THE STANDARD

Thermal Energy Transfer Design

Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

DCI — DISCIPLINARY CORE IDEA

PS3.A · Definitions of Energy

> *Temperature is a measure of the average kinetic energy of particles of matter.*

Thermal energy moves from hot to cold on its own. Always. A warm cup of coffee gives up its heat to the cool room. An ice cube pulls heat in from the air around it. **The standard pairs that core idea with engineering: students design a device that either slows that flow down (an insulated cup) or speeds it up (a solar cooker), then test and rebuild it.**

SEP — SCIENCE & ENGINEERING PRACTICE

Constructing Explanations and Designing Solutions

> *Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system.*

Students aren't running a one-shot experiment. They're designing a device against criteria and constraints, testing it with a thermometer, reading the data, and changing one variable to make the next version better. **Their notebook should show a v1, a test, a decision, and a v2.**

CCC — CROSSCUTTING CONCEPT

Energy and Matter

> *The transfer of energy can be tracked as energy flows through a designed or natural system.*

Energy doesn't disappear when something cools off. It flows. Out of the hot water, through the cup walls, into the room air. Students track that flow with a thermometer. **The temperature reading over time IS the energy story, and a good design either blocks the flow or opens a faster path for it.**