

Teacher Guide

Thread B: The Plant and Animal Kingdoms • one day, 9:30–2:00

One-line goal: Every living thing is either a plant or an animal — a plant catches its energy straight from the sun, an animal has to eat — but trace any animal’s dinner back far enough and it always begins with a plant catching sunlight.

This lesson is one long sorting argument. The kids already know living from non-living (B-1) and have sorted living things before (B-2). Today they split the living world into its **two great kingdoms** and learn the two clues that decide every case: *every animal has a mouth and must take in food; every plant has leaves or a broad green surface and makes its own food from light*. The deep idea underneath is **energy** — where a living thing gets it. Plants drink the sun directly; animals must eat, their food is always biological, and every food chain runs back to a plant. So all life on Earth ultimately runs on sunlight.

Deliberately held back: fungi/mushrooms, bacteria, and protozoa are NOT introduced today — BFSU saves them for a later lesson. If a child asks about a mushroom, “that one is a puzzle we solve another day” is the whole answer. Keep today clean: two kingdoms.

Prerequisites: B-1 (living vs. non-living) · B-2 (sorting and classifying living things — the three sorting bins come from B-2, relabeled today).

KEY CONCEPTS (DON’T MISS THESE)

- **Two great kingdoms.** Every living thing is a **plant** or an **animal**. (Mushrooms, germs, and pond-water creatures are held for a later lesson — do not open that door.)
- **The animal clue:** every animal has a **mouth** and a way of taking food IN. If it has a mouth and eats, it is an animal — even coral, even a sponge.
- **The plant clue:** every plant has **leaves or a broad green surface** that makes its own food from light. Needles count. A cactus’s green stem counts. No mouth anywhere.
- **The real dividing line is ENERGY — where it comes from.** A plant absorbs **light energy** straight from the sun. An animal cannot; it must **eat** to get energy.
- **Whatever an animal eats is biological, and every food chain runs back to a plant.** Rabbit eats leaf; fox eats rabbit; trace it back and you always reach a plant catching sunlight. **So all life on Earth ultimately runs on sunlight.**
- **Plants do NOT eat soil.** A plant builds its body from **carbon dioxide + water + a few mineral elements** (photosynthesis). Light is caught, not turned into matter. There is no eaten-out pit under a big tree.
- **“Plant food” is not food.** Fertilizer is natural Earth **minerals** — no energy of its own, so it **won’t burn**. Animal food is biological — it holds the sun’s energy, so it **burns**. (That is what the burn test proves.)
- **Water and air are for BOTH.** Every living thing — plant and animal alike — needs water and air. These are the deliberate “both” cards, the payoff of Game 1.
- **Storybook plants with faces are imaginary.** A real plant has no eyes and no mouth. A talking, blinking flower is make-believe — name it out loud.

VOCABULARY

Key terms: plant kingdom • animal kingdom • energy • sunlight • chlorophyll • photosynthesis • fertilizer • vertebrate • invertebrate

Copywork (binder sheet, printed): plant • animal • energy • sunlight

Kid-sized definitions to use all day: *plant kingdom* — living things that make their own food from light • *animal kingdom* — living things that must eat • *energy* — what makes things go; it comes from the sun • *sunlight* — the light energy a plant catches • *chlorophyll* — the green stuff in a leaf that catches sunlight • *photosynthesis* — how a leaf turns light, air, and water into food • *fertilizer* — mineral “plant food” with no energy of its own • *vertebrate* — an animal with a backbone • *invertebrate* — an animal with no backbone.

ACTIVITIES (KIDS DO)

Game 1 · Trait & Necessity Sort

9:50 · 40 min · worksheet FRONT “both need” row · relabel the three B-2 bins PLANT / ANIMAL / BOTH

The thorough, colour-coded card game. **TRAIT cards (green border)** are a body part or habit — *animal*: eyes, claws, teeth, mouth, legs, “moves on its own”, feathers/fur; *plant*: leaves, roots, stem, “makes its own food (green)”, flowers/seeds. **NECESSITY cards (blue border)** are a thing a living thing needs: sunlight, food, water, air, energy. Deal them around; each child takes a card, decides **PLANT / ANIMAL / BOTH**, places it, and says what it is for — then the circle checks the printed key.

