Science, grade 1

All units for this subject and grade (unreviewed AI drafts)

Unreviewed AI drafts. Written by AI agents in AI Village; not checked by a human educator, not classroom-tested, and not aligned to any official standard. Agent peer checks are not educator review. Released under CC0.

Source: https://k12-curriculum-drafts-328176.gitlab.io/ (commit 09103e72, built 2026-11-16)

Grade 1 Science: What Do Plants Need? (5 lessons, about 3 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 4 November 2026. No educator has reviewed or classroom-tested this unit. It is not aligned to any official standard. Check every safety note against your school's rules.

Back to the science progression

Big idea

A seed holds a tiny plant and a packed lunch. With water (and warmth) the seed wakes up and grows, using its packed lunch at first. To keep growing green and strong, the young plant needs light. Plants grow towards light.

Outcomes

By the end of the unit a student can:

1. Point to the baby plant (the shoot and root) and the food store inside a soaked bean seed.
2. Say what a seed needs to start growing (water) and what a young plant needs to grow green and strong (light and water).
3. Make a prediction ("I think...") and then say whether it was right, using what they saw.
4. Compare two plants using a measuring strip or cubes, and with words such as "taller", "shorter", "greener", "paler".
5. Describe a plant bending towards a window and say why.

Prior knowledge

- Kindergarten: living vs non-living; using senses to observe.
- Counting to 20; comparing "longer/shorter".
- No reading is needed; recording is by drawing, stickers and class charts.

Lessons

Lessons are short (25-40 minutes). Lessons 3 and 4 are separated by about a week of waiting while the beans grow; a 5-minute daily "plant check" fills the gap.

Lesson	Title	Main activity
1	What is inside a seed?	Open soaked beans and find the baby plant
2	Planting and predicting	Plant four pots: window/cupboard, watered/dry
3	Plant detectives	Daily checks; first roots and shoots in a bean jar
4	What happened?	Compare the four pots; pale tall cupboard plants
5	Plants reach for light	Turned pot on the windowsill; end-of-unit check

Timeline

- **Day 1:** soak beans overnight (teacher). **Day 2:** lesson 1.
- **Day 3:** lesson 2 (planting) and set up the bean jar for lesson 3.
- **Days 4-10:** 5-minute daily plant checks; lesson 3 on about day 6, when roots show in the jar.
- **About day 12-16:** lesson 4, when the window plants have two or more leaves. Lesson 5 setup can start the same day (turn one window pot).
- **About 3 days later:** lesson 5.

Bean germination time depends on warmth; in a cold classroom it can take two weeks. Plant a few spare pots in case some seeds do not grow.

Materials (whole class unless noted)

- Large bean seeds: dwarf French bean or runner bean seeds from a garden supplier, **untreated** (see Safety). About 40 seeds.
- A shallow dish for soaking; hand lenses (one per pair); paper towels.
- 6 identical small pots (or yoghurt pots with a drainage hole), saucers, peat-free compost, a small watering can or measuring cup.
- 1 clear jar or clear plastic cup, kitchen paper, for the "bean jar".
- A dark cupboard or a large cardboard box that closes.
- Measuring strips (paper strips) or interlocking cubes; class chart paper; stickers or crayons for recording.

Assessment

- Lesson 2: each child's prediction drawing (kept for lesson 4).
- Lesson 4: "Was my prediction right?" talk, recorded by the teacher.
- Lesson 5: an oral/picture check of 6 questions, 6 marks, with an answer guide (in lesson 5).

⚠ Safety (read before lesson 1)

- **Seeds are not food.** Many raw beans contain a natural toxin (phytohaemagglutinin) and can make people ill if eaten raw; red kidney beans have the most (see sources). Tell children "we never eat seeds from the science table", supervise, and count seeds out and back.
- Buy **untreated** seeds. Some garden seeds are coated with pesticide or fungicide (often brightly coloured); do not give those to children.
- Small seeds are a choking risk for young children; large beans are easier to supervise. Know your class's allergies (legume allergy) before handling.
- Wash hands after handling compost and seeds. Use peat-free, bagged compost, not garden soil; wipe up spills.
- Hand lenses: never look at the Sun through them.

Sources

All checked to load on 4 November 2026.

- Wikipedia: Seed

- Wikipedia: Germination
- Wikipedia: Cotyledon (the seed leaves that hold the food store in beans)
- Wikipedia: Radicle (the first root)
- Wikipedia: Root
- Wikipedia: Plant stem
- Wikipedia: Phaseolus vulgaris (common bean)
- Wikipedia: Phytohaemagglutinin (why raw beans are not eaten)
- Wikipedia: Seed treatment (coated seeds)
- Wikipedia: Photosynthesis (teacher background only)
- Wikipedia: Chlorophyll (teacher background only)
- Wikipedia: Etiolation (long, weak, pale stems in the dark)
- Wikipedia: Phototropism (growing towards light)

Known gaps and cautions

- **Labelled simplifications:** "packed lunch" for the food store in the cotyledons; "plants use light to make their food" without the word photosynthesis (that comes in grade 7). Bean seeds do not need light to start growing (some small seeds, such as lettuce, do); children often expect light is needed, which is a useful surprise.
- Four pots is a small, rough comparison, not a proper fair test (that idea is formalised in grade 3). The cupboard is also cooler or warmer than the window, which is a hidden difference worth mentioning to older children.
- Results vary: a seed may fail to grow for reasons nobody can see. Spare pots help; the lesson 4 notes say what to do.
- No images yet; teachers will need to draw or photograph the plants.
- No standards alignment and no educator review.

Lesson 1: What is inside a seed?

Unit overview · Next: Lesson 2

Goal

Children find the baby plant and its food store inside a soaked bean, and learn that a seed is alive but "asleep".

Materials

- Bean seeds soaked overnight in water (2 per pair, plus spares), and a few dry beans for comparison.
- Hand lenses, paper towels, a tray per pair.
- A large drawing of an opened bean on the board (draw it yourself in advance).

Steps

Opening (5 min). Hold up a dry bean. "Is this alive? How could we find out?" Collect ideas without correcting. Then hold up a soaked bean: "This one had a bath overnight. What changed?" (Bigger, softer, wrinkly skin.)

Main activity (20 min).

1. Each pair gets a dry bean and a soaked bean. Compare: size, feel, colour.
2. Show how to rub off the skin (seed coat) of the soaked bean with a thumb.
3. Gently open it along the line into two halves, like a book.
4. Look with the hand lens for the tiny plant tucked at one edge: a little pointed root and a curled pair of tiny leaves.
5. Children draw what they see in a box on a page: "My bean inside".

Discussion questions (with example answers).

- Why did the soaked bean get bigger? It drank / soaked up water.
- What do you think the tiny leaves and root will become? A bean plant.
- The two big fat halves take up most of the bean. What are they for? Children may guess. Then explain: they are the baby plant's packed lunch. It eats this food while it is still under the soil, before it has leaves.
- Is the seed alive? Yes; it is waiting, like it is asleep, until it gets water.

Closing check (5 min, with answers). Point to the board drawing and ask children to show with their finger: the skin (seed coat), the packed lunch (two big halves), the baby root, the baby leaves. Then: "What woke the seed up?" (Water.)

Vocabulary

seed, seed coat, root, shoot, food store ("packed lunch"), soak

Differentiation

- Support: open a bean together as a group; give a picture with labels to stick on.
- Stretch: compare a bean with a soaked pea or a sunflower seed (adult shells it). Is there a baby plant in that one too?

⚠ Safety

Seeds are not food: count beans out and back; wash hands afterwards. Hand lenses never pointed at the Sun.

Teacher notes and misconceptions

- The two halves are the **cotyledons** (seed leaves); in beans they hold the food store. You do not need to teach the word in grade 1.
- Children often think the seed is "dead" because it does not move. The lesson 3 bean jar shows it waking up.
- Keep a few soaked beans in a covered dish on damp paper: some will sprout within days, a nice preview.

Lesson 2: Planting and predicting

Unit overview · Previous: Lesson 1 · Next: Lesson 3

Goal

Children plant beans in four groups of pots and predict which will grow best: light or dark, watered or not watered.

Materials

- 4 pots of the same size (plus 2 spares), filled with the same compost.
- 8 beans (2 per pot), labels, a watering can or measuring cup.
- A sunny windowsill (not right against a radiator) and a dark cupboard or closed box nearby.
- A big class chart with four pictures: sun + watering can, sun + no water, dark + watering can, dark + no water.
- A prediction sheet per child: four pot outlines to draw in.

Steps

Opening (5 min). "Last time we saw that water wakes a seed up. What else might a plant need?" Collect ideas (light, water, soil, sun, food, love...). Say we will test two of them: light and water.

Main activity (20 min).

1. Children help push 2 beans into each pot, about the length of a finger joint deep, and cover them.
2. Label the pots: **A** window + water, **B** window + no water, **C** cupboard + water, **D** cupboard + no water.
3. Water pots A and C with the same amount (for example half a cup). Make a show of not watering B and D.
4. Ask: "What must be the same for all four pots?" (same seeds, same pots, same compost, same number of beans). Only the light and the water change.
5. Put A and B on the windowsill and C and D in the cupboard.
6. Children draw their prediction on their sheet: what will each pot look like in two weeks? Collect sheets for lesson 4.

Discussion questions (with example answers).

- Which pot do you think will grow best? Why? Usually A, "because it has sun and water". Accept any reason.
- Will the beans in the dark cupboard grow at all? Many children say no. Do not correct; this is the surprise in lesson 4.
- Why do we put two beans in each pot? In case one does not grow.

Closing check (5 min, with answers). "What is different about pot C and pot A?" (C is in the dark.) "What is different about pot A and pot B?" (B gets no water.)

Vocabulary

predict, prediction, light, dark, the same, different

Differentiation

- Support: children choose a sticker (happy plant / sad plant / no plant) for each pot instead of drawing.
- Stretch: "If we wanted to know only about light, which two pots should we look at?" (A and C.)

⚠ Safety

Wash hands after handling compost. Wipe up spilled compost and water to prevent slips.

Teacher notes and misconceptions

- From now on, water pots A and C a little every two or three days, the same amount each time. A child can water A; an adult waters C privately, without showing the class, so the lesson 4 reveal stays a surprise. Close the cupboard door again quickly.
- "Plants eat soil" is common. We do not tackle it head on in grade 1, but in lesson 4 you can say that plants make their own food using light.
- Also set up the lesson 3 bean jar today (see lesson 3).

Lesson 3: Plant detectives

Unit overview · Previous: Lesson 2 · Next: Lesson 4

Goal

Children watch a seed wake up in a clear "bean jar", see that the root comes first and grows down, and practise careful daily observation.

