

Levers, pulleys and gears

Autumn 1 · Week 4 · Lesson A · 40 minutes

Learning objective

Name levers, pulleys and gears, identify a lever pivot and explain the force-distance trade-off without claiming extra energy.

Source lesson timing

Elapsed minutes	Source stage	Minutes
0–1	Title	1
1–5	Arrival Task	4
5–7	Today at a Glance	2
7–16	I Do 1	9
16–26	We Do 1	10
26–30	I Do 2	4
30–40	We Do 2	10

Split slide times are added within their original source stages. Printed tasks and adaptations replace activity within these timings; they do not add extra lesson time.

Equipment and preparation

- Safe blunt scissors or a simple original drawing
- Adult-secured ruler/card lever, broad stable pivot, light secured eraser load
- Two pivot marks, fixed effort mark and small lift-height target
- Board/paper for wheelbarrow, flagpole and bicycle sketches; no publisher media needed

TEACHING SEQUENCE

Guide the lesson

Use the source stage times; choose prompts appropriate to the pupil.

Title · 1 minute

Introduce mechanisms, pivot and gain/cost.

Arrival Task · 4 minutes

Identify turning point on scissors and, if ready, wheelbarrow.

Today at a Glance · 2 minutes

Find pivot, compare effort and explain trade-off.

I Do 1 · 9 minutes

Model lever with same load and target rise; compare middle and near-load pivots.

We Do 1 · 10 minutes

Classify everyday mechanisms and distinguish fixed-pulley direction from lever/gearing force-distance effects.

I Do 2 · 4 minutes

Model a complete gain-and-cost explanation.

We Do 2 · 10 minutes

Sort claims, correct misconceptions and keep the plan for Tuesday. Stop here.

TEACHER ANSWERS

Worked answers and expected evidence

Use after an attempt. Accept equivalent correct explanations; record support given.

Lever demonstration

For same load, load position, effort point and target rise, a pivot nearer load increases effort-arm/load-arm ratio. Less effort force is ideally required; effort end travels farther. Real friction/bending can obscure the effect.

1. Find and explain a pivot

Pivot. Scissors turn around the screw/joint; wheelbarrow lever turns about wheel axle. Lever sketch: rigid bar, pivot beneath, effort applied at one end and light secured load at the other. Accept correct diagrams regardless of left/right orientation if forces and labels coherent.

2. Name the mechanism and job

Wheelbarrow: lever, wheel axle pivot. Scissors: paired levers, central joint pivot. Spanner: lever acting about bolt axis. Fixed flagpole pulley: changes pull direction so pulling down lifts flag; ideal fixed pulley alone does not reduce effort force. Bicycle: geared chain drive; ratios trade wheel turning effect against rotations per pedal turn.

3. Sort gains and costs

Less effort: gain. Farther hand travel: cost. Pull down instead of up: direction benefit/gain for stated job. Extra energy created: neither; false claim. Slower turn with greater turning effect: gain and cost. Turning effect means torque; do not equate it with new energy.

4. Explain the lever trade-off

Pivot nearer load lengthens effort arm relative to load arm, so less effort force is needed ideally. The effort end travels farther for the same load rise. Real friction/bending may affect observation. Mechanism does not create energy. If no demonstration occurred, label prediction/explanation rather than measured result.

Misconceptions and corrections

- Every pulley reduces effort: a single fixed pulley primarily changes direction.
- Gears create power: ratios trade rotational speed for turning effect, with real losses.
- Bicycle cogs touch like paired gears: the source example uses a chain drive.
- Scissors have no lever: each side rotates about the joint.
- More force for free: mechanisms cannot create energy.

Teach safely; keep the evidence

The source record identifies this conversion; it is not a claim of publication.

Safety

- Use adult-approved safe scissors or drawing; no pointing at sharp blades.
- Small controlled lever lifts only; never flick or launch a load.
- Keep hands clear of pivot and moving parts; no heavy masses.
- Explain pulleys/gears with drawings; do not wrap ropes around bodies or touch moving gears.

Access and offline alternatives

- Paper cards or spoken choices replace interactive classification.
- Native editable lever diagram substitutes animation without claiming a measurement.
- Adult operation/directing and non-handling routes remain available.
- Preserve original logo; no substitute or publisher footage is included.

Close and continue

Monday ends after We Do 2 at 40 minutes. Tuesday practical is 32 minutes plus 4 feedback and 4 exit; preserve those timings.

Source and revision

Repository: [MattRoper1977/Lessons](https://github.com/MattRoper1977/Lessons)

Source path: [Science_Teesside/Grow/SCI_G_W4_Mechanisms.html](#)

Source file Git blob: [8aa3e1f001c3d3c944207d4eb44b93b1df4d7e46](#)

Current source link (mutable): https://github.com/MattRoper1977/Lessons/blob/main/Science_Teesside/Grow/SCI_G_W4_Mechanisms.html

Document revision: 2026-09-06

Recorded conversion changes

- Preserves current Monday stages and 40-minute duration; Tuesday practical remains separate.
- Native editable lever schematic and spoken/paper sorts replace animation and HTML tapping.
- Fixed-pulley direction change is distinguished from force gain; gears are described using turning effect and speed.
- Wheelbarrow/scissors/spanner examples retained, with safe drawings or adult-handled objects.
- No publisher footage copied; no substitute silver logo drawn.