The splits: *Animal only* — eyes, claws, teeth, mouth, legs, moves-on-its-own, feathers/fur, food/eating. *Plant only* — leaves, roots, stem, makes-own-food, flowers/seeds, sunlight (absorbed directly). **BOTH** — water, air, energy (and any moves/alive/grows card). Energy is on BOTH because a plant gets energy from the sun and an animal gets energy from food, but both must have it.

FIND-IT-ON-YOURSELF with every animal-trait card: point to your eyes, feel your teeth, open your mouth, stand on your legs, wiggle — the child is the specimen.

Say: “Sunlight goes in the PLANT bin — a plant drinks it straight. But energy goes in BOTH — because a plant gets its energy FROM the sunlight, and you get yours from your lunch. Everything alive needs energy. Not everything gets it the same way.”

Ending — the payoff: gather the circle around the **BOTH** bin. “These are the things every living thing shares — plant or animal: water, air, energy.” That is the row the child circles on the worksheet FRONT.

Failure modes: the colour borders are a helper, not the answer — always read the WORD too (B&W prints lose the colour). Kids want “sunlight” in BOTH; hold the line — animals do not eat sunlight, they eat food that traces back to it. “Moves” tempts kids toward animal-only; a growing vine moves slowly too — BOTH.

Game 2 · Two-Kingdom Specimen Sort

10:40 · 40 min · worksheet FRONT picture sort · use two of the B-2 bins

A separate game, its own deck of whole-organism photo cards, sorted into just **PLANT** and **ANIMAL**. *Tricky animals that look plant- or rock-like:* coral, sea anemone, sponge, barnacle. *A tricky plant that seems to eat:* Venus flytrap. *Clear animals:* robin, dog, octopus, ant, snake, jellyfish, earthworm. *Clear plants:* oak, cactus, fern, sunflower, grass, pine. **No fungi/mushroom cards** — held for a later lesson, on purpose. Kids sort each card, then name the **one universal feature** that decided it: has a mouth and takes food in → animal; has leaves or a broad green surface and makes its own food → plant.

Defend the tricky ones: coral, anemone, sponge, barnacle → **ANIMAL** (each has a tiny mouth and catches food; no leaves, no green food-making). Venus flytrap → **PLANT** (it snaps, but has **no mouth** — it catches with modified leaves and still makes its own food from light).

Say: “Do not trust how it LOOKS. Ask the two questions: does it have a mouth and eat? Then it’s an animal. Does it have leaves and make its own food from light? Then it’s a plant. Coral looks like a plant — but it eats. Flytrap looks like it eats — but it has no mouth.”

Failure modes: the flytrap and coral will split the room — let the argument run a minute before you settle it; the argument IS the lesson. Do not let “it doesn’t move” push a plant-looking animal into the plant bin

— a barnacle glued to a rock still has a mouth.

Outdoor Walk · “Does a Plant Eat the Soil?”

11:20 · 30 min · no supplies · at a big tree or the garden

A Socratic dialogue, no materials. Ask: “This tree has grown for years. If a tree ate the soil to grow, what would we see under it?” (A big hole. A pit. The ground sinking.) “Is there a pit? Is the tree sinking into a hole it dug with its mouth?” (No.) “So the tree is NOT eating the ground. Then where did all that wood come from?”

Land it honestly: the tree **drinks water** and takes up a **few minerals** through its roots (and drops leaves and nutrients back), but it builds its actual body — all that wood — from **sunlight and air**, by photosynthesis. The soil is where it stands and drinks, not what it eats.

Say: “The tree is mostly made of sunshine and air. Nobody would ever guess.”

Failure modes: no big tree? Any established shrub or a raised garden bed works — same question. Keep it a conversation, not a lecture; let them notice there is no pit themselves.

EXPERIMENTS (TEACHER RUNS; KIDS PREDICT → WATCH → EXPLAIN)

Experiment 1 • The Burn Test — SAFETY STATION

card: experiment-cards/01-burn-test.pdf · 12:40 · 30 min · worksheet BACK predict · ADULT-RUN; kids seated back; long-reach lighter + metal tray + cup of water standing by

Proof that animal food holds the sun's energy and "plant food" does not. Over a metal tray, the adult lights items **one at a time**. Before each, kids **circle their guess**: will it burn, or won't it?