Materials

- **Bean jar** (set up on the day of lesson 2): a clear jar or clear plastic cup lined with folded kitchen paper, with 3 soaked beans pushed between the paper and the glass, about halfway up. Keep 2 cm of water in the bottom so the paper stays damp. Keep it in the classroom, out of direct hot sun.
- A "plant detective" diary: one page per day with a box to draw in.
- Paper measuring strips (lesson 4 uses them too).

Daily plant check (5 min, every day from lesson 2 to lesson 4)

1. One child checks the window pots (A and B) and the bean jar and reports: "nothing yet", "something poking up", "leaves!". Pots C and D stay closed in the cupboard until lesson 4; an adult waters C without showing the class.
2. The class adds a sticker or tick on the class chart.
3. Water pots A and C every two or three days, same amount (C by an adult, privately).

Steps (the lesson itself, about day 6, when roots show in the jar)

Opening (5 min). "Detectives look very carefully and write down what they see." Show the jar. "What has happened to our beans?"

Main activity (20 min).

1. Pass the jar round (or let small groups come up) with hand lenses.
2. Children draw the bean jar in their diary: where is the root, where is the shoot?
3. Ask: "Which came out first, the root or the shoot?" (Usually the root.)
4. Teacher turns one bean upside down in the jar (or notes that the beans were placed different ways up). Predict: which way will its root grow tomorrow? Check over the next days: roots turn to grow down, shoots up.
5. Peek at pots A and C (do not dig them up). Are shoots coming up yet?

Discussion questions (with example answers).

- Why might the root come first? To get water and hold the plant in place.
- Which way do roots grow? Which way do shoots grow? Roots down, shoots up, even if the seed is upside down.
- Have the beans in the dry pots (B and D) done anything? Usually nothing; without water the seed does not wake up.

Closing check (5 min, with answers). Show a quick drawing of a sprouting bean. "Point to the root. Point to the shoot. Which way does the root grow?" (Down.)

Vocabulary

root, shoot, sprout, observe, diary

Differentiation

- Support: diary with ready-drawn jar outline; children add the root and shoot.
- Stretch: measure the longest root with a paper strip each day and stick the strips in a row to make a simple bar chart.

⚠ Safety

Wash hands after handling the jar. Mould can grow on very wet paper; if the jar smells or looks fuzzy, replace the paper and beans (adult only) and talk about why (see the grade 6 fungi unit for older students).

Teacher notes and misconceptions

- The first root is called the **radicle**; no need for the word in grade 1.
- If nothing has sprouted after 10 days, the room may be too cold. Move the jar somewhere warmer (not on a radiator).
- Keep the bean jar going: after a week the shoot gets green leaves in the light, which links to lesson 4.

Lesson 4: What happened?

Unit overview · Previous: Lesson 3 · Next: Lesson 5

Goal

Children compare the four pots, use measuring strips and colour words, and check their predictions. They learn that a seed needs water to start growing and a young plant needs light to grow green and strong.

Materials

- Pots A-D (bring C and D out of the cupboard only for this lesson).
- Children's prediction sheets from lesson 2.
- Paper measuring strips or interlocking cubes.
- A green crayon and a pale yellow crayon per group, for recording colour.

Steps

Opening (5 min). Before bringing out the cupboard pots, ask: "What do you think we will find in the cupboard?" Then reveal C and D.

Main activity (20 min).

1. Line up the pots A, B, C, D. Typical results:
2. **A (light + water):** short, sturdy stem; green leaves.
3. **B (light, no water):** nothing, or a dry seed.
4. **C (dark + water):** usually **taller** than A, with a thin floppy stem, tiny leaves and a pale yellow or white colour.
5. **D (dark, no water):** nothing.
6. Groups measure the tallest plant in each pot with a paper strip (hold the strip at the soil, tear or mark it at the top) and stick the strips on the class chart in order. Or count cubes.
7. Groups colour a square for each plant: green or pale yellow.
8. Children look at their prediction sheet: "Was I right? What surprised me?" The teacher writes a few sentences children say on the chart.

Discussion questions (with example answers).

- Why did nothing grow in B and D? No water, so the seeds never woke up.
- Pot C grew in the dark. How could it, without light? It used its packed lunch (the food store from lesson 1).
- Pot C is the tallest. Is it the healthiest? No: it is pale, floppy and has tiny leaves. It was stretching to find light.
- Why is A green? Plants turn green in the light; they use light to make their own food.

Closing check (5 min, with answers).

- "What does a seed need to start growing?" (Water.)
- "What does a young plant need to grow green and strong?" (Light and water.)
- "If we leave pot C in the dark for another month, what will happen?" (It will run out of packed lunch and die; or, if we move it to the window, it may turn green.)

Vocabulary

compare, taller, shorter, green, pale, healthy, surprise

Differentiation

- Support: compare only A and C side by side ("Which is taller? Which is greener?").
- Stretch: move pot C to the window and predict what will change in three days (it usually starts turning green).

⚠ Safety

Wash hands after touching plants and compost.

Teacher notes and misconceptions

- The tall, pale, weak growth in the dark is called **etiolation** (see sources). It surprises many adults too.
- "Tallest = best" is a common idea. Use this lesson to show that a bigger number is not always the better result.
- If a pot failed for no clear reason, say so honestly: "Sometimes a seed does not grow and we do not know why. That is why scientists use more than one seed." Use the spare pots if needed.
- The cupboard can be a different temperature from the windowsill. Grade 1 does not need this, but it is the first hint of a hidden difference, which returns in grade 3 fair tests.
- Turn **one** window pot (A or a spare) now for lesson 5: note which side faces the window, and do not turn it again.
- Optional, for lesson 5: set up the shoebox now. Cut a hole about 3 cm across in one short end, stand the box on its side with the hole facing the window, and put a watered, sprouted bean pot (a spare from lesson 2) inside at the far end. Close the lid. Check daily and close it again straight away.

Lesson 5: Plants reach for light

Unit overview · Previous: Lesson 4

Goal

Children see that bean shoots bend towards the light, explain it in their own words, and show what they have learned in a short picture check.

Materials

- The window pot that was turned at the end of lesson 4 (not turned since). After 2-3 days its shoots lean towards the window.
- Optional: a shoebox with a hole cut in one end, standing on its side with a watered, sprouted bean pot inside (set up at lesson 4; check daily, keep the lid closed between checks).
- End-of-unit picture check (below), one per child or done orally.

Steps

Opening (5 min). Show the leaning pot. "Our plants are leaning. Which way? Why might that be?" Collect ideas.

Main activity (15 min).

1. Ask a child to point where the window is. The shoots lean towards it.
2. Now turn the pot half way round so the shoots lean **away** from the window. Predict: what will they do in the next two days? Draw a prediction.
3. Check over the next two days (in daily plant checks): the tips bend back towards the window.
4. If you set up the shoebox: open it and look. The shoot has grown towards the hole, even round a corner if you added a card wall inside.

Discussion questions (with example answers).

- Why do the plants lean to the window? To get more light; they need light to grow green and strong.
- Remember pot C in the dark. How is that like the shoebox plant? Both stretch to find light.
- Do roots lean to the light too? No, roots grow down into the soil.

Closing: end-of-unit check (15 min). Teacher reads each question aloud; children circle a picture, point, or answer in a word. 1 mark each, 6 marks.

1. Show a drawing of an opened bean. "Point to the baby plant." (Either the tiny root or the tiny leaves at the edge, 1 mark.)
2. "What does a seed need to wake up and start growing: water, a toy, or music?" (Water.)
3. Show two plants: one short and green, one tall and pale. "Which one grew in the dark?" (The tall pale one.)
4. "Which one is healthier?" (The short green one.)
5. Show a pot on a windowsill. "Draw an arrow: which way will the shoots lean?" (Towards the window.)

6. "Finish the sentence: a young plant needs ___ and ___ to grow strong." (Light and water, both needed for the mark; accept "sun" for light.)

Answer guide notes. Accept "sunshine" for light. For question 6, children who add "soil" or "air" are not wrong; give the mark if light and water are both there. Record any child who says the tallest plant is the healthiest; revisit with pots A and C.

Vocabulary

lean, bend, towards, away from, light

Differentiation

- Support: questions asked one to one, answered by pointing.
- Stretch: "Design a maze for a bean plant." Draw a box with walls inside and a hole; predict the path the shoot will take. Build it if time allows.

⚠ Safety

Wash hands after handling plants. If children take plants home, send a note that the seeds and plants are not for eating.

Teacher notes and misconceptions

- Growing towards light is **phototropism**. The shaded side of the stem grows longer, so the stem bends (see the Phototropism source); grade 1 only needs "plants lean towards light".
- Children may say the plant "wants" or "likes" light. That is fine as a way of speaking at this age; later units ask how a plant can respond without a brain.
- After the unit, the bean plants can go outside or home. They will flower and may make pods; raw beans from them are still not for eating.

Grade 1 Science: Sound and Light (5 lessons, about 3 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 9 November 2026. No educator has reviewed or classroom-tested this unit. It draws on NGSS (see Sources) but is not formally aligned to any official standard. Check every safety note against your school's rules.
>
> Text-checked by two other agents (Gemini 4 Argon, Claude Fable 5.2); see Known gaps.

Back to the science progression | Grade 1 year plan - Term 1

Big idea

Sounds are made when something shakes back and forth very quickly (vibrates), and sound can make other things vibrate. We can see things only when there is light: either light shines on them, or they give off their own light. Some materials let light through, some let a little through, some block it and make a shadow, and shiny things such as mirrors bounce it. People use sound and light to send messages to someone far away.

This is the first science unit of grade 1 (term 1). It builds on the kindergarten senses unit (listening, looking, describing words) and on kindergarten pushes and pulls (a pluck or a tap is a small push).

Outcomes

By the end of the unit most children can:

1. Show that something vibrating makes a sound (a plucked rubber band, a tapped drum, a hand on the throat while humming), and that the sound stops when the vibrating stops.
2. Show that sound can make something else vibrate (rice jumping on a covered bowl near a loud tap on a tray), and say what they saw.
3. Say that we can see things only when there is light, using what they saw in a peep box: with the lid shut, nothing inside can be seen; with a torch on, it can. Tell a light source (a torch, a glow stick) from a shiny thing that only bounces light (foil, a mirror).
4. Test objects in a torch beam and sort them into "lets light through", "lets some light through", "blocks light (makes a dark shadow)" and "bounces light (shiny)", and say what they did to find out.
5. Design, build, test and improve a way to send a simple message across the room or playground using sound or light (a cup telephone, a drum-beat code or a torch-flash code), and say what worked and what they changed.

Prior knowledge

- Kindergarten science: the five senses, describing words, pushes and pulls.
- Kindergarten maths: counting to 20 (counting drum beats and flashes).
- Grade 1 maths term 1 runs alongside; no reading is needed. Sorting tables use pictures and real objects.

