

## Photo Description



This image shows a fried egg cooking on a dark skillet placed over a blue gas flame. The egg white has turned from clear to solid white, and the yolk remains yellow in the center. The heat from the flame below is causing the egg to change from its raw state to a cooked state.

## Scientific Phenomena

Anchoring Phenomenon: Heat transfer and the effects of thermal energy on matter.

**Why It's Happening:** When the skillet sits over the flame, thermal energy (heat) from the burning gas transfers into the metal pan through conduction. The hot pan then conducts heat into the egg. This thermal energy causes the proteins in the egg white to denature (unwind and bond differently), making the clear, liquid egg white turn opaque and solid. This is an irreversible change—once cooked, the egg cannot return to its raw state. The yolk heats more slowly because it's covered by the thicker egg white, which insulates it slightly from direct heat.

## Core Science Concepts

- \* **Thermal Energy Transfer:** Energy moves from a warmer object (the flame and pan) to a cooler object (the raw egg) until they reach equilibrium or the egg is removed.
- \* **Conduction:** Heat transfers directly through solid materials touching each other—the flame heats the metal pan, and the pan heats the egg by direct contact.
- \* **States of Matter and Phase Changes:** The egg white undergoes a chemical change (not just a physical change) when heated, demonstrating that temperature affects how matter behaves.
- \* **Temperature vs. Heat:** Temperature measures how fast particles are moving; heat is the energy that flows from hot to cold objects. The pan's high temperature causes heat to flow into the egg.

### Pedagogical Tip:

When teaching this lesson, avoid the common misconception that "heat" and "temperature" are the same thing. Use this analogy: Temperature is like a speedometer (measuring speed), while heat is like the engine (the energy doing the work). Students often confuse these terms, so reinforce the difference repeatedly with concrete examples from their daily lives.

### UDL Suggestions:

**Multiple Means of Representation:** Provide a labeled diagram showing the path of thermal energy from the flame to the pan to the egg, with arrows indicating heat flow direction. For students who learn better kinesthetically, have them physically act out heat transfer: one student as heat, moving from "hot zone" to "cold zone."

**Multiple Means of Action & Expression:** Allow students to document their observations of the cooking egg through drawings, written descriptions, or video recordings rather than requiring only written responses.

### Discussion Questions

- \* What do you observe happening to the egg white as it cooks, and why do you think those changes are occurring? (Bloom's: Analyze | DOK: 2)
- \* If we removed the egg from the hot pan right now, would it go back to looking like a raw egg? Why or why not? (Bloom's: Evaluate | DOK: 3)
- \* Where is the thermal energy coming from in this picture, and how does it travel to reach the egg? (Bloom's: Understand | DOK: 2)
- \* How is cooking an egg similar to or different from melting an ice cube? What does this tell us about thermal energy? (Bloom's: Create | DOK: 3)

### Extension Activities

#### Activity 1: Thermal Energy Investigation Station

Set up stations where students safely observe different materials being heated (with supervision): a piece of butter melting, chocolate softening, a sugar cube dissolving in hot water. Have students predict which materials will change reversibly vs. irreversibly, then record their observations. Discuss why some changes can be "undone" and others cannot.

#### Activity 2: Energy Tracking Challenge

Give students a card or worksheet tracing the energy path: "Where did the energy in this cooked egg come from?" Students draw or write the journey backward (sun !' plant/grain !' chicken !' egg !' your body). This connects to PS3-1 and helps them understand energy conservation across systems.

#### Activity 3: Design a Better Insulator

Challenge students to design a "blanket" (using foam, cloth, air pockets, etc.) that slows down heat transfer to an egg. Using identical eggs and heat sources, students test their insulators by measuring how long it takes for the egg white to set. Discuss which materials were best conductors vs. insulators.

### NGSS Connections

#### Performance Expectation:

5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

#### Disciplinary Core Ideas:

- \* 5-PS3.A Definitions of Energy
- \* 5-PS3.B Conservation of Energy and Energy Transfer

#### Crosscutting Concepts:

- \* Energy and Matter – Energy is transferred when objects interact; energy takes many forms.
- \* Cause and Effect – The thermal energy from the flame causes observable changes in the egg's appearance and texture.

### Science Vocabulary

- \* Thermal Energy: The energy that comes from heat; the faster the particles in an object move, the more thermal energy it has.
- \* Conduction: The transfer of heat through direct contact between two objects or materials touching each other.

- \* Temperature: A measure of how fast the particles in an object are moving; measured in degrees.
- \* Irreversible Change: A change that cannot be undone or reversed (like cooking an egg); different from a reversible change like freezing water.
- \* Heat: The flow of thermal energy from a warmer object to a cooler object.

### External Resources

#### Children's Books:

- Heat\* by Marion Dane Bauer (Let's Read and Find Out Science Series) – Explains thermal energy and heat transfer in accessible language.
- What is the Sun?\* by Janet Slingerland – Connects the sun as the ultimate energy source to everyday thermal phenomena.
- The Magic School Bus and the Electric Field Trip\* by Joanna Cole – While focused on electricity, it covers energy transfer concepts that transfer to thermal energy lessons.

#### YouTube Videos:

- \* "Heat Transfer for Kids" by SciShow Kids – A 5-minute overview of conduction, convection, and radiation with clear visuals. URL: [https://www.youtube.com/watch?v=FgW\\_N5AWNHY](https://www.youtube.com/watch?v=FgW_N5AWNHY)
- \* "What is Thermal Energy?" by Amoeba Sisters – An engaging, animated explanation of how thermal energy affects matter and the difference between heat and temperature. URL: <https://www.youtube.com/watch?v=HfBhzlHr6AA>

---

Teacher Note: This lesson naturally scaffolds into discussions about energy sources (sun !' food !' cooking !' body), making it a bridge between life science and physical science standards. Encourage students to share examples of thermal energy from their homes and community!