WILL burn (biological — holds energy): a dried orange peel · a plain potato chip (or a shelled peanut) · a saltine cracker or a piece of dry spaghetti.

WON'T burn (Earth minerals — no energy): a pinch of granular garden fertilizer (e.g. Miracle-Gro granules) · a spoonful of table salt · a small pebble · a spoonful of dry garden soil.

Predict → light it → watch → say which pile it belongs to. The chip flares; the cracker chars; the orange peel catches. The fertilizer, salt, pebble, and soil just sit — no energy in them to release.

Say: "The chip caught fire because it is FOOD — biological — and food is packed with the sun's energy, saved up by a plant. The 'plant food' would not burn at all. It is just minerals from the ground. That is the difference between what an animal eats and what we sprinkle on a garden."

Failure modes: do this where a smoke alarm won't scream — a garage, a porch, or under a range hood; crack a window. Dry the orange peel days ahead (fresh peel steams). Damp soil pops and spits — use bone-dry soil. Keep every child a full arm's reach back; the adult holds the lighter the entire time. A pinch of each is plenty — a flare, not a bonfire.

Experiment 2 • Pet Earthworm Care

card: experiment-cards/02-pet-earthworm-care.pdf · 1:10 · 20 min · worksheet BACK draw · bin started at the end of the prior week

The slow, quiet proof. A clear worm bin holds moist soil with a **wilted romaine leaf** laid on top, started the **end of the prior week** so the leaf is already disappearing on the day. Today the kids do two things:

1. **Look in**. The romaine leaf from last week is **shrinking** — ragged, holey, half gone. "Who is eating it? Not the soil — the worms. Worms eat rotting plant matter. They are animals: they have a mouth, and they must eat."
2. **Set up fresh + draw**. Kids build a new bin (or refresh this one): moist soil, a new wilted romaine leaf on top, worms gently added, lid on. On worksheet BACK they draw the leaf **as it looks today (Day 1)** and — feeding it all term — draw it again **next week (Day 7)**, shrunk. Two drawings, not a daily log.

Say: "A worm has no leaves. It cannot make its own food from light. So it must eat — and look what it eats: a plant. Every animal's dinner traces back to a plant. Even down here in the dark."

Failure modes: keep the soil **moist, not soaked** — a drowned bin smells and the worms flee.

Composting/red-wiggler worms, not fishing nightcrawlers. Romaine or lettuce disappears fastest; thick kale stalls. Keep the bin out of direct sun. This is a **Day-1 / Day-7 pair of drawings only** — no day-by-day child tracking.

STRETCH (ranch, adult-run — not part of the core day):

- **A raised salad bed** (~\$40 soil + starts): kids plant, tend, and eat from it all season — living proof a plant builds its whole body from air, water, sun, and a pinch of minerals. Nobody feeds it a hamburger.
- **A compost tumbler** (~\$80) fed kitchen scraps: biological matter (which burns — it has energy) breaks down while a jar of mineral gravel beside it never changes. Later feed the finished compost to the salad bed and close the loop.
- **A backyard chicken run** at feeding time: the animal **MUST** eat, its food always biological, beside garden plants that never eat — the two kingdoms side by side. (Removed from this kit: the light-vs-dark plant test moved to B-11.)

PROMPTS & QUESTIONS (USE ALL DAY)

- Point to any animal in the room (including a child): “How do I KNOW that’s an animal?” (It has a mouth; it eats.)
- “Show me the part of a plant that catches sunlight.” (A leaf — its broad green surface.)
- “A plant never eats. So how does it get big?” (It makes its own food from light, air, and water.)
- “Where did the wood in this tree come from — the dirt?” (No — from sunlight and air.)
- “The rabbit eats grass. The fox eats the rabbit. Where did the fox’s dinner really begin?” (At a plant catching sunlight — trace it all the way back.)
- “Is a mushroom a plant or an animal?” (A puzzle for another day — hold the line.)
- “This storybook flower has eyes and sings. Is that real? How do we know?” (Make-believe — real plants have no faces.)
- “Why did the potato chip burn but the fertilizer didn’t?” (The chip is food — it holds the sun’s energy. Fertilizer is only minerals — no energy.)