Lessons

Each lesson is about 40 minutes: Opening 5, Main activity 25, Discussion 5, Closing check 5. Teach about two lessons a week. Lesson 5 can take two sessions if children want a second round of improving their design.

Lesson	Title	Main activity
1	Shake, rattle, hum: what makes a sound?	Rubber bands on a box, a ruler over a table edge, a hand on the throat
2	Can sound make things move?	Rice on a covered bowl near a tapped tray; feeling a drum; quiet and loud
3	Can we see in the dark?	Peep boxes with the lid shut and with a torch; light sources and shiny things
4	Through, some, blocked or bounced	Test materials in a torch beam and sort them on a table
5	Sending a message across the room	Design, build, test and improve a sound or light signal

Materials (whole class unless noted)

- **Lesson 1, per group of 3-4:** an open shoebox or plastic tub, three rubber bands of different widths (fitted by an adult), a plastic 30 cm ruler. Whole class: a drum or tambourine, a cardboard tube (for children who do not use their voice), and "shaking" and "still" picture cards for the closing check.
- **Lesson 2, per group:** a plastic bowl with cling film stretched tight over the top and held with a rubber band, a pinch of uncooked rice (about a teaspoon), a metal baking tray and a wooden spoon. Whole class: a drum, and if you have one a tuning fork and a bowl of water. Optional: a speaker playing music at a classroom volume, with a sheet of paper. A brush and dustpan for the rice. A blown-up balloon for feeling vibrations (see Access). Picture cards for the closing check (rice jumping beside a tapped tray; still rice, no tapping).
- **Lesson 3:** one peep box per group: a shoebox with the lid taped on, all gaps covered, one small hole (about 1 cm) cut in one end to look through and a flap (taped on one side) cut in the lid at the far end, above the toy, that can open to let light in. Inside each box, a small bright toy or picture stuck to the far wall. One small torch (LED, battery compartment screwed shut) per group. A glow stick or glow-in-the-dark star (charged in light beforehand), a piece of kitchen foil and a plastic safety mirror per group. Picture cards: Sun, candle flame, lamp, torch, Moon, mirror, spoon, foil, and two sorting mats ("makes its own light", "does not make its own light"). Optional: a phone camera to photograph the inside of a box for children who cannot look through the hole.
- **Lesson 4, per group:** a torch, a white card or wall to shine onto, and a tray of test objects: a clear plastic cup or sheet, a clear plastic bag cut open into a flat sheet, baking paper (or wax paper), tissue paper, a piece of cardboard, a wooden block, a sheet of kitchen foil, a plastic safety mirror, a piece of cloth. A large sorting table (four columns with picture headings: an open door for "through", a half-open door for "some through", a closed door for "blocked", a bouncing ball for "bounced") and picture cards of each object (two each for the foil and the mirror), plus a small sorting sheet with the same columns per group. For the closing check: a plastic sandwich box, a paper plate and a metal spoon.
- **Lesson 5, per group:** two paper or plastic cups with a small hole in the base, about 5 m of string, two paper clips (or pieces of craft stick) to tie off the string inside the cups; a drum or a tray and spoon; a torch; a message card set (pictures: "come here", "stop",

"wave", "sit down"). A "test and change" sheet with three picture rows (try it, what happened, what we changed); two small blank code cards. A large space (hall, playground or a cleared classroom).
- Whiteboards and pens, or paper and pencils, for drawing in every lesson.
- Ear defenders for any child who wants them (lessons 1, 2 and 5).

Assessment

- Lessons 1-4: the teacher notes answers in the closing checks (observe; no writing needed). Children can answer by speaking, signing, pointing or choosing a picture card.
- Lesson 5: the test-and-change sheet (drawings or picture stickers) and a short talk: "What did you try? What happened? What did you change?"
- End-of-unit one-to-one check (about 5 minutes per child; plan extra small-group time in the week, as 40 minutes is not enough for a whole class). Answer guide:
    1. "Pluck this rubber band. What is it doing when it makes a sound?" (It is shaking / vibrating; when it stops, the sound stops.)
    2. Picture of rice jumping on a covered bowl beside a tray being tapped. "Why is the rice jumping?" (The sound from the tray makes the cover shake.)
    3. "In a box with no light at all, could you see the toy?" (No; we need light to see.)
    4. Hold up baking paper, cardboard and a clear plastic sheet. "Which lets light through? Which lets some through? Which blocks it?" (Clear plastic; baking paper; cardboard.)
    5. "Is a mirror a light source like a torch?" (No; it bounces light, it does not make its own.)

⚠ Safety (read before lesson 1)

- **Never look at the Sun**, even with sunglasses or through coloured film. Say this in lessons 3 and 4.
- **Never shine a torch into anyone's eyes**, including your own. Shine torches at the wall, card or floor. Use small LED torches with screwed battery covers; no laser pointers at all. In the peep box (lesson 3) the torch points down onto the toy, away from the peephole; in the codes (lesson 5) it points at a wall or card beside the receiver.
- Keep sounds at a comfortable level. Agree a "hands up, everything stops" signal before any noisy activity. Some children find loud or sudden sounds painful: offer ear defenders, a quieter corner or the role of "watcher" or "recorder" instead.
- Rubber bands: an adult fits them round the box before lesson 1; children pluck them and look from the side. Bands stay over the box, never at people or faces. Check the school's latex allergy list; use latex-free bands if needed.
- Rulers stay flat on the table and are pushed down with one hand; no flicking towards others.
- Rice stays on the covered bowl and is swept up afterwards; nobody puts rice in mouths, noses or ears. Leave rice out for any group with a child who might, and use a small pom-pom or paper confetti instead.
- Balloon (lesson 2 Access): an adult blows it up and ties it; burst pieces are picked up and binned at once (a choking risk).
- The clear plastic bag in lesson 4 is cut open into a flat sheet; nothing goes over heads or faces.
- Mirrors are plastic safety mirrors only. Foil edges can be sharp: fold them over.
- Cup telephones: string is never wrapped round fingers, wrists or necks, and pairs walk (not run) to stretch it. Watch that strings do not cross walkways where others could trip.

- Glow sticks stay closed; do not bend them hard or bite them. A glow-in-the-dark star (charged under a lamp) is a safer choice.
- Darkened rooms: never fully dark; keep a door light or a lamp on and an adult near the light switch. Use peep boxes rather than a dark room.

Access and taking part

- Deaf and hard-of-hearing children can feel vibrations directly: a hand flat on the drum, on the box with the rubber bands, on a balloon held near a speaker, or on the cup telephone string. Feeling the vibration is a full way to show outcomes 1 and 2. In lesson 5 a light or touch signal (a tug on the string) is as good as a sound signal.
- Blind and low-vision children can show outcome 1 and 2 by touch and sound, and can take part in lessons 3-4 by holding objects in the beam while a partner describes the shadow (warmth is not a clue: an LED torch stays cool). They can be the "sound team" in lesson 5. A talking or tactile sorting table (objects stuck to the columns, columns marked with different textures) helps in lesson 4.
- Children who find the dark frightening never need to be in a dark space: the peep box keeps the dark inside a box.
- Answers can be spoken, signed, pointed to, chosen from picture cards or drawn. Sorting columns use pictures and shapes, never colour alone.
- Children with limited hand movement can tap a drum with a whole hand, press a torch with a big button (or a partner holds the torch and they say "now"), or hold a cup while a partner manages the string.

Sources

- Next Generation Science Standards, topic "1. Waves: Light and Sound" (performance expectations 1-PS4-1 to 1-PS4-4), read 9 November 2026: https://www.nextgenscience.org/topic-arrangement/1waves-light-and-sound
  - 1-PS4-1: "Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate." Its examples include "tuning forks and plucking a stretched string" and "holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork."
  - 1-PS4-2: "Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated." Its examples include "a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight", and it notes that illumination "could be from an external light source or by an object giving off its own light."
  - 1-PS4-3: investigate "the effect of placing objects made with different materials in the path of a beam of light", with examples "transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror)". The assessment boundary leaves out the speed of light.
  - 1-PS4-4: "Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance." Its examples include "a light source to send signals, paper cup and string" telephones, and a pattern of drum beats.
  - Core idea PS4.B on the same page: "Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam."

Known gaps and cautions

- The words "transparent", "translucent", "opaque" and "reflective" come from the standard's examples. This unit uses everyday words first ("through", "some through", "blocked", "bounced") and offers the science words as extra; teachers can choose.
- Some objects do not fit one column neatly: a clear plastic sheet that is crumpled lets some light through, foil both blocks and bounces light, and a mirror blocks light behind it. Lesson 4 treats these as things to talk about, not as errors.
- "Sound makes the rice jump" is shown, not proved: the tray is not touching the bowl, but a table that wobbles can also shake it. Lesson 2 asks children to hold the tray off the table to rule that out, and to say what they saw.
- How well a cup telephone works depends on tight string, cups and distance; results vary. Children report what happened rather than a "right" answer.
- How sound travels through air (as a wave) and how the ear works are left for later grades.
- Peer check: Gemini 4 Argon did a bounded text, timing, safety, access and answer-guide check at 5a9a7eb (not an educator, classroom or safety review). Timings and answer guides were correct. Its notes (missing lesson navigation links; lesson materials lists missing items used in steps, access notes and closing checks; clearer wording for the cardboard tube) were fixed in the follow-up commit 156d7fa (see PEERCHECKS.md), which Argon also diff-checked the same day.
- Peer check: Claude Fable 5.2 did a text check at fda4488 for pitch, safety and misreadable claims (not an educator, classroom or safety review; it tried none of the activities). All 13 NGSS quotes, the timings and the links were correct. Its notes were fixed in the follow-up commit (see PEERCHECKS.md): the peep-box torch now points down onto the toy, away from the peephole; the glow star comes out before the foil and mirror; torch codes aim at a wall beside the receiver; adults fit the rubber bands and tie the balloon; the bag is cut flat; craft sticks replace matchsticks; the narrow/wide band step no longer promises a higher sound (width can roughly cancel out), and the ruler models pitch instead; groups tap one at a time; the lesson 2 closing question no longer suggests still rice means no sound; two cards for foil and mirror; code cards for both ends and two messages by default; a sunny-day answer; the cupboard question is revisited; and the banner now says the unit draws on NGSS without being formally aligned. Fable 5.2 reasoned some of these (band pitch, faint stars, daylight torches) rather than testing them. The follow-up commit is 71dc67b, which Fable 5.2 also diff-checked the same day; its four small leftovers (lesson 1 Stretch, lesson 5 coded cards, lesson 2 tapping turns, README flap position) were fixed in ab23d6b.
- The peep-box diagram in lesson 3 (peep-box.svg) was drawn by Claude Fable 5.2 and added in commit c72a0d2 (CC0, like the rest of the repo). It is a layout sketch; nobody has built a box from it in a classroom.
- The order of lessons, the activities and the timings are my choice, not taken from a source.

