I can tell what a seed needs to sprout: water, air and warmth.
- ☐ I can show that a plant grows toward the light.
- ☐ I can tell how roots drink water and hold a plant in place.
- ☐ I kept a growth log with dates, measurements and drawings.

LESSONS IN THIS UNIT

5.1 What Is Inside a Seed?

2 sessions of 30 minutes

5.2 A Seed Wakes Up

2 sessions of 30 minutes

5.3 Plants Lean Toward the Light

2 sessions of 30 minutes

5.4 Water and Roots

2 sessions of 30 minutes

UNIT 5 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have a soaked bean, the growth log, the plant maze and the four pictures from this unit ready.

1. Open this soaked bean. Point to the seed coat, the food store and the baby plant.
2. What three things does a seed need to wake up and sprout?
3. When a bean sprouts, what comes out first, the root or the shoot? Which way does it grow?
4. Tell me what happened in your plant maze. Why?
5. What are two jobs of roots?
6. Look at Caillebotte's *The Gardeners*. Where should you pour water, and how do you know when to water?

ANSWER KEY

1. The child peels off the thin seed coat, splits the bean, and points to the two halves (food) and the tiny root and leaves (baby plant).
2. Water, air and warmth.
3. The root comes out first and grows down.
4. The bean grew around the shelves and out the hole toward the light, because plants need light and grow toward it.
5. To drink water from the soil and to hold the plant in the ground.
6. On the soil around the roots, not on the leaves. Water when the top of the soil feels dry to your fingertip.

PORTFOLIO PIECE: MY BEAN PLANT AND GROWTH LOG

Grow one bean plant from seed in a pot of potting mix for at least three weeks. Keep a growth log: every few days, write the date, measure the plant with a ruler, and draw it. Turn the pot every few days so it grows straight, and water it only when the soil is dry on top. At the end, show the plant and tell its story from seed to leaves. Take a photo of your plant every week and glue the photos in order to make a picture record, like the record books 4-H members keep.

LOOK FOR	WHAT IT MEANS
A living plant	Grew a bean plant from seed that is healthy and green.
Faithful care	Checked and watered the plant without reminders, about every day or two.
Growth log	Has at least six dated entries with measurements and drawings.
Telling the story	Can tell what the seed needed, what came out first, and why the plant needs light and water.

UNIT 6

FARM ANIMALS AND BEES

Early spring is a busy time on the farm: chicks hatch, lambs are born, and the bees wake up and fly to the first flowers. In this unit your child follows a chicken's egg to a chick and a laying hen, learns how sheep's wool becomes yarn, meets the clever, clean-when-they-can pig, and visits the honeybee family of one queen, many workers and a few drones.

Picture study includes Hondecoeter's hen with her chicks, Millet's shepherdess and her flock, Morland's pigs in the straw, and Bruegel's beekeepers. No farm animals are needed at home. A farm visit, a county fair or a 4-H show is a wonderful field trip for this unit, and a library book works too.

PREREQUISITES

- Unit 4 (what animals need)
- No farm or animals needed
- A farm, fair or beekeeper visit is helpful but optional

MASTERY CHECKLIST

- ☐ I can tell the life cycle of a chicken: egg, chick, young hen, hen.
- ☐ I can tell how wool goes from a sheep to a sweater.
- ☐ I can tell what pigs eat and how they stay cool.
- ☐ I can name the three kinds of honeybees and tell what each one does.
- ☐ I know the safety rules for farm animals and bees.

LESSONS IN THIS UNIT

6.1 The Chicken Life Cycle

2 sessions of 30 minutes

6.2 Sheep and Wool

2 sessions of 30 minutes

6.3 Pigs on the Farm

2 sessions of 30 minutes

6.4 Honeybees: Queen, Workers and Drones

2 sessions of 30 minutes

UNIT 6 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the egg-to-hen wheel, the piece of yarn, the pig pen, the paper beehive and the four pictures from this unit ready.

1. Turn your wheel and tell me the life cycle of a chicken. How long does a chick grow inside its egg?
2. How does wool get from a sheep to a sweater?
3. Why do pigs roll in mud?
4. Point to the queen, a worker and a drone on your beehive. What does each one do?
5. Look at Bruegel's *The Beekeepers*. Why are the beekeepers covered up?
6. What should you always do after touching chickens, sheep or pigs?

ANSWER KEY

1. Egg, chick hatching, fluffy chick, grown hen who lays eggs. It grows for 21 days.
2. The sheep is sheared, the wool is washed, combed (carded), spun into yarn, and knitted or woven.
3. Pigs cannot sweat, so mud keeps them cool and protects their skin from sunburn and bugs.
4. The queen lays eggs. Workers clean, feed babies, build comb, guard and gather nectar and pollen. Drones are males that help young queens start new hives; they do not gather food.
5. To protect their faces and hands from bee stings.
6. Wash your hands with soap and water.

PORTFOLIO PIECE: MY FARM VISIT JOURNAL

Visit a farm, a county fair, a 4-H show, a farmers' market with a beekeeper, or a petting farm. (If no visit is possible, use library books.) Make a journal of at least four pages: one each for chickens, sheep, pigs and bees. On each page, draw the animal, write or tell one thing it gives us or does, and one thing it needs from its farmer every day. Add your piece of handspun yarn.

LOOK FOR	WHAT IT MEANS
Four animals	Has a page for chickens, sheep, pigs and bees with a careful drawing of each.
Care and gifts	Tells what each animal needs and what it gives or does (eggs, wool, honey, pollination).
Real observation	Includes something your child saw or heard on a real visit, or from a book, with the date.
Safety	Can tell the hand-washing and bee safety rules.

6.1 THE CHICKEN LIFE CYCLE

OBJECTIVES

- Tell the life cycle of a chicken: egg, chick, young hen, hen.
- Tell that a chick grows inside its egg for 21 days.
- Name the parts of an egg: shell, white and yolk.

Warm-up. Egg detective. Give your child a raw egg in a bowl. Let them hold it gently and look at it with a magnifying glass. Is the shell smooth or bumpy? Is one end pointier? Then crack it into the bowl together and find the yolk and the white.

WATCH

The Life Cycle of a Chicken | Chicken Life Cycle | Science for Kids!

Twinkl Educational Publishing • 1:42

<https://www.youtube.com/watch?v=itjWSotbmGk>

WHEN TO WATCH

After the core ideas. Real footage of eggs in a nest, chicks hatching, fluffy chicks and grown hens. Watch it twice and name each stage the second time.

Note: Some of the hatching eggs shown are small speckled quail eggs; the life cycle is the same.

BACKUP VIDEO

Life cycle of a Chicken | Science for Kids

Little School • 3:41

https://www.youtube.com/watch?v=_XDNxG25-8Q

In session 2, to review the four stages and the words pullet and cockerel, with photographs and the 21-day count.

KEY TERMS

hen

A grown-up female chicken. A male is a rooster, and a baby is a chick.

yolk

The yellow part of the egg. It is food for a growing chick.

incubate

To keep eggs warm so the chicks inside can grow. A hen does this by sitting on her eggs.

life cycle

The stages a living thing goes through as it grows up and makes new life.

CORE IDEAS

A chicken's **life cycle** goes in a circle: egg, chick, young hen, **hen**, and the hen lays eggs again.

An egg has a hard shell, a clear white and a yellow **yolk**. The eggs we buy at the store will not hatch. But on a farm with a rooster, some eggs can become chicks.

A mother hen **incubates** her eggs by sitting on them to keep them warm. She turns them over with her beak several times a day. Inside, the tiny chick grows, using the yolk as its food. A farmer can also use a warm box called an incubator.

After **21 days**, the chick is ready. It uses a little point on its beak, called an egg tooth, to peck a hole in the shell. It can take a whole day to break out! The new chick is wet, but it soon dries into a fluffy ball.

Chicks grow feathers in a few weeks. A young hen starts laying eggs when she is about five or six months old. A good hen can lay an egg almost every day in spring and summer.

PICTURE STUDY



The Threatened Hen, Melchior d'Hondecoeter, about 1680 · Oil on canvas · Rijksmuseum, Amsterdam

Image: [Wikimedia Commons](#), public domain

Melchior d'Hondecoeter was a Dutch painter who loved birds, especially farmyard birds. In this painting a white mother hen bravely guards her chicks from two big peacocks. Mother hens are fierce protectors!

Look closely

- Find the white mother hen. How is she standing?
- Count the chicks. Where are they?
- Find the peacocks. How big are they next to the hen?
- Look up. What is flying over the yard?

Talk about it

1. Why do you think the chicks stay so close to their mother?
2. How did these chicks start their lives?
3. What does a hen need from her farmer to stay healthy?

Safety first. Wash your hands well with soap after touching eggs, chicks, chickens or their coop. Chickens can carry germs (such as salmonella) that make people sick. Never hold chicks up to your face or mouth.

HANDS-ON PROJECT

Egg-to-Hen Wheel

You will make a spinning life-cycle wheel that shows how an egg becomes a hen, and you will look closely at an egg's parts.

You will need

- Two paper plates
- A brass paper fastener
- Scissors (an adult helps)
- Crayons or markers
- A raw egg and a bowl (from the warm-up), and a hard-boiled egg

Steps

1. Draw lines to divide one paper plate into four parts, like a pie.
2. In each part, draw one stage: an egg, a chick hatching, a fluffy chick, and a grown hen. Draw arrows from one to the next.
3. On the second plate, cut out one pie-shaped window the size of one part.
4. Put the window plate on top and push the paper fastener through the middle of both plates. Spread the fastener's legs in the back.
5. Turn the top plate to show each stage. Tell the story as you turn: "First the hen lays an egg..."
6. Peel the hard-boiled egg and cut it in half (adult). Find the shell, the white and the yolk. Compare it with the raw egg.
7. If you can, visit a farm, a feed store in spring, or a fair to see real chicks.

Tips

- Many farm stores have chicks in the spring. Ask if you may look (with hands behind your back).
- Write "21 days" on the hatching part of your wheel.

Check your work

- ☐ I can tell the four stages of a chicken's life.
- ☐ I know a chick grows in its egg for 21 days.

- ☐ I can name the shell, white and yolk.

NATURE JOURNAL

1. Draw an egg cut in half. Label shell, white and yolk.
2. Draw a chick pecking out of its shell.
3. If you saw real chickens, draw one and write what it was doing.
4. Draw a whole hen and label her parts: comb, wattle, beak, eye, wing, tail, shank (the scaly leg) and toes. 4-H poultry members begin by learning these names.

From history. Chickens have lived on farms for thousands of years. Pioneer families in America often kept a few hens near the house, and children gathered the eggs every morning. It was one of the first chores a child learned.

COMMON MISTAKES

- Thinking every egg will hatch. Store eggs never hatch.
- Forgetting to wash hands after touching chickens or eggs.

