

Photo Description



This image shows an egg cooking on a dark skillet over a blue gas flame. The egg white has turned from clear to solid white, while the yellow yolk remains soft in the center. The heat from the flame below is transferring energy to the pan, which then transfers that energy to the egg, causing it to change.

Scientific Phenomena

Anchoring Phenomenon: Heat transfer causing a change of state and irreversible physical/chemical change.

Why This Happens: Thermal energy (heat) from the gas flame travels upward into the metal skillet. The hot skillet transfers this thermal energy to the egg. When eggs are heated, the proteins in the white portion unwind and bond together (called denaturing), turning the liquid egg white into a solid. This is an irreversible change—you cannot turn a cooked egg back into a raw egg. The yolk cooks more slowly because it's thicker and insulates itself from the direct heat.

Core Science Concepts

* **Thermal Energy & Heat:** Thermal energy is the total energy of moving particles in matter. Heat is thermal energy that flows from warmer objects to cooler objects. The flame and skillet have more thermal energy than the raw egg, so heat flows into the egg.

Heat Transfer Methods: Heat moves through conduction (direct contact between the skillet and egg), convection (the flame warming the air around the skillet), and radiation* (infrared energy from the flame).

* **Irreversible Changes:** Cooking an egg is a permanent change. The protein structure of the egg fundamentally transforms and cannot be reversed by cooling it down.

* **Energy Transformation:** Chemical energy stored in the gas fuel is converted into thermal energy (heat and light), which then transfers to the egg.

Pedagogical Tip:

Tip for Teachers: Students often confuse heat and temperature. Reinforce that temperature is how fast particles are moving (measured in degrees), while heat is the transfer of thermal energy between objects. Use the phrase "heat flows FROM hot TO cold" repeatedly throughout the lesson to build this mental model.

UDL Suggestions:

UDL Strategy: Provide multiple means of engagement by allowing students to observe the actual cooking process (if safe) or watch a slow-motion video, draw diagrams showing heat flow with arrows, and verbally describe what they observe. This addresses visual, kinesthetic, and auditory learners. For students with limited access to kitchen experiences, use videos or virtual demonstrations to ensure equitable access to the phenomenon.

Discussion Questions

1. What do you observe happening to the egg white as it cooks? (Bloom's: Remember | DOK: 1)
2. Why do you think the egg white turns from clear to white when it cooks? (Bloom's: Analyze | DOK: 2)
3. If we let the cooked egg cool down on the counter, will it turn back into a raw egg? Why or why not? (Bloom's: Evaluate | DOK: 3)
4. How does the thermal energy from the flame get to the egg? Trace the path it takes. (Bloom's: Apply | DOK: 2)

Extension Activities

1. Egg Cooking Stations: Set up a safe, supervised cooking station where students observe eggs being cooked using different methods (boiling, frying, scrambling). Have them record observations about how the appearance and texture change differently based on the cooking method. Discuss how different amounts of thermal energy create different results.
2. Heat Transfer Investigation: Provide students with cups of hot water and various materials (cloth, plastic wrap, aluminum foil, paper). Have them wrap the cups and measure how long it takes for the water to cool. Discuss which materials conduct heat away fastest and slowest, connecting this to real-world applications (oven mitts, insulated containers).
3. Thermal Energy Drawing & Writing: Students create a labeled diagram showing the path of thermal energy from the flame to the skillet to the egg. Have them write captions explaining each step. Use different colors for arrows to represent conduction, convection, and radiation.

NGSS Connections

Performance Expectation:

- 4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- 4-PS3-2: Make observations to provide evidence that energy in motion has the ability to move objects.

Disciplinary Core Ideas:

- * 4-PS3.A - Energy can be transferred in various ways and between objects
- * 4-PS3.B - Energy is present whenever there are changes occurring

Crosscutting Concepts:

- * Energy and Matter - Energy is transferred when objects interact; matter flows into and out of systems
- * Cause and Effect - Cause and effect relationships identify and describe mechanisms in systems

Science Vocabulary

- * Thermal Energy: The energy that all moving particles in matter have; another word for heat energy.
- * Heat: The flow of thermal energy from a warmer object to a cooler object.
- * Conduction: The transfer of heat through direct contact between two objects (like the skillet touching the egg).
- * Irreversible Change: A change that cannot be undone or reversed, like cooking an egg.
- * Protein: A substance in food (like in eggs) that changes when heated.
- * Temperature: How hot or cold something is; a measure of how fast the particles in matter are moving.

External Resources

Children's Books:

Heat* by Margaret C. Hall (Capstone Press) – A simple exploration of thermal energy and how heat affects everyday objects

What is Energy?* by Harriet Ziefert (Little Blue Truck series) – Age-appropriate introduction to forms of energy including heat

Cooking Up a Storm: Recipes and Stories for Kids* by Susie Bowen – Connects cooking to science concepts

YouTube Videos:

* "How Cooking Changes Food" by Crash Course Kids (3:45)

<https://www.youtube.com/watch?v=IVK4HF9sA2A>

A clear, visually engaging explanation of how heat transforms food at the molecular level.

* "Heat Transfer: Conduction, Convection, and Radiation" by Physics Girl (5:12)

<https://www.youtube.com/watch?v=NQnkamqKpkl>

An interactive video demonstrating the three ways heat moves, with relatable everyday examples.