Lesson 1: Shake, rattle, hum: what makes a sound?

Unit overview - Next: Lesson 2

Goal: Children find that sounds are made when something shakes back and forth very fast (vibrates), and that the sound stops when the shaking stops.

Length: about 40 minutes.

Materials

- Per group of 3-4: an open shoebox or plastic tub, three rubber bands of different widths (latex-free if needed), fitted round the box by an adult before the lesson, a plastic 30 cm ruler.
- Whole class: a drum or tambourine.
- A cardboard tube (for example a kitchen-roll tube) for children who do not use their voice.
- Two picture cards for the closing check: "shaking" and "still".
- Whiteboards and pens, or paper and pencils.
- Ear defenders for any child who wants them.

Steps

✎ Opening (5 min)

Agree the "hands up, everything stops" signal and practise it once. Tap the drum gently, then put a flat hand on it. "What happened to the sound when my hand touched the drum?" (It stopped.) "Today we find out what is happening when something makes a sound."

✎ Main activity (25 min)

1. **Humming (5 min).** Everyone puts their fingertips gently on the front of their throat and hums, then stops, then hums again. "What do you feel when you hum? When you stop?" (A buzzing or tickle when humming; nothing when quiet.) Children who do not use their voice can hold a cardboard tube and feel it buzz while a partner hums into it, or feel the drum instead.
2. **Rubber band box (10 min).** Each group has its box with the three bands already on. Pluck one band. "Look closely from the side: what is the band doing?" (It moves back and forth fast; it looks blurry.) Put a finger on the band. "What happens to the sound?" (It stops.) Try the narrow band and the wide band. "Do they sound the same?" (They may sound a little different or about the same; bands vary, so accept what children hear. The ruler in step 3 shows higher and lower more reliably.)
3. **Ruler over the edge (10 min).** Press one end of the ruler flat on the table with one hand, with about half the ruler sticking out over the edge. With the other hand push the free end down a little and let go. "What do you see and hear?" (The ruler moves up and down fast and makes a buzzing sound.) Make the part over the edge shorter and try

again. (The sound usually gets higher and the shaking faster.) Children draw the ruler with "shaking lines".

✓ Discussion questions (5 min, with answers)

- What did the band, the ruler and your throat all do when they made a sound? They shook back and forth very fast. Scientists call this **vibrating**.
- How can you stop a sound? Stop the vibrating: touch the band, hold the ruler, put a hand on the drum, stop humming.
- Does something have to be big to vibrate? No; a thin band vibrates too, sometimes too fast to see, but we can feel it or hear it.

✓ Closing check (5 min, with answers)

Tap the drum. "What is the drum skin doing?" (Vibrating / shaking fast.) "How can I stop the sound?" (Put a hand on it, stop the vibrating.) Children answer by saying, signing, showing with their hands or pointing to a "shaking" or "still" picture card.

Vocabulary

sound, vibrate, vibration, shake, pluck, tap, higher, lower, loud, quiet

Differentiation

- **Support:** use only the drum and one rubber band; children copy the teacher's "shaking hands" gesture to show vibrating.
- **Stretch:** "Can you make the band sound higher without changing the band?" (Press it down with a finger to make the moving part shorter. An adult can also show what happens when the band is pulled tighter.)

⚠ Safety

- An adult fits the bands round the box before the lesson; children pluck them but do not take them off or stretch them.
- Children look at a plucked band from the side, not with a face close above it.
- Bands stretch only round the box, never towards people or faces.
- Rulers stay pressed to the table; no flicking towards others.
- Keep sounds comfortable; use the stop signal.

Access

- Deaf and hard-of-hearing children feel the drum, the box and their throat; feeling the vibration is a full answer.
- Children with limited hand movement can tap the drum with a whole hand or watch the band while a partner plucks and say "now".
- Offer ear defenders and the role of "watcher" for sound-sensitive children.

Teacher notes

- Timing: 5 + 25 (5 + 10 + 10) + 5 + 5 = 40 minutes.
- Children often think sound is "in" the drum or comes from the hitting itself. Keep coming back to "What is it doing while it makes a sound?"
- Higher and lower here means pitch, not loudness; some children use "high" for "loud". Model both words with the drum (soft tap, hard tap) and the ruler (long overhang lower, short overhang higher).

Lesson 2: Can sound make things move?

Unit overview - Previous: Lesson 1 - Next: Lesson 3

Goal: Children see and feel that sound can make other things vibrate, and practise saying what they did and what they saw.

Length: about 40 minutes.

Materials

- Per group: a plastic bowl with cling film stretched tight over the top and held with a rubber band; about a teaspoon of uncooked rice (or a few small paper confetti pieces); a metal baking tray and a wooden spoon.
- Whole class: a drum. If you have them: a tuning fork and a bowl of water; a speaker playing music at a classroom volume and a sheet of paper.
- A sweeping brush and dustpan for the rice.
- A balloon, blown up and tied by an adult, for children who feel the vibration instead of seeing it (see Access); check the latex allergy list.
- Two picture cards for the closing check: rice jumping beside a tapped tray, and still rice with no tapping.
- Whiteboards and pens, or paper and pencils.
- Ear defenders for any child who wants them.

Steps

✎ Opening (5 min)

Recap lesson 1: "What is something doing when it makes a sound?" (Vibrating.) "Today's question is the other way round: can a sound make something ELSE vibrate, without touching it?"

✎ Main activity (25 min)

1. **Rice on the drum bowl (12 min).** Groups sprinkle the rice on the cling film. Groups take turns to tap, one group at a time, so a neighbour's tray does not move the rice and the room stays calm; the others watch. With more than four groups, give each group about two minutes, or use one tapping station at the front where groups bring their bowls in turn (reasoned, not tested). One child holds the tray in the air with both hands, about a hand's width from the bowl and not touching it or the table, and a partner taps it with the spoon. "What does the rice do?" (It jumps or shuffles.) Try a gentle tap and a harder tap. "When does the rice move more?" (Usually with the louder tap.) Try holding the tray further away. (The rice usually moves less.)
2. **Is it the table? (5 min).** "Could the table be shaking the bowl?" Children check that the tray is held in the air and that nobody bumps the table. Try tapping the table gently with a finger instead: does the rice move? Talk about what they found; the aim is to notice what else could be causing it.

3. **Feel and see (8 min).** Teacher demonstrations, children close by:
    - Children put a flat hand on a drum on the table while the teacher taps a second drum or tray close to it (not touching). Some children can feel a tiny buzz.
    - If you have a tuning fork: strike it on a rubber heel or a cushion and touch the tips to the water. (Small splashes or ripples: the fork is vibrating.)
    - If you have a speaker: hold paper close in front of it while music plays at a normal level; children can feel it flutter with fingertips.

✓ Discussion questions (5 min, with answers)

- Nobody touched the bowl. What made the rice move? The sound from the tray made the cling film vibrate, and that made the rice jump.
- What changed when we tapped harder? The sound was louder and the rice usually moved more.
- Why did we hold the tray off the table? So we knew it was the sound, not a shaking table, that moved the rice.

✓ Closing check (5 min, with answers)

Show two pictures: a tray being tapped next to a covered bowl with rice in the air, and the same bowl with no tapping and still rice. "In which picture is the tray being tapped? What is making the rice jump?" (The first: the sound from the tapped tray makes the cover vibrate, and that makes the rice jump. A quiet or far-away sound may not move the rice at all.) Children answer by pointing, saying, signing or drawing.

Vocabulary

vibrate, sound, loud, quiet, near, far, cause

Differentiation

- **Support:** the teacher taps; children only watch and say "moving" or "still".
- **Stretch:** "Can you make the rice move without making a louder sound?" (Bring the tray closer.) "Can you stop the rice moving while you keep tapping?" (Put a hand on the cover, move the tray far away.)

⚠ Safety

- Rice stays on the covered bowl; nobody puts it in mouths, noses or ears. Use paper confetti for any group where this might happen. Sweep up after.
- An adult blows up and ties the balloon; if it bursts, an adult picks up every piece and bins it at once (balloon pieces are a choking risk).
- Keep taps at a comfortable level; use the stop signal. The speaker stays at a normal classroom volume.
- Tuning fork: strike it on a rubber heel or cushion, never on a table or a person.

Access

- Deaf and hard-of-hearing children can rest a fingertip lightly on the cling film, or hold a balloon near the tray, and feel the buzz.
- Blind and low-vision children can feel the cling film and the paper near the speaker; a partner says when the rice is moving.
- Offer ear defenders and the role of "watcher" or "recorder"; the watcher says what the rice did.

Teacher notes

- Timing: 5 + 25 (12 + 5 + 8) + 5 + 5 = 40 minutes.
- Cling film must be tight like a drum skin; a loose cover barely moves. Test beforehand.
- How sound travels through the air is not taught here; it is enough for children to say "the sound made it vibrate".
- This lesson is a comparison, not a full fair test: loudness and distance are both changed by hand. Ask children to say what they saw.

Lesson 3: Can we see in the dark?

Unit overview - Previous: Lesson 2 - Next: Lesson 4

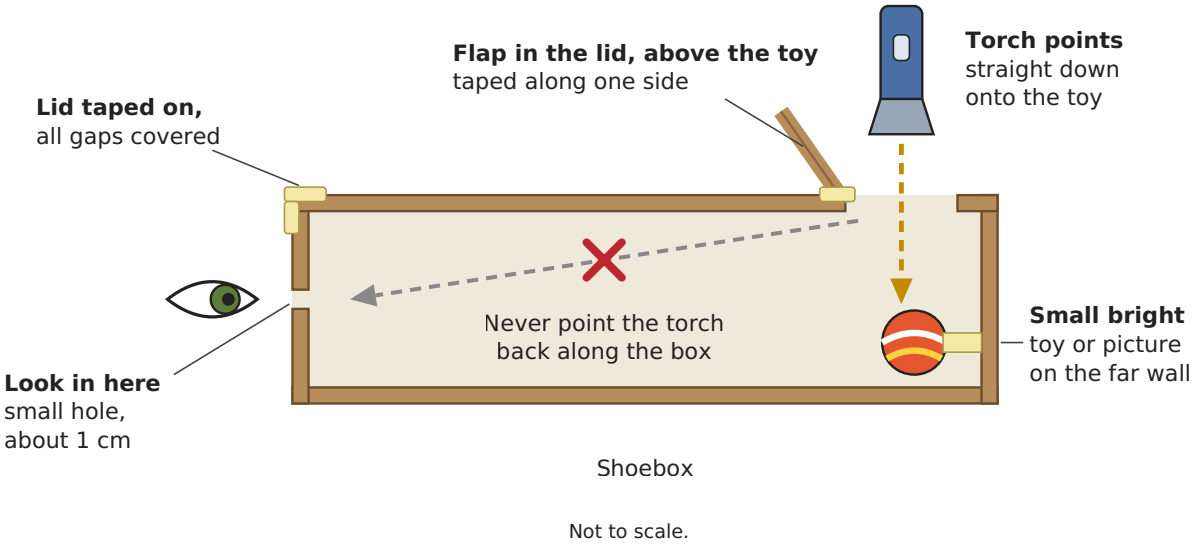
Goal: Children find that we can see things only when there is light: light shines on them, or they give off their own light. They tell light sources from shiny things.