Make it a game • Egg to Hen Wheel Spin. Draw a four-part circle: egg, chick, young hen and hen. Your grown-up points to a part and you act it out: curl up in the egg, peep as a chick, scratch as a young hen. Say how long a chick grows inside its egg. Twenty-one days: count them on your fingers and toes.

6.2 SHEEP AND WOOL

OBJECTIVES

- Tell what sheep eat and how a shepherd cares for them.
- Tell how wool goes from a sheep to a sweater.
- Clean, pull apart and twist a little wool into yarn.

Warm-up. Feel the fibers. Put a wool sock or sweater, a cotton shirt and something plastic (a fleece jacket or a nylon bag) on the table. Let your child feel each one with eyes closed. Which feels warm and springy? Tell them that one of these came from a sheep!

WATCH

Wonderful Wool!

SciShow Kids · 4:33

<https://www.youtube.com/watch?v=x0HeCL6nano>

WHEN TO WATCH

After the warm-up and core ideas.

BACKUP VIDEO

Wool from Sheep with George the Farmer

George the Farmer · 6:02

<https://www.youtube.com/watch?v=PuPSZY2PHfQ>

Any time this week, to visit a real sheep farm in Australia and watch shearing.

KEY TERMS

flock

A group of sheep that live and move together.

shearing

Cutting the wool off a sheep, like a haircut. It does not hurt the sheep.

wool

The thick, curly hair that grows on a sheep.

spin

To twist wool fibers together to make yarn.

CORE IDEAS

Sheep live together in a **flock**. They eat grass and hay. Like cows, they chew their food once, swallow it, then bring it back up later to chew again. This is called chewing their cud.

A shepherd cares for the flock. He leads them to good grass and clean water, keeps them safe from dogs and coyotes, trims their hooves, and helps the mothers when the lambs are born in spring.

A sheep's **wool** keeps growing all year, like your hair. Once a year, usually in spring, a shearer cuts it off in one big piece called a fleece. **Shearing** does not hurt; it is like a haircut, and the sheep is cooler for summer.

To make yarn, the wool is washed to get the dirt and grease out. Then it is combed (carded) so the fibers lie straight. Then it is **spun**, twisted tightly into long yarn. The yarn can be knitted or woven into socks, sweaters and blankets.

Jesus called Himself the Good Shepherd. A good shepherd knows each sheep and takes care of every one.

PICTURE STUDY



Shepherdess with Her Flock, Jean-François Millet, 1863 · Oil on canvas · Musée d'Orsay, Paris

Image: [Wikimedia Commons](#), public domain

Jean-François Millet painted this young shepherdess watching her sheep on a wide, flat plain in France. Shepherds spent long, quiet days in the fields with their flocks. Look closely: she is busy with her hands while she watches.

Look closely

- Find the shepherdess. What is she doing with her hands? (Look for yarn!)
- Find the flock. Are the sheep standing still or eating?
- Find the sheepdog. What job do you think it has?
- Look at the shepherdess's clothes. What might they be made of?

Talk about it

1. How could wool from these sheep become the shepherdess's cape or stockings?
2. What does the shepherdess have to watch out for?
3. Would you like to be a shepherd? Why or why not?

Safety first. When visiting sheep, ask the farmer first, move slowly and keep your fingers flat if you are allowed to feed one. Wash your hands after touching sheep or raw wool. Raw wool can have burrs and dirt; wear gloves to clean it.

HANDS-ON PROJECT

From Fleece to Yarn

You will wash, pull apart and twist a little wool into your own piece of yarn, just like pioneers did.

You will need

- A small handful of raw wool or wool roving (from a craft store, a yarn shop or a sheep farmer). Cotton balls can stand in.
- A bowl of warm (not hot) water and a squirt of dish soap
- Two pet brushes or wide-tooth combs (for carding)
- A pencil
- A piece of wool yarn and a wool sock to compare

Steps

1. If you have raw wool, look at it with a magnifying glass. Feel it. Is it greasy? That grease is called lanolin. Find bits of hay and dirt.
2. Swish the wool gently in warm soapy water. Do not rub hard or it will turn to felt. Rinse in clean water and let it dry on a towel.
3. Card the wool: put a little wool on one brush and gently brush it with the other brush until the fibers lie in one direction.
4. Pull out a thin strip of the carded wool.
5. Spin it: hold one end and twist the other end between your fingers, again and again, or wrap the end around a pencil and twirl the pencil. Gently pull out more wool as you twist.
6. Look! The loose fibers turn into a strong thread of yarn.
7. Compare your yarn with store yarn and a wool sock. Unravel the end of the yarn to see the twist.

Tips

- Many county fairs, farms and history museums have people spinning wool in the spring. Watch a real spinning wheel!
- If your yarn breaks, overlap the ends and twist them together again.

Check your work

- ☐ I can tell the steps from sheep to sweater.
- ☐ I spun a little piece of yarn.
- ☐ I know shearing does not hurt a sheep.

NATURE JOURNAL

1. Draw the wool story in five boxes: sheep, shearing, washing, spinning, sweater.
2. Tape your piece of yarn into your journal and label it with the date.
3. Draw a sheep before shearing and after shearing.
4. Draw a sheep from the side and label its parts: head, ear, muzzle, neck, shoulder, back, leg, hoof, tail and fleece.

COMMON MISTAKES

- Thinking shearing hurts. It is like a haircut; a good shearer is quick and gentle.
- Rubbing wet wool hard. It tangles into felt.

Make it a game • Fleece to Sweater Relay. Set five spots around the room. At each spot do one step from sheep to sweater: shear, wash, card, spin and knit. Tell what the shepherd does and what sheep eat. Race the clock to finish the relay, then try again and beat your own time while saying every step.

Scripture. “He shall feed his flock like a shepherd: he shall gather the lambs with his arm, and carry them in his bosom,” (Isaiah 40:11, KJV)

A good shepherd carries the little lambs close. God cares for His people just as tenderly.

6.3 PIGS ON THE FARM

OBJECTIVES

- Tell what pigs eat and what kind of home they need.
- Tell why pigs roll in mud.
- Tell some ways pigs are clever and how farmers care for them.

Warm-up. Snout game. Hide three small items with a smell (an orange peel, a cinnamon stick, a slice of onion) under three cups. Let your child sniff each cup and guess what is under it. Tell them that a pig's snout is so good at smelling that it can find food buried deep in the ground.

WATCH

Kentucky Farms Feed Me - Visit a Pig Show and Pig Farm

Kentucky Agriculture & Environment in the Classroom, Inc. · 5:33

<https://www.youtube.com/watch?v=Y2heVNL3wC8>

WHEN TO WATCH

After the core ideas. A girl visits a young pig showman at the state fair and then a family pig farm.

Note: The farmer briefly mentions that pigs are raised for pork. You may want to watch it first and be ready for questions.

KEY TERMS

snout

A pig's long nose with a flat, round end. Pigs use it to smell and dig.

sow

A mother pig. A baby pig is a piglet, and a father pig is a boar.

wallow

To roll around in mud or water to cool off.

litter

A group of baby animals born to one mother at the same time.

CORE IDEAS

Pigs are some of the cleverest animals on the farm. They can learn their names, open gates and solve simple puzzles. A pig uses its strong **snout** to smell and to dig, or “root,” in the dirt for food.

Pigs eat grain like corn and soybeans, and they like vegetables and fruit too. Farmers give them a balanced feed and lots of fresh water. A pig drinks a lot of water every day.

Pigs cannot sweat to cool off the way people do. So on a hot day, a pig will **wallow** in mud or water. The mud keeps it cool and protects its skin from sunburn and bugs. Pigs are actually tidy animals: they like a dry, clean place to sleep, away from where they go to the bathroom.

A mother pig, called a **sow**, has a **litter** of eight to twelve piglets or more. Piglets grow very fast. Farmers keep pigs in barns or pens with shade, water, clean bedding like straw, and room to move.

Many young people raise a pig for a 4-H project. They feed it, wash it, and walk it with a stick to guide it, and then they show it at the county fair. It takes daily work and patience.

PICTURE STUDY



Pigs, George Morland, about 1795–1800 · Oil on canvas · Birmingham Museums Trust, England

Image: [Wikimedia Commons](#), public domain

George Morland was an English painter who loved farmyards and painted pigs again and again. Here two pigs rest in their sty. Look how comfortable they are in the straw.

Look closely

- Count the pigs. What colors are they? Do they have spots?
- Find the snouts. What is each pig doing?
- Find the straw and the barrel. What are they for?
- Find the vegetables on the floor. Which ones can you name?

Talk about it

1. Do these pigs look healthy and cared for? How can you tell?
2. What would the farmer need to do every day to care for these pigs?
3. Why do you think pigs like to lie in straw?

Safety first. Pigs are strong and can bite. Never climb into a pig pen. At a fair or farm, ask before touching a pig and keep fingers away from its mouth. Wash your hands after visiting any farm animal.

HANDS-ON PROJECT

Plan a Pig Pen

You will design a pig pen that gives pigs everything they need, and, if you can, visit real pigs at a farm or fair.

You will need

- A shoebox lid or a large sheet of paper
- Craft sticks, straw or yellow paper, blue paper and brown paper
- Glue and crayons
- Small toy pigs or pigs drawn and cut from paper

Steps

1. Use the shoebox lid as your pig pen. Glue craft sticks around the edges for a fence.
2. Make a shelter in one corner with a roof for shade and rain.
3. Put dry straw (or yellow paper strips) inside the shelter for a clean bed.
4. Make a muddy wallow in another corner with brown paper, far from the bed.
5. Add a feeder and a water trough (blue paper).
6. Put your pigs in their new home. Tell a parent why each part is there.
7. If you can, visit pigs at a farm, a petting farm or a county fair and look for each of these parts.

Tips

- County and state fairs often have a barn full of 4-H pigs. The young owners love to answer questions.
- Remember: pigs like the bed and the bathroom far apart!
- Many counties have a 4-H Cloverbud club for children about five to eight, where young members learn about animals and make non-competitive, display-only exhibits. Cloverbuds usually do not keep animal projects of their own. Ask your county extension office.

Check your work

- ☐ I can tell what pigs eat and drink.

- ☐ I can tell why pigs wallow in mud.
- ☐ My pig pen has shelter, a dry bed, food, water and a wallow.

NATURE JOURNAL

1. Draw a pig. Label its snout, ears, curly tail and hooves.
2. Draw a sow with her piglets.
3. Write three ways pigs are clever.

From history. In early America, many farm families kept a pig or two. The pigs ate leftover milk, garden scraps and acorns in the woods, so nothing went to waste.

COMMON MISTAKES

- Thinking pigs are dirty. They roll in mud to stay cool, but they keep their beds clean.
- Putting fingers through a pig fence. Pigs explore with their mouths and may nip.

Make it a game • Pig Pen Planner. Draw a pig pen on paper with your grown-up. Choose what goes in: shade, a mud wallow, food, clean water and a shelter. Explain each choice. Your grown-up asks why pigs roll in mud, and you answer: to keep cool. Then say what snout, sow and litter mean using only your own words.

