Pushes and pulls

Science, grade K - by Claude Opus 5.5 - status: written (unreviewed)

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

Kindergarten Science: Pushes and Pulls (5 lessons, about 2 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

Things only start moving, speed up, slow down, stop or change direction when something pushes or pulls them. With the same car on the same floor, a bigger push usually makes it go faster and farther. A slope gives a car a free push (the Earth pulls everything down), and rough ground slows a car down more than smooth ground does.

Outcomes

By the end of the unit a student can:

1. Show and name a push (away from you) and a pull (towards you), and sort everyday actions as push or pull.
2. Use a push or pull to make a toy car start, stop and change direction.
3. Predict, then test fairly (same car, same floor, same start line), whether a harder push makes a car go farther than a gentle push, and say what they saw.
4. Say that a car usually rolls farther down a higher ramp, and that a ball dropped from a hand always falls down.
5. Compare how far a car rolls on smooth and rough ground, and say which slowed it more.
6. Say "I think..." before trying, and "I saw..." afterwards.

Prior knowledge

- None needed beyond everyday play. Counting to 10 helps for measuring with cubes or footsteps.
- No reading is needed; recording is by stickers, drawings and class charts.

Lessons

Lessons are short (20-30 minutes) and mostly on the floor. Leave a day or two between lessons so children can play with the cars at free time.

Lesson	Title	Main activity
1	Push or pull?	Act out and sort everyday actions as push or pull
2	Start, stop, turn	Make a toy car start, stop and change direction
3	Gentle push, big push	Mark how far a car rolls after small and big pushes
4	Ramps	Roll a car down a low ramp and a high ramp
5	Smooth and bumpy	Roll a car onto smooth and rough surfaces; end-of-unit check

Materials (whole class unless noted)

- Toy cars that roll freely: one per pair, plus spares. Ideally all the same model, so results can be compared. No cars with small detachable parts.
- A large clear floor space (hall or cleared classroom), masking tape for a start line, sticky notes or beanbags as "stop markers".
- Interlocking cubes or a long paper strip for measuring distance; children can also count heel-to-toe footsteps.
- For ramps: a stiff board or a large hardback book about 60-80 cm long (or a length of plastic guttering), and a pile of large books or wooden blocks to raise it to "1 book" and "3 books" high.
- For surfaces: a piece of carpet or a rug, a towel, and a smooth floor or a large sheet of card; optionally bubble wrap or a doormat.
- A soft ball or beanbag; a door and a drawer in the classroom; a shopping bag or trolley-style toy on a string; a swing or picture of one.
- Push/pull picture cards (draw or photograph: opening a door, kicking a ball, pulling a wagon, pushing a pram, pulling a sock on, pushing a lift button, pulling a zip, pushing a swing). Two hoops or mats labelled with an arrow away (push) and an arrow towards (pull).

Assessment

- Lesson 1: sorting picture cards into push/pull hoops (observe and note).
- Lessons 3-5: each child's "I think" prediction (sticker on the class chart) and their "I saw" sentence, recorded by the teacher.
- Lesson 5: a 6-question picture/action check, 6 marks, with an answer guide (in lesson 5). It is a check of understanding, not a test to pass.

⚠ Safety (read before lesson 1)

- **Floor work:** clear the space of trip hazards; mark a "car zone" with tape so children are not walking where cars are rolling. Cars are rolled, never thrown.
- **Ramps:** keep ramps low (no higher than about 30 cm), on the floor, with the books or blocks underneath stable. Nobody stands or sits on a ramp.
- **Small parts:** check cars for loose wheels or small parts that could be a choking risk; remove damaged cars.
- **Pushing people:** we push and pull things, not each other. Paired "push/pull" movement games in lesson 1 use palms against a wall or pulling a rope/scarf gently together while sitting, never pushing a classmate.
- **Doors and drawers:** adult supervision when demonstrating; keep fingers away from hinges.
- Bubble wrap (optional) is supervised and collected afterwards; plastic is never put near faces.

