

Start Here · Thermal Energy

Foundation collection: Read Temperature Data Before Explaining It reads temperature records; Was It a Fair Comparison? evaluates fair comparisons; Which Design Is Better Supported? compares trials and limits design claims. Use a sequence or enter at an observed response. Paper and pencil only; optional calculator, number line, pointing or oral explanation. Intended for Grade 6; related NGSS expectations span Grades 6–8. Check local course placement.

Choose and print

Read Temperature Data Before Explaining It: Read Temperature Data Before Explaining It — Teach the Lesson includes Prerequisite bridge/Teacher model/Model representation/Guided practice/Independent task. Was It a Fair Comparison?: Was It a Fair Comparison? — Teach the Lesson includes Prerequisite bridge/Teacher model/Guided practice/Independent task. Which Design Is Better Supported?: Which Design Is Better Supported? — Teach the Lesson includes Prerequisite bridge/Teacher model/Guided practice/Independent task. Each resource has separate student PDF/DOCX, teacher PDF/DOCX, five named student PDF selections and readable HTML.

For a short check use the kit's Use a Quick Check, task Independent task. It repeats that kit's independent page; do not treat it as fresh after Teach the Lesson. Use the separately supplied Later Check after Independent task. Every selection contains its own setup/data. Student and teacher downloads are visibly separate.

Prepare without a lab

Read the one-page teacher quick start and the key for the selected route; print student pages only. Paper and pencil required. Optional supports: calculator, projection, number line, pointing, oral response. These are paper tasks; use the separate practical teacher guide for equipment work.

Planning estimates: 35–45 min for Read Temperature Data Before Explaining It, Was It a Fair Comparison?, 36–44 min for Which Design Is Better Supported?; 10–15 min per reteach and 5–8 min per later check. Start Here reading/preparation estimate 10–15 min. None are observed classroom timings.

Begin where the evidence suggests

Use the included prerequisite check first. Clarify labels and response access, then teach the relevant route. A correct choice with no explanation calls for a question; a blank response does not identify the difficulty. Do not require a fixed claim/evidence/reasoning paragraph.

Vocabulary and representations

Words for the reasoning

Temperature: a reading at a stated time, in °C here. Temperature change: difference between start and finish for the same sample, with direction. Warming: final is higher. Cooling: final is lower. Elapsed time: duration between readings. Evidence: relevant observations used to support a claim. A limit: a condition or question that the record does not settle.

Matched comparison: relevant conditions agree so differences can be attributed more defensibly to the factor being compared. Confound: another relevant difference that mixes possible effects. Trial: a fresh comparison, not merely the next time reading of the same sample. Complete design: all construction choices together; a result does not isolate one material property.

Read before explaining

Read the heading, unit, sample label, time, start and finish. Trace one row or column completely. On Read Temperature Data Before Explaining It's graph, time advances in equal 5-minute spaces; points repeat the same table values. A graph is a representation, not an extra experiment. Use the accompanying text table when graph access is difficult; plotting is not a prerequisite.

Scientific boundaries

Temperature is a reading, not the total energy stored in a sample. Total energy also depends on the type, state and amount of matter. In these passive water examples, net thermal-energy transfer is from the warmer part toward the cooler part. A temperature record alone does not identify conduction, convection or radiation separately. Less warming does not mean cooling or stopped transfer.

When starts/masses/times differ, subtracting does not repair the comparison. A few matched trials can reveal a supplied pattern without proving a reliable difference. Small differences with unknown measurement accuracy warrant caution. Insufficient evidence of a difference is not proof of identical performance. Repeated trials do not automatically remove systematic bias.

All numerical activity data in this collection were invented, not measured or produced by a physical computer simulation. Keep the disclosure beside every extracted table. Never label a student's proposed redesign as tested unless actual testing occurs.

Response-to-next-task index and planning record

Use the activity titles below to choose the separate student print choices; each includes the needed setup and data. In the classroom ZIP, each resource has a Print choices folder and separate Student tasks and Teacher guide folders. Match the student activity title and question number to the teacher key.

Choose a supplied next task

Mixed rows, reversed warming/cooling: Read Temperature Data Before Explaining It Reteach Compare the Measurements (PDF), Keep readings in one row, questions 1–2; First follow-up. Confused final value with change: Read Temperature Data Before Explaining It Reteach Value or Change (PDF), A value is not a change, questions 1–3; Second follow-up. Ignored unequal mass/start: Was It a Fair Comparison? Reteach Repair the Comparison (PDF), Subtraction does not fix a confound, questions 1–2; First follow-up. Vague procedure or material-property claim: Was It a Fair Comparison? Reteach Specify the Plan (PDF), Specify a usable plan, questions 1–3; Second follow-up.

Used one convenient trial or said “always”: Which Design Is Better Supported? Reteach Use All Results and Limit the Claim (PDF), Use all results and limit the claim, questions 1–4; teacher Use all results and limit the claim. Misread Which Design Is Better Supported? measurements: Which Design Is Better Supported? Reteach Compare the Measurements (PDF), Compare the measurements, questions 1–3; teacher Compare the measurements. For later transfer use the chosen kit’s Use-a-Later-Check.pdf, T tasks and teacher Later check; these are new records, not validated equivalent forms.

Clarify before deciding

Ask: “Show me the values you used.” “What does the question ask us to compare?” “Can you explain aloud or label an arrow?” Record the response mode and supplied support. Separate difficulty expressing the reasoning from difficulty with the idea. A pointed-to matched comparison may show reasoning without a polished paragraph.

Local planning record · copy as needed

Date: _____ Kit/task ID: _____ Response mode/support:

Observed excerpt or pointed-to data:

Reading/direction: _____ Comparison: _____ Scientific connection/limits:

Next supplied selection/task: _____ Why: _____ New check/date:

Use descriptive visible/partly visible/not yet visible notes, not a composite scientific-ability score. Keep records locally; this collection does not require student uploads.

Sources and classroom copying

What each record covers

Read Temperature Data Before Explaining It: temperature, row/time/units, graph-table equivalence, fresh checks and keys. Was It a Fair Comparison?: question/controls/confounds, usable plans, fresh checks and keys.

Official sources and selected connections

Official sources checked 2026-09-29: NGSS MS-PS3-4 (<https://www.nextgenscience.org/pe/ms-ps3-4-energy>) supports temperature/energy distinctions and investigation planning; MS-PS3-3 (<https://www.nextgenscience.org/pe/ms-ps3-3-energy>) supports transfer direction and requires actual design, construction and testing. These paper tasks address selected components, not complete performance expectations. Original text/data/graph; no third-party passages or graphics reproduced. Classroom copying/adaptation follows <https://mentorteaching.com/terms-of-use/>.

DOE Building Science Education, Heat Flow (<https://bsesc.energy.gov/energy-basics/heat-flow>), supports background on the three transfer pathways. It does not validate the invented designs. Read Temperature Data Before Explaining It reads observations; Was It a Fair Comparison? supports investigation planning; Which Design Is Better Supported? supports comparative evidence. Paper analysis does not fulfill physical design/construction/testing requirements.

Rights and provenance

The teaching text, tasks, constructed data and graphics are original project materials. Classroom copying and adaptation follow the Mentor Teaching Terms of Use: <https://mentorteaching.com/terms-of-use/>.