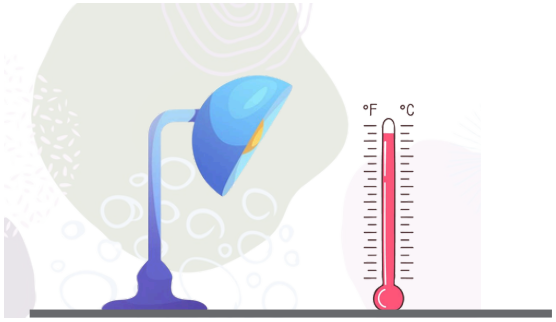

Temp Probe

Chasing Heat

Grades: Middle School
Time: 45 Minutes
Subject: Physical Science
Topics: Temperature, Temperature Changes

Overview

Have you ever noticed how some things feel hot after sitting in the sun or cool off after a while in the shade? Today, you're going to learn about how **temperature** changes over time and why it happens using scientific methods to make careful observations and measurements.

Background

Temperature tells us how hot or cold something is and it is measured in degrees Celsius (°C) or Fahrenheit (°F). Scientists study **temperature** changes to understand how energy moves. When something heats up, like a metal object under a lamp, it's absorbing energy from the light. When the heat source is removed, the object cools down by releasing energy into the air.

Heat is a form of energy that moves in three ways: **conduction**, **convection**, and **radiation**. In this experiment, the lamp transfers heat to the metal object through **radiation**, and the object's surface warms up. Over time, the heat spreads throughout the object (**conduction**). By recording **temperature** changes, you'll create a graph to see how fast or slow the object heats up.

Understanding **temperature** changes is important in everyday life—like cooking, building safe homes, and even predicting the weather! By studying how **temperature** changes, you're learning how to use science to make sense of the world!

What You Will Need/Prep

- databot with temperature sensor
- IOS/Android Smart Device
- Metal object and heat source (e.g., lamp)
- Ruler and adhesive tape
- Graph paper or computer with spreadsheet software (optional)
- Install Vizeey™ on your Smart device.
- Scan the QR code to load the experiment.
- Test your databot™ connection.
- You will be prompted to select and connect to databot™ each time you launch an experiment.
- If there are two or more databot™'s listed, the one closest to your device will be highlighted.
- Study the background information and terms and prepare to explore!

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Temp Probe

In this lab, you will observe how temperature changes when an object is exposed to a heat source. You'll use databot to measure temperature over time, collect data, and analyze your results using tables and graphs.

Learning Objectives

In this investigation you will master the following knowledge and skills:

- Visualize, collect and analyze data
- Measure and record temperature in C or F
- Graph temperature changes over time and interpret the data to identify patterns.
- Apply the scientific method to conduct an experiment, including making observations, recording data, and drawing conclusions.

Important Terms

Conduction: The transfer of heat through direct contact between objects or particles.

Convection: The transfer of heat through the movement of fluids, which can be liquids or gases.

Energy Transfer: The movement of energy from one place or object to another, often seen as heat.

Heat: A form of energy that moves from a warmer object to a cooler one.

Radiation: The transfer of heat through electromagnetic waves, such as light from the sun or a lamp.

Temperature: A measure of how hot or cold something is, typically measured in degrees Celsius (°C) or Fahrenheit (°F).

Interesting Facts

Heat Transfer is Everywhere: From cooking food to charging a phone (which gets warm), energy transfer is happening all the time!

Metal Heats Up Fast: Metals are excellent conductors of heat, which is why a metal spoon in hot soup quickly becomes warm, while a wooden spoon stays cooler.

Heat Can Make Things Glow: When objects get really hot, like metal in a blacksmith's forge, they emit thermal radiation and start to glow red, orange, or even white!

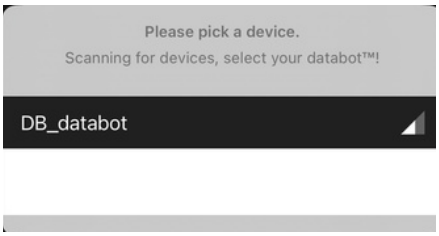
Temp Probe

Using Vizeey

In order to work with the experiment you need to launch the Vizeey application and click on + in the upper right corner.

