TEACHER PREPARATION GUIDE.

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The Cold-Hand Rebound: A Homeostasis Lab

Biology | TEACHER GUIDE

Planning notes for teachers: materials, setup, expected results, and what to watch for.

Not yet classroom-tested. This is a new lab design that has not been tested in a classroom yet. Expected results, times and costs are estimates, not measured values. Run the full lab yourself before you use it with students or grade it, and adjust amounts to match your materials.

Item	Details
Unit and lessons	Unit 6: Cells and Homeostasis. Lessons: Organ Systems, Stimulus and Response
Class time	One 50-minute period
Groups	3 students (subject, timer, reader)
Cost	About $1 per group, plus one infrared thermometer per group (about $15, reusable)
Standards	HS-LS1-3. SEP: Planning and Carrying Out Investigations; Analyzing and Interpreting Data. CCC: Stability and Change.

Big Idea

Students plan and run a short homeostasis investigation (HS-LS1-3) and see a recovery curve, the signature of negative feedback. Note for discussion: fingertip temperature is not held at a fixed set point the way core temperature is. It reflects how much warm blood the body sends to the skin, which is part of thermoregulation.

Materials for 8 Groups

Item	Amount	Notes
Infrared (no-touch) thermometers	8	Forehead thermometers work. Some read only above 32 °C in body mode; use surface mode if it has one, and test first.
Tubs or dish pans	8	
Lab thermometers	8	To check the water is about 15 °C.
Towels	8	

Advance Preparation

1. Test your thermometers on a cooled fingertip. Many medical models have a body mode that will not show readings below about 32 °C. You need a surface or object mode.
2. Fill tubs with cold tap water. If it is below 13 °C, add warm water; if above 17 °C, add a few ice cubes and remove any that have not melted before students start.
3. Send home or post an opt-out note: any student can be the timer or reader instead of the subject.

Expected Results

Fingertip skin starts around 28 to 34 °C, depending on the room. Expect a drop of about 8 to 14 °C after a 60-second dip, and recovery to within 1 to 2 °C of the start in about 4 to 8 minutes. The sample values in the key are estimates.

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What Can Go Wrong

- Readings jump around if the distance and spot change. Mark the spot and hold the distance steady.
- A cold room slows recovery. Run the lab in a normal-temperature room.
- Wet skin reads colder. Pat dry quickly but completely.

Misconceptions to Listen For

- "Homeostasis means nothing ever changes." Conditions change and are pushed back toward normal.
- "The hand warmed itself." Warm blood from the body core did most of the work.

Differentiation and Extensions

- Support: a pre-drawn feedback loop with boxes to fill in. Sentence frame: "When the skin got cold, the body responded by ___, which caused the temperature to ___."
- Extension: students design their own variable (glove vs no glove, after jumping jacks vs resting, dominant vs other hand) and plan a fair test.
- Extension: compare with heart rate recovery after exercise, another feedback example from HS-LS1-3.

Safety and Disposal

- No ice water. Watch for students who look uncomfortable and stop the trial.
- Students can opt out of being the subject for any reason.

Standards

This lab builds toward these NGSS performance expectations:

- **HS-LS1-3:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Disciplinary core ideas: LS1.A Structure and Function (feedback mechanisms)

Science and engineering practices: Planning and Carrying Out Investigations; Analyzing and Interpreting Data

Crosscutting concepts: Stability and Change

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