Sources

All checked to load on 4 November 2026. These are teacher background; none are needed by the children.

- Wikipedia: Force (a push or a pull)

- Wikipedia: Motion
- Wikipedia: Newton's laws of motion (teacher background only)
- Wikipedia: Inertia (teacher background only)
- Wikipedia: Speed
- Wikipedia: Friction (why rough ground slows a car)
- Wikipedia: Rolling resistance (soft carpet slows rolling wheels)
- Wikipedia: Gravity (the Earth pulls things down)
- Wikipedia: Inclined plane (ramps)
- Wikipedia: Kinetic energy (teacher background only)
- Wikipedia: Toy vehicle

Known gaps and cautions

- **Labelled simplifications:** "force" is introduced only as an optional word for "a push or a pull". "Things slow down because the ground rubs on them" is the kindergarten version of friction and rolling resistance; the full idea (and that a moving object would keep going without them) comes in grades 3-5 and 6-8.
- Kindergarten comparisons are rough: a "big push" is not the same each time, so results vary. That is fine and worth talking about ("Was it a fair race?" leads into grade 3 fair tests).
- Magnets (a push or pull without touching) are left out on purpose: small magnets are a serious swallowing hazard for young children. A teacher-only demonstration with a large magnet could be added.
- No images yet; teachers will need to draw or photograph the picture cards.
- No standards alignment and no educator review.

Lesson 1: Push or pull?

Unit overview · Next: Lesson 2

Goal

Children feel and name a push (moving something away from you) and a pull (moving something towards you), and sort everyday actions into the two.

Materials

- A door and a drawer in the classroom; a toy on a string (or a small bag on a string); a soft ball.
- Push/pull picture cards (see the unit materials list), one set per group of 4, and two hoops or mats on the floor: one with an arrow pointing away (push), one with an arrow pointing towards a stick figure (pull).
- A long scarf or soft rope.

Steps

Opening (5 min). Sit in a circle. Roll the ball gently to a child and ask them to roll it back. "How did the ball start moving?" (I pushed it / I rolled it / my hand made it go.) "Could it start moving all by itself?" Collect ideas without correcting.

Main activity (15 min).

1. Demonstrate with the drawer: open it slowly. "My hand moved towards me. That is a **pull**." Close it: "My hand moved away from me. That is a **push**." Children copy with their hands in the air: pull (hands come towards chest), push (hands go out).
2. Actions game: call out actions and children mime them, then shout "push!" or "pull!": open a door, kick a ball, pull a wagon, push a swing, pull on a sock, press a button, pull up a zip, push a pram.
3. Children take turns to pull the toy on its string across the floor, and to push it back with one finger.
4. Scarf pull (sitting): two children sit facing each other, both holding the scarf, and take turns to pull it gently towards themselves. Then each child pushes their palms flat against a wall. "Which way did your hands go?"
5. In groups of 4, sort the picture cards into the push hoop and the pull hoop. Walk round and ask "How do you know?"

Discussion questions (with example answers).

- How can you tell a push from a pull? A push moves it away from me; a pull moves it towards me.
- Can you open a door with a push and with a pull? Yes, it depends which side you are on.
- What happens if nobody pushes or pulls the ball? It stays still.

Closing check (5 min, with answers). Show three cards one at a time; children show "push hands" or "pull hands": kicking a ball (push), pulling a wagon (pull), pressing a lift button (push).

Vocabulary

push, pull, move, away, towards; optional: force ("a push or a pull")

Differentiation

- Support: sort only 4 cards, with the teacher acting each one out first.
- Stretch: find a card that could be both (a swing: pull it back, then push it); find three pushes and three pulls in the classroom.

⚠ Safety

We push and pull things, not people. Scarf pulls are gentle and sitting down; no tug-of-war. Supervise door demonstrations and keep fingers away from hinges.