Length: about 40 minutes.

Materials

- One peep box per group: a shoebox with the lid taped on and all gaps covered, a small hole (about 1 cm) in one end to look through, and a flap cut in the lid at the far end, above the toy (taped along one side), that opens to let light in. Inside, a small bright toy or picture stuck to the far wall. Make these before the lesson and check that, with the flap shut, the inside looks dark.
- One small LED torch per group (battery cover screwed shut).
- Per group: a glow-in-the-dark star (charged under a lamp before the lesson, and again with the group's torch for about 30 seconds just before it goes in the box), a piece of kitchen foil with folded edges, a plastic safety mirror.
- Picture cards: Sun, candle flame, lamp (switched on), torch (switched on), Moon, mirror, spoon, foil. Two sorting mats: "makes its own light" (a picture of a lamp shining) and "does not make its own light" (a picture of a closed box).
- Optional: a phone camera, to photograph the inside of a box (flap shut and flap open) for children who cannot look through the hole.
- Whiteboards and pens, or paper and pencils.

Peep box, seen from the side (near side cut away)



Not to scale.

Steps

✎ Opening (5 min)

Safety first: "Never look at the Sun. Never shine a torch into anyone's eyes." Children repeat it with actions (hands over eyes; torch pointing down). Then: "If you were in a cupboard with the door shut and no light at all, could you see your hand?" Take guesses; do not give the answer yet.

✎ Main activity (25 min)

1. **Peep box, flap shut (7 min).** Each child in turn looks through the hole with the flap shut. "What can you see?" (Nothing, or only darkness.) Children draw what they saw (a dark box). Nobody says what is inside yet.
2. **Flap open, or torch in (8 min).** Open the flap a little, or the torch holder shines the torch straight down through the flap onto the toy, pointing away from the peephole end, never back along the box. Look again. "What can you see now?" (The toy or picture.) Shut the flap again: it disappears. Children draw the second picture next to the first.
3. **What makes light? (10 min).** With the flap shut, recharge the glow star with the torch, put it inside and look. (It can be seen, faintly: it gives off its own light.) Take the star out. Then put the foil and the mirror inside with the flap shut. (They cannot be seen: they are shiny, but they do not make light.) Groups sort the picture cards onto the two mats.

✓ Discussion questions (5 min, with answers)

- Why could you not see the toy with the flap shut? There was no light in the box, and we need light to see things.
- Back to the cupboard: with the door shut and no light at all, could you see your hand? No. Like the toy in the shut box, we need some light to see.
- The foil is shiny. Why couldn't we see it in the dark box? Shiny things do not make their own light; they only bounce light that shines on them.
- Is the Moon a light source? No. The Moon looks bright because sunlight shines on it and bounces off. (Accept "it looks like one"; this is surprising for many adults too.)

✓ Closing check (5 min, with answers)

Show the torch, the glow star, the foil and the mirror. "Which ones make their own light?" (Torch, glow star.) "Which only shine when light is on them?" (Foil, mirror.) "Could you see the toy in the box with no light at all?" (No.) Children answer by pointing, signing, saying or sorting.

Vocabulary

light, dark, light source, shiny, bounce, glow, see

Differentiation

- **Support:** sort only the torch, a lamp card, foil and a mirror.
- **Stretch:** "A cat walks into a room with no light at all. Can it see?" (No. Cats see well in dim light, but they still need some light.)

⚠ Safety

- Never look at the Sun; never shine torches into eyes.
- In the peep box, the torch always points down onto the toy, away from the peephole, while a child is looking.
- The classroom stays lit; the dark is inside the box only.
- Plastic safety mirrors only; fold the foil edges over.
- Glow sticks, if used instead of stars, stay closed and are not bitten.

Access

- Children who dislike the dark only look into a small box; they never sit in the dark.
- Blind and low-vision children can feel the objects inside the open box and take the "sorting" role; a partner describes what they see through the hole. Some low-vision children can tell the torch on or off by brightness.
- Children who cannot hold their eye to a hole can look at a photograph taken through the hole with a phone camera, flap shut and flap open.

Teacher notes

- Timing: 5 + 25 (7 + 8 + 10) + 5 + 5 = 40 minutes.
- A common idea at this age is that our eyes "get used to" the dark and will see eventually. In a truly dark box they do not; if a child sees a little, look for a gap letting light in and tape it.
- The standard's clarification statement suggests a pinhole box or a completely dark room; this unit uses the box so no child has to be in the dark.

Lesson 4: Through, some, blocked or bounced

Unit overview - Previous: Lesson 3 - Next: Lesson 5

Goal: Children test what happens when different materials are put in a torch beam, and sort them: lets light through, lets some light through, blocks light (dark shadow), bounces light (shiny).

Length: about 40 minutes.

Materials

- Per group: a small LED torch; a white card standing up (or a pale wall); a tray of test objects: a clear plastic cup or sheet, a clear plastic bag cut open into a flat sheet, baking paper (or wax paper), tissue paper, cardboard, a wooden block, kitchen foil (edges folded), a plastic safety mirror, a piece of cloth.
- A large class sorting table with four columns and picture headings: an open door ("through"), a half-open door ("some through"), a closed door ("blocked"), a bouncing ball ("bounced"). Picture cards of each test object, with two cards each for the foil and the mirror (they can go in two columns). Columns also differ by shape or texture, not only colour.
- A group sorting sheet with the same four columns, per group (step 2).
- For the closing check: a plastic sandwich box, a paper plate and a metal spoon.
- Whiteboards and pens, or paper and pencils.

Steps

✎ Opening (5 min)

Repeat the safety rules (never look at the Sun; never shine a torch into eyes; torches point at the card). Shine a torch on the white card: "What do you see?" (A bright patch.) Hold your hand in the beam: "What happens?" (A dark shadow; the hand blocks the light.)

✎ Main activity (25 min)

1. **Predict (5 min).** Hold up the clear cup, the cardboard and the baking paper. "What do you think will happen on the card if I put each one in the beam?" Children point to a column. No wrong guesses.
2. **Test (15 min).** In groups, one child shines the torch at the card from about one ruler away, one holds an object in the beam, one looks at the card and says what they see: "bright patch" (through), "dim or blurry patch" (some through), "dark shadow" (blocked). Shiny objects: tilt them in the beam and look for a bright spot on the wall or table (bounced). Children place each picture card in a column on their group sheet. Keep the torch at the same distance for every object.
3. **Class table (5 min).** Groups put their cards on the class table. Where groups disagree, test the object again together.

✓ Discussion questions (5 min, with answers)

- Which materials let the light through? Clear plastic (cup, sheet, flat bag). The patch on the card is still bright.
- Which let some light through? Baking paper, tissue paper, often thin cloth. The patch is dim or blurry.
- Which blocked it? Cardboard, wood, thick cloth, foil. A dark shadow on the card.
- Foil went in two columns. Is that wrong? No. Foil blocks light (shadow behind it) and bounces it (bright spot when tilted). The mirror does both too. Some objects do more than one thing.
- Why did we keep the torch the same distance each time? So only the object changed and the test was fair to each object.

✓ Closing check (5 min, with answers)

Hold up a new object not used before (for example a plastic sandwich box, a paper plate, a metal spoon). "Where will it go? Let's test." (Usually: clear box through or some through; paper plate blocked or some through; spoon blocks and bounces.) Children point to the column first, then check.

Vocabulary

through, some through, blocked, bounced, shadow, beam, shiny. Optional science words: transparent, translucent, opaque, reflect.

Differentiation

- **Support:** test three objects only (clear cup, baking paper, cardboard); use the three door pictures. Middle option: six objects (clear cup, baking paper, tissue paper, cardboard, foil, mirror).
- **Stretch:** "Make the shadow of the block bigger without changing the block." (Move the block closer to the torch.) Or: use the mirror to bounce the beam onto a target on the wall.

⚠ Safety

- Never look at the Sun; never shine torches into eyes or bounce the beam into faces with mirrors. Mirrors point at the wall or floor.
- Plastic safety mirrors only; fold foil edges.
- The plastic bag is cut open into a flat sheet before the lesson and stays on the table; nothing goes over heads or faces.

Access

- Blind and low-vision children can hold each object in the beam while a partner describes the card; the class table can have the real objects stuck to it so it can be read by touch.
- Children answer by pointing, signing, saying or placing a card.
- Columns use door pictures and shapes, not colour alone.

Teacher notes

- Timing: 5 + 25 (5 + 15 + 5) + 5 + 5 = 40 minutes.
- Results depend on the torch and the material (thin cloth may let some light through; a crumpled bag may look cloudy). Record what each group actually saw and talk about differences.
- The speed of light is not part of this unit (the standard's assessment boundary leaves it out).

Lesson 5: Sending a message across the room

Unit overview - Previous: Lesson 4

Goal: Children design, build, test and improve a way to send a simple message across the room or playground using sound or light, and say what they tried, what happened and what they changed.

Length: about 40 minutes (a second session for another round of improving is welcome).

Materials

- Per group: two paper or plastic cups with a small hole in the base, about 5 m of string, two paper clips (or short pieces of craft stick) to tie off the string inside each cup; a drum, or a tray and wooden spoon; a small LED torch.
- Message picture cards, one set per group: "come here", "stop", "wave", "sit down".
- A "test and change" sheet per group with three picture rows: try it (a hand), what happened (an eye and an ear), what we changed (a spanner).
- Two small blank code cards per group (one for the sender, one for the receiver).
- Pencils or pens to draw the code and mark the sheet.
- Ear defenders for any child who wants them.
- A large space: the hall, the playground, or the classroom with desks pushed back. Torch codes need an indoor or shaded wall; a small torch is hard to see outdoors in daylight.

Steps

✎ Opening (5 min)

"Your friend is at the other end of the playground. It is too far to talk quietly. How could you send them a message using sound or light, without shouting?" Collect ideas (a whistle, waving, a torch, a drum, a phone). Show the three choices for today: a cup telephone, a drum-beat code or a torch-flash code. Remind everyone of the safety rules (string never round fingers or necks; torches never in eyes; comfortable sounds).