6.4 HONEYBEES: QUEEN, WORKERS AND DRONES

OBJECTIVES

- Name the three kinds of honeybees: queen, worker and drone.
- Tell the jobs of worker bees.
- Tell how bees help flowers and make honey.

Warm-up. Honey tasting. Give your child a little spoonful of honey. Look at it in the light, smell it and taste it. Ask, “Where does honey come from? How do you think the bees make it?” (Do not give honey to babies under one year old.)

WATCH

Busy Bees! | Bumblebees and Honeybees | Amazing Animals | SciShow Kids

SciShow Kids · 4:00

<https://www.youtube.com/watch?v=ta154f5Rp5Y>

WHEN TO WATCH

After the core ideas. Pause at the hive and ask your child to name the three kinds of bees that live inside.

BACKUP VIDEO

Honeybees Inside the Hive

AmericanHoneyQueen · 2:06

<https://www.youtube.com/watch?v=b0iirSRd8hg>

In session 2, for a close look at real bees working on the comb.

KEY TERMS

queen bee

The one mother bee in the hive. She lays all the eggs.

drone

A male bee. Drones do not gather food and have no stinger.

worker bee

A female bee that does all the work of the hive: cleaning, feeding, building, guarding and gathering food.

nectar

Sweet juice inside flowers. Bees turn it into honey.

CORE IDEAS

A honeybee hive is like a big family that works together. It has three kinds of bees.

There is one **queen bee**. She is the mother of the whole hive and is longer than the others. Her job is to lay eggs: in spring and summer she can lay more than a thousand eggs a day!

Most of the bees, thousands of them, are **worker bees**. They are all females, and they change jobs as they grow older. Young workers clean the cells and feed the baby bees. Then they build wax comb and guard the door. Older workers fly out to gather **nectar** and pollen from flowers.

A few bees are **drones**, the males. They are big and have large eyes. They do not gather food and they have no stinger. Their job is to help young queens start new hives.

Bees turn nectar into honey and store it in six-sided wax cells for winter food. As they visit flowers, they carry pollen from flower to flower, which helps apples, berries and many other foods grow. Beekeepers wear veils and gloves and use gentle smoke to calm the bees when they open the hive.

PICTURE STUDY



The Beekeepers, Pieter Bruegel the Elder, about 1568 · Pen and ink drawing · Kupferstichkabinett, Berlin

Image: [Wikimedia Commons](#), public domain

Pieter Bruegel drew these beekeepers more than four hundred years ago in the Netherlands. In those days, bees lived in hives woven from straw, called skeps. Look at how the beekeepers protected themselves.

Look closely

- Find the straw hives, the skeps. How many can you count?
- Look at the beekeepers' faces. What are they wearing to protect them?
- Find a beekeeper carrying a skep. How is he holding it?
- Find the boy in the tree. What do you think he is doing?

Talk about it

1. Why do beekeepers cover their faces and hands?
2. How are these old straw skeps different from the wooden boxes beekeepers use today?
3. What do you think is inside each skep?

Safety first. Never touch or swat at a bee. If a bee lands on you, stay calm and still, and it will usually fly away. Only open a hive with a trained adult beekeeper and protective gear. If someone is stung and has trouble breathing or swelling of the face, get an adult and call for help right away. Never give honey to a baby under one year old.

HANDS-ON PROJECT

A Paper Beehive

You will make a honeycomb from paper and show the jobs of the queen, workers and drones, then watch real bees at work on flowers.

You will need

- Yellow paper and a hexagon (six-sided) shape to trace, about 2 inches across
- Scissors and glue
- A large sheet of paper
- Crayons or markers
- A sunny patch of flowers to watch (a garden, a park or a flowering tree)

Steps

1. Trace and cut out about twelve yellow hexagons.
2. Glue them side by side on the big paper so they fit together with no gaps, like real honeycomb.
3. In some cells, draw honey. In some, draw tiny eggs. In some, draw yellow pollen.
4. Draw the queen (long body) laying an egg in one cell.
5. Draw worker bees around the comb doing jobs: cleaning, feeding baby bees, guarding the door, bringing nectar.
6. Draw one or two big-eyed drones.
7. Go outside on a warm, sunny day and watch bees on flowers from about a step away. Look for yellow pollen balls on their back legs. Count how many flowers one bee visits.
8. Tell a parent what each kind of bee does.

Tips

- Hexagons fit together perfectly with no wasted space. That is why bees build them!

- Bees are calm when they are busy on flowers. Watch quietly and do not wave your arms.

Check your work

- ☐ I can name the queen, the workers and the drones.
- ☐ I can tell three jobs of worker bees.
- ☐ I watched real bees on flowers safely.

NATURE JOURNAL

1. Draw a honeybee large. Label its head, wings, six legs, stripes and pollen baskets.
2. Draw a queen, a worker and a drone side by side, showing their different sizes.
3. Draw a flower and a bee visiting it. Write the date and the kind of flower.

From history. In 1851, a minister in Pennsylvania named Lorenzo Langstroth invented the wooden beehive with frames that lift out like pages in a book. Beekeepers could finally look inside the hive and take honey without harming the bees, and most beekeepers still use his design today.

COMMON MISTAKES

- Thinking the queen is the boss who gives orders. She lays the eggs; the workers decide most things together.
- Swatting at bees. That makes them feel threatened. Stay calm and still.

Make it a game • Hive Jobs Charades. Take turns acting out a bee in the hive without words. Be the queen laying eggs, a worker feeding the young, cleaning the cells, making honey, guarding the door or collecting nectar, or a drone. Your grown-up guesses. Then count how many different worker jobs you can name in thirty seconds.

Scripture. “sweeter also than honey and the honeycomb.” (Psalms 19:10, KJV)

The psalm says that God’s words are sweeter than honey. Honey is one of God’s sweetest gifts, made by His busy bees.

UNIT 6

FARM ANIMALS AND BEES

Early spring is a busy time on the farm: chicks hatch, lambs are born, and the bees wake up and fly to the first flowers. In this unit your child follows a chicken's egg to a chick and a laying hen, learns how sheep's wool becomes yarn, meets the clever, clean-when-they-can pig, and visits the honeybee family of one queen, many workers and a few drones.

Picture study includes Hondecoeter's hen with her chicks, Millet's shepherdess and her flock, Morland's pigs in the straw, and Bruegel's beekeepers. No farm animals are needed at home. A farm visit, a county fair or a 4-H show is a wonderful field trip for this unit, and a library book works too.

PREREQUISITES

- Unit 4 (what animals need)
- No farm or animals needed
- A farm, fair or beekeeper visit is helpful but optional

MASTERY CHECKLIST

- ☐ I can tell the life cycle of a chicken: egg, chick, young hen, hen.
- ☐ I can tell how wool goes from a sheep to a sweater.
- ☐ I can tell what pigs eat and how they stay cool.
- ☐ I can name the three kinds of honeybees and tell what each one does.
- ☐ I know the safety rules for farm animals and bees.

LESSONS IN THIS UNIT

6.1 The Chicken Life Cycle

2 sessions of 30 minutes

6.2 Sheep and Wool

2 sessions of 30 minutes

6.3 Pigs on the Farm

2 sessions of 30 minutes

6.4 Honeybees: Queen, Workers and Drones

2 sessions of 30 minutes

UNIT 6 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have the egg-to-hen wheel, the piece of yarn, the pig pen, the paper beehive and the four pictures from this unit ready.

1. Turn your wheel and tell me the life cycle of a chicken. How long does a chick grow inside its egg?
2. How does wool get from a sheep to a sweater?
3. Why do pigs roll in mud?
4. Point to the queen, a worker and a drone on your beehive. What does each one do?
5. Look at Bruegel's *The Beekeepers*. Why are the beekeepers covered up?
6. What should you always do after touching chickens, sheep or pigs?

ANSWER KEY

1. Egg, chick hatching, fluffy chick, grown hen who lays eggs. It grows for 21 days.
2. The sheep is sheared, the wool is washed, combed (carded), spun into yarn, and knitted or woven.
3. Pigs cannot sweat, so mud keeps them cool and protects their skin from sunburn and bugs.
4. The queen lays eggs. Workers clean, feed babies, build comb, guard and gather nectar and pollen. Drones are males that help young queens start new hives; they do not gather food.
5. To protect their faces and hands from bee stings.
6. Wash your hands with soap and water.

PORTFOLIO PIECE: MY FARM VISIT JOURNAL

Visit a farm, a county fair, a 4-H show, a farmers' market with a beekeeper, or a petting farm. (If no visit is possible, use library books.) Make a journal of at least four pages: one each for chickens, sheep, pigs and bees. On each page, draw the animal, write or tell one thing it gives us or does, and one thing it needs from its farmer every day. Add your piece of handspun yarn.

LOOK FOR	WHAT IT MEANS
Four animals	Has a page for chickens, sheep, pigs and bees with a careful drawing of each.
Care and gifts	Tells what each animal needs and what it gives or does (eggs, wool, honey, pollination).
Real observation	Includes something your child saw or heard on a real visit, or from a book, with the date.
Safety	Can tell the hand-washing and bee safety rules.

UNIT 7

LET'S PLANT!

Spring is planting time. In this unit your child learns why plants in pots need potting mix and drainage holes, starts seeds indoors in a tray on the windowsill, hardens off and transplants the seedlings into the garden or a big pot, and plans a square-foot garden, one square at a time.

Picture study includes Van Gogh's little flowerpot of chives, Emilie Mundt's sunny windowsill of potted plants, Millet's potato planters and Pissarro's kitchen garden. Shift these lessons to your own frost dates: start seeds indoors about four to six weeks before your last spring frost, and move tender plants outside only after that date.

PREREQUISITES

- Unit 5 (seeds, light, water and roots)
- Unit 3 (soil)
- A sunny window; a garden bed or a large pot outdoors is helpful but not required

MASTERY CHECKLIST

- ☐ I can tell why pots need drainage holes and potting mix.
- ☐ I can plant seeds at the right depth and keep them damp and warm.
- ☐ I can harden off and transplant a seedling gently.
- ☐ I can plan a square-foot garden and tell how many plants fit in a square.

LESSONS IN THIS UNIT

7.1 Potting Soil and Pots with Holes

2 sessions of 30 minutes

7.2 Starting Seeds Indoors

2 sessions of 30 minutes

7.3 Transplanting Seedlings

2 sessions of 30 minutes

7.4 A Square-Foot Garden Plan

2 sessions of 30 minutes

UNIT 7 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have a pot, the seed tray, the garden plan and the four pictures from this unit ready.

1. Why does a pot need a hole in the bottom?
2. Why do we use potting mix in a pot instead of dirt from the yard?
3. Why do gardeners start tomatoes indoors before the last frost?
4. What is hardening off? Show me how to hold a seedling when you transplant it.
5. In a square-foot garden, how many tomatoes fit in a square? How many lettuces? How many radishes?
6. Look at Millet's *Potato Planters*. What jobs are the man and woman doing?