Then select “Add experiment from QR code” and scan the QR code prepared for this experiment. Your experiment will appear in the list.

When you start the experiment you will be immediately offered to connect to your databot. Make sure that databot is enabled.

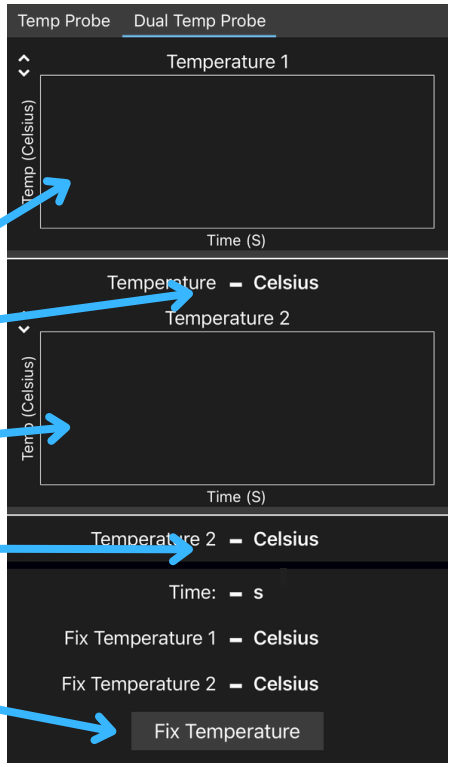


Don’t forget to check that the temperature probe 1 is connected to the Temp 1 port and temperature probe 2 is connected to the Temp 2 port.

You can switch tabs here.

Once in the Experiment

- Here you will see a graph of temperature 1 change over time.
- Current temperature 1
- Here you will see a graph of temperature 2 change over time.
- Current temperature 2.
- The temperature value you can fix at the current moment by pressing the button.



During the experiment, you need to record the temperature values every 30 seconds.

Press the "Fix Temperature" button every 30 seconds to capture the next values for your data table.

Once you have captured the values, write them down in the table to avoid losing any information and prepare to capture the values at the next 30 second mark. Be fast and accurate!

Temp Probe

Part 1: Initial Observations and Questions

What do you predict will happen to the temperature of an object over time when it is exposed to heat? Write your question or prediction below:

_____

_____

Part 2: Hypothesis

Temperature Hypothesis: Predict the pattern you expect to see in the temperature of an object as it is heated over time.
Prediction:

_____

_____

Part 3: Experiment Procedure

Setup

Prepare:

- a heat source, such as a light bulb;
- the sample to be heated, e.g. a metal ruler.

- Determine the distance from the sample to the lamp, e.g. 10 cm, and fix it.
  - Use it for the next measurements.
- Turn on databot (using the small button on the left side) and connect the temperature probe to it.
- Open the Vizeey app on your smart device.
- Tap on "**Chasing Heat**" in Vizeey to load the experiment. Use the first tab of the experiment *"Temp Probe"* for this part of the measurements.
- You will be prompted to connect to databot.
  - Hint- if there is more than one databot in use, the one closest to you will be in blue!
  - A solid blue light on databot means you are connected.
- Start your experiment using: ▶
- Use these icons ▶ ⏸ at the top of the screen in Vizeey to start and to pause the experiment.

Note: Before starting a new experiment, cool the surface and sensor to room temperature to get more accurate results for data analysis

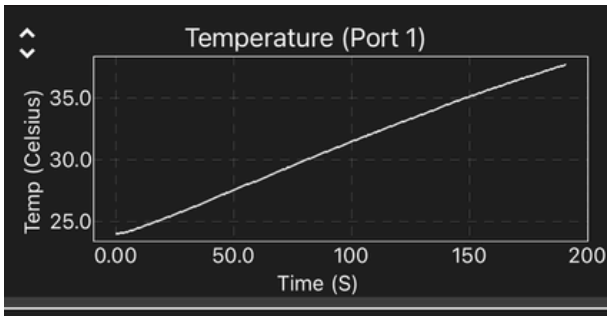
Temp Probe

Part 3: Experiment Procedure

Experiment 1.

