

Quick start · Evidence portfolio

Target: describe evidence across six dimensions without a composite score. Print Integrative A (PDF) or Integrative-B.pdf; show initial page first, collect response, then reveal new evidence. Full student packet is not reveal-safe. The two task keys follow; the optional blank teacher recording sheet is separate.

Materials: paper and pencil. Intended for middle school. Prerequisites: headings/time/change, comparison conditions, net transfer, claim scope and design constraints; use the individual kit bridges if needed. Planning estimates: each two-page integrative sequence 20–30 min, optional oral response. No timed classroom evidence.

Record “evidence visible”, “partial/unclear”, or “not yet elicited”, anchored to a specific response. Missing evidence does not prove lack of understanding. Clarify table access, question meaning and response mode before reteaching. No validated rubric, mastery label, ability score or effect-size claim.

The two integrative tasks differ in context and demands; do not treat them as equivalent forms. If already exposed, report exposure, use for practice, and use an unseen supplied later check in the relevant kit. All numerical values are constructed.

Complete teacher key

Integrative record A · Explain and limit, question 1 · H falls 6/7/6°C; J falls 4/5/4°C. J limits cooling more: e.g., 34 vs 32°C and 33 vs 31°C, with the same 38°C starts. Keep direction explicit; a lower endpoint is worse for this goal of protection against cooling.

Integrative record A · Explain and limit, question 2 · Water at 38°C is warmer than the 20°C surroundings; net thermal energy transfers outward. Both cool; smaller falls for J are consistent with less net transfer out of matched water over 12 min. This does not prove a unique pathway, total energy, guaranteed real performance or performance in future conditions.

Integrative record A · New evidence, question 1 · New H falls 3°C in 25°C surroundings, a different room temperature from the original 20°C. Retain the bounded initial statement that J limits cooling more than H; narrow any generalization to all rooms. There are no new J data at 25°C, so there is no ranking there. Withhold a confident performance inference across conditions while describing the H record. Accept a combination of retaining, narrowing and uncertainty with correct scope.

Integrative record A · New evidence, question 2 · Name a question, e.g., H vs J at 25°C. Use fresh matched 100 g samples starting at 38°C, for 12 min, with the same cups, lids, exposure and readout, independent repeated paired trials, room logs, raw starts and endpoints, and departures from the procedure. If investigating room effects, keep the design and other conditions the same across controlled room comparisons; do not erase values.

The cooling task elicits reading, representative cooling evidence, explanation, scope revision and a comparison plan. It does not itself elicit building/testing. Accept a labeled representation or oral account with pointed-to data.

Complete teacher key

Integrative record B · Design and evidence, question 1 · R and S are feasible. T fails: $17.5 > 17^{\circ}\text{C}$ in trial 2. R saves 2 tokens and 3 mm; S ends 1°C lower in all pairs but uses more resources. Either justified priority is accepted. All warm from 12°C ; net transfer is from the 24°C surroundings toward the water. No total energy ratio or transfer pathway is proved.

Integrative record B · Design and evidence, question 2 · Accept a specified proposal within 6 tokens and 18 mm, a predicted direction grounded in a transfer idea, and a matched repeated comparison of 90 g samples starting at 12°C in a 24°C room for 15 min against the unchanged chosen design. Record all initial and final readings, room, time, construction details and departures; use ≥ 3 fresh paired trials for instruction, not a reliability guarantee. Larger warming or a criterion miss could challenge the prediction.

Integrative record B · Revised design record, question 1 · R-tight fails at 17.5°C in trial 3; earlier favorable readings of $15.5/16^{\circ}\text{C}$ cannot erase the failure. S-thin passes at $15.5/16/16^{\circ}\text{C}$, with 6 tokens and 16 mm; compared with original S, it saves 2 mm but warms $0.5/0.5/1^{\circ}\text{C}$ more. Original R and S both remain feasible; accept a chosen tradeoff with scope, with no universal improvement.

Integrative record B · Revised design record, question 2 · Measurement accuracy, construction and real performance remain unknown, and trials are limited. Repeat matched conditions with characterized measurements, test the actual proposed design, or change the environment to investigate a specified limit. Neither the outcome of the learner's own proposal nor unique conduction, convection or radiation is established. Close future differences may prevent a preference; they do not prove equality.

The design task elicits design-brief feasibility, explanation, proposed test and revision. Construction and actual testing remain unobserved in paper work.

Annotated responses · Measurement reading

Measurement reading · Read Temperature Data Before Explaining It/Independent task · New readings, question 1

Fictional response: "It rose by the final number."

Visible: A final reading is mentioned; the change is not established.

Plausible but unconfirmed: The learner may have missed the starting row, or may be using imprecise words.

Clarify: Point to the start and finish. Is the finish above or below the start?

Exact next task: Read Temperature Data Before Explaining It/Keep readings in one row, question 1 then Keep readings in one row, question 2; student p. 6

Measurement reading · Explain Why the Temperature Changed/Independent task · Explain the record, question 1

Fictional response: "31 to 27. Down 4."

Visible: Accurate first-trial cooling and change, despite sparse writing.

Plausible but unconfirmed: The learner may or may not read the other trials consistently.

Clarify: Show me the other two rows and their changes.

Exact next task: Explain Why the Temperature Changed/Later check · A changed setting, question 1; student p. 10, Later selection p. 1

Annotated responses · Comparison conditions

Comparison conditions · Was It a Fair Comparison?/Independent task · Fresh critique, question 2

Fictional response: “Subtracting fixes the different water amounts.”