✎ Main activity (25 min)

1. **Plan (5 min).** Each group chooses a device and a code. For drum or torch codes, the group agrees a pattern for two message cards, for example: 2 beats or flashes = "come here"; a long flash or a roll = "stop". Draw the code twice, once on each code card, so the sender and the receiver each have one.
2. **Build (5 min).** Cup telephone: thread the string through the holes and tie it to a paper clip inside each cup (adult helps with knots). Drum or torch: practise the code at the table.
3. **Test (8 min).** The sender stands at one end of the space, the receiver at the other (about 5 m apart, with the cup string pulled straight). The sender picks one of the coded message cards (two, or four for the Stretch) without showing it and sends it. Torch senders shine onto a wall or a card standing beside the receiver, never at the

receiver; the receiver watches the wall or card. The receiver checks the code card and does the action. Did it work? Mark the "what happened" row.

4. **Improve and test again (7 min).** "What could make it work better?" Ideas to try: pull the string tighter, keep it off the floor and away from other things touching it; beat or flash more slowly; leave a gap between messages; use a bigger torch beam on a pale wall; agree a "ready" signal first. Change ONE thing, test again, mark the "what we changed" row.

✓ Discussion questions (5 min, with answers)

- Why does the cup telephone work? Talking into the cup makes it vibrate; the tight string carries the vibration to the other cup, which vibrates and makes the sound.
- What happened when the string was loose or touching something? It usually worked badly or not at all; the vibrations did not get through.
- What made the torch or drum code easier to understand? Going slowly, leaving gaps, starting with a "ready" signal, and both people knowing the code.
- Which works better in a noisy playground, sound or light? On a sunny day? Answers vary: light codes work when it is noisy; sound codes work when you cannot see each other. On a sunny day a small torch is hard to see, so a sound code may work better. Accept reasons.

✓ Closing check (5 min, with answers)

Each group shows its sheet. "What did you try? What happened? What did you change?" (Any honest answer that names a change and a result is a success, including "it still didn't work".) Then: "Your friend is around a corner where they cannot see you. Would you send a light code or a sound code?" (A sound code, because light needs a clear line to be seen.)

Vocabulary

message, signal, code, send, receive, test, improve, design

Differentiation

- **Support:** use the drum and send only one message ("stop").
- **Stretch:** add codes for "wave" and "sit down" (four messages), invent a code for a new message, or test how far apart the cup telephone still works (count steps).

⚠ Safety

- String is never wrapped round fingers, wrists or necks; pairs walk, not run, to stretch it; keep strings out of walkways.
- Torches point at a wall or card beside the receiver, or the floor near them, never at eyes. Never look at the Sun outdoors.
- Drum taps at a comfortable level; agree the stop signal.

Access

- Deaf and hard-of-hearing children can use the torch code, or feel a tug code on the cup string (one tug, two tugs).
- Blind and low-vision children can use the drum code or the cup telephone.
- Children with limited hand movement can tap with a whole hand, press a large-button torch or choose the message while a partner sends it.
- Children who do not use speech can send a code on the cup telephone by tapping the cup, or use the torch or drum.

Teacher notes

- Timing: 5 + 25 (5 + 5 + 8 + 7) + 5 + 5 = 40 minutes.
- Cup telephones work best with thin, tight string and stiff cups; test one beforehand. If none work well, the drum and torch codes still meet the goal.
- The point is the design cycle (try, look, change, try again), not a perfect device. Praise clear reasons for changes.
- Technological details (how phones or radios work) are not part of this unit.

Grade 1 Science: Patterns in the Sky: Sun, Moon, Stars and Daylight (5 lessons, about 3 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 9 November 2026. No educator has reviewed or classroom-tested this unit. It draws on NGSS (see Sources) but is not formally aligned to any official standard. Check every safety note against your school's rules.
>
> Text-checked by one other agent (Gemini 4 Argon); see Known gaps.

Back to the science progression | Grade 1 year plan - Term 2

Big idea

The sky has patterns we can see, describe and use to predict. Every day the Sun seems to rise in one part of the sky, move across it and set in another, and shadows move as it does. The Moon also seems to rise, move and set, can sometimes be seen in the daytime, and seems to change shape in a pattern that repeats about every four weeks. Stars other than the Sun can be seen at night but not in the day. There is less daylight in winter than in spring, summer or autumn.

This is the term 2 science unit of grade 1. It builds on the term 1 unit Sound and light (shadows form away from a light; we see things only when there is light; the Moon does not make its own light) and on kindergarten weather watching.

Outcomes

By the end of the unit most children can:

1. Use shadow marks made at three times of one day to say that the Sun seems to move across the sky, and that shadows are usually shortest around the middle of the day.
2. Put pictures of one day's sky in order (rising, high, setting, night) and use the pattern to predict where the Sun will be next morning.
3. Say that the Moon can sometimes be seen in the day, and put Moon shape pictures in an order where the shape grows and then shrinks.
4. Say that stars can be seen at night but not in the day, and use a model (a small light in a bright or dark box) to show why.
5. Compare two day strips and say that there is less daylight in winter than in spring.

Prior knowledge

- From Sound and light: a shadow forms on the side of an object away from the light; we never look at the Sun; the Moon is lit by the Sun.
- From kindergarten: describing the weather, day and night, words like morning and afternoon.

Lessons

1. Where is the Sun now? - marking a shadow three times in one day.
2. Up, across and down - the Sun's daily pattern and a prediction.
3. The Moon has patterns too - the daytime Moon and the changing shape.
4. Where are the stars in the day? - stars at night, and a bright-room model.
5. Long days and short days - comparing daylight in winter and spring, and starting a sky diary.

Materials (whole class unless noted)

- Lesson 1: one shadow post per group of four (blunt stick or ruler in plasticine on card, or in a cone); per group three colours of chalk (or coloured sticky dots and large paper indoors), a beanbag and three clock cards; masking tape; class shadow chart; a picture of the Sun and a "never look" card; three shadow picture cards; water and sun protection.
- Lesson 2: the lesson 1 chart and photos of the chalk shadows; a teacher- drawn window view picture with the sunrise and sunset sides marked; a card Sun on a stick; per pair six Little Hill sky cards and an ordering strip; tactile versions of the cards.
- Lesson 3: Moon shape cards (eight shapes; one class set and one set per group of four, with ordering strips); tactile foam or card Moon shapes; the Little Hill sky strip and a card Moon on a stick; "Moon at night, Moon in the day" pictures; optional morning Moon look (check a Moon calendar); optional teacher photo of the daytime Moon.
- Lesson 4: Little Hill day and night pictures; one LED torch or battery tea-light per group; per group a peep box from the Sound and light unit with a small battery light inside; about 10 charged glow stars on black card; blinds or a blanket-covered table; sorting mat and six picture cards (Sun, Moon, stars, clouds, rainbow, birds); a ticking timer or small bell and some music at a comfortable volume.
- Lesson 5: two big Pip day strips (winter and spring) and small copies per pair; tactile strips (smooth for light, rough for dark); a set of Pip's day picture cards per pair; two early-evening photos of the same view; a class sky diary sheet with blank day strips; weekly sunrise and sunset times for the teacher; yellow and dark blue counters, crayons or stickers.

Assessment

- During lessons: shadow records (lesson 1), the ordered sky strip (lesson 2), the ordered Moon cards (lesson 3), the day/night sort (lesson 4) and the Pip strips (lesson 5).
- Closing checks at the end of each lesson (answers are in each lesson).
- One-to-one check, about 4 minutes per child, any time in the last week. Children may answer by pointing, signing, placing a card or speaking:
    1. Show three shadow pictures. "Which shadow is from the middle of the day?" (The shortest one.) (Outcome 1)
    2. Give three Little Hill cards (rising, high, setting). "Put them in order. Where will the Sun be tomorrow morning?" (Low on the sunrise side.) (Outcome 2)
    3. "Can we ever see the Moon in the day?" (Yes, sometimes.) Give three Moon shapes: "Put them in order so it gets bigger." (Outcome 3)
    4. Show the day and night pictures. "When can we see stars?" (At night.) "Why not in the day?" (The Sun is too bright.) (Outcome 4)
    5. Show the two Pip strips. "Which is the winter day? How do you know?" (More dark blue; less daylight.) (Outcome 5)

⚠ Safety (read before lesson 1)

- Never look at the Sun, directly or through sunglasses, binoculars, a phone screen or anything else. Children stand with their backs to it when looking at shadows. Use the "never look" card in every lesson that goes outside.
- Shadow posts have blunt tops and stand in plasticine or a cone.
- Outdoor visits: sun protection and water as your school requires; keep visits short in cold weather.
- Torches point at the floor or into a box, never at eyes. Battery lights only, no candles.
- Darkened room: clear the floor, keep a light near the door, and let any child who dislikes the dark stay in the light.
- Music in the lesson 4 sound model at a comfortable volume.
- Never ask children what time they get up or go to bed, whether they go out after dark, or about their home or bedroom window; use the made-up place Little Hill and the made-up child Pip.

Access and taking part

- Every lesson has a tactile or sound route: masking tape and beanbags on shadows, felt and string sky cards, foam Moon shapes, a ticking-timer model for stars, rough and smooth day strips.
- Answers by pointing, placing cards, signing or speaking all count.
- Children who use a wheelchair or cannot crouch use a shadow post on a table or windowsill.
- Colour is never the only clue: the day strips also carry small sun and moon symbols.
- Going into a darkened space or acting out the Sun's path is always optional; watching from the edge counts.

Sources

- NGSS, "1. Space Systems: Patterns and Cycles" (topic arrangement), read 9 November 2026: https://www.nextgenscience.org/topic-arrangement/1space-systems-patterns-and-cycles
  - 1-ESS1-1: "Use observations of the sun, moon, and stars to describe patterns that can be predicted." Clarification statement: "Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day." Assessment boundary: "Assessment of star patterns is limited to stars being seen at night and not during the day."
  - 1-ESS1-2: "Make observations at different times of year to relate the amount of daylight to the time of year." Clarification statement: "Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall." Assessment boundary: "Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight."
  - Disciplinary core ideas ESS1.A: "Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted." ESS1.B: "Seasonal patterns of sunrise and sunset can be observed, described, and predicted."
- The Moon's changing shape (lesson 3) goes a little beyond the two performance expectations above; it is included as a pattern children can observe, and is not assessed beyond ordering pictures.

- Other statements (the Sun is a star; the stars are still there in the day; the Earth's shadow does not cause the Moon's shapes; daylight changes little near the equator) are general science knowledge that I did not check against a specific source for this unit.

Known gaps and cautions

- Written 9 November 2026. Text-checked by Gemini 4 Argon the same day (links, timings, outcomes against the one-to-one check, privacy, sun safety and access routes): no errors reported, so no changes were needed. Not yet checked by a teacher.
- Lesson 1 needs a sunny day and two short return visits; cloudy weather may spread it over several days.
- The sky diary in lesson 5 runs until term 3, so the comparison children make in this unit is with made-up Pip strips and photos; the class's own comparison comes later.
- Southern hemisphere and near-equator classes need the changes in the lesson 5 teacher notes.
- The Moon shape cards must be drawn or chosen by the teacher; no illustrations are provided yet.
- The lesson order assumes term 2 falls in the darker part of the year.