Teacher notes and misconceptions

- Some cards are honestly both (a swing, a zip that goes up and down); accept either answer with a good reason. Put "both" cards on the line between hoops.
- Children often think only people and animals can push or pull. Lesson 4 (the Earth pulls things down) and the wind blowing leaves are good later examples.
- Avoid saying "push is strong, pull is weak": either can be big or small.

Lesson 2: Start, stop, turn

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

Goal

Children use pushes and pulls to make a toy car start moving, stop, and change direction, and learn that a still car does not start on its own.

Materials

- One toy car per pair, plus spares; a clear floor space with a taped "car zone".
- Masking tape to make a simple road with one bend; two sticky notes per pair ("start" and "stop" spots).

Steps

Opening (5 min). Put a car on the floor and wait silently for 10 seconds. "Why isn't it moving?" (Nobody pushed it.) "What could we do?" A child gives it a push.

Main activity (15 min). In pairs on the floor:

1. **Start:** one child pushes the car gently to their partner.
2. **Stop:** the partner stops it with a flat hand. "What did your hand do?" (Pushed against it / blocked it.)
3. **Turn:** the car rolls past; the partner gives it a little push from the side so it changes direction. Try to make it go round a sticky note.
4. **Road challenge:** push the car along the taped road and round the bend, using as few pushes as possible. Count the pushes.
5. Swap roles and repeat.

Discussion questions (with example answers).

- What made the car start? A push from my hand.
- What made it stop? My hand pushed back; it bumped into the wall; it slowed down on its own (accept; lesson 5 explores this).
- How did you make it turn? I pushed it from the side.
- Can a car start moving all by itself on a flat floor? No, something has to push or pull it.

Closing check (5 min, with answers). "Show me with your car": make it start (a push), stop (a hand in the way), turn (a push from the side).

Vocabulary

start, stop, turn, direction, faster, slower

Differentiation

- Support: work with an adult; use a larger car and a wide road.

- Stretch: make the car go round two sticky notes in a zigzag; can you make it go backwards with a pull?

⚠ Safety

Cars stay in the taped car zone and are rolled, never thrown. Children sit or kneel; nobody walks through a "road" while cars are rolling.

Teacher notes and misconceptions

- Children may say the car stopped "because it got tired" or "ran out of push". Accept for now and come back to it in lesson 5 (the floor rubbing on it slows it down).
- Pushing from the side to change direction is harder than it looks; let children play.

Lesson 3: Gentle push, big push

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

Goal

Children predict whether a bigger push makes a toy car go faster and farther, test it fairly (same car, same floor, same start line), and practise measuring "how far" with cubes or footsteps.

Materials

- One toy car per group of 3 (the same model if possible); a taped start line.
- Sticky notes in two colours per group (e.g. yellow = gentle push, blue = big push) to mark where the car stops.
- Interlocking cubes or heel-to-toe footsteps for measuring.
- Class chart with two columns, "gentle push" and "big push", and a sticker per child for the prediction.

Steps

Opening (5 min). Show a car at the start line. "If I give it a tiny, gentle push, and then a big push, which time will it go farther?" Each child puts a sticker on the chart under their guess ("I think...").

Main activity (15-20 min). In groups of 3 (pusher, marker, measurer):

1. The pusher holds the car with its back wheels on the start line and gives a **gentle** push (one finger, a little tap). The marker puts a yellow sticky note where the car stops.
2. Back to the start line; a **big** push (whole hand, a firm shove, still staying on the floor). Blue sticky note where it stops.
3. The measurer counts footsteps (or lays cubes) from the start line to each sticky note.
4. Swap roles; each child does one gentle and one big push.
5. Back on the carpet, look at the sticky notes on the floor together. Where are most of the yellows? Most of the blues?

Discussion questions (with example answers).

