

Start Here · Five-resource route

Use this guide for the five-resource sequence. Each resource has student tasks, a separate teacher guide, focused follow-up tasks and a later check.

Choose a sequence or enter from a response

Read Temperature Data Before Explaining It: read measurements—headings,units,time,starts,change. Was It a Fair Comparison?: evaluate comparison conditions—question,confounds,matched repair,recording. Which Design Is Better Supported?: support a design choice—paired evidence across trials and limits. Explain Why the Temperature Changed: explain the pattern—sample/surroundings,net-transfer direction and scientific connection. Revise a Claim When Evidence Changes: revise a particular claim—compare new conditions/evidence and retain,narrow,change or remain uncertain.

Each resource has its own prerequisite bridge. The sequence helps connect ideas but is not required before entering a kit. Check the bridge; clarify task/language/representation access. A correct selected design does not by itself show explanation; a blank response does not identify a science difficulty.

Prepare and print

Required: paper and pencil. Optional: calculator,number line,pointing,projection,oral response or labeled representation. Read the one-page teacher quick start and relevant key. Print student files only,keeping keys separate. Use actual standalone selections listed here,not the whole packet when exposure/reveal matters.

Planning estimates,not classroom timings: Read Temperature Data Before Explaining It, Was It a Fair Comparison? 35–45 min;Which Design Is Better Supported? 36–44 min;Explain Why the Temperature Changed 36–45 min;Revise a Claim When Evidence Changes 45–55 min or two lessons. Reteach 10–15 min in the first four thermal energy resources,15–20 min in Revise a Claim When Evidence Changes;later 5–8 min in foundation,8–12 min Explain Why the Temperature Changed,10–15 min Revise a Claim When Evidence Changes. Guide preparation 10–15 min estimate.

Equipment-free supplied-data analysis is not evidence of conducting an investigation or designing,constructing and testing a physical device.

Vocabulary and scientific boundaries

Observation: a supplied reading at a stated time. Evidence: a relevant observation selected for a question. Explanation: connect that evidence to a scientific idea. Temperature: reading in °C here; change: start-to-finish difference with direction. Warming: higher final; cooling: lower final. Sample: matter studied; surroundings: parts outside it; net: overall transfer accounting for opposite directions.

Matched comparison: relevant conditions agree for the intended question. Confound: another relevant difference mixes possible effects. Independent trial: a fresh comparison; repeated time readings from one sample are one run. Complete design: construction choices together, not an isolated material property. Claim scope: conditions/results the statement actually concerns.

Revision can retain a bounded claim, narrow its scope, change a conclusion or withhold confidence. Decisions depend on exact wording and comparability. A new result does not require reversal. One design's changed-condition record does not rank it against an untested design. Keep contrary raw records; an exclusion needs a procedural reason, not convenience.

A temperature reading is not total energy. Type, state and amount of matter also affect total energy. For these passive, single-phase cases, net thermal-energy transfer is from warmer parts toward cooler parts. An arrow represents that net transfer, not a substance called cold or an individual particle path. Temperature readings alone do not isolate conduction, convection or radiation, calculate total transferred energy, or show an instantaneous transfer rate. Limiting warming is not cooling; limiting transfer is not stopping it.

At idealized uniform equal temperatures, with no other input/output or phase change, there is no net thermal-energy transfer driven by a temperature difference; particles at 22°C still move. One unchanged reading does not establish equilibrium or absent particle motion.

Small/variable differences plus unknown accuracy can leave a comparison uncertain; overlap does not prove identical performance. Display precision is not accuracy. More trials do not automatically remove systematic bias. No joules, statistical significance or total-energy ratios from Celsius numbers are required.

Every dataset is constructed teaching data, not experiment measurements or computer simulation. All fictional responses are labeled. The Read Temperature Data Before Explaining It graph repeats its model table; the Explain Why the Temperature Changed arrow is an explanatory model, not an observed pathway. Text alternatives give equivalent information, not assessment answers.

Print choices · First three resources

In the classroom ZIP, the Read temperature data, Compare test conditions and Support a design choice folders each contain Student tasks, Teacher guide and Print choices folders. Choose the full student packet or the separate student selection you need. Each resource also has separate print-choice downloads; use the activity titles below to select them.

Read Temperature Data Before Explaining It · Read Temperature Data Before Explaining It

Teach-the-Lesson.pdf:Prerequisite bridge/Teacher model/Model representation/Guided practice/Independent task,full student pp 1–5,teacher Prerequisite bridge/Teacher model and representation/Guided practice and independent task. Use-a-Quick-Check.pdf:Independent task,full p 5,teacher Guided practice/Independent task. Reteach Compare the Measurements (PDF):First follow-up,full p 6,Keep readings in one row, questions 1–2,teacher First follow-up. Reteach Value or Change (PDF):Second follow-up,full p 7,A value is not a change, questions 1–3,teacher Second follow-up. Use-a-Later-Check.pdf:Later check,full p 8,Later check · A changed direction, questions 1–3,teacher Later check.

