

Teacher quick start · Kit 5

Target: compare new evidence with a particular claim, check relevant conditions and retain/narrow/change/withhold only as justified. Prerequisites: starts/units/change, matched trials and bounded claims; bridge P supplies a check and explanation. Grade 6 is a provisional authoring target within the NGSS Grades 6–8 band; check local course placement. Paper and pencil only. Optional calculator, number line, pointing, projection, oral explanation or labeled diagram.

Print menu with actual reveal order

Teach the Lesson: Kit5-v 1.0.0-Teach-the-Lesson.pdf, full student pp 1–8:P → M0 → M1 → MR → G0 → G1 → I0 → I1. Teacher pp 2–7. Quick Check: Kit5-v 1.0.0-Use-a-Quick-Check.pdf,I0 → I1,student pp 7–8;teacher p 7. Same I sequence, not fresh after the lesson.

Reteach: Keep the Evidence, Change the Claim: Kit5-v 1.0.0-Reteach-Keep-the-Evidence-Change-the-Claim.pdf,A0 → A1 → Ac 0 → Ac 1,student pp 9–12;teacher pp 8–10. Reteach: Compare Conditions Before Revising: Kit5-v 1.0.0-Reteach-Compare-Conditions-Before-Revising.pdf,B0 → B1 → Bc 0 → Bc 1,student pp 13–16;teacher pp 11–12. Later Check: Kit5-v 1.0.0-Use-a-Later-Check.pdf,T0 → T1,student pp 17–18;teacher p 13.

Print one-sided. Hand out initial page first; collect/record its claim before distributing its new page. Do not show new records/keys early. Each selection has all conditions/data; MR is the model's seven-field record.

Sequence and response route

Author estimates only: P8 min,M0/M1/MR15 min,G0/G110 min,I0/I112 min:45–55 min, or split over two lessons. Reteach 15–20 min;later 10–15 min. Readiness P first, model M, guide G, collect I; no apparatus.

Ignores inconvenient rows/overgeneralizes → A/Ac. Pools incomparable results or reverses automatically → B/Bc. Accept accurate connected prose, a labeled representation, or an oral explanation pointing to data. First ask the learner to point to the row, restate the question and explain aloud. Record response mode and support. An unclear or blank response is insufficient evidence of a science difficulty; clarify reading, language and access before choosing a reteach.

Sources/limits p 14;print/exposure p 15. All data constructed;human review/classroom feedback separate.

P · Bridge explanation and answers

K5-D-P · 100 g, 12°C start, 22°C surroundings, 10 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Start (°C)	After 10 min (°C)
P-1	12	16
P-2	12	17

Say: “A claim is a particular statement. I preserve its exact wording before new evidence. Both P trials warm 4°C/5°C. That supports warming here, not everywhere. I check whether a new record addresses the same conditions and whether it actually challenges this claim. A new result may support retaining it.”

K5-P1: 4°C/5°C warming. (a) is supported under stated 10 min/100 g/22°C conditions; (b) exceeds the record and ignores possible cooler surroundings. No real experiment is established.

K5-P2: Name material/mass/start/interval/surroundings/setup/procedure and trial scope. Compare the exact claim, relevant conditions, quality/amount/pattern of new evidence; do not change just because a record is newer.

Readiness: request initial/final/change and two matched conditions. If arithmetic alone is difficult use number-line support. If claim scope unclear, ask “Which room/time does your sentence name?” If all claims reverse automatically, preview B’s principle: compare conditions first. This bridge is usable without earlier kits.

Repeated time readings in one run differ from fresh independent trials. “More data” is not automatically unbiased or decisive; relevance, quality and pattern matter.

M0 · Model the initial bounded claim

K5-D-M0 · 100 g, 10°C start, 22°C surroundings, 20 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve R final (°C)	Sleeve S final (°C)
M-1	14.0	16.0
M-2	14.5	16.5
M-3	14.0	16.0

Think aloud: “R’s values 14/14.5/14°C meet the nominal 15°C rule in each supplied trial. I keep 22°C, 100 g, 10°C start and 20 min in the claim. I can also describe R’s 2°C lower endpoints than S. I do not promise every room or future trial. Accuracy is not supplied; nominal margin is not a robust guarantee.”