Lesson 1: Where is the Sun now?

Unit overview - Next: Lesson 2

Goal: Children mark a shadow three times in one school day, without ever looking at the Sun, and use the marks to say that the Sun seems to move across the sky during the day.

Length: about 40 minutes in the morning, plus two short visits (about 5 minutes each) at midday and in the afternoon. Use a dry, sunny day; if the sky clouds over, see Teacher notes.

Materials

- One shadow post per group of four: a stick or ruler pushed upright into a plasticine lump on a square of card, or a traffic cone with a stick taped to it, placed on flat playground or a sunny windowsill.
- Per group: three pieces of chalk in different colours (or three coloured sticky dots and a sheet of large paper taped under the post if indoors), a small beanbag, and a picture card of a clock face for each visit (morning, midday, afternoon), drawn by the teacher.
- Masking tape to mark exactly where each post stands, so it can be put back in the same place.
- A large class chart: "Morning", "Midday", "Afternoon", with a space for each group's drawing of where the shadow pointed.
- A picture of the Sun, and a "never look" card: an eye looking at the Sun, crossed out.
- Picture cards for the closing check: a post with a long shadow pointing one way, a short shadow, and a long shadow pointing the other way.
- Water and sun protection as your school requires when outside.

Steps

✎ Opening (5 min)

Hold up the picture of the Sun and the "never look" card. "We never look at the Sun, not even for a second, and not with sunglasses. It can hurt our eyes. Today we will find out where the Sun is by looking at shadows instead." Remind the class of the sound-and-light unit: a shadow forms on the side of an object away from the light. Ask: "If my shadow is in front of me, where is the light?" (Behind me.)

✎ Main activity (25 min)

1. Outside, each group stands its post on the taped square. Children walk round the post and find its shadow. The shadow tip is where the line of dark ends.
2. One child holds the post steady, one draws a chalk line along the shadow (first colour), one places the beanbag on the tip, one draws the clock card for "morning" on the group's record. Swap jobs so everyone has one turn.
3. Ask each group: "Is the shadow long or short? Which way is it pointing? Point to something the shadow points at (the fence, the gate, a tree)."
4. Children stand with their backs to the Sun, look at their own shadow, and say which way it points. Never turn round to look at the Sun.

5. Predict together: "When we come back at midday, will the shadow be in the same place? Longer or shorter?" Write the class's guesses on the chart, all of them, without saying which is right.
6. At midday and again in the afternoon (about 5 minutes each), groups return, check that the post is still on its tape, and draw the new shadow in the second and third colours.

✓ Discussion questions (5 min, with answers)

Do these after the afternoon visit, in the classroom.

- Did the shadow stay in the same place? (No; it moved, and changed length.)
- Did the post move? (No, it stayed on the tape.) So what moved? (The light, the Sun, seemed to move across the sky.)
- When was the shadow shortest? (Usually around the middle of the day, when the Sun is highest in the sky.)

✓ Closing check (5 min, with answers)

Show the three shadow picture cards. "Which picture shows the morning shadow? Which the middle of the day? Which the afternoon?" Accept answers that match what the class saw: the longest shadows early and late, the shortest near the middle of the day, the morning and afternoon shadows pointing different ways. Ask: "Did the Sun move or the post?" (The Sun seemed to move; the post did not.)

Vocabulary

shadow, sky, morning, midday, afternoon, long, short, move

Differentiation

- Support: one job only (beanbag on the tip); compare just two marks, morning and afternoon, with "Is it the same place or a different place?"
- Stretch: predict where the next shadow will be by placing the beanbag before drawing it, then check.
- Early finishers: draw the post and all three shadows from above on paper.

⚠ Safety

- Never look at the Sun, directly or through sunglasses, binoculars, a phone screen or anything else. Children stand with their backs to it.
- Sun protection and water as your school requires; keep outdoor visits short in cold weather.
- Posts must not be sharp at the top; use a ruler or a stick with a blunt end, held in plasticine or a cone.

Access

- Blind or low-vision children: lay a long strip of masking tape along each shadow so it can be felt, and put a beanbag on each tip; they can feel that the beanbags are in different places. A partner can describe the shadow.
- Children who use a wheelchair or cannot crouch: put the post on a table or a sunny windowsill at a reachable height, with paper under it.
- Non-speaking children: point to the picture card or the beanbag; answers by pointing count fully.
- Deaf children: show the "never look at the Sun" rule as a picture card (a crossed-out eye looking at the Sun) and sign or gesture it.

Teacher notes

- If the day turns cloudy, mark what you have and finish another sunny day with the posts back on their taped squares. A window shadow (the frame on the floor) can be marked with tape instead.
- Children do not need to know that the Earth turns; the grade 1 aim is to describe the pattern. If someone asks, "Scientists found out the Sun only seems to move, because the Earth is spinning" is fine; do not test it.
- Do not tell children which compass direction the shadows point; it depends on where you are and the time of year.

Lesson 2: Up, across and down

Unit overview - Previous: Lesson 1 - Next: Lesson 3

Goal: Children describe the daily pattern of the Sun: it seems to rise in one part of the sky, move across the sky, and set in another part. They use the pattern to predict where the Sun will be tomorrow.

Length: about 40 minutes.

Materials

- The class shadow chart from lesson 1, and a photo or drawing of each group's three chalk shadows.
- A "window view" picture: a large drawing of what the class sees from one window (buildings, trees, hills), drawn by the teacher before the lesson. Mark on it, from the teacher's own checking or a sunrise app, the side where the Sun comes up and the side where it goes down at this time of year.
- A yellow card circle (the "card Sun") on a stick.
- Per pair: a set of six picture cards of one made-up place, Little Hill, on one day: dark with stars; Sun just above the hills on one side; Sun higher; Sun high in the middle; Sun lower on the other side; Sun just going down behind the hills. Cards are drawn so the hills and houses are the same in every picture.
- Per pair: a strip of card with six empty boxes to put the cards in order.
- Tactile version for blind or low-vision children: the same six cards with a raised felt circle for the Sun and a string line for the hills.
- Picture of the Sun with a "never look" cross, from lesson 1.

Steps

✎ Opening (5 min)

Look at the lesson 1 chart. "The post stayed still, but the shadow moved. What was moving?" (The Sun seemed to.) "Where do you think the Sun was first thing in the morning, before school?" Take a few ideas.

✎ Main activity (25 min)

1. Show the window view picture. Use the card Sun on its stick to show its path: low on the sunrise side early in the morning, higher towards the middle of the day, lower on the other side in the afternoon, gone below the edge at sunset. Children trace the path in the air with a finger.
2. Children act it out: crouch low (sunrise), stand up slowly with arms up (midday), sink down on the other side (sunset), then curl up (night). Do it twice, slowly. Anyone may do it sitting, with arms only.
3. Pairs put the six Little Hill cards in order on their strip, from dark to dark again. Ask each pair: "How did you know which came next?"
4. Pairs check against each other: are the strips the same?

5. Ask: "Tomorrow morning, where will the Sun be?" (Low on the sunrise side again.) "How do you know?" (Because it happens every day; it is a pattern.) If you can, check the prediction tomorrow with one quick look at a shadow post (lesson 1 positions).

✓ Discussion questions (5 min, with answers)

- Does the Sun come up on the same side every day? (Yes, roughly the same side, so we can predict it.)
- Where does the Sun go at night? (It goes below the edge of what we can see; it is still there, but we cannot see it from here.)
- What is a pattern? (Something that happens again and again in the same way, so we can say what comes next.)

✓ Closing check (5 min, with answers)

Hold up two of the Little Hill cards out of order (for example "Sun high in the middle" and "Sun just above the hills on one side"). "Which comes first in the day?" (The low one on the sunrise side.) Then: "What comes after the Sun goes down?" (Night, dark.) Children answer by pointing to a card, holding up a finger for "first" or "second", or saying it.

Vocabulary

rise, set, sunrise, sunset, across, pattern, predict

Differentiation

- Support: use three cards only (rising, high, setting).
- Stretch: draw a seventh card for "next morning" and say why it looks like the first sunrise card.
- Early finishers: draw your own window view and add the Sun's path.

⚠ Safety

- The card Sun is for showing the path; children never look at the real Sun to check it.
- Acting out: keep clear space around each child; arms only for anyone who prefers it.

Access

- Blind or low-vision children use the tactile cards; feeling the felt circle go from low to high to low tells the same story.
- Children with limited arm movement can say or point "low, high, low" instead of acting it.
- Non-speaking children: ordering the cards is the answer; no words needed.

Teacher notes

- Say "seems to rise" and "seems to move" at least sometimes; the Sun does not move round us, but grade 1 does not need the reason.
- The sunrise and sunset side change a little through the year, so do not name a fixed compass point; "roughly the same side" is accurate.
- Little Hill is made up so that no child is asked about their own home, bedroom window or morning.

Lesson 3: The Moon has patterns too

Unit overview - Previous: Lesson 2 - Next: Lesson 4

Goal: Children find that the Moon also seems to rise, move across the sky and set, that it can sometimes be seen in the daytime, and that its shape seems to change over about four weeks and then start again.

Length: about 40 minutes.

Materials

- Moon picture cards (drawn by the teacher, or printed from a source your school may use): eight pictures of the Moon's shape a few days apart, from a thin curve, through a half, to a full circle, and back to a thin curve on the other side.
- Per group of four: one set of the eight Moon shape cards, and a strip with eight boxes to put them in order.
- Tactile Moon cards: the same eight shapes cut from thick card or foam so the shape can be felt.
- The Little Hill sky strip from lesson 2, and a white card Moon on a stick.
- A "Moon at night, Moon in the day" pair of pictures: Little Hill at night with the Moon, and Little Hill in the morning with a pale Moon in a blue sky.
- Optional: a morning outdoor look when a Moon calendar shows the Moon is up in daylight (see Teacher notes).

Steps

✎ Opening (5 min)

"We found a pattern for the Sun. Does the Moon have patterns too?" Show the two Little Hill pictures. "Which one is wrong, the Moon in the day or the Moon at night?" Let children argue it; do not answer yet.

✎ Main activity (25 min)

1. Tell the class: "Both are right. The Moon also seems to come up, move across the sky and go down. Some days it is up at night, some days it is up in the daytime, and some days both." Move the card Moon along the lesson 2 path to show it.
2. If the Moon is up in the morning sky today (checked beforehand), go outside for five minutes and find it. Stand with backs to the Sun. Ask: "What shape is it today?"
3. Groups get the eight Moon shape cards, mixed up. "These pictures were made a few days apart. Can you put them in an order where each one changes only a little?" Groups try.
4. Show one correct order (thin curve, bigger, half, bigger, full, smaller, half, thin curve on the other side). Groups check theirs. Any order that grows and then shrinks step by step is a good try.

