

## Photo Description



A person holds an orange tool that can tell how hot or cold things are without touching them. The tool shows the number 113.5 on its screen. This special tool is pointing at a brick walkway on a sunny day.

## Scientific Phenomena

The Anchoring Phenomenon shown here is infrared temperature measurement - the ability to detect heat energy that objects give off without physical contact. All objects emit invisible heat energy called infrared radiation. The infrared thermometer contains a special sensor that detects this heat energy and converts it into a temperature reading on the digital display. The high reading of 113.5°F indicates the brick surface has absorbed significant heat energy from the sun, demonstrating how materials absorb and emit thermal energy.

## Core Science Concepts

1. Heat Transfer: Objects can give off heat energy that we cannot see but special tools can detect
2. Temperature Measurement: Different tools can measure how hot or cold something is in different ways
3. Solar Energy Absorption: Dark surfaces like bricks absorb heat from the sun and become very warm
4. Non-contact Measurement: Some scientific tools can gather information without touching the object being studied

### Pedagogical Tip:

Use concrete comparisons students can relate to: "Just like you can feel heat from a campfire without touching it, this tool can 'feel' the heat coming from the bricks without touching them."

### UDL Suggestions:

Provide multiple ways for students to explore temperature: tactile experiences (safely feeling warm vs. cool objects), visual representations (color-coding hot/cold), and kinesthetic activities (body movements to show fast vs. slow molecules).

## Zoom In / Zoom Out

1. Zoom In: At the molecular level, the heated brick contains molecules moving very quickly due to absorbed solar energy. These fast-moving molecules create the heat energy that the infrared thermometer detects as invisible waves.
2. Zoom Out: This demonstrates part of Earth's energy system where solar radiation heats surfaces during the day. This heating affects local weather patterns, creates thermal currents, and influences the water cycle through evaporation from heated surfaces.

## Discussion Questions

1. "What do you think would happen if we measured the temperature of the same bricks at nighttime?" (Bloom's: Predict | DOK: 2)
2. "How is this tool different from a regular thermometer that goes in your mouth?" (Bloom's: Compare | DOK: 2)
3. "Why might the bricks be hotter than the air around them on this sunny day?" (Bloom's: Analyze | DOK: 3)
4. "What other objects around our school might be really hot on a sunny day like this?" (Bloom's: Apply | DOK: 1)

## Potential Student Misconceptions

1. Misconception: "The tool is shooting something at the bricks to make them hot."  
Reality: The tool only detects heat energy already coming from the bricks; it doesn't add heat.
2. Misconception: "Only things that feel hot give off heat energy."  
Reality: All objects give off some heat energy, even ice cubes, just at different amounts.
3. Misconception: "You need to touch something to know its temperature."  
Reality: Heat energy travels through space as invisible waves that special tools can detect.

## Cross-Curricular Ideas

1. Math - Temperature Data Collection: Have students measure the temperature of different surfaces around the classroom and playground (sunny vs. shady spots, dark vs. light colored objects). Create a simple bar graph or pictograph showing which surfaces are warmest. This connects to 2.MD.D.9 (measuring and representing data).
2. ELA - Descriptive Writing: Students write or dictate sentences describing how different materials feel when they're hot or cold. Create a "Hot and Cold" word wall with descriptive words (warm, toasty, chilly, cool). Students can illustrate their words, combining literacy with sensory science vocabulary.
3. Social Studies - Community Helpers: Discuss jobs that use thermometers and temperature measurement in our community (doctors, weather forecasters, restaurant workers, construction workers). Create a classroom poster showing "Who Uses Thermometers?" connecting science tools to real community roles.
4. Art - Color Temperature: Create an art project where students use warm colors (reds, oranges, yellows) to paint hot objects and cool colors (blues, purples) to paint cold objects. Display alongside the infrared thermometer photo to show the connection between how we represent temperature visually and how tools measure it.

## STEM Career Connection

1. Weather Forecaster: Weather forecasters use special thermometers and tools (like infrared thermometers) to measure the temperature of air and ground to predict what the weather will be like. They tell people on TV if it will be hot or cold so families can decide what to wear. Average Annual Salary: \$97,500 USD
2. Doctor/Nurse: Doctors and nurses use thermometers to check if people have fevers and are healthy. They use different kinds of thermometers—some go in your mouth, some on your forehead, and some don't touch you at all—just like the infrared tool in this photo! Average Annual Salary: \$75,000-\$90,000 USD (for nurses); \$200,000+ USD (for doctors)

3. Thermal Engineer: Thermal engineers are scientists who study and work with heat energy. They design buildings that stay cool in summer and warm in winter, create better heating systems for homes, and even design spacesuits for astronauts. They use tools like infrared thermometers to measure and understand how heat moves. Average Annual Salary: \$105,000 USD

### NGSS Connections

- Performance Expectation: 2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
- Disciplinary Core Idea: 2-PS1.B - Chemical Reactions (heating and cooling effects)
- Crosscutting Concept: Energy and Matter - Objects may break into smaller pieces or change properties when heated or cooled

### Science Vocabulary

- \* Temperature: How hot or cold something is
- \* Infrared: Invisible heat energy that comes from all objects
- \* Thermometer: A tool that measures how hot or cold things are
- \* Absorb: To take in energy, like a sponge takes in water
- \* Heat energy: The energy that makes things feel warm or hot

### External Resources

Children's Books:

- Heat Wave by Helen Ketteman
- Hot and Cold by Karen Bryant-Mole
- Temperature: Heating Up and Cooling Down by David Dreier