Lesson 10

materials

States of matter and changing state

Lesson at a glance

Open by holding up an ice cube and asking how it differs from sink water. Name solid, liquid and gas, then pupils write one prediction on the PredictObserveRecord page before a teacher-only tray demo: ice, warm water in a cup, kettle, and a cold fridge lid held in the steam path. They record what they saw, link it to the states-of-matter interactive on the IWB, sort everyday items by state, and close with a display-only talk on dairy and distilling as real heating-and-cooling uses.

Learning objectives

- Identify solid, liquid and gas as the usual states of everyday materials
- Describe how heating and cooling move water between ice, liquid and steam, including condensation
- Link changing state to what particles are doing and to Irish industries such as dairy and distilling

Before the bell — prep

Night before: freeze ice cubes and chill a clean metal lid or mirror in the fridge. Set a front demo tray with ice, a jug of hand-safe warm water, clear cup, kettle (teacher only), and the cold lid. Ready four sort items: block or pencil, spoon, sealed water bottle, inflated balloon.

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Item	Qty	Per	Source	Low-cost substitute
ice cubes from the same tray	6	class	school kit	freeze water in identical bottle caps the day before
electric kettle (teacher only)	1	class	classroom	teacher-only saucepan of recently boiled water brought from staff room (pupils still stay well back from steam)
jug of warm hand-safe water	1	class	classroom	tap water that feels clearly warmer than the ice, judged by the teacher's hand
clear plastic or glass cup	1	class	classroom	any clear jar or bottle base
cold metal lid or small mirror	1	class	classroom	a clean metal baking tray or spoon chilled the same way
everyday state-sort items (wooden block or pencil, metal spoon, small sealed water bottle, inflated balloon or sealed bag of air)	1	class	classroom	use whatever safe classroom objects you already have and name three zones for solid, liquid and gas
paper zone mats labelled solid, liquid and gas	3	class	classroom	three areas of desk or board marked with sticky notes
Investigation Journal page	1	pupil	classroom	ruled paper with a predict line and four rows headed ice, liquid water, steam, cold lid

Safety watch-point

Kettle and steam are teacher-only. Pupils stay well back; never let children pour boiling water or hold the kettle. Wipe spills; teacher empties warm water when cool.

Teaching moves

- **Solid, liquid and gas:** Project only the three state words. Hold changing state and condensation until after the demo. Stress that true water vapour is invisible and do not call the white kettle plume a gas.
- **What do you predict?:** Point to ice, jug, kettle and cold lid so every pupil can name them. Hand out PredictObserveRecord; partners write one short prediction only. Collect two or three spoken guesses on the board in their words—do not reveal the lid result.
- **Watching water change state:** Run the modelled beats tightly: show ice, pour warm water, boil the kettle yourself with pupils well back, hold the cold lid for beads. Say aloud: invisible vapour is the gas; white mist is tiny liquid drops. If the lid stays dry, breathe gently on the cold mirror as backup rather than waiting.
- **Record what we saw:** Pupils complete the observe rows for ice, cup water, steam and lid drops before any particle talk. Circulate with: 'Is steam solid, liquid or gas?' and 'What made the drops appear?' Revoice steam if anyone points at the white cloud as gas.
- **What the particles were doing:** Drive the states-of-matter interactive in guided mode only—brief visual link, not a second lesson. Pause at solid wobble, melting, sliding liquid, invisible gas near 100°C, and cooling back to liquid drops. Ask: did the particles change, or only how they move?
- **Everyday materials by state:** Shared front sort: block/pencil, spoon, sealed water, balloon into solid / liquid / gas. Demand keeps-its-shape, flows, or spreads-out as the why. Challenge anyone who treats air in the balloon as 'nothing'.
- **Making sense of states:** Display-only talk. Point back to meltwater and lid drops if anyone says ice 'went away'. Match Irish dairy heating/cooling and distillery vapour-cooled-to-liquid to heating, cooling, or both—one pair share is enough.

What it should show

Ice stays solid then softens; cup water flows as liquid; some water leaves the kettle as mostly invisible gas; clear drops form on the cold lid (condensation). It is still water each time. Weak lid beads usually mean the lid was not cold enough—use the chilled-mirror breath backup. White plume is tiny liquid, not the gas.

Misconceptions & interventions

- **Pupils say the ice 'disappeared' or 'went away' when it melted.** — Point to the meltwater in the tray and the drops on the lid: 'Where is the water now?' Revoice: still water—only the state changed.
- **Pupils point at the white kettle plume and call it gas or steam-as-gas.** — Say: some water left as a gas we mostly cannot see; the white mist is tiny liquid drops already forming in cooler air. The cold lid shows more liquid as that gas cools.
- **Pupils think heated particles get bigger, or that steam particles are 'air particles'.** — On the states-of-matter interactive, freeze on one step and trace: same water particles, different movement and spacing—wobble, slide, or race freely.

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Differentiation

Emerging	Developing	Proficient
• Allow drawing of the four demo stages with a board word bank (solid / liquid / gas) instead of full sentences on PredictObserveRecord. • Pair at the teacher table during the sort and prompt only keeps-its-shape / flows / spreads-out.	• Add one journal sentence: 'It was still water because…' beside the observation ticks. • Cold-call one justification per sort item using the three state phrases.	• Ask them to explain why the white mist is not the gas, using the lid drops as evidence. • Stretch: match dairy and distilling examples to heating, cooling, or both and name the state change.

Cross-curricular hook

Link to Irish dairy and distilling—heating then cooling materials on purpose, same idea as the cold lid.