Was It a Fair Comparison? · Was It a Fair Comparison?

Teach-the-Lesson.pdf:Prerequisite bridge/Teacher model/Guided practice/Independent task,full student pp 1–4,teacher Prerequisite bridge/Teacher model/Guided practice and independent task. Use-a-Quick-Check.pdf:Independent task,full p 4. Reteach Repair the Comparison (PDF):First follow-up,full p 5,Subtraction does not fix a confound, questions 1–2,teacher First follow-up. Reteach Specify the Plan (PDF):Second follow-up,full p 6,Specify a usable plan, questions 1–3,teacher Second follow-up. Use-a-Later-Check.pdf:Later check,full p 7,Later check · Cooling and a repaired test, questions 1–3,teacher Later check.

Which Design Is Better Supported? · Which Design Is Better Supported?

Teach-the-Lesson.pdf:Prerequisite bridge/Teacher model/Guided practice/Independent task,full student pp 1–4,teacher Prerequisite bridge/Teacher model/Guided practice/Independent task. Use-a-Quick-Check.pdf:Independent task,full p 4,teacher Independent task. Reteach Compare the Measurements (PDF):Compare the measurements,full p 5,Compare the measurements, questions 1–3,teacher Compare the measurements. Reteach Use All Results and Limit the Claim (PDF):Use all results and limit the claim,full pp 6–7,Use all results and limit the claim, questions 1–4,teacher Use all results and limit the claim. Use-a-Later-Check.pdf:Later check,full p 8,Later check · Reverse the direction, questions 1–3,teacher Later check.

For every kit,Quick Check reuses the independent task from Teach the Lesson. It is an alternate print route,not an unseen recheck after Independent task. Foundation fresh checks are inside reteaches and Later check. Record if any were already shown.

Print choices and new-evidence sequence

The Explain temperature change and Revise a claim folders each contain Student tasks, Teacher guide and Print choices. PDF, editable Word and readable HTML versions are supplied. Match each separate student selection to the keys and full-packet page references in its teacher quick start.

Explain Why the Temperature Changed · Explain Why the Temperature Changed

Teach-the-Lesson.pdf: Prerequisite bridge/Teacher model/Model representation/Guided practice/Independent task, full student pp 1–5, teacher pp 2–5. Use-a-Quick-Check.pdf: Independent task, full p 5, teacher p 5, reused after Independent task. Reteach Connect Evidence to the Explanation (PDF): First follow-up and fresh check, full pp 6–7, Connect evidence to the explanation, questions 1–2; Fresh recheck · Connect a new record, question 1, teacher p 6. Reteach Trace Energy Transfer (PDF): Second follow-up and fresh check, full pp 8–9, Trace energy transfer, questions 1–2; Fresh recheck · Trace a new case, question 1, teacher p 7. Use-a-Later-Check.pdf: Later check/Explanation check, full pp 10–11, Later check · A changed setting, question 1; Later check · Idealized equal temperatures, questions 1–2, teacher p 8.

Revise a Claim When Evidence Changes · Revise the Claim When Results Change

Teach-the-Lesson.pdf: Prerequisite bridge → Initial model record → New model evidence → Revision record → Initial practice record → New practice evidence → Initial independent record → New independent evidence, full pp 1–8, teacher pp 2–7. Use-a-Quick-Check.pdf: Initial independent record → New independent evidence, full pp 7–8, teacher p 7, reused after Independent task. Reteach Keep the Evidence Change the Claim (PDF): Initial follow-up record → New follow-up evidence → Initial fresh-check record → New fresh-check evidence, full pp 9–12, Initial claim and support, question 1; Keep the evidence, change the claim, question 1; Fresh recheck · Initial record, question 1; Fresh recheck · Additional record, question 1, teacher pp 8–10. Reteach Compare Conditions Before Revising (PDF): Initial comparison record → New comparison evidence → Initial fresh comparison → New fresh comparison evidence, full pp 13–16, Initial conditions and claim, question 1; Compare conditions before revising, questions 1–2; Fresh recheck · Initial conditions, question 1; Fresh recheck · Changed surroundings, question 1, teacher pp 11–12. Use-a-Later-Check.pdf: Initial later-check record → New later-check evidence, full pp 17–18, Later check · Initial evidence, question 1; Later check · New evidence, questions 1–2, teacher p 13.