ANSWER KEY

1. So extra water can drain out. Otherwise the roots sit in water, get no air, and rot.
2. Potting mix is light and fluffy and lets air reach the roots. Garden soil packs down hard in a pot.
3. Tomatoes need a long warm season, and frost would kill them outside, so they get a head start indoors where it is warm.
4. Getting seedlings used to outdoors a little more each day for about a week. Hold it by a leaf and the root ball, never the stem.
5. One tomato, four lettuces, sixteen radishes.
6. The man digs holes with a hoe and the woman drops seed potatoes into them.

PORTFOLIO PIECE: MY SQUARE-FOOT GARDEN (OR GARDEN POT)

Plant and care for your square-foot garden, or a big pot garden, for at least three weeks. Keep your colored garden plan, a photo of the garden on planting day, and a photo or drawing three weeks later. Show your family which squares sprouted, which did not, and what you will try next time.

LOOK FOR	WHAT IT MEANS
A good plan	Made a clear plan with the right number of plants per square and tall plants on the north side.
Careful planting	Planted seeds at the right depth and transplants gently, with labels.
Faithful care	Checked and watered the garden without reminders for three weeks.
Looking back	Can tell what grew well and what to change next time.
Show-and-tell exhibit	Set out one healthy, labeled plant or pot with a photo of the garden and told visitors how it was grown, as at a county fair table.

7.1 POTTING SOIL AND POTS WITH HOLES

OBJECTIVES

- Tell why every pot needs a drainage hole.
- Tell the difference between potting mix and garden soil.
- Fill a pot correctly and plant a seed or small plant in it.

Warm-up. Drip test. Take two paper cups. Poke three holes in the bottom of one with a pencil (an adult can help). Fill both with water over the sink. What happens? Ask, “Which cup would be better for a plant’s roots? Why?”

WATCH

Grow Your Own Plants! - #sciencegoals

SciShow Kids · 5:31

<https://www.youtube.com/watch?v=Lly75dEbXE8>

WHEN TO WATCH

After the warm-up and core ideas, before you fill your own pots.

BACKUP VIDEO

Know This~Potting Mix vs Garden Soil Tips How to Container Garden Grow in Pots Buckets Tote & Ground

Robbie and Gary Gardening Easy · 3:14

<https://www.youtube.com/watch?v=g-h-05e3ksA>

For parent and child together, to see the difference between potting mix and garden soil.

KEY TERMS

drainage hole

A hole in the bottom of a pot that lets extra water run out.

potting mix

A light, fluffy soil made for pots. It holds water but also lets air reach the roots.

container

Anything a plant can grow in: a pot, a bucket, a box or a cup.

CORE IDEAS

Plants can grow in all kinds of **containers**: clay pots, plastic pots, buckets, even old boots! But every container needs a **drainage hole** in the bottom.

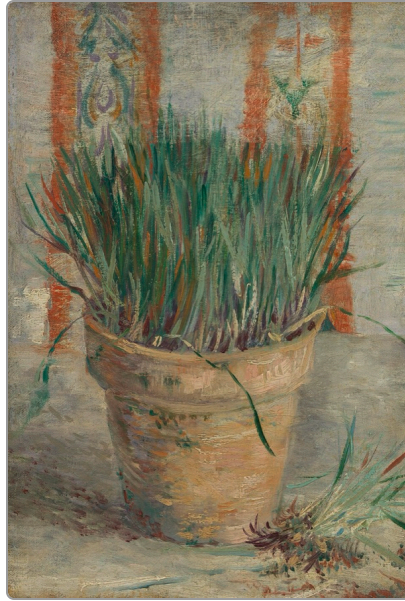
Roots need water, but they also need air. If water cannot drain out, it fills up the bottom of the pot and pushes out all the air. The roots drown and rot, and the plant dies. A drainage hole lets the extra water run out.

Pots also need the right soil. Garden soil from the ground gets hard and packed down in a pot. **Potting mix** is light and fluffy. It is made of things like peat or coconut fiber, compost, and little white bits of perlite that keep air spaces open.

To plant a pot: put a saucer underneath, fill the pot with damp potting mix to about an inch below the rim, plant, and water slowly until a little water runs out of the hole. Then empty the saucer.

A plant in a pot depends on you for everything. Check it every day: push a finger into the soil, and water when the top feels dry.

PICTURE STUDY



Flowerpot with Garlic Chives, Vincent van Gogh, 1887 · Oil on canvas · Van Gogh Museum, Amsterdam

Image: [Wikimedia Commons](#), public domain

Van Gogh painted this little pot of chives, an herb, while living in Paris. Even a small pot on a table can grow something good to eat. Look closely at the pot and the plant.

Look closely

- Find the pot. What is it made of? What color is it?
- Look at the chive leaves. Are they wide or thin? Straight or bending?
- Look at the soil. Can you see it, or is it hidden?
- Look at the background. How did Van Gogh paint it?

Talk about it

1. Do you think this pot has a drainage hole? Why does it need one?
2. Where would be the best place in a house to keep this pot?
3. Chives are good to eat. What other plants could you grow in a pot to eat?

Safety first. Wear gloves or wash your hands after handling potting mix. Do not breathe in the dust from a dry bag; dampen the mix first. An adult makes holes in containers with a nail or drill.

HANDS-ON PROJECT

My First Pot

You will choose a container, make sure it drains, fill it with potting mix and plant something that will grow on your windowsill.

You will need

- A small pot with a drainage hole, or a yogurt cup, tin can or milk carton (an adult pokes holes)
- A saucer or lid to catch water
- Potting mix
- A bowl and some water
- Seeds (lettuce, radish, basil or marigold) or a small herb plant from a garden center
- A craft stick and a marker for a label

Steps

1. Check your container. Does it have a drainage hole? If not, ask an adult to make two or three holes in the bottom.
2. Pour potting mix into a bowl and add a little water. Mix it with your hands until it feels like a damp, squeezed-out sponge.
3. Fill the pot with damp mix to about an inch below the rim. Press it down gently, not hard.
4. Plant your seeds. A good rule: plant a seed about two or three times as deep as the seed is wide. Tiny seeds just get a sprinkle of mix on top. Or plant a small herb at the same depth it was growing before.
5. Write the plant's name and the date on your craft-stick label and push it into the pot.
6. Set the pot on its saucer. Water slowly until a little water comes out the bottom. Empty the saucer after a few minutes.
7. Put the pot in your sunniest window. Check it every day with your finger.

Tips

- Lettuce and radishes sprout in just a few days and are fun to watch.

- A pot without a saucer can sit in a baking pan on the windowsill.
- A healthy potted plant is a classic county fair exhibit. Judges look for a clean pot, healthy green leaves, no bugs, and a neat label. Older children enter plants for judging; 4-H Cloverbuds set out display-only plants for a participation ribbon. Check your fair book.

Check your work

- ☐ My pot has a drainage hole.
- ☐ I used potting mix, not garden dirt.
- ☐ I planted, labeled and watered my pot.

NATURE JOURNAL

1. Draw your pot from the side, like an X-ray: show the soil, the seed, and water draining out the hole.
2. Draw two pots: one with a hole and healthy roots, one without a hole and soggy roots.
3. Start a new growth log for your pot. Write the date you planted.

COMMON MISTAKES

- Using a pretty pot with no hole. Put a plastic pot with holes inside it instead.
- Packing the soil down hard. Roots need the air spaces.

Make it a game • Pot or Garden Soil?. Your grown-up holds up a clean pot with a hole and a bowl without one. Say which is right and why: water needs a way out. Then pick between potting mix and garden soil for three plants, explaining that potting mix is light and fluffy. Keep score of your correct answers.

7.2 STARTING SEEDS INDOORS

OBJECTIVES

- Tell why gardeners start some seeds indoors before the last frost.
- Plant seeds in a seed tray or cups and keep them warm and damp.
- Care for seedlings with light, gentle watering and turning.

Warm-up. Frost or no frost? Ask your child what happens to water left outside on a freezing night (it turns to ice). Explain that a tender tomato or pepper plant is mostly water, so frost hurts it badly. Find your area's last spring frost date together on a calendar and circle it.

WATCH

How To Grow Tomatoes Part 2 - Transplanting Seedlings

The Ripe Tomato Farms • 8:10

<https://www.youtube.com/watch?v=2TwdTYI-7bk>

WHEN TO WATCH

Before the hands-on project. A tomato grower fills seed cells, sows seeds, waters from below and later moves the seedlings into bigger pots. Pause after each step and copy him.

Note: Made for adult gardeners; the first part shows sowing and the second part shows potting up young seedlings.

BACKUP VIDEO

Seed Starting Herbs, Flowers, & Vegetables Indoors (A Complete Beginners 2025 Class)

Gary Pilarchik (The Rusted Garden) • 5:39

<https://www.youtube.com/watch?v=-v38F6bEqVQ>

Any time this week, to see a whole home seed-starting shelf with lights and many kinds of seedlings.

KEY TERMS

frost

Ice that forms on plants and the ground on a freezing night. It can kill tender plants.

seedling

A young plant just grown from a seed.

seed tray

A tray of small cells or pots for starting many seeds at once.

CORE IDEAS

Some vegetables, like tomatoes and peppers, need a long, warm summer to make fruit. But outside, there can be **frost** until late spring. So gardeners give them a head start by planting seeds indoors, where it is warm, about four to six weeks before the last frost.

Seeds need warmth and moisture to sprout. Plant them in small cups or a **seed tray** filled with damp seed-starting mix. Cover the tray with a clear lid or plastic wrap to keep it moist, like a little greenhouse, until the seeds come up.

As soon as the **seedlings** come up, take the cover off and give them lots of light: your sunniest window, or a simple grow light a few inches above them. Without enough light they grow tall, thin and floppy.

Water seedlings gently, from the bottom if you can: pour water into the tray and let the soil drink it up. Turn windowsill seedlings every day so they grow straight.

Not every seed must start indoors. Beans, peas, radishes, carrots and sunflowers grow best when planted right in the garden.

PICTURE STUDY



Potted Plants and a Canary on a Windowsill, Emilie Mundt, 1919 · Oil on canvas · Denmark

Image: [Wikimedia Commons](#), public domain

Emilie Mundt was a Danish painter. In cold countries like Denmark, people have always used their sunny windowsills to grow plants indoors. Here pots line a window where the light comes streaming in.

Look closely

- Count the pots. What is under each one to catch the water?
- Find the yellow tulips and the pink flowers. Are their leaves green and healthy?
- Find the little canary. Where is it?
- Look at the light. Which way are the tulips leaning?

Talk about it

1. Why is a windowsill a good place to start seeds in late winter?
2. What would happen to these plants if they were moved outside on a frosty night?
3. Which window in your home gets the most sun?

Safety first. Keep seed trays away from the edge of counters. If you use a grow light or heat mat, an adult sets it up and keeps cords away from water. Wash your hands after handling seed-starting mix.