- Place the temperature probe in front of the lamp, then turn on the lamp.
- Fix the temperature data using Fix Temperature button every 30 seconds and record it into the table

Time (s)	Temperature (°C)
0	
30	
60	
90	
120	
150	
180	



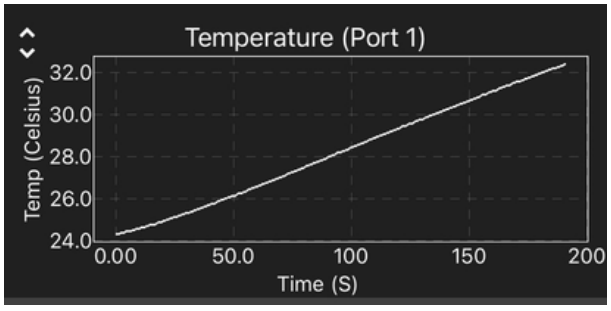
Experiment 2.

How quickly the surface of a metal ruler heats up

- Place the temperature probe under the metal ruler
  - Make sure that the light does not shine directly on the probe.
- Fix the temperature data every 30 seconds and record it into the table
  - You may notice that the probe heats up slowly because the ruler gets hot first, transferring its heat to the probe.

Place the temperature probe under the metal ruler
Make sure that the light does not shine directly on the probe.

Time (s)	Temperature (°C)
0	
30	
60	
90	
120	
150	
180	

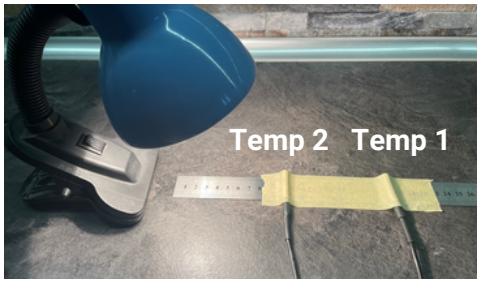


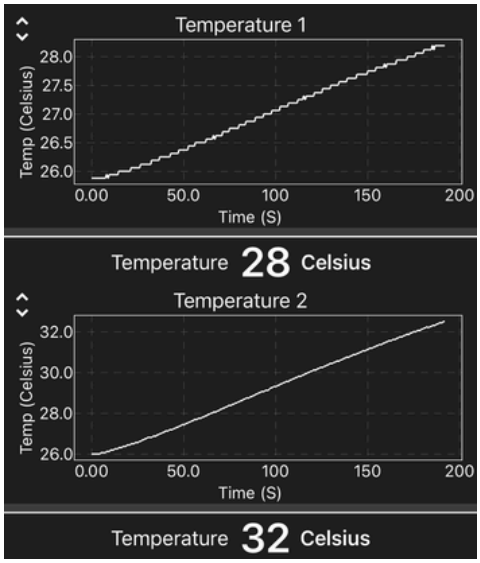
Temp Probe

Part 3: Experiment Procedure

Experiment 3.

- Use 2 temperature probes at different distances from the light source.
- Fix them at different distances. Cover the temperature sensors so that the light does not hit them.
- Now start heating the metal ruler.
- Use the second tab *"Dual Temp Probe"* of the experiment for this part of the measurements.
- Fix the temperature data every 30 seconds and record it into the table
  - You can see the heat spreads along the entire length of the ruler.
  - The closer to the light source, the faster the sensor is heated up.





Time (s)	Temperature 2 (°C)	Temperature 1 (°C)
0		
30		
60		
90		
120		
150		
180		

Part 4: Data Analysis

1. Graphing Your Data:

Create a line graph to compare temperature changes over time in different experiments

- X-axis: Time (seconds)
- Y-axis: Temperature (°C)
- Use different colors or labels for different experiments.

Temp Probe

Part 5: Concept Questions

Data Interpretation:

1. Describe any trends you observe in the temperature data over time.

2. How does this pattern align with your original hypothesis?

Part 6: Reflection

1. Explain one thing you learned about the relationship between temperature and time when an object is heated.

2. How did using databot help you understand the data more effectively?