Revise a Claim When Evidence Changes: print one-sided; hand out initial record first; record the original claim; then hand out the separate new-evidence page. Keep both visible for revision. The revision record has seven fields; teacher revision record has a completed example. Student full packet/download preview is not a reveal-safe whole-class handout.

After Independent task, use a still-unseen Later Check; after reteach, use its supplied fresh recheck. Freshness is conditional on actual prior exposure, not the filename. If all were shown, use as practice and document that limitation.

Response → actual next task

Clarify meaning/access first: “Show the values you used.” “What does your statement claim?” “Which part is warmer?” “Can you explain aloud or label a drawing?” Record mode/support. Do not infer misunderstanding from writing fluency.

Mixed rows/reversed direction → Read Temperature Data Before Explaining It Compare the Measurements, Keep readings in one row, questions 1–2. Confuses endpoint and change → Read Temperature Data Before Explaining It Value or Change, A value is not a change, questions 1–3. Uses subtraction to excuse unequal conditions → Was It a Fair Comparison? Repair the Comparison, Subtraction does not fix a confound, questions 1–2. Vague recording plan → Was It a Fair Comparison? Specify the Plan, Specify a usable plan, questions 1–3.

Uses one convenient trial or says always → Which Design Is Better Supported? Use All Results and Limit the Claim, Use all results and limit the claim, questions 1–4. Misreads Which Design Is Better Supported? values → Which Design Is Better Supported? Compare the Measurements, Compare the measurements, questions 1–3. Repeats readings without a scientific link → Explain Why the Temperature Changed Connect Evidence to the Explanation, Connect evidence to the explanation, questions 1–2; Fresh recheck · Connect a new record, question 1. Reversed net arrow/cold substance/stopped transfer → Explain Why the Temperature Changed Trace Energy Transfer, Trace energy transfer, questions 1–2; Fresh recheck · Trace a new case, question 1, after checking intended meaning.

Ignores inconvenient new results/overgeneralizes → Revise a Claim When Evidence Changes Keep the Evidence, Change the Claim, Initial claim and support, question 1; Keep the evidence, change the claim, question 1; Fresh recheck · Initial record, question 1; Fresh recheck · Additional record, question 1. Pools incomparable new records or changes automatically → Revise a Claim When Evidence Changes Compare Conditions Before Revising, Initial conditions and claim, question 1; Compare conditions before revising, questions 1–2; Fresh recheck · Initial conditions, question 1; Fresh recheck · Changed surroundings, question 1. Correct reasoning with unclear writing → oral/labeled response, not automatic science reteach. Quick Check The independent task is reused; choose unseen Fresh follow-up check/Fresh follow-up check or T for later evidence.

Local planning record · copy if useful

Date: _____ Kit/task: _____ Mode/support: _____

Observed excerpt or pointed-to values: _____

Data reading: _____ Comparison/conditions: _____

Science connection/claim limits: _____ Revision rationale: _____

Next supplied selection/task: _____ Why: _____

Later check/date/exposure: _____

Use visible/partly visible/not yet visible descriptions with evidence, not a composite ability score or mastery label. Keep notes locally; no student accounts, uploads or automated scoring are required.

Sources and classroom copying

Official sources checked 2026-09-29: NGSS MS-PS3-3 (<https://www.nextgenscience.org/pe/ms-ps3-3-energy>) and MS-PS3-4 (<https://www.nextgenscience.org/pe/ms-ps3-4-energy>); NSTA revision connection (<https://my.nsta.org/ngss/NSforSEP.aspx?id=3>). These support specific ideas, not validation or complete standards coverage. All text/data/representations are original; external sources are paraphrased and linked, not reproduced. Classroom copying/adaptation follows <https://mentorteaching.com/terms-of-use/>.

OpenStax College Physics 2e sections 13.1 and 13.4 support the equal-temperature and continued-particle-motion distinction. See the links in the Explain Why the Temperature Changed teacher guide. This background supports selected ideas; it does not imply complete standards coverage.

Specific connections, not a blanket alignment badge

Read Temperature Data Before Explaining It supports measurement reading; Was It a Fair Comparison? selected planning/controls; Which Design Is Better Supported? comparative evidence; Explain Why the Temperature Changed connects observations to net-transfer explanation; Revise a Claim When Evidence Changes evaluates new evidence/conditions and revision. Selected ideas in MS-PS3-3/4 and NSTA's 6–8 revision connection are used. These supplied-data tasks do not conduct an investigation or physically design, construct and test a device, or complete those expectations.

The text, tasks, tables and constructed data are original project materials. External source rights are not granted. Classroom copying and adaptation follow the Mentor Teaching Terms of Use.