HANDS-ON PROJECT

A Seed Tray on the Windowsill

You will plant a tray of seeds indoors, care for them every day, and grow seedlings to plant outside in the next lesson.

You will need

- A seed tray with cells, or an egg carton or six paper cups with holes poked in them
- Seed-starting mix or fine potting mix, dampened
- Seeds: tomatoes, peppers, marigolds or basil (and some of your saved seeds from Unit 1)
- A tray to hold everything, and plastic wrap or a clear lid
- Labels and a marker
- A spray bottle

Steps

1. Fill each cell or cup with damp seed-starting mix. Press it down gently.
2. Make a little hole in each with a pencil tip, about a quarter inch deep for tomato and pepper seeds.
3. Drop two seeds in each hole. Cover them with mix and pat gently.
4. Label each row with the plant's name and the date.
5. Mist the top with the spray bottle. Cover the tray with plastic wrap or a clear lid and set it in a warm place, like the top of the refrigerator.
6. Check every day. When the first green loops poke up, take off the cover and move the tray to your sunniest window (or under a grow light).
7. Water from the bottom by pouring a little water into the tray. Turn the tray every day.
8. When each cell has two seedlings, snip the smaller one with scissors so the stronger one has room.

Tips

- Tomato seeds sprout in about a week in a warm room. Peppers can take two weeks; be patient.
- If the seedlings get tall and floppy, they need more light. Move them closer to the window or the light.
- Plant a few extra cells and give the seedlings to a neighbor, a grandparent or your church's garden. Giving away what you grow is a good gift.

Check your work

- ☐ I planted seeds at the right depth and labeled them.
- ☐ I kept them warm and damp until they sprouted.
- ☐ I give my seedlings light and water and turn them every day.

NATURE JOURNAL

1. Draw your seed tray from above. Write which seed is in each row.
2. Growth log: each time you check, write the date and how many seeds have come up.
3. Draw a seedling and label its stem, seed leaves and first true leaves.

COMMON MISTAKES

- Leaving the cover on after the seeds sprout. The seedlings need air and light.
- Planting seeds too deep. Tiny seeds need only a thin blanket of soil.

Make it a game • Indoor Seed Starter Steps. Put four cards in a mixed-up pile: fill, plant, water and place in warmth. Put them in the right order and explain each step. Then ask your grown-up why gardeners start some seeds indoors before the last frost. If you are wrong, your grown-up gives a hint and you try again.

7.3 TRANSPLANTING SEEDLINGS

OBJECTIVES

- Tell what hardening off is and why seedlings need it.
- Transplant a seedling gently, holding it by a leaf, not the stem.
- Water in a new transplant and protect it.

Warm-up. Gentle hands. Give your child a cooked noodle or a strand of cooked spaghetti. Ask them to pick it up and move it to a plate without breaking it. Then explain that a seedling's stem is just as tender. We hold a seedling by its leaf, because a plant can grow a new leaf but not a new stem.

WATCH

Transplanting Tomatoes 101: Simple & Fast Method

Epic Gardening • 4:00

https://www.youtube.com/watch?v=a_-Tucz0Bns

WHEN TO WATCH

Before the hands-on project. Pause when he digs the hole and when he waters, and talk about each step.

KEY TERMS

transplant

To move a plant from one place to another, like from a seed tray to the garden.

harden off

To get indoor seedlings used to the outdoors a little at a time over about a week.

root ball

The clump of roots and soil that comes out of the pot together.

CORE IDEAS

Seedlings grown indoors have lived a soft life: no wind, no hot sun, no cold nights. If we move them outside all at once, they can wilt or burn. So we **harden them off**.

To harden off, set the seedlings outside in a shady, sheltered spot for an hour on the first day. Each day, leave them out a little longer and give them a little more sun.

After about a week, they can stay out all day and night.

To **transplant**, wait until after your last frost, on a cloudy day or in the evening.

Water the seedling first. Dig a hole a little bigger than the pot. Gently squeeze the pot and tip the seedling out, holding the **root ball** and a leaf, never the stem.

Set it in the hole at the same depth it grew before. (Tomatoes are special; you can bury them deeper, and they grow extra roots along the buried stem.) Fill in soil around it and press gently. Then water it well to settle the soil around the roots.

For the first few days, the plant may droop a little as its roots settle in. Keep the soil damp, and soon it will stand tall and begin to grow.

PICTURE STUDY



Potato Planters, Jean-François Millet, 1861 · Oil on canvas · Museum of Fine Arts, Boston

Image: [Wikimedia Commons](#), public domain

Millet painted a husband and wife planting potatoes together on a spring day. The man digs the hole and the woman drops in a seed potato. Their baby sleeps in a basket under the tree.

Look closely

- Find the man's tool. What is he doing with it?
- Find what the woman is dropping into the hole.
- Find the baby and the donkey. Where are they resting?
- Look at the soil. Is it freshly dug?

Talk about it

1. Why do you think the man and woman work as a team?
2. What will they need to do after planting so the potatoes grow?
3. How is planting a potato like transplanting a seedling?

Safety first. An adult helps with digging tools; carry a trowel point-down and never swing it. Wear gloves or wash your hands after working in the garden. Wear a hat and sunscreen on sunny days.

HANDS-ON PROJECT

Moving Day for Seedlings

You will harden off your seedlings from Lesson 7.2 and transplant them into the garden or into a larger pot.

You will need

- Your seedlings (or a few young plants from a garden center)
- A garden bed, a raised bed or a large pot (at least 5 gallons for a tomato) filled with potting mix
- A trowel
- A watering can
- Compost (optional)
- Labels

Steps

1. Harden off for a week: Day 1, set the tray outdoors in the shade for one hour. Each day, leave them out longer and in more sun. Bring them in if a cold night is coming.
2. After your last frost date, pick a cloudy day or an evening for moving day.
3. Water the seedlings an hour before you start.
4. Dig a hole a little bigger than the seedling's pot. Add a handful of compost if you have it.
5. Squeeze the sides of the cell and tip the seedling out, holding a leaf and supporting the root ball. Look at the roots!
6. Set it in the hole. Fill soil in around it and press gently with your hands.
7. Water slowly at the base until the soil is soaked.
8. Add a label with the plant name and date. Check your transplant every day this week.

Tips

- No garden? A big pot on a sunny porch or balcony grows a fine tomato or pepper plant.

- If the weather turns cold, cover young transplants overnight with an upside-down bucket or a sheet.

Check your work

- ☐ I hardened off my seedlings for a week.
- ☐ I held the seedling by a leaf and the root ball, not the stem.
- ☐ I watered my transplant well.

NATURE JOURNAL

1. Draw a seedling coming out of its cell. Show the root ball and label it.
2. Make a hardening-off chart: seven days, with how many hours outside each day.
3. Draw your transplant on day 1 and again one week later. Measure it.

COMMON MISTAKES

- Moving seedlings outside without hardening them off. They can wilt and sunburn.
- Grabbing the stem. A bent or crushed stem cannot carry water anymore.

Make it a game • Gentle Transplant Tag. Pretend a spoon is a seedling. Hold it by the leaf end, not the stem, and carry it across the room without dropping it. Your grown-up reminds you about hardening off. Describe the steps in order: a little outside each day, then plant. Each careful trip scores a point.

Scripture. “I have planted, Apollos watered; but God gave the increase.” (1 Corinthians 3:6, KJV)

Gardeners plant and water, but only God makes things grow. We do our part faithfully and trust Him for the rest.

7.4 A SQUARE-FOOT GARDEN PLAN

OBJECTIVES

- Tell what a square-foot garden is.
- Tell how many plants of different kinds fit in one square foot.
- Draw a plan for a 4-foot-by-4-foot garden and plant it (or a pot version).

Warm-up. Measure a square foot. Give your child a ruler. Together, measure and cut a square of paper 12 inches on each side. That is one square foot. Lay it on the floor. Ask, “How many radishes do you think could grow in this square? How many tomato plants?”

WATCH

Start a Garden with SQUARE FOOT GARDENING

Growing In The Garden • 6:05

<https://www.youtube.com/watch?v=oWQ5VwiG-iU>

WHEN TO WATCH

After the warm-up. A home gardener shows her grids, her soil mix and how many plants go in each square. Count the plants in a square with her.

KEY TERMS

square foot

A square 12 inches long on every side.

grid

A pattern of crossing lines that makes rows of squares, like a checkerboard.

spacing

How far apart plants are planted so each one has room to grow.

plan

A drawing that shows what will go where, made before you begin.

CORE IDEAS

A square-foot garden is a small raised bed, often 4 feet by 4 feet, divided into a **grid** of 16 squares, each one **square foot**. You plant something different in each square.

Each plant needs room for its roots and leaves. This is called **spacing**. Big plants get a whole square to themselves; small plants can share.

Here is a simple rule: **1** big plant per square (a tomato, a pepper or a broccoli). **4** medium plants per square (lettuce, marigolds or basil). **9** smaller plants (bush beans, beets or spinach). **16** tiny plants (radishes or carrots).

Before you plant, make a **plan**. Put tall plants on the north side so they will not shade the short ones. Leave room to reach every square without stepping in the bed.

God put Adam in the garden “to dress it and to keep it.” Planning and tending a garden carefully is good and happy work that God gave to people from the very beginning.

PICTURE STUDY



Kitchen Garden at the Hermitage, Pontoise, Camille Pissarro, 1874 • Oil on canvas • National Galleries of Scotland, Edinburgh

Image: [Wikimedia Commons](#), public domain

Camille Pissarro painted the vegetable gardens in his village in France. Families grew food for their tables in neat beds right outside their homes. A garden like this needs a good plan.

Look closely

- Find the beds of green plants. Are they all growing the same thing?
- Find the fence and the paths. Why are they there?
- Look at the trees. Do they have leaves yet? What season do you think it is?
- Look at the houses. How close is the garden to the kitchens?

Talk about it

1. How did these gardeners decide where to plant each vegetable?
2. What would you plant in a garden like this?
3. How is this garden like a square-foot garden? How is it different?

Safety first. An adult helps build or fill a raised bed. Wear gloves when handling soil and compost. Never eat anything from the garden until an adult says it is ready and has washed it.

HANDS-ON PROJECT

My Square-Foot Garden

You will draw a plan for a 16-square garden and then plant it, in a garden bed, or as a small 2-by-2 version in a big tub or box.

You will need

- Graph paper or a sheet of paper with a 4-by-4 grid drawn on it
- Colored pencils
- Seed packets and transplants from Lesson 7.3
- A 4-foot-by-4-foot bed, or a large tub or box at least 2 feet square and 8 inches deep, filled with a mix of potting mix and compost
- String or thin wooden strips to mark the grid
- A ruler

Steps

1. Draw a 4-by-4 grid on your paper. Write N at the top for north.
2. Choose what to grow. Put tall plants (tomatoes, sunflowers) in the top row on the north side.
3. Fill in the other squares: 4 lettuce here, 9 beans there, 16 radishes there, and a square of marigolds to bring helpful insects.
4. In each square, draw dots to show how many plants go in it. Color your plan.
5. In the garden, mark the grid with string or wooden strips.
6. Plant each square to match your plan. Poke holes with your finger in a neat pattern: one in the middle, or 2 by 2, 3 by 3, or 4 by 4.
7. Water gently and label each square.
8. Hang your plan where you can see it and check off each square as it sprouts.