K5-M1: R14.0/14.5/14.0°C, all at or below 15°C in these three 20 min/100 g/10°C-start/22°C constructed trials. R warms 4/4.5/4°C, 2°C less than S each row. Nominal pass only; accuracy unknown, 14.5°C gives only 0.5°C nominal margin; no future guarantee. Accept a comparison claim if bounded.

Have students write M1 before showing M1 data. Their original bounded statement remains visible. A scientifically adequate limitation can concern actual empirical testing, method/accuracy or other conditions. No fixed paragraph format.

M1 · Model narrowing scope

K5-D-M1 ·R only;100 g,10°C start,28°C surroundings,20 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve R start (°C)	Sleeve R final (°C)
M-4	10	18.0
M-5	10	18.5
M-6	10	18.0

Think aloud: “Only the surrounding temperature changes from 22 to 28°C. R now exceeds 15°C in all three rows. That challenges every-room wording. It does not erase the 22°C results. We have no new S data, so I cannot rank R versus S at 28°C. I can retain the bounded earlier statement and explicitly limit its scope.”

K5-M2: Surroundings 22 → 28°C; R now 18/18.5/18°C, above 15°C. Retain the historical 22°C conclusion; narrow/reject every-room claim. No new S readings, so no 28°C R/S ranking. Room is the relevant changed condition; same 10°C start/mass/time/versions/procedure.

K5-M3: Keep original 22°C statement, reject extension to 28°C; the original record need not be wrong. Complete fields MR1–MR7. Accept retain for an already bounded 22°C claim together with recognition of 28°C limit; narrow for an every-room claim.

If a learner says “S now wins,” ask for an actual S reading at 28°C; none is supplied. If “the old data were wrong,” ask which value is contradicted under the same stated conditions. New changed-condition data identify a limit, not an error in the first record.

MR · Fully completed revision record

This is the completed teacher example; student MR contains only fields and response space.

K5-MR-1: Example original claim: R kept water at or below 15°C in each of three stated 22°C-room, 20 min trials.

K5-MR-2: Support: M-1/2/3 = 14.0/14.5/14.0°C; 100 g, 10°C start, 20 min, 22°C surroundings.

K5-MR-3: New M-4/5/6 = 18.0/18.5/18.0°C for R; surroundings 28°C; other R conditions match; no S new record.

K5-MR-4: Retain bounded original; narrow any every-room extension; uncertain about ranking at 28°C. More than one decision accepted when its target claim is explicit.

K5-MR-5: R nominally met the criterion in the supplied 22°C record but not at 28°C; no 28°C ranking with S follows.

K5-MR-6: Changed surroundings challenge scope, not the first record's values. Both records retained. A performance requirement and a design ranking are different claims.

K5-MR-7: Matched independent R/S trials at 28°C, 100 g, 10°C start, 20 min, same versions/cups/lids/exposure/procedure; retain raw readings and obtain accuracy/method information. No fabricated outcome.

Accept another original claim if accurately preserved and evaluated. "Retain" is correct for a bounded 22°C sentence; "narrow" is correct for the fictional every-room sentence. A classification without specifying the claim is ambiguous: clarify before assigning reteach. Stronger evidence must address the proposed extension, not simply add unrelated endpoints.

G · New evidence can support retention

K5-D-G0 · 100 g, 11°C start, 23°C surroundings, 18 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve C final (°C)	Sleeve D final (°C)
G-1	16	18
G-2	17	19
G-3	16	18

K5-D-G1 · same conditions; additional independent trials

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve C final (°C)	Sleeve D final (°C)
G-4	16	18
G-5	16	18
G-6	17	19

Ask before reveal: “What exactly does your claim say?” After reveal: “Which conditions match? Does the relevant pattern persist?” Anticipate “always change because new data”: point to the consistent 2°C paired differences. Anticipate “six trials prove all conditions”: request the listed scope and accuracy limit.

K5-G1: C warms 5/6/5°C; D 7/8/7°C, C 2°C less in each of first three trials. Bounded descriptive support for C in these conditions; not guaranteed future advantage.

K5-G2: G-4/5/6: C 5/5/6°C, D 7/7/8°C; same 2°C pattern. Comparable additional evidence is consistent, so retain bounded claim rather than reverse automatically. Accept continued caution about confidence/unknown accuracy; no forced global preference.

K5-G3: Example: In these six constructed 18 min/23°C comparisons C had 2°C less warming than D each time. Further independent matched trials/method accuracy or a specific changed-condition test strengthens a targeted claim; none proves every condition.

