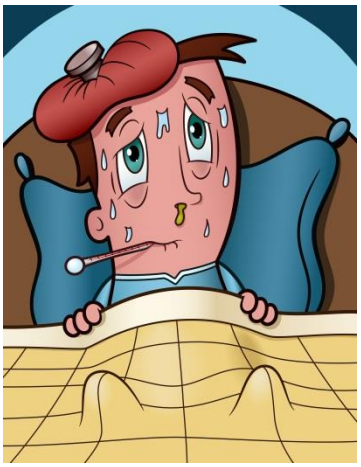
The Effect of Perspiration

Challenge

Have a look at the two pictures below:

1. What do the two have in common? Do they represent common experiences?
2. Try to explain what is happening to the kids in the pictures and how they are feeling.



What will we investigate?

We will investigate the connection between the perspiration and cooling. To do this we will measure the temperature of your hand, once while uncovered, and again after sealing your hand in a bag to increase the amount of perspiration.

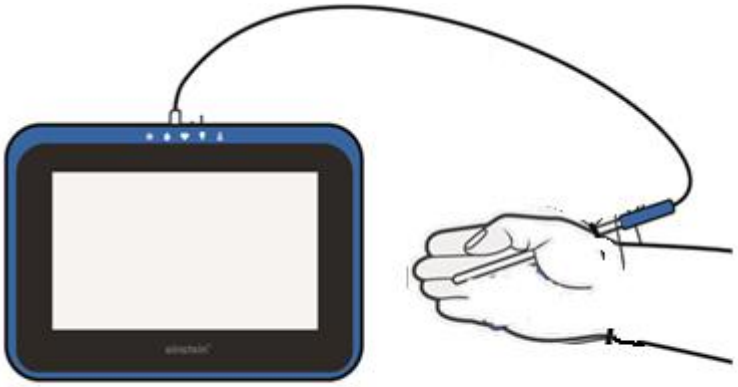
Equipment and Materials

- einstein™Tablet+ or einstein™Labmate+™ paired with a tablet
- Temperature sensor (-40 to 140 °C)
- Plastic Bag
- Rubber band (to seal the plastic bag

Experimental Setup

Group Work

Measurement 1 – Measuring the temperature of an uncovered hand



1. Turn on the einstein™Tablet+ or einstein™Labmate+™ paired with a tablet.
2. Tap the MiLAB ( ) icon to open the application.
3. Attach the Temperature sensor to the sensor port.