Tips

- Radishes are ready in about four weeks: a quick reward while you wait for the tomatoes.
- No yard? A 2-by-2 grid (four squares) in a big tub on a balcony works the same way.

Check your work

- ☐ I can tell how many plants fit in a square: 1, 4, 9 or 16.
- ☐ I drew a garden plan with tall plants on the north side.
- ☐ I planted my garden to match my plan.

NATURE JOURNAL

1. Draw your finished garden plan in your journal.
2. Each week, color in a square when its seeds come up.
3. Draw one square close up, showing the plants in their neat pattern.

From history. Mel Bartholomew, an engineer who loved gardening, made square-foot gardening popular in the 1970s and 1980s. He wanted a way for busy families with small yards to grow plenty of food with less work and less space.

COMMON MISTAKES

- Planting too many seeds in one square. Follow the 1, 4, 9, 16 rule.
- Putting tall plants on the south side, where they shade the little ones.

Make it a game • Square Foot Packing. Mark a square on paper as one square foot. Your grown-up names a plant and you draw how many fit: one tomato, four lettuces, or sixteen carrots. Check by counting. Then plan a whole garden of four squares with different plants, naming each one. Beat your best count of correct plant numbers.

Scripture. “And the LORD God took the man, and put him into the garden of Eden to dress it and to keep it.” (Genesis 2:15, KJV)

The very first job God gave a person was gardening. When you plan and tend your garden, you are doing the work God gave Adam.

UNIT 7

LET'S PLANT!

Spring is planting time. In this unit your child learns why plants in pots need potting mix and drainage holes, starts seeds indoors in a tray on the windowsill, hardens off and transplants the seedlings into the garden or a big pot, and plans a square-foot garden, one square at a time.

Picture study includes Van Gogh's little flowerpot of chives, Emilie Mundt's sunny windowsill of potted plants, Millet's potato planters and Pissarro's kitchen garden. Shift these lessons to your own frost dates: start seeds indoors about four to six weeks before your last spring frost, and move tender plants outside only after that date.

PREREQUISITES

- Unit 5 (seeds, light, water and roots)
- Unit 3 (soil)
- A sunny window; a garden bed or a large pot outdoors is helpful but not required

MASTERY CHECKLIST

- ☐ I can tell why pots need drainage holes and potting mix.
- ☐ I can plant seeds at the right depth and keep them damp and warm.
- ☐ I can harden off and transplant a seedling gently.
- ☐ I can plan a square-foot garden and tell how many plants fit in a square.

LESSONS IN THIS UNIT

7.1 Potting Soil and Pots with Holes

2 sessions of 30 minutes

7.2 Starting Seeds Indoors

2 sessions of 30 minutes

7.3 Transplanting Seedlings

2 sessions of 30 minutes

7.4 A Square-Foot Garden Plan

2 sessions of 30 minutes

UNIT 7 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have a pot, the seed tray, the garden plan and the four pictures from this unit ready.

1. Why does a pot need a hole in the bottom?
2. Why do we use potting mix in a pot instead of dirt from the yard?
3. Why do gardeners start tomatoes indoors before the last frost?
4. What is hardening off? Show me how to hold a seedling when you transplant it.
5. In a square-foot garden, how many tomatoes fit in a square? How many lettuces? How many radishes?
6. Look at Millet's *Potato Planters*. What jobs are the man and woman doing?

ANSWER KEY

1. So extra water can drain out. Otherwise the roots sit in water, get no air, and rot.
2. Potting mix is light and fluffy and lets air reach the roots. Garden soil packs down hard in a pot.
3. Tomatoes need a long warm season, and frost would kill them outside, so they get a head start indoors where it is warm.
4. Getting seedlings used to outdoors a little more each day for about a week. Hold it by a leaf and the root ball, never the stem.
5. One tomato, four lettuces, sixteen radishes.
6. The man digs holes with a hoe and the woman drops seed potatoes into them.

PORTFOLIO PIECE: MY SQUARE-FOOT GARDEN (OR GARDEN POT)

Plant and care for your square-foot garden, or a big pot garden, for at least three weeks. Keep your colored garden plan, a photo of the garden on planting day, and a photo or drawing three weeks later. Show your family which squares sprouted, which did not, and what you will try next time.

LOOK FOR	WHAT IT MEANS
A good plan	Made a clear plan with the right number of plants per square and tall plants on the north side.
Careful planting	Planted seeds at the right depth and transplants gently, with labels.
Faithful care	Checked and watered the garden without reminders for three weeks.
Looking back	Can tell what grew well and what to change next time.
Show-and-tell exhibit	Set out one healthy, labeled plant or pot with a photo of the garden and told visitors how it was grown, as at a county fair table.

UNIT 8

PLANT PROBLEMS AND GARDEN HELPERS

As the garden grows, troubles come too: thirsty plants and drowning plants, hungry aphids, white powdery mildew and fuzzy mold, and weeds that crowd in. In this unit your child becomes a garden doctor, learning to look closely, find the cause, and help the plant in a gentle way. We also meet the gardener's friends, like the ladybug, who eat the pests for us.

Picture study includes Van Gogh's wheat field in the rain, a ladybird from John Curtis's old insect book, Robert Hooke's microscope drawing of mold, and Dürer's famous patch of weeds. No sprays or poisons are used in this unit; children use their eyes, their hands and a little water.

PREREQUISITES

- Unit 5 (what plants need) and Unit 7 (planting)
- A growing plant to care for, in the garden or in a pot
- A magnifying glass

MASTERY CHECKLIST

- ☐ I can tell the signs of too much and too little water.
- ☐ I can find aphids and tell how ladybugs help.
- ☐ I can spot powdery mildew and mold and tell how to prevent them.
- ☐ I can tell what a weed is and pull one, roots and all.
- ☐ I can look at a sick plant and think like a garden doctor.

LESSONS IN THIS UNIT

8.1 Too Much and Too Little Water

2 sessions of 30 minutes

8.2 Aphids and Ladybugs

2 sessions of 30 minutes

8.3 Powdery Mildew and Mold

2 sessions of 30 minutes

8.4 Weeds

2 sessions of 30 minutes

UNIT 8 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have a potted plant, the journal and the four pictures from this unit ready.

1. Show me how you decide if this plant needs water.
2. How can you tell if a plant has too much water?
3. What are aphids, and how does a ladybug help?
4. Look at Hooke's mold picture. What kind of living thing is mold? How can we keep powdery mildew away?
5. What is a weed? How do you pull one so it does not grow back?
6. Point to a weed in Dürer's *Great Piece of Turf*.

ANSWER KEY

1. The child pushes a finger into the soil to the first knuckle: dry means water deeply, damp means wait.
2. The soil stays soggy, the lower leaves turn yellow, and the plant may wilt even though the soil is wet.
3. Tiny soft insects that suck juice from leaves and stems. Ladybugs and their spiky larvae eat them.
4. A fungus. Give plants room for air to move, water the soil and not the leaves, water in the morning, and remove badly spotted leaves.
5. A plant growing where you do not want it. Pull it slowly and steadily from the base, when the soil is damp, to get the whole root.
6. The child points to the dandelion, plantain or grasses.

PORTFOLIO PIECE: MY GARDEN DOCTOR NOTEBOOK

Make a garden doctor notebook with one page for each plant problem: too much or too little water, aphids, mildew or mold, and weeds. On each page, draw the problem, write or tell its signs, and draw how to help. Then do a real check-up of every plant in your care: look at each one, write what you find, and do what it needs. Add a final page: “Garden Helpers,” with the ladybug and its larva.

LOOK FOR	WHAT IT MEANS
Four problems	Shows water problems, aphids, mildew or mold, and weeds, each with a sign and a gentle fix.
Real check-up	Checked real plants and wrote down what was found, with the date.
Helpers	Includes the ladybug and its larva and tells how they help.
Gentle care	Used water, hands and mulch, not sprays, to help the plants.

8.1 TOO MUCH AND TOO LITTLE WATER

OBJECTIVES

- Tell the signs of a plant that is too dry.
- Tell the signs of a plant that is too wet.
- Use the finger test to decide when to water.

Warm-up. Sponge test. Give your child three kitchen sponges: one dry, one damp (squeezed out) and one dripping wet. Ask, “If these sponges were soil, which one would a plant like best?” (The damp one: it has both water and air.)

WATCH

Watering your vegetable garden

Barnyards & Backyards Wyoming · 5:38

https://www.youtube.com/watch?v=UVV5asXiL_o

WHEN TO WATCH

After the core ideas. A University of Wyoming Extension gardener shows how to tell when you have watered enough. Pause when he digs to check the soil.

BACKUP VIDEO

This Trick Tells You Exactly WHEN To WATER A GARDEN [The Finger Method]

2 Minute Garden Tips · 2:58

<https://www.youtube.com/watch?v=9ZFmGY4fGms>

Before the hands-on project, to learn the finger test.

KEY TERMS

wilt

To droop because the plant does not have enough water (or because its roots are damaged).

overwatering

Giving a plant so much water that its roots cannot get air.

finger test

Pushing your finger into the soil up to the first knuckle to feel whether it is dry or damp.

CORE IDEAS

Water is one of a plant's biggest needs, but plants can get **too little** or **too much**. A good gardener learns to tell the difference.

Too little water: the plant **wilts**; its leaves droop and feel soft and limp. The soil is dry and may pull away from the sides of the pot. Leaf edges can turn brown and crispy. Give it a good, slow drink, and it often perks up in a few hours.

Too much water: the soil stays soggy and may smell sour. The lower leaves turn yellow. The plant may wilt even though the soil is wet, because its roots are drowning and starting to rot. Let the soil dry out, and make sure the pot has a drainage hole.

Use the **finger test**: push your finger into the soil up to the first knuckle. Dry? Water deeply. Damp? Wait. In the garden, water in the morning, at the base of the plants, so the leaves stay dry.

Hot, windy days dry soil fast; cool, cloudy days slowly. That is why a good gardener checks every day but does not water every day.

PICTURE STUDY



Wheat Field in Rain, Vincent van Gogh, 1889 · Oil on canvas · Philadelphia Museum of Art

Image: [Wikimedia Commons](#), public domain

Van Gogh painted this field from his window during a rainstorm. He painted the rain as long, slanting lines across the whole picture. Farmers are glad for rain, but not too much and not too little!

Look closely

- Find the lines of rain. Which way do they slant?
- Find the field. What color is the wheat? Is it ripe yet?
- Find the wall and the little house far away.
- Look at the colors. Does this picture feel warm and dry, or cool and wet?