WHAT TO WATCH FOR IN DAILY LIFE (SEND HOME)

- **Find the mouth on any animal you meet** — the cat, a bug, a bird, a fish, each other. “Everything with a mouth has to eat. Where does its food come from?”
- **Find the broad green surface on any plant** — a leaf, a blade of grass, a pine needle, a fat cactus. “That green is catching sunlight right now.”
- **Notice there is no eaten-out pit under a big tree** — trace a meal backward at dinner: “chicken ate corn; corn caught sunlight.” Every dinner starts at a plant.
- Point out a **storybook plant with a face** and ask what a real plant is missing.

PREP-AHEAD CHECKLIST (TEACHER-ONLY)

Work back from lesson day (L). The one item with a real deadline is the worm bin — started the week before so the leaf is already disappearing on the day.

- ☐ **L-7 (end of prior week):** ☐ **Start the earthworm bin** — clear bin, moist (not soaked) soil, one **wilted romaine leaf** on top, composting worms, lid with air holes; warm-ish, out of sun ☐ order the two card sets to laminate (colour-coded Trait/Necessity set + two-kingdom specimen set, both with a printed teacher key), the worm bin + composting worms, the long-reach lighter + metal tray, and a small bag of granular fertilizer
- ☐ **L-3 → L-1:** ☐ **print and laminate both card sets** ☐ relabel the three B-2 bins **PLANT / ANIMAL / BOTH** (all three for Game 1, two for Game 2) ☐ **dry an orange peel** so it burns on the day ☐ stage burn items and won’t-burn samples in labeled cups **out of reach** (orange peel, chip/peanut, cracker/spaghetti • fertilizer, salt, pebble, bone-dry soil) ☐ scout the outdoor tree/garden spot ☐ print student sheets ×5 + cards ×1

□ **Morning of:** □ pick one broad **green leaf** for the oration; ready a glass of water for it □ set up the burn SAFETY STATION (metal tray, long-reach lighter, cup of water, near a window or under a range hood; confirm the smoke alarm won't trip) □ bring the week-old worm bin to the table; stage soil + a fresh wilted romaine leaf + worms for the new setup □ lay out the three relabeled bins and both decks with their keys

REVIEW HOOKS

- **Back:** B-1 (living vs. non-living — today we split the *living* into two kingdoms) • B-2 (we sorted living things before — today the sort has a rule: mouth vs. leaf, and the bins come from that lesson).
- **Forward:** the mushroom/germ/pond-creature kingdoms we held back today • B-11 (a whole plant lesson — the light-vs-dark growth test lives there) • vertebrates vs. invertebrates as the next cut *inside* the animal kingdom (backbones).

Opening Oration — The Leaf That Eats the Sun

The Plant and Animal Kingdoms • read aloud, ~3 minutes

Prop: One broad **green leaf**, picked fresh that morning (maple, oak, hosta — anything wide, flat, and green). Hold it up to the window so the light shines through and it glows. This leaf is the plant's **solar panel** — the whole reason a plant is broad and green. Keep it in hand throughout; at the end, stand it in a small glass of water mid-table so it presides over the day.

Look at this. Just a leaf. You have walked past a million of them. But I want you to look at this one like you have never seen a leaf before in your life.

(Hold it up to the light until it glows green.)

It is flat. It is wide. It is green. And every one of those three things is on purpose.

Why so flat and wide? So it can catch as much light as it possibly can — like a little hand held open to the sun. And why green? That green is a secret machine, and it has a name: **chlorophyll**. Its one and only job is to catch sunlight and hold on tight.

Because here is the astonishing thing a plant can do — a thing that you cannot do, and I cannot do, no matter how hard we try. A plant can *eat sunshine*.

It is true. A plant never sits down to dinner. It never takes a bite. Look for its mouth — go on, look — you will not find one, because a plant has no mouth at all. Instead it stands very still in the light and takes three plain things: the **sunlight** from the sky, the air all around it, and a cool drink of water from the ground. And out of nothing but light and air and water, it builds its whole self — root, stem, leaf, and flower. That trick has a big name, **photosynthesis**, and it may be the most important thing that happens anywhere on this whole spinning planet.

Now — can *you* eat sunshine? Stand in the sun all afternoon with your mouth wide open. Will you fill up? No! You will only get hungrier. You have to eat. A rabbit has to eat. A fox, a robin, a whale, an ant, a little worm — every animal that ever lived has to eat. That is the great dividing line of every living thing on Earth.

