

## Photo Description



A person is holding an orange infrared thermometer that shows a temperature reading of 113.5 degrees Fahrenheit on its digital screen. The thermometer is pointed at a brick patio surface on a sunny day. This special thermometer can measure how hot something is without touching it.

## Scientific Phenomena

The anchoring phenomenon is non-contact temperature measurement using infrared radiation. All objects emit invisible infrared energy (heat waves) based on their temperature. The infrared thermometer contains a special sensor that detects these heat waves and converts them into a temperature reading on the digital display. This works because warmer objects give off more infrared energy than cooler objects, allowing the device to calculate temperature from a distance.

## Core Science Concepts

1. Heat Transfer and Radiation - All objects give off invisible heat energy called infrared radiation, and warmer objects emit more energy than cooler objects.
2. Temperature Measurement - Temperature tells us how hot or cold something is, and we can measure it using different tools like thermometers.
3. Technology and Tools - Scientists and engineers create special instruments to help us observe and measure things we cannot see or touch safely.
4. Energy and Matter - Heat is a form of energy that moves from warmer objects to cooler objects and can be detected even when we're not touching the object.

### Pedagogical Tip:

Have students predict temperatures of different classroom objects before measuring them with a regular thermometer, then discuss how an infrared thermometer could measure the same objects from far away.

### UDL Suggestions:

Provide multiple ways for students to record temperature data - through drawings, numbers, color coding (red for hot, blue for cool), or digital photos of thermometer readings to support diverse learning needs.

## Zoom In / Zoom Out

1. Zoom In: At the molecular level, heat is actually tiny particles (molecules) moving faster or slower. When molecules move fast, the object feels hot. When they move slowly, the object feels cold. The infrared thermometer detects the energy from these moving molecules.

2. Zoom Out: This technology connects to weather systems, where meteorologists use infrared satellites to measure temperatures of clouds, land, and oceans from space to predict weather patterns and track storms across the entire planet.

### Discussion Questions

1. What do you think would happen if we pointed this thermometer at different objects around our classroom? (Bloom's: Predict | DOK: 2)
2. Why might this type of thermometer be more useful than a regular thermometer in some situations? (Bloom's: Analyze | DOK: 3)
3. How do you think the temperature reading would change if we measured the same brick at different times of day? (Bloom's: Hypothesize | DOK: 2)
4. What other tools or technologies help us measure things we cannot see or touch? (Bloom's: Apply | DOK: 2)

### Potential Student Misconceptions

1. Misconception: The thermometer shoots heat rays at objects to measure them.  
Clarification: The thermometer only receives heat energy that objects are already giving off naturally - it doesn't send anything out.
2. Misconception: Only "hot" things give off heat energy.  
Clarification: All objects give off some heat energy, even ice cubes, but warmer objects give off more energy than cooler objects.
3. Misconception: You need to touch something to know its temperature.  
Clarification: While contact thermometers work by touching, infrared thermometers can measure temperature from far away by detecting invisible heat waves.

### NGSS Connections

- Performance Expectation: 3-PS2-1 - Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object
- Disciplinary Core Ideas: PS3.B - Energy can be transferred from place to place by heat
- Crosscutting Concepts: Patterns - Patterns in nature can be observed and used as evidence
- Science and Engineering Practices: Planning and carrying out investigations using tools and technologies

### Science Vocabulary

- \* Infrared: Invisible heat energy that all objects give off
- \* Temperature: A measurement that tells us how hot or cold something is
- \* Radiation: Energy that travels through space without needing to touch anything
- \* Sensor: A part of a tool that detects or feels something in the environment
- \* Digital display: A screen that shows numbers or information electronically

### External Resources

- Children's Books:
- Heat Wave by Helen Kettelman

- Temperature: Heating Up and Cooling Down by David Dreier
- What Is Temperature? by Robin Johnson

YouTube Videos:

- "How Do Thermometers Work?" - Simple explanation of different types of thermometers including infrared ones: [https://www.youtube.com/watch?v=rQhzMT\\_bW1Q](https://www.youtube.com/watch?v=rQhzMT_bW1Q)
- "Heat Transfer for Kids" - Demonstrates how heat moves and can be measured: <https://www.youtube.com/watch?v=rbBvet6rSy4>