

Technology Idea: Investigating Temperature

Background:

If two substances with different thermal energies come into contact, energy will flow from high to low energy. But how can this be observed?

The purpose of this activity is to use the temperature sensor to record the temperature of cold and hot liquids before and after they are mixed.

The Question:

What happens to temperature when you mix hot and cold water?

Materials:

- USB link
- temperature sensor
- beaker, 250 - 400 mL
- graduated cylinder, 100 mL or measuring cup
- ice
- heat resistant glove
- hot water

Procedure:

Step 1:

Plug the temperature sensor into the USB link (that is connected to the computer).

Step 2:

Configure the data collection software to collect temperature data over time.

Step 3:

Use the graduated cylinder to measure 100 ml of ice water. Pour the 100 ml of ice water into one of the glass containers. Use the graduated cylinder to measure 100 ml of hot water (**do not burn yourself - only touch the graduated cylinder with a heat-resistant glove**). Pour the hot water into the other glass container.

Step 4:

Place the temperature sensor into the ice water. Click "start" in the DataStudio software to start recording data. Watch the graph for about 10 seconds.

Step 5:

Move the temperature sensor to the hot water container and watch the graph for another 10 seconds or so. Click "stop" in the DataStudio software to stop recording data.

Step 6:

Use the DataStudio software to record different ways of changing the temperature, such as putting the tip of the sensor directly on an ice cube, or taking the sensor out of the water and blowing on the tip of it. In your notes, keep a list of the things you try. For each thing you try, write down your predictions about what will happen to the temperature before you do the experiment.

Step 7:

Repeat steps 4 and 5, but leave the temperature sensor in the hot water. Before you stop recording data, slowly add the cold water to the hot water.

Step 8:

When you have finished collecting your temperature data, you are ready to analyze it. Re-scale the graph so all the data collected fills the whole graph window.

Find the lowest temperature you recorded. (If you are using DataStudio software, click on the "Smart Cursor" button . The cursor becomes a crosshair which you can drag over the graph in order to more easily determine the coordinates at any particular point.) Write down this temperature in your notes.

Find the highest temperature you recorded. Write down this temperature in your notes.

Analyze:

1. What was the most amount of change you were able to produce in the temperature?
2. Which temperature change took the least amount of time? Which took the longest?
3. What happened to the temperature when you mixed hot and cold water?

Conclude and Apply:

4. Using the results of this experiment, describe what happens to thermal energy when hot and cold substances come into contact.