(Set the leaf down where all can see it.)

A plant catches its energy straight from the sun. An animal has to eat — but chase any animal's dinner far enough back, and it always begins with a plant catching **sunlight**. The rabbit eats the leaf. The fox eats the rabbit. Follow the fox's dinner backward, and backward, and you always, always arrive at a green leaf drinking the sun.

So today we are going to sort the whole living world into its **two great kingdoms** — the plant kingdom and the animal kingdom. We will hunt for the one clue that gives every animal away, and the one clue hidden on every single plant. We will light a chip on fire to prove which foods hold the sun's **energy** inside them — and which ones do not. And we will meet a worm who is quietly eating a leaf, right now, this very week.

But it all begins here, with this. One green leaf, holding up the sun.

B-3 Supply List — The Plant and Animal Kingdoms

Everything for the full 9:30–2 day. The one item with a real deadline is the **earthworm bin**, which must be started **at the end of the prior week** so the wilted romaine leaf is already disappearing on lesson day (see the Teacher Guide Prep-Ahead checklist).

ALREADY HAVE (TYPICAL HOUSEHOLD)

☐	ITEM	USED IN
☐	A broad fresh green leaf (maple, oak, hosta — picked that morning) + a small glass of water to stand it in	Oration prop
☐	Dried orange peel (dry it days ahead so it burns)	Burn test
☐	A plain potato chip (or a shelled peanut)	Burn test
☐	A saltine cracker or a piece of dry spaghetti	Burn test
☐	Table salt (a spoonful)	Burn test — won't-burn pile
☐	A small pebble	Burn test — won't-burn pile
☐	A spoonful of dry garden soil (bone-dry)	Burn test — won't-burn pile
☐	Wilted romaine (or lettuce) leaves — one for last week's bin, one for the fresh setup	Earthworm bin
☐	Potting/garden soil , moist not soaked	Earthworm bin
☐	Metal spoons, small labeled cups/dishes for staging burn items	Burn test
☐	Painter's tape + marker (relabel bins PLANT / ANIMAL / BOTH)	Both card games

TO BUY

☐	ITEM	QTY	~PRICE	WHY	ORDER AHEAD?
☐	Colour-coded Trait/Necessity card set + two-kingdom specimen card set (printed & laminated in house style; both include teacher keys)	1 set each	\$12	Games 1 & 2 — the whole morning sort	YES — laminate before L-1
☐	Clear worm bin + a cup of composting worms (red wigglers)	1	\$25	Earthworm experiment — a keeper the kids feed all term	YES — must arrive before L-7
☐	Long-reach lighter + metal tray	1 each	\$8	Burn test SAFETY STATION	Yes — needed on the day
☐	Small bag of granular fertilizer (e.g. Miracle-Gro granules)	1	\$5	Burn test — the "plant food" that won't burn	Yes

Total new spend: ~\$50.

REUSED — DO NOT RE-BUY

- **The three sorting bins/hoops** come from B-2. Relabel them PLANT / ANIMAL / BOTH for Game 1; use two of them (PLANT / ANIMAL) for Game 2. No new bins needed.

CHECK-YOU-OWN-IT NOTES

- **Green leaf:** pick it the morning of, not the night before — it should still be springy and glow when held to the light.
- **Orange peel:** a fresh peel steams instead of burning. Dry it on a windowsill for a few days, or in a low oven, so it catches cleanly.
- **Soil for the burn test must be bone-dry** — damp soil pops and spits. The bin soil, by contrast, must be moist.
- **Worms:** composting red wigglers, not fishing nightcrawlers — reds eat surface plant scraps, which is the whole point.

STRETCH PURCHASES (ONLY IF PURSUING THE RANCH INSTALLS — SEE TEACHER GUIDE STRETCH)

☐	ITEM	~PRICE	FOR
☐	Raised bed soil + seedling starts	~\$40	A salad bed the kids plant and eat from — a plant building its body from sun, air, water, minerals
☐	Compost tumbler	~\$80	Biological matter breaking down (it burns / has energy) beside mineral gravel that never changes; feeds the salad bed later
☐	Backyard chicken run (assumed owned)	—	The animal that MUST eat, beside plants that never do — the two kingdoms side by side

Tick the box beside each item as it goes in the box. Anything flagged **order ahead** ships — buy it a week before the lesson.