Accept retaining a cautious description rather than declaring a winner. Adding comparable support does not turn a constructed record into empirical proof.

I · Independent uncertain case and alternatives

K5-D-I0 · 120 g, 40.0°C start, 22°C surroundings, 15 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Cover P final (°C)	Cover Q final (°C)
I-1	35.0	34.8
I-2	35.1	34.9

K5-D-I1 · same conditions; four additional trials

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Cover P final (°C)	Cover Q final (°C)
I-3	34.7	35.0
I-4	35.1	34.9
I-5	34.9	35.0
I-6	35.0	35.1

K5-I1: P falls 5.0/4.9°C, Q 5.2/5.1°C; P limits cooling by 0.2°C in each initial nominal pair. Accept “P has higher endpoints in these two trials” with caution or uncertain preference because differences are small/accuracy unknown. Do not demand an unqualified winner.

K5-I2: New I-3 Q higher by 0.3°C; I-4 P higher by 0.2°C; I-5/6 Q higher by 0.1°C. All six: P higher in three, Q higher in three. Small variable differences/unknown accuracy do not support a confident ranking. Revise a confident P claim to uncertainty; retain the historical first-two description with narrowed scope plus uncertainty across full record. Accept a qualified numerical summary only if it does not claim reliability; acknowledge contrary rows.

K5-I3: Check accuracy/calibration/method, matched conditions and additional independent trials/raw records. Overlap does not prove identical performance; a slightly different mean or newest row does not establish a reliable difference. More trials do not automatically remove systematic bias.

A cautious retained historical description is acceptable alongside uncertainty about full-series performance. A confident universal winner is unsupported. Do not force reversal or award credit merely for choosing “uncertain”; ask which rows and limits explain it. Use A for selective evidence; B for condition/automatic-change issues; clarify expression first.

A0 · Keep the original evidence visible

K5-D-A0 · 90 g, 9°C start, 21°C surroundings, 16 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve J final (°C)	Sleeve K final (°C)
A-1	14	17
A-2	15	18

Have learner record A1 before revealing A1 data. Say: “J has less warming in these first two pairs. I keep this evidence, with its scope, even if my overall conclusion later changes.” Ask the learner to underline conditions and retain the original wording.

K5-A1: J warms 5/6°C, K8/9°C in two initial pairs: J3°C less nominal warming each. Bound to first two 16 min/90 g/9°C-start/21°C trials; no universal claim.

Do not teach “initial evidence never counts” or “newest always wins.” The relevant claim may be a historical statement about two rows, a tentative overall preference or a universal assertion; compare new records to the actual wording.

A1 · Worked intervention and revised conclusion

K5-D-A1 · same 90 g/9°C/21°C/16 min conditions;six new pairs

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve J final (°C)	Sleeve K final (°C)
A-3	18	13
A-4	19	14
A-5	18	13
A-6	19	14
A-7	18	13
A-8	19	14

Think aloud: “The six new comparisons all favor K by 5°C. I keep the two old J-favoring pairs. Six relevant repeated pairs with larger contrary differences materially weaken my earlier overall J preference; it is not because the last row is newest. I revise toward a tentative K preference for this combined record, acknowledge two contrary results and check the method before promising reliable performance.”

K5-A2: New J rises 9/10°C and K4/5°C;K5°C less warming in all six new pairs. Earlier J advantage is retained as historical evidence, but a current confident J preference is undermined. Across eight comparable trials K has lower endpoints in six and J in two; larger contrary margins in six support changing a tentative overall preference toward K while stating uncertainty. Not statistical significance or a guarantee. Accept withholding confident ranking due to conflicting subsets/unknown accuracy if the full pattern and stronger K support are described. Response 1 cherry-picks; response 2 relies on recency rather than the relevant six-row pattern. Do not exclude old rows.

Alternative: withhold a confident ranking pending accuracy/method checks while explaining why the full record favors K more strongly. Do not dismiss this. Do not assert significance from trial counts. Raw records are not discarded; an exclusion needs a documented procedural reason, not inconvenience.

Practice: learner revises A2 using the complete record. Prompt “Which old result stays in your explanation?” and “What does your next evidence test?” Withhold Ac until practice ends.