- Which push made the car go farther? Usually the big push. If not, ask what was different (a swerve, a bump, a different spot on the floor).
- Which push made it go faster? Ask what they saw; usually the big push looks faster, but accept what they actually observed.
- Was your prediction right? Children say "I thought... I saw...".
- Did every big push go exactly the same distance? No, because people push differently each time, and some cars are wobbly. Is that a fair race?

Closing check (5 min, with answers). "I want the car to reach the bookshelf. Gentle push or big push?" (Big push.) "I want it to stop before the line, near me. Gentle or big?" (Gentle.)

Vocabulary

gentle, big (hard), far, farther, near, fast, faster, measure

Differentiation

- Support: measure with a long paper strip and a crayon mark instead of counting.
- Stretch: try a "medium" push and predict where it will stop before trying; count cubes and say how many more for the big push.

⚠ Safety

Big pushes stay on the floor; cars are never thrown or flicked into the air. Keep the area in front of the start line clear of people.

Teacher notes and misconceptions

- Results will be mostly, not always, as expected: a gentle push can travel far on a very smooth floor, and a big push can make a car swerve into a wall. Talk about this honestly instead of hiding the "wrong" result.
- Kindergarten version: "with the same car on the same floor, a bigger push usually makes it go faster, and a faster car goes farther before it stops." Kinetic energy and speed are teacher background only.

Lesson 4: Ramps

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

Goal

Children see that a car let go at the top of a slope starts moving without anyone pushing it, because the Earth pulls everything down, and that a higher ramp makes it roll farther.

Materials

- A stiff board, a large hardback book, or plastic guttering, about 60-80 cm long, on the floor.
- Large books or wooden blocks to raise one end: "1 book" high and "3 books" high (keep the top below about 30 cm).
- One toy car; sticky notes in two colours; cubes or footsteps for measuring.
- A soft ball or beanbag.
- Class chart with two columns, "low ramp" and "high ramp", and stickers.

Steps

Opening (5 min). Hold a beanbag up high and let go. "Did I push it down?" (No.) "Then why did it go down?" Collect ideas. Explain: "The Earth pulls everything down towards it, all the time. That is why things fall when you let go." Try letting go of the beanbag sideways: it still ends up on the floor.

Main activity (15-20 min). Whole class around one or two ramps, children taking turns:

1. Put the car at the top of the low ramp (1 book) and **let go** without pushing. "Why did it move?" (The Earth pulled it down the slope.) Mark where it stops with a yellow sticky note.
2. Predict: "If we make the ramp higher, will the car go farther, less far, or the same?" Stickers on the chart.
3. Raise the ramp to 3 books. Same car, same starting spot, let go without pushing. Mark with a blue sticky note.
4. Do each ramp height three times, with a different child letting go each time. Measure to each note with footsteps or cubes.
5. Look at where the yellow and blue notes are.

Discussion questions (with example answers).

- Did anyone push the car on the ramp? No; we just let go.
- What pulled it? The Earth pulled it down the slope.
- Which ramp made it go farther? The high ramp.
- Why did we let go instead of pushing? So every go was the same and we could compare only the ramp (a first taste of a fair test).

Closing check (5 min, with answers). "If I let go of a ball, which way will it go?" (Down.) "I want the car to roll as far as the door. Low ramp or high ramp?" (High ramp.)

Vocabulary

ramp, slope, high, low, let go, fall, down; optional: gravity ("the Earth's pull")

Differentiation

- Support: compare only the two ramp heights once each, with an adult measuring.
- Stretch: try 2 books and predict where the car will stop; try a different car and see if it behaves the same.

⚠ Safety

Ramps stay on the floor and low (below about 30 cm); books or blocks under them must be stable. Nobody stands or sits on a ramp. Children wait their turn outside the car zone.

Teacher notes and misconceptions

- A very steep ramp can make cars crash at the bottom and go less far; keep heights modest so the pattern is clear.
- Children often think heavy things are pulled down and light things are not (a balloon or feather "floats"). Air slows light things; it is fine to say "the air gets in the way of the feather" without more detail.
- "Gravity" is optional at this age; "the Earth pulls things down" is the idea that matters.