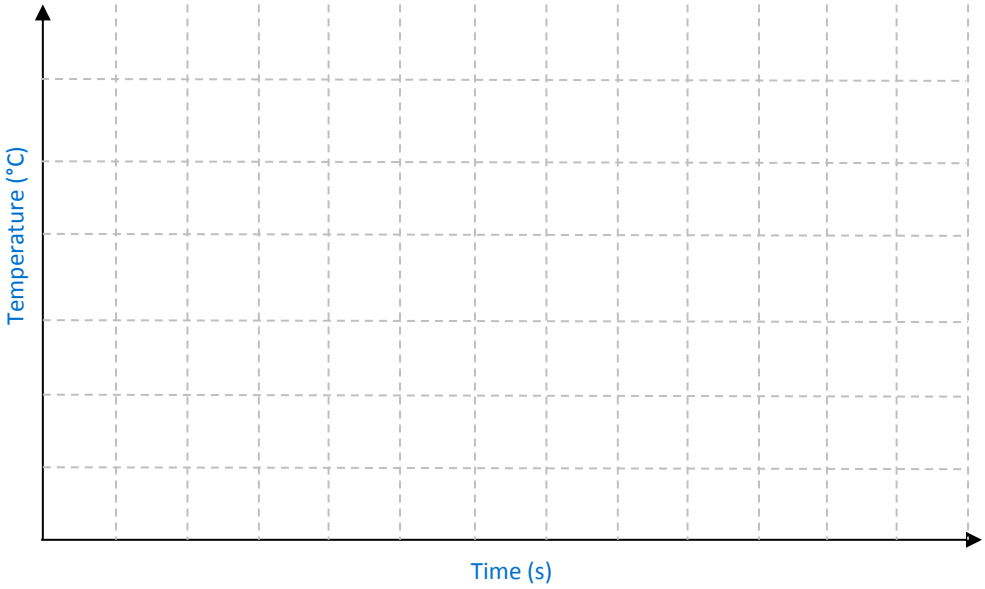
Sensor Setup

Tap the **Setup** cog ( ) and use the table below to set up the measurement parameters:

Sensor:	Temperature (-40 to 140 °C)
Rate:	10 / sec
Duration:	2 minutes

Before You Begin

1. Predict what will happen to the temperature of your hand while uncovered.
2. Predict what will happen to the temperature of your hand after it is covered with a plastic bag.



Experimental Procedure

1. Connect the Temperature sensor to your einstein™-enabled device.
2. Select the external Temperature sensor (-40 to 140 °C).
3. Hold the Temperature sensor as seen in the illustration above
4. Tap **Run** ( ) to begin collecting data.
5. Observe the graph of the temperature
6. Fill out the table below

Measurement 2 – Measuring the temperature of a covered hand

Change the settings of the sensor as follows:

Sensor:	Temperature (-40 to 140 °C)
Rate:	10 / sec
Duration:	15 minutes

7. Cover your hand with a plastic bag
8. Tap **Run** ( ) to begin collecting data.
9. After 10 minutes ask a friend to remove the plastic bag
10. Wait 5 more minutes
11. Observe the graph of the temperature
12. Fill out the table below

Understanding the Measurements

1. What label should you give to the *y*-axis?
2. What are the units of the *y*-axis?
3. Using data from your graph, fill in the table below:

The Effect of Perspiration

	While uncovered	While sealed	After the seal was removed
Temperature of your hand			

Understanding the Experiment

Look at the graph and table for your uncovered hand and discuss the following questions:

1. What was the starting temperature?
2. What was the final temperature?
3. What happened to the temperature? (**Rose/Fell/Stayed the Same**)

Look at your graph and table for your hand when it was sealed by the plastic bag

1. What was the starting temperature?
2. What was the final temperature?
3. What happened to the temperature? (**Rose/Fell/Stayed the Same**)

1. How did your hand feel when it was sealed in the bag? What was produced on your skin?
2. What was produced inside the bag?
3. Where did the water on your hand and in the bag come from?
4. What happened to the temperature when the bag was removed from your hand?
5. What happened to the drops of perspiration?
6. Summarize the effect of perspiration on body temperature. Include:
   - The results your conclusions are based on.
   - Refer to the “Understanding the Science” section from below.

Using What You Learned

A group of students has just finished gym class. Some of the students wipe the sweat off their faces with a towel before it has time to evaporate. Why might this be a mistake?

1. Watch this video for a good summary of perspiration

Understanding the Science

What is perspiration? Why do we perspire? When do we perspire? Do all living things perspire?

When it is hot or when we exert ourselves our bodies try to maintain a stable temperature by cooling the body through perspiration.

What is perspiration? Perspiration consists of fluids secreted by our bodies through the sweat glands found in our skin. And we are not alone – many mammals use perspiration to regulate their body temperature.

How does perspiration cool us? Perspiration uses the natural process of evaporation – after the perspiration moistens our skin, it evaporates, that is the liquid turns into a gas. The energy needed for this evaporation is taken from our body, helping the body cool off. This helps prevent our bodies from overheating during hot weather or when we exert ourselves. In fact, we almost always perspire, even when we don't feel it. On days when the heat index is high (both temperature and humidity are high), sweat does not evaporate, thus preventing the body from cooling off. This situation was replicated when you covered your hand in a plastic bag.