Visible: Changes are considered, but a confound is treated as removed.

Plausible but unconfirmed: Could be uncertainty about why mass matters rather than arithmetic difficulty.

Clarify: Which conditions still differ after subtraction?

Exact next task: Was It a Fair Comparison?/Subtraction does not fix a confound, question 1 then Subtraction does not fix a confound, question 2; student p. 5

Comparison conditions · Fresh recheck · Whole design or one feature?, question 1

Fictional response: “Two features changed; whole design only.”

Visible: Separates matched whole-design evidence from a feature claim.

Plausible but unconfirmed: The learner may need help specifying the narrower comparison.

Clarify: How would you hold layer count fixed to test the seam?

Exact next task: Later check · Changed requirements, question 1; Later check · One new environment record, questions 1–2; student pp. 10–11, Later selection pp. 1–2

Annotated responses · Representative evidence

Representative evidence · Which Design Is Better Supported?, independent task, question 1

Fictional response: “D: 16 versus 18; 15 versus 17. Same start.”

Visible: Two matched comparisons support D; sparse expression is adequate.

Plausible but unconfirmed: Scope and all-trial consistency still need eliciting.

Clarify: What about the third trial and conditions outside this record?

Exact next task: Which Design Is Better Supported?/Later check · Reverse the direction, questions 1–3; student p. 8, Later selection

Representative evidence · Independent challenge · Separate redesign evidence, question 1

Fictional response: “J-sealed improved: 15.5 in trial 1.”

Visible: Selects one favorable value; ignores trial 3 failure.

Plausible but unconfirmed: Might not have noticed the every-trial criterion.

Clarify: Which result challenges your statement? Keep it visible.

Exact next task: Meet every requirement, questions 1–2 then Fresh recheck · What if none qualifies?, question 1; student pp. 6–7

Annotated responses · Scientific explanation

Scientific explanation · Explain Why the Temperature Changed/Connect evidence to the explanation, question 1

Fictional response: “It went from 15 to 20.”

Visible: Correct observation, no scientific connection yet visible.

Plausible but unconfirmed: Could understand transfer but not know the requested form.

Clarify: Which part is warmer? Explain aloud what that means for net transfer.

Exact next task: Explain Why the Temperature Changed/Connect evidence to the explanation, question 2 then

Fresh recheck · Connect a new record, question 1; student pp. 6–7

Scientific explanation · Integrative record A · Explain and limit, question 2

Fictional response: “Water warmer; net energy outward; both drop.”

Visible: Correct transfer direction tied to cooling.

Plausible but unconfirmed: Does not yet establish limits or whether a pathway was measured.

Clarify: What does the thermometer not tell you about the route of transfer?

Exact next task: Explain Why the Temperature Changed/Later check · Idealized equal temperatures, questions 1–2; student p. 11 conceptual later check

Annotated responses · Claim revision

Claim revision · Revise a Claim When Evidence Changes/Fresh recheck · Changed surroundings, question 1

Fictional response: “E is worse than F at 28.”

Visible: An unsupported new ranking with only E in the new room.

Plausible but unconfirmed: May be generalizing F’s older-room result.

Clarify: Where is F’s 28°C reading? Which earlier statement can remain?

Exact next task: Revise a Claim When Evidence Changes/Initial conditions and claim, question 1; Compare conditions before revising, questions 1–2 then Fresh recheck · Initial conditions, question 1; Fresh recheck · Changed surroundings, question 1; student pp. 13–16

Claim revision · Integrative record A · New evidence, question 1

Fictional response: “Keep J at 20; no J at 25.”

Visible: Retains bounded earlier comparison and withholds unsupported new ranking.

Plausible but unconfirmed: The proposed next evidence has not been elicited.

Clarify: What matched new pair would address the 25°C question?

Exact next task: Integrative record A · New evidence, question 2; student p. 2

Annotated responses · Design improvement

Design improvement · Independent challenge · Record a proposal first, question 1

Fictional response: “J saves 2 tokens and 5 mm; K warms less. I choose J.”

Visible: A feasible design is selected and a resource tradeoff is visible; individual requirement checks are not shown.

Plausible but unconfirmed: Whether proposal/testing is understood remains open.

Clarify: What modification would you test, and what could disconfirm it?

Exact next task: Independent challenge · Record a proposal first, question 2 then reveal Independent challenge · Separate redesign evidence, questions 1–2; student pp. 4–5

Design improvement · Integrative record B · Revised design record, question 1

Fictional response: “S-thin is guaranteed better because thinner.”

Visible: A size benefit is offered; warming tradeoff and scope are absent.

Plausible but unconfirmed: May be using “better” for size only.

Clarify: Better by which criterion? Compare every requirement and trial.

Exact next task: A proposal needs a relevant test, questions 1–2 then Fresh recheck · Whole design or one feature?, question 1; student pp. 8–9

Local portfolio record · Copy as needed

Date / resource / task / actual prior exposure: _____

Mode and supplied support: _____

Observed words, pointed-to readings or diagram description: _____

For each dimension record evidence visible / partial or unclear / not yet elicited, with a reason.

Measurement reading: _____

Comparison conditions: _____

Representative evidence: _____

Scientific explanation: _____

Claim revision: _____

Criteria-based design improvement: _____

Clarifying question and response: _____

Exact next supplied task / why / later revisit date: _____

Keep locally. No student uploads or automated scoring. Do not infer broad ability from an unelicited dimension.