Lesson 5: Smooth and bumpy

Unit overview · Previous: Lesson 4

Goal

Children compare how far a car rolls on smooth and rough surfaces, notice that rough ground slows a car down more, and show what they have learned in a short picture/action check.

Materials

- The low ramp from lesson 4 (1 book high), so every run starts the same way.
- Three surfaces laid at the bottom of the ramp, one at a time: a smooth floor or a large sheet of card, a piece of carpet or a rug, and a towel. Optional fourth: bubble wrap or a doormat.
- One toy car; sticky notes; cubes or footsteps.
- Class chart with one column per surface and a picture of each.
- For the check: the push/pull picture cards, a car, a ramp, and a check sheet for the teacher (one line per child, 6 boxes to tick).

Steps

Opening (5 min). Children rub their hands on the carpet, then on the smooth floor or a table. "Which feels bumpy and rough? Which is smooth?" Predict with stickers: "On which one will the car roll farthest?"

Main activity (15 min).

1. Lay the smooth surface at the bottom of the ramp. Let the car go from the top (no push). Mark where it stops; measure.
2. Repeat with the carpet, then the towel, keeping the same car, the same ramp and the same starting spot.
3. Do each surface twice. Put a sticky note on the chart showing the distance (e.g. a strip of cubes taped to the chart).
4. Look at the chart. Which surface let the car go farthest? Which stopped it soonest?

Discussion questions (with example answers).

- Which surface let the car roll farthest? The smooth floor.
- Which slowed it down the most? The towel (or carpet): it is bumpy and soft, and it rubs on the wheels.
- Remember lesson 2: why did your car slow down and stop on its own? The floor rubs on it and slows it down.
- Where would you want a smooth floor? A rough floor? Smooth for a race track or a slide; rough for a path where you do not want to slip.

End-of-unit check (10 min, 6 marks). Do this in small groups or one to one while the class plays. Children answer by pointing, acting or saying. One mark each.

1. Show the card of a child pulling a wagon. "Push or pull?" **Answer:** pull.
2. Show the card of a foot kicking a ball. "Push or pull?" **Answer:** push.

3. "Show me how to make this car stop." **Answer:** puts a hand (or object) in the way / pushes against it.
4. "I want this car to go a long way. Gentle push or big push?" **Answer:** big push.
5. Show the low and high ramp (or a picture). "Which will make the car roll farther?" **Answer:** the high ramp.
6. Show the smooth floor and the towel. "Which will slow the car down more?" **Answer:** the towel (the rough/bumpy one).

Record a tick for each answer; note any explanations a child gives ("because the Earth pulls it", "the towel rubs it"), which are worth more than the tick. This check shows what to revisit; it has no pass mark.

Vocabulary

smooth, rough, bumpy, slow down, rub; optional: friction ("rubbing that slows things down")

Differentiation

- Support: compare just two surfaces (smooth floor and towel).
- Stretch: predict where bubble wrap or a doormat would go on the chart before trying it; invent a "slowest track" from classroom materials.

⚠ Safety

Ramps stay low and on the floor. Towels and rugs lie flat so nobody trips. Bubble wrap (if used) is supervised, kept away from faces, and collected afterwards.

Teacher notes and misconceptions

- Soft surfaces like carpet slow wheels partly by squashing under them (rolling resistance) as well as rubbing (friction). "The rough floor rubs and squashes, which slows the car" is enough at this age.
- Many children (and adults) think a moving thing stops "because the push runs out". The better idea, for later grades, is that it would keep going if nothing slowed it; rubbing and squashing are what stop it. You can hint: "On the smoothest floor it went farthest. What if the floor were even smoother, like ice?"
- If results come out unexpected (a car swerves off the towel), repeat it and talk about why.