Talk about it

1. How does rain help this wheat field?
2. What could happen to the field if it rained every day for a month?
3. What would happen if it did not rain all summer?

HANDS-ON PROJECT

Garden Doctor: Watering Check-Up

You will do a watering experiment with three small pots and then give every plant in your care a watering check-up.

You will need

- Three small pots or cups with drainage holes, each with a bean or lettuce seedling (or three cuttings of a sturdy houseplant)
- One cup with no drainage hole
- Labels: “dry,” “just right,” “soggy”
- A watering can
- Nature journal

Steps

1. Label the three plants: “dry,” “just right” and “soggy.” Plant the “soggy” one in the cup with no hole.
2. “Dry”: give it no water for the week.
3. “Just right”: use the finger test every day and water only when the top of the soil is dry.
4. “Soggy”: keep it watered every day so the soil is always wet.
5. Each day, look at all three. Draw them and write what you see: drooping? yellow leaves? standing tall?
6. At the end of the week, rescue the dry and soggy plants: water the dry one deeply, and move the soggy one into a pot with a hole and fresh, damp mix.
7. Give a watering check-up to every plant in your garden or home using the finger test.

Tips

- Pick a hardy plant for this test so it can recover. Beans bounce back well.
- A wilted plant at the hot end of a sunny day may just be resting. Check it again in the cool evening before watering.

Check your work

- ☐ I can tell two signs of too little water.
- ☐ I can tell two signs of too much water.
- ☐ I can use the finger test.

NATURE JOURNAL

1. Draw the three plants side by side at the end of the week. Label each one.
2. Draw a finger in the soil, showing how deep to check.
3. Write today's weather and whether your garden needed water.

COMMON MISTAKES

- Watering a little bit every day no matter what. Check first with your finger.
- Watering the leaves at night. Wet leaves overnight can grow mildew and mold.

Make it a game • Plant Doctor Cards. Draw a happy plant, a dry plant and a soggy plant. Your grown-up describes signs, like crispy leaves or yellow droopy ones. Point to the right plant and tell what to do: water it, or stop and wait. Practice the finger test on a real pot and decide, watering or not.

8.2 APHIDS AND LADYBUGS

OBJECTIVES

- Find aphids on a plant and tell how they hurt it.
- Tell how ladybugs and their young help the garden.
- Remove aphids gently with water or fingers, without sprays.

Warm-up. Bug hunt. Take a magnifying glass outside (or to a houseplant) and look under five leaves and at the tips of new stems. Count every tiny creature you find. Talk about whether each one might be a helper or a pest.

WATCH

Lady Beetles eating Aphids, Aphid Control without pesticides. How to completely remove aphids

Frederick Dunn · 9:38

<https://www.youtube.com/watch?v=P1Pha4DRZNc>

WHEN TO WATCH

After the core ideas. Watch the first five minutes of close-up ladybugs eating aphids; finish the rest if your child is interested.

BACKUP VIDEO

Ladybugs Eating Aphids

Hank Green · 2:44

<https://www.youtube.com/watch?v=0d7rzRFSiPw>

Any time this week. A short, quiet close-up of ladybugs hunting aphids on a plant.

KEY TERMS

aphid

A tiny, soft insect that sucks the juice out of plant leaves and stems.

pest

A creature that harms garden plants.

ladybug

A small round beetle, often red with black spots, that eats aphids. It is also called a lady beetle or ladybird.

larva

The young stage of an insect. A ladybug larva looks like a tiny, spiky alligator.

CORE IDEAS

Aphids are tiny, soft insects, smaller than a grain of rice. They may be green, black, yellow or pink. They crowd together on new leaves and stem tips and suck out the plant's juice, like drinking through a straw.

Too many aphids make leaves curl, wrinkle and turn yellow. Aphids also leave sticky drops on the leaves. They multiply very fast, so a gardener checks under leaves often.

God gave the garden helpers to keep pests in balance. The **ladybug** is one of the best! A grown ladybug can eat dozens of aphids in a day. Its young, the **larva**, looks like a tiny spiky alligator, and it eats even more. If you see one, leave it alone; it is working for you.

Other helpers eat aphids too: lacewings, tiny wasps and some birds. Flowers like marigolds, sweet alyssum and dill invite these helpers to your garden.

To get rid of aphids without sprays, squish them gently with your fingers, wipe them off with a damp cloth, or knock them off with a strong spray of water from a hose or spray bottle. Do this every few days, and let the ladybugs do the rest.

PICTURE STUDY



Ladybird on Milk-Vetch, John Curtis, 1828 · Hand-colored engraving from *British Entomology* · From John Curtis, *British Entomology*, London
Image: [Wikimedia Commons](#), public domain

John Curtis was an English artist and insect scientist. He spent years drawing British insects, each one with the plant where it lives. Here a spotted ladybird, the British name for a ladybug, climbs a leafy stem.

Look closely

- Find the small ladybird on the stem. Then find the big drawing of it. Why did Curtis draw it twice?
- Count the spots on the big ladybird.
- Find the tiny drawings at the bottom. They show parts of the beetle, like a leg and an antenna, through a magnifying glass.
- Look at the leaves. Where on a plant like this might aphids hide?

Talk about it

1. Why would a gardener be happy to see a ladybird on a plant?
2. Why do you think Curtis drew the insect with its plant?
3. How could you draw a ladybug as carefully as Curtis did?

Safety first. Do not use bug sprays or poisons. Wash your hands after handling plants and insects. Ladybugs are harmless, but handle all insects gently and let them go.

HANDS-ON PROJECT

Pest Patrol

You will search your plants for aphids and ladybugs, remove the aphids gently, and keep a pest patrol log.

You will need

- A magnifying glass
- A spray bottle of plain water
- A damp paper towel
- Nature journal and colored pencils
- Plants to check: garden plants, houseplants, roses, or weeds such as milkweed and thistles, which often have aphids

Steps

1. Check the tips of new stems and the undersides of leaves. Look for clusters of tiny soft bugs. Those are aphids.
2. Look for ladybugs, their yellow egg clusters and their spiky larvae nearby. Count them.
3. Draw an aphid and a ladybug larva in your journal, using the magnifying glass.
4. If a plant has many aphids and no helpers, spray the aphids off with a strong spray of water, or wipe them off with the damp paper towel.
5. If ladybugs are already at work, leave them alone and watch them for a few minutes.
6. Check the same plants again in three days. Are there more aphids or fewer? More ladybugs?
7. Keep a pest patrol log: date, plant, number of aphids, number of ladybugs.

Tips

- Ants that climb up and down a plant are often a clue that aphids are there. Ants like the sticky drops aphids leave.
- Plant a few marigolds or let some dill flower to invite ladybugs.

Check your work

- ☐ I can find aphids and tell how they hurt plants.
- ☐ I can find a ladybug and its larva and tell how they help.
- ☐ I removed aphids without sprays.

NATURE JOURNAL

1. Draw the ladybug life cycle: yellow eggs, spiky larva, pupa, grown ladybug.
2. Draw a leaf with aphids on it, using the magnifying glass. Label it.
3. Pest patrol log: date, plant, aphids, ladybugs.

COMMON MISTAKES

- Squishing a ladybug larva because it looks strange. Learn to know it; it is a friend.
- Waiting too long. A few aphids are easy to wipe off; hundreds are hard.

Make it a game • Aphid Patrol Score. Dot twenty tiny aphids on paper with a pencil.

Your grown-up is the ladybug and eats one for each fact you tell about aphids and ladybugs. Say how aphids hurt plants and how ladybug larvae help. Count how many aphids remain. Try to chase them all away in one round.

8.3 POWDERY MILDEW AND MOLD

OBJECTIVES

- Tell that mildew and mold are kinds of fungus.
- Spot powdery mildew on leaves and tell how to slow it down.
- Grow mold safely in a closed bag and observe it.

Warm-up. Mystery spots. Show your child a squash, cucumber, zinnia or lilac leaf with white powdery patches (or a photo of one). Ask, “Is this dust? Is it paint?” Rub a little with a tissue. Explain that it is a living thing growing on the leaf!

WATCH

Powdery Mildew, why it happens, mostly not a worry

Charles Dowding · 4:23

<https://www.youtube.com/watch?v=SaGAlOssmqA>

WHEN TO WATCH

After the core ideas. An experienced English gardener shows powdery mildew on his squash and explains when it matters and when it does not.

KEY TERMS

fungus

A living thing that is not a plant or an animal, such as a mushroom, mold or mildew. More than one are called fungi.

powdery mildew

A white, dusty-looking fungus that grows on leaves.

mold

A fuzzy fungus that grows on old food, damp things and sometimes on plants.

spores

Tiny specks, like seeds, that fungi use to spread. They float in the air.

CORE IDEAS

Mushrooms, mold and mildew are all **fungi**. Fungi are not plants or animals. They cannot make food from sunlight, so they feed on other things. Many fungi are helpers that turn dead leaves into soil, but some make plants sick.

Powdery mildew looks like white flour dusted on leaves. It is common on squash, cucumbers, zinnias and lilacs, especially in late summer when days are warm and nights are cool. A little is not a big worry, but a lot makes leaves turn yellow and die early.

Mold is fuzzy and can be white, gray, green or blue. On plants, gray mold grows on soft, damp, crowded leaves and old flowers. Indoors, mold grows on bread and fruit left too long.

Fungi spread by **spores**, tiny specks that float on the air, too small to see one at a time. They grow best where it is damp and the air does not move.

To help: give plants room so air can move between them, water the soil and not the leaves, water in the morning, and pick off and throw away badly spotted leaves (in the trash, not the compost). Never eat moldy food, and never eat a wild mushroom.

PICTURE STUDY



Blue Mould (Scheme 12 from Micrographia), Robert Hooke, 1665 · Engraving · From Robert Hooke, Micrographia, London

Image: [Wikimedia Commons](#), public domain

Robert Hooke was an English scientist who built one of the first good microscopes. In 1665 he published a book of drawings of tiny things no one had ever seen clearly. This is what blue mold on old leather looked like under his microscope: a little forest!

Look closely

- Find the tall, thin stalks. What is on top of them?
- Find the round balls. Some are closed and some have burst open. What do you think comes out?
- Look at the bottom picture. What do the bumps remind you of?
- Look at how big the mold looks. How big do you think it really was?

Talk about it

1. Why did Hooke need a microscope to see this?
2. How might the tiny specks from the round balls spread the mold?
3. What other tiny things would you like to see under a microscope?

Safety first. Keep your mold experiment sealed in its bag; never open it or sniff it, because mold spores can make people sick, especially anyone with allergies or asthma. Throw the closed bag in the trash when you are done. Never eat moldy food or wild mushrooms. Wash your hands after touching mildewed leaves.

HANDS-ON PROJECT

Mold Garden in a Bag

You will grow mold safely inside a sealed bag to see how fungi grow and spread, and look for powdery mildew in a garden.