Ac · Fresh retention recheck

K5-D-Ac 0 · 100 g, 12°C start, 24°C surroundings, 14 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve U final (°C)	Sleeve V final (°C)
Ac-1	16	19
Ac-2	16	19

K5-D-Ac 1 · same conditions; new independent trials

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve U final (°C)	Sleeve V final (°C)
Ac-3	17	20
Ac-4	16	19
Ac-5	17	20

K5-A3: U warms 4/4°C, V 7/7°C; U 3°C less in each initial pair; bounded to these 14 min/24°C trials. No reliable future or material-property guarantee.

K5-A4: New U rises 5/4/5°C, V 8/7/8°C; same 3°C nominal pattern in all five. Retain bounded claim. Accept uncertainty about robust performance if accuracy/trials limits named; a reversal is unsupported. Next matched trials/accuracy or specified new conditions, not discarding old results.

Reveal Ac 1 only after A3. This contrasts A's change case: retaining a bounded statement is now defensible. If learner reverses just because it is new, use B. If all values recognized but written revision unclear, ask orally which sentence should stay and why. Success shows application on this new task, not mastery or validated equivalence.

B · Compare conditions before revising

K5-D-B0 · 100 g, 10°C start, 22°C surroundings, 20 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve L final (°C)	Sleeve N final (°C)
B-1	15	18
B-2	16	19
B-3	15	18

K5-D-B1 · masses/starts/times differ; 22°C surroundings

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID / setup	Mass (g)	Start (°C)	Time (min)	Final (°C)
B-4 / L	80	12	20	18
B-4 / N	160	10	10	13
B-5 / L	80	12	20	19
B-5 / N	160	10	10	14

Think aloud: “I keep L’s initial matched advantage. The new pairs have 80/160 g, 12/10°C starts and 20/10 min. I can describe complete setups, but pooling endpoints would mix different conditions and cannot isolate a sleeve effect. Subtraction also leaves those differences. I revise the claim’s applicability, not automatically its ranking.”

K5-B1: L warms 5/6/5°C, N 8/9/8°C; L 3°C less in each initial matched pair. Relevant 100 g/10°C/22°C/20 min/versions/cups/lids/exposure/procedure.

K5-B2: B-4 L 6°C, N 3°C; B-5 L 7°C, N 4°C. New N complete setups warmed less, but masses 80/160 g, starts 12/10°C, times 20/10 min differ. Those confounds block a sleeve-alone attribution and pooling as one matched series. Subtraction does not fix them. New evidence describes these particular complete setups; it does not reverse initial matched ranking.

K5-B3: Retain historical matched B0 conclusion; remain uncertain about sleeve comparison in B1. Example next: both 100 g, 10°C start, 22°C surroundings, 20 min, same cups/lids/exposure/procedure and L/N versions; fresh independent repeated trials; retain readings/notes. Accept other common masses/starts/times if explicitly matched and relevant. Do not pool or assume newer wins.

Ask “Which exact conditions differ? What does the new question actually compare?” Accept a coherent matching plan with different common values. Do not require one-variable-at-a-time as a universal rule for science.

Bc · Fresh scope and ranking recheck

K5-D-Bc 0 · 100 g, 10°C start, 22°C surroundings, 20 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve E final (°C)	Sleeve F final (°C)
Bc-1	15	17
Bc-2	16	18

K5-D-Bc 1 · E only; 100 g, 10°C start, 28°C surroundings, 20 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Sleeve E start (°C)	Sleeve E final (°C)
Bc-3	10	18
Bc-4	10	19

K5-B4: E 5/6°C warming versus F 7/8°C; E 2°C less in these 22°C/20 min trials, not universally better.

K5-B5: Room 22 → 28°C; E warms 8/9°C. Retain 22°C E/F statement; narrow any every-room extension and withhold 28°C ranking because no F result. Example next: matched E/F at 28°C, 100 g, 10°C start, 20 min, same versions/cups/lids/exposure/procedure plus repeats/accuracy. Do not infer F now wins.

Reveal Bc 1 only after B4. New E evidence addresses changed conditions; without F there is no new ranking. Accept retain bounded 22°C comparison, narrow universal scope, uncertain 28°C comparison. The labels depend on the wording evaluated; request that wording rather than imposing one option.

If learner names correct room change but ranks F anyway, ask for the missing evidence; if inaccurate rows, clarify table access and trace each sample before the science decision.

T · Later cooling revision and limits

K5-D-T0 · 110 g,38°C start,20°C surroundings,12 min

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Cover A final (°C)	Cover B final (°C)
T-1	32	28
T-2	31	27

K5-D-T1 · same conditions;five additional trials

Constructed teaching data: these values were invented for this activity, not collected in an experiment.