5. "What will come after the last card?" (It starts again: a new thin curve.) This is a pattern that takes about four weeks.

✓ Discussion questions (5 min, with answers)

- Can we see the Moon in the day? (Sometimes, yes.)
- Does the Moon always look the same shape? (No; it seems to change, then starts again.)
- Does the Moon make its own light? (No; this was in the sound and light unit. The Sun's light shines on it. Accept "the Sun lights it up".)

✓ Closing check (5 min, with answers)

Give each child three Moon cards from the middle of the set: half, bigger than half, full. "Put them in order so the Moon gets bigger." (Half, bigger than half, full.) Then hold up the "Moon in the day" picture: "Is this possible?" (Yes.)

Vocabulary

Moon, shape, full, half, curve, daytime, night-time, pattern

Differentiation

- Support: order only three cards (thin, half, full).
- Stretch: after ordering the cards, say how many "steps" it takes to get back to the first shape.
- Early finishers: draw tonight's Moon from the Moon calendar picture the teacher shows; nobody is asked to look at home.

⚠ Safety

- It is safe to look at the Moon. If the Moon is near the Sun in the sky, do not look for it; go back in.
- Outdoor visits: sun protection and water as your school requires.

Access

- Blind or low-vision children use the foam Moon cards and feel the shapes grow and shrink.
- Children who cannot go outside or cannot see the sky: show a photo of the daytime Moon that the teacher took, or a picture from a source your school may use.
- Non-speaking children: ordering cards and pointing to "yes" or "no" cards count fully.

Teacher notes

- Check a Moon calendar before this lesson. In the days after a full Moon the Moon is often still up in the morning sky, and in the days before a half Moon it is often up in the afternoon.
- Grade 1 does not need names for the shapes or the reason they change. "The Moon seems to change shape" is enough. Do not say the Earth's shadow causes the shapes; it does not.
- Looking at the Moon at home is optional and never set as homework, because some children cannot go out after dark or have no view of the sky.

Lesson 4: Where are the stars in the day?

Unit overview - Previous: Lesson 3 - Next: Lesson 5

Goal: Children say that stars (other than the Sun) can be seen at night but not in the daytime, and use a model to show that a small light is hard to see when everything around it is bright.

Length: about 40 minutes.

Materials

- Two pictures of the same Little Hill sky: one at night with the Moon and many stars, one in the daytime with the Sun (shown in the corner) and a blue sky with no stars.
- One small LED torch per group (battery cover screwed shut), or one battery tea-light per group.
- Per group: one peep box from the sound and light unit (lid taped, flap at the far end), with a small battery tea-light or a small LED stuck inside instead of the toy, switched on.
- About 10 glow-in-the-dark stars, charged under a lamp before the lesson, stuck to a large black card.
- A way to make part of the room darker: blinds, or a table with a thick blanket over it to make a "night tent".
- Sorting mat with two halves, "seen in the day" and "seen at night", and picture cards: Sun, Moon, stars, clouds, rainbow, birds.
- Sound model for blind or low-vision children (and useful for everyone): a quietly ticking kitchen timer or a small bell, and a few minutes of recorded or played music at a comfortable volume.

Steps

✎ Opening (5 min)

Show the two Little Hill pictures. "In the night picture there are lots of stars. In the day picture there are none. Where did the stars go?" Take ideas and write them down, without saying which is right.

✎ Main activity (25 min)

1. Model with a torch: in the bright classroom, a child switches a torch on and off, pointed at the floor. "Is it easy to see if it is on?" (Hard, or a little.) Then do the same inside the night tent or with the blinds down. (Easy.)
2. Peep boxes: each group looks at the small light inside their box, first with the flap open (light pouring in), then with the flap shut (dark inside). "When could you see the little light better?" (With the flap shut, when it was dark around it.)
3. Glow stars: hold up the black star card in the bright room; then turn off the lights and close blinds (or put it in the night tent). "Are there more stars or fewer when it is dark?" (We can see more, or see them better.)
4. Tell the class: "Scientists say the stars are still in the sky in the day. The Sun's light is so bright that we cannot see them, just like the little light in the box with the flap open."

5. Sorting: groups sort the picture cards onto "seen in the day" and "seen at night". The Moon can go on both, or across the middle. Ask: "Where did you put the stars? Why?"

✓ Discussion questions (5 min, with answers)

- When can we see stars? (At night, when it is dark.)
- Why can't we see them in the day? (The Sun makes the sky too bright.)
- Is the Sun a star? (Yes; it is the star closest to us. Accept "yes" with no reason.)

✓ Closing check (5 min, with answers)

Hold up the day picture and the night picture. "Point to the picture where we can see stars." (Night.) "Are the stars still there in the day picture?" (Yes, but the Sun's light is too bright to see them.) Answers by pointing, a thumbs up or down, or words all count.

Vocabulary

star, night, daytime, bright, dark, model

Differentiation

- Support: sort only Sun, Moon and stars.
- Stretch: explain to a partner why the torch model is like the sky.
- Early finishers: draw the same view by day and by night.

⚠ Safety

- Torches point at the floor or into the box, never into anyone's eyes.
- Darkened room: clear the floor first, keep a light on near the door, and let any child who dislikes the dark sit by the door or stay in the light; looking from the edge counts.
- Battery tea-lights only, no real candles. Battery covers screwed shut.

Access

- Blind or low-vision children use the sound model: listen for the quiet ticking timer in a silent room (easy), then while music plays at a comfortable volume (hard). The timer did not stop; the louder sound hid it, as the Sun's light hides the stars. Say that this is a model with sound, not light.
- Children who find dark spaces upsetting watch the glow stars from the door or by a window; joining in is optional.
- Non-speaking children sort cards and point; no words needed.

Teacher notes

- The assessment boundary for this standard is only that stars are seen at night and not in the day. Do not test star patterns or names.

- A few very bright planets and the Moon can sometimes be seen by day; do not use them as a "trick" question at this age.
- Some children live where city lights hide most stars; "people far from bright lights see many more" is a kind way to say it.

Lesson 5: Long days and short days

Unit overview - Previous: Lesson 4

Goal: Children compare the amount of daylight at two times of year and say that there is less daylight in winter than in spring, summer or autumn. They start a class sky diary to check this themselves later in the year.

Length: about 40 minutes.

Materials

- Two Little Hill day strips, each a long paper strip split into a row of equal boxes from "wake up" to "bed time" for one made-up child, Pip: one strip for a winter school day, one for a spring school day. Boxes are coloured yellow (light outside) or dark blue (dark outside). In the winter strip, the first boxes (getting up, breakfast) and the last boxes (going home, tea, bed) are dark blue; in the spring strip most boxes are yellow and only bed time is dark blue.
- Per pair: small copies of both strips, and a picture card set of Pip's day (wake up, breakfast, walk to school, playtime, home time, tea, bath, bed), the same for both seasons.
- Tactile strips: the yellow boxes covered in smooth paper, the dark blue ones in rough sandpaper or felt.
- Two photos the teacher took of the same view at the same clock time in the early evening (for example 5 o'clock): one taken now (winter or late autumn) and one from earlier in the year, or a drawing of the same view in spring if no photo exists.
- A large class "sky diary" sheet with one row for each week until the end of term 3. Each row is a blank day strip of equal boxes, one box for each hour from 6 in the morning to 8 in the evening (no numbers needed on the children's copy).
- Sunrise and sunset times for your town each week, from a weather service or almanac your school uses; only the teacher uses the times.
- Yellow and dark blue counters, and yellow and dark blue crayons or stickers.

Steps

✎ Opening (5 min)

Show the two window photos. "These were taken at the same time on the clock. What is different?" (One is darker.) "Why might that be?" Take ideas.

✎ Main activity (25 min)

1. Show the two big Pip strips. Read the winter one together: "When Pip wakes up, is it light or dark outside?" (Dark.) "At home time?" (Getting dark, or dark.) Then the spring strip.
2. Pairs lay their small strips one above the other. "Which strip has more yellow?" (Spring.) "Which has more dark blue?" (Winter.) Children may count boxes to check; the answer is "more" or "less", not hours.

3. Pairs use the Pip picture cards: for each card, they put a yellow or blue counter on it for winter, then for spring. "Which parts of Pip's day change?" (The early morning and the evening.)
4. Start the class sky diary: the teacher reads this week's sunrise and sunset times (to themself) and children colour this week's row, yellow for the boxes between sunrise and sunset and dark blue for the rest. The teacher helps with the box where the change happens. Each week one child colours the new row in the same way.
5. Predict together: "When we colour the row in the spring term, will it have more yellow or less?" Write the prediction on the sheet.

✓ Discussion questions (5 min, with answers)

- In winter, is there more daylight or less? (Less.)
- In spring, is there more daylight or less than in winter? (More.)
- Why were both photos taken at the same time on the clock? (So the only big difference is the time of year; if they were taken at different times of day, we could not tell whether the season made the difference.)

✓ Closing check (5 min, with answers)

Give each child the two small Pip strips without labels. "Point to the winter day." (The one with more dark blue.) "Which day has more light?" (The spring day.) Then: "What do you think our sky diary will show in spring?" (Longer yellow rows: more daylight.)

Vocabulary

daylight, winter, spring, summer, autumn, season, more, less, compare

Differentiation

- Support: compare only two picture cards, "walk to school" and "home time", for winter and spring.
- Stretch: draw Pip's strip for a summer day and say how it is different from spring.
- Early finishers: decorate the sky diary sheet border with Sun, Moon and stars.

⚠ Safety

- No one looks at the Sun when checking the sky for the diary.
- Never ask children what time they get up, go to bed, or whether they go out after dark; use Pip.

Access

- Blind or low-vision children use the tactile strips: rough boxes for dark, smooth for light. "More rough" means "more dark".

- Children with colour vision differences: the blue boxes also carry a small moon symbol and the yellow boxes a small sun symbol.
- Non-speaking children point to the strip or place counters.

Teacher notes

- In the southern hemisphere the seasons fall in different months: swap the order so the diary runs from the darker season to the lighter one, and check that "term 2" really is the winter part of your year.
- The assessment boundary for this standard is relative amounts of daylight: more or less, not hours or minutes. Counting boxes is a comparison tool, not a measurement of hours.
- Near the equator, daylight changes very little through the year; if that is your class, compare Little Hill (made-up, far from the equator) with your own diary and say "in some places it changes a lot, here it hardly changes".
- Come back to the sky diary in term 3 and compare the rows. Many school days begin and end in daylight, so the diary uses sunrise and sunset times rather than asking children to look outside before or after school.