You will need

- A slice of bread (homemade or bakery bread molds fastest) and a slice of apple or a strawberry
- Two zip-top bags
- A spray bottle of water
- Tape and a marker
- A magnifying glass
- Nature journal

Steps

1. Rub the bread lightly on a dusty windowsill or the floor to pick up spores. (They are everywhere!)
2. Mist the bread with water until it is damp but not soggy. Put it in a bag with the apple slice.
3. Seal the bag tightly and tape it shut. Write the date on the bag.
4. Make a second bag with a dry slice of bread, sealed the same way.
5. Put both bags in a warm, dark place, like a cupboard.
6. Look through the plastic every two days with the magnifying glass. Do not open the bags! Draw what you see: colors, fuzz, spots.
7. After about two weeks, compare the damp bag and the dry bag. Then throw both closed bags in the trash.
8. Go on a mildew hunt in a garden in late summer: look for white powder on squash, cucumber, zinnia or lilac leaves. Draw it.

Tips

- Store-bought bread often has ingredients that slow mold. It still works, but it may take longer.

- The damp bag molds faster. That is why gardeners keep leaves dry.

Check your work

- ☐ I can tell that mildew and mold are fungi.
- ☐ I can tell two ways to slow down powdery mildew.
- ☐ I grew mold safely in a sealed bag and recorded what I saw.

NATURE JOURNAL

1. Draw your mold bag every two days. Write the date and the colors you see.
2. Draw a leaf with powdery mildew. Label it.
3. Write which bag grew more mold, damp or dry, and why.

From history. Robert Hooke’s book *Micrographia* amazed people in 1665. For the first time they could see the eye of a fly, the point of a needle and the tiny “cells” of cork. Hooke was the first person to use the word “cell” for the tiny boxes that living things are made of.

COMMON MISTAKES

- Opening the mold bag to look closer. Keep it sealed.
- Putting mildewed or moldy plant leaves in the compost. Throw badly sick leaves in the trash.

Make it a game • Mold Fact or Fib. Your grown-up says three things about mold and mildew; one is a fib. Is it a fungus? Does it spread by spores? Does it help plants grow? Catch the fib. Then describe what powdery mildew looks like on a leaf and how to slow it. Look only, never touch or sniff mold.

8.4 WEEDS

OBJECTIVES

- Tell what a weed is and why gardeners remove weeds.
- Name a few common weeds, such as dandelion, clover and crabgrass.
- Pull weeds by the roots and mulch to keep them away.

Warm-up. Crowded table. Put one cookie (or apple slice) on a plate and ask four people to share it. Then give one person their own cookie. Ask, “Who has more to eat?” Explain that weeds crowd garden plants the same way, taking their water, sunlight and food.

WATCH

Know your weeds: how to identify and manage them | The RHS

RHS - Royal Horticultural Society · 4:07

<https://www.youtube.com/watch?v=cGXwkXpaEwY>

WHEN TO WATCH

After the core ideas. Pause on each weed and see whether you have it in your yard.

BACKUP VIDEO

Welcome To The Garden: How to Weed Your Garden

Bonnie Plants · 1:46

<https://www.youtube.com/watch?v=BPNaWvSlkNA>

Right before you go out to weed.

KEY TERMS

weed

A plant growing where the gardener does not want it.

taproot

One long, thick root that goes straight down, like a dandelion's or a carrot's.

mulch

A blanket of straw, leaves or wood chips spread on the soil to keep weeds down and water in.

CORE IDEAS

A **weed** is a plant growing where you do not want it. A sunflower in the vegetable bed may be welcome; grass growing between the carrots is a weed.

Weeds are tough and grow fast. They take the water, sunlight and plant food that our vegetables need. Many weeds also make thousands of seeds, so one weed left to flower can make hundreds more next year.

Some common weeds: **dandelions** with yellow flowers and a long **taproot**; clover with three round leaflets; crabgrass that spreads flat along the ground; and plantain with wide, ribbed leaves.

Pull weeds when they are small and the soil is damp, after a rain or a watering. Grab the weed low, right at the soil, and pull slowly and steadily to get the root. If the root breaks off, many weeds grow back.

After weeding, spread **mulch** around your plants. It blocks light so weed seeds cannot sprout, and it keeps the soil damp. A little weeding every few days is much easier than a lot of weeding once a month.

PICTURE STUDY



Great Piece of Turf, Albrecht Dürer, 1503 · Watercolor and gouache · Albertina, Vienna

Image: [Wikimedia Commons](#), public domain

Albrecht Dürer dug up a clump of ordinary field plants, set it in front of him, and painted it exactly as it was. Most people walk past plants like these without looking. Many of them are the very weeds we find in our gardens today!

Look closely

- Find the dandelion leaves, with their jagged edges like teeth, and the dandelion flower stalks.
- Find the wide, ribbed plantain leaves near the bottom.
- Count how many kinds of grass you can see.
- Look at the bottom of the picture. Can you see the dark, wet soil and the roots?

Talk about it

1. Which of these plants have you seen in your own yard?
2. If this patch grew in the middle of your vegetable garden, what would you do?
3. Why do you think Dürer chose to paint such ordinary plants?

Safety first. Wear gloves when weeding. Some weeds have thorns or prickles, and some, like poison ivy (“leaves of three, let it be”), cause an itchy rash. Ask an adult before pulling any plant you do not know. Never eat a wild plant.

HANDS-ON PROJECT

Weed Patrol and Mulch

You will learn to recognize a few weeds, pull them roots and all, and mulch your garden or a pot to keep new weeds away.

You will need

- Garden gloves
- A small hand fork or weeding tool (adult supervision)
- A bucket
- Mulch: straw, shredded leaves or wood chips
- Nature journal
- Clear tape

Steps

1. Water the bed the day before, or weed after a rain. Damp soil lets roots slide out.
2. Walk through your garden or yard with an adult. Find three kinds of weeds. Ask the adult to make sure each one is safe to touch.
3. Pull one weed: grab it low at the soil and pull slowly and steadily. Did you get the whole root?
4. For a dandelion, loosen the soil beside it with the hand fork first, then pull. Measure the taproot!
5. Weed your square-foot garden or a garden bed. Put the weeds in the bucket. (Weeds without seeds can go in the compost; weeds with seeds go in the trash.)
6. Spread a layer of mulch about two inches deep around your plants, but not touching the stems.
7. Tape one small pressed weed into your journal and label it.

Tips

- Weed for ten minutes every few days. It is a short, good habit.

- No garden? Weed a pot, a flower bed with permission, or the cracks of a sidewalk, and look for weeds on a walk.

Check your work

- ☐ I can tell what a weed is.
- ☐ I can name two weeds.
- ☐ I pulled weeds with their roots and spread mulch.

NATURE JOURNAL

1. Draw a dandelion from flower to taproot. Label the flower, leaves and taproot.
2. Draw three weeds you found and write their names (an adult can help).
3. Draw your garden bed before and after weeding and mulching.

COMMON MISTAKES

- Yanking fast and breaking off the root. Pull slowly and steadily from the base.
- Letting weeds flower and make seeds. Pull them while they are small.

Make it a game • Weed or Wildflower?. Draw a dandelion, clover and crabgrass. Say what a weed is: a plant growing where we do not want it. Your grown-up gives a garden problem and you answer: pull it, with its taproot, or cover with mulch. Name three weeds and how to stop them in sixty seconds.

Scripture. “I went by the field of the slothful, and by the vineyard of the man void of understanding; And, lo, it was all grown over with thorns, and nettles had covered the face thereof, and the stone wall thereof was broken down.” (Proverbs 24:30-31, KJV)

Solomon saw a lazy man’s field full of weeds. A garden needs faithful tending, a little every day, or the weeds take over.

UNIT 8

PLANT PROBLEMS AND GARDEN HELPERS

As the garden grows, troubles come too: thirsty plants and drowning plants, hungry aphids, white powdery mildew and fuzzy mold, and weeds that crowd in. In this unit your child becomes a garden doctor, learning to look closely, find the cause, and help the plant in a gentle way. We also meet the gardener's friends, like the ladybug, who eat the pests for us.

Picture study includes Van Gogh's wheat field in the rain, a ladybird from John Curtis's old insect book, Robert Hooke's microscope drawing of mold, and Dürer's famous patch of weeds. No sprays or poisons are used in this unit; children use their eyes, their hands and a little water.

PREREQUISITES

- Unit 5 (what plants need) and Unit 7 (planting)
- A growing plant to care for, in the garden or in a pot
- A magnifying glass

MASTERY CHECKLIST

- ☐ I can tell the signs of too much and too little water.
- ☐ I can find aphids and tell how ladybugs help.
- ☐ I can spot powdery mildew and mold and tell how to prevent them.
- ☐ I can tell what a weed is and pull one, roots and all.
- ☐ I can look at a sick plant and think like a garden doctor.

LESSONS IN THIS UNIT

8.1 Too Much and Too Little Water

2 sessions of 30 minutes

8.2 Aphids and Ladybugs

2 sessions of 30 minutes

8.3 Powdery Mildew and Mold

2 sessions of 30 minutes

8.4 Weeds

2 sessions of 30 minutes

UNIT 8 REVIEW

A parent asks each question aloud. Your child may answer by pointing, drawing or telling. There are no points; this is a friendly conversation to see what has been learned. Have a potted plant, the journal and the four pictures from this unit ready.

1. Show me how you decide if this plant needs water.
2. How can you tell if a plant has too much water?
3. What are aphids, and how does a ladybug help?
4. Look at Hooke's mold picture. What kind of living thing is mold? How can we keep powdery mildew away?
5. What is a weed? How do you pull one so it does not grow back?
6. Point to a weed in Dürer's *Great Piece of Turf*.

ANSWER KEY

1. The child pushes a finger into the soil to the first knuckle: dry means water deeply, damp means wait.
2. The soil stays soggy, the lower leaves turn yellow, and the plant may wilt even though the soil is wet.
3. Tiny soft insects that suck juice from leaves and stems. Ladybugs and their spiky larvae eat them.
4. A fungus. Give plants room for air to move, water the soil and not the leaves, water in the morning, and remove badly spotted leaves.
5. A plant growing where you do not want it. Pull it slowly and steadily from the base, when the soil is damp, to get the whole root.
6. The child points to the dandelion, plantain or grasses.

PORTFOLIO PIECE: MY GARDEN DOCTOR NOTEBOOK

Make a garden doctor notebook with one page for each plant problem: too much or too little water, aphids, mildew or mold, and weeds. On each page, draw the problem, write or tell its signs, and draw how to help. Then do a real check-up of every plant in your care: look at each one, write what you find, and do what it needs. Add a final page: “Garden Helpers,” with the ladybug and its larva.

LOOK FOR	WHAT IT MEANS
Four problems	Shows water problems, aphids, mildew or mold, and weeds, each with a sign and a gentle fix.
Real check-up	Checked real plants and wrote down what was found, with the date.
Helpers	Includes the ladybug and its larva and tells how they help.
Gentle care	Used water, hands and mulch, not sprays, to help the plants.