Trial ID	Cover A final (°C)	Cover B final (°C)
T-3	27	33
T-4	26	32
T-5	27	33
T-6	26	32
T-7	27	33

K5-T1: A cools 6/7°C,B10/11°C;A4°C less cooling in initial pairs. Bound to these two 110 g/38°C-start/20°C/12 min trials; accuracy/trial-count/constructed-data limit accepted.

K5-T2: New A falls 11/12/11/12/11°C;B5/6/5/6/5°C;B6°C less cooling in each new pair. All seven: B favors five pairs, A two;five sizable relevant differences undermine an overall A preference and support a tentative change toward B. Keep contrary initial rows and historical claim. Accept uncertainty pending methods/accuracy if full pattern is recognized. Newest row alone not the rationale; no significance or universal performance guarantee.

K5-T3: Verify procedure/versions,accuracy and additional fresh matched comparisons;keep raw readings/contrary rows. Water remains warmer than 20°C surroundings, so net transfer outward is consistent with cooling;Cooling shows net transfer was not stopped. A cover may limit transfer, but no no-cover comparison here measures that effect. No pathway split or instantaneous rate inferred.

Reveal T1 only after T1 task on initial page. A coherent response shows claim revision with reversed temperature direction and retained contrary evidence. It does not prove durable mastery, validated equivalence with I, physical investigation or real-device performance. The initial/new dataset labels and task IDs differ: K5-D-T1 is the new record; K5-T1 is the initial prompt. Keep this distinction in exposure notes.

Science, revision and partial standards

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.

K5 M/G//A/B/T analyze selected evidence and conditions, connecting to the MS-PS3-4 evidence/explanation nature-of-science statement and planning/data-amount elements. Transfer background comes from PS3.B in MS-PS3-3. No kit task completes physical design/construction/testing or full investigation planning/content expectations.

NSTA's "Scientific Knowledge Is Open to Revision in Light of New Evidence" Grades 6–8 connection supports revision/improvement and differing certainty. This is a nature-of-science connection, not a separate performance expectation or validation of these tasks. M is narrow scope;G/Ac retain;A/T change tentative conclusion;l uncertainty;B comparability. Keys accept combined decisions and justified alternatives.

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/>.

All examples are invented, not measured. Accuracy is not supplied;0.1°C display is not an accuracy guarantee. No means/significance needed. Different trial counts and margins can support a cautious descriptive preference without proving a reliable difference. Human science review,classroom feedback and assistive-technology testing remain separate.

Print references, freshness and response notes

Full student packet: P1, M0=2, M1=3, MR4, G0=5, G1=6, I0=7, I1=8, A0=9, A1=10, Ac 0=11, Ac 1=12, B0=13, B1=14, Bc 0=15, Bc 1=16, T0=17, T1=18. Teacher: QS1, P2, M0=3, M1=4, MR5, G6, I7, A0=8, A1=9, Ac 10, B11, Bc 12, T13, S14, X15.

Teach selection pp 1–8=P/M0/M1/MR/G0/G1/I0/I1; teacher pp 2–7. Quick selection pp 1–2=I0/I1; teacher p 7. Evidence reteach pp 1–4=A0/A1/Ac 0/Ac 1; teacher pp 8–10. Conditions reteach pp 1–4=B0/B1/Bc 0/Bc 1; teacher pp 11–12. Later pp 1–2=T0/T1; teacher p 13. Exact filenames on QS. All selections print one-sided and preserve initial → new order.

Exposure: P supported bridge; M0/M1/MR modeled; G0/G1 practiced; I0/I1 initially independent, reused by Quick Check; A/B interventions practiced; Ac/Bc fresh until shown; T new later. No K5 numerical record reuses foundation data. Full packet is not a reveal-safe handout; print only the intended route and distribute page by page.

Accept accurate connected prose, a labeled representation, or an oral explanation pointing to data. First ask the learner to point to the row, restate the question and explain aloud. Record response mode and support. An unclear or blank response is insufficient evidence of a science difficulty; clarify reading, language and access before choosing a reteach.

Record original wording, selected evidence, conditions, revision and next task separately. No diagnostic score or mastery label. If all suitable checks have already been shown, report exposure and use them for practice; do not claim an unseen check.