



Activity 3.2.2 The Quest for Data

Purpose

Data collection is a very important part of science. While data has been collected by hand for thousands of years, the technology to collect data electronically has been around for fewer than 80 years. Only in the last 20 years has this technology been available to schools.

This experiment will introduce you to two of the most common modes of data collection used in this class. You will first collect and analyze data over time. You will also collect data using a mode called Events with Entry, which allows you to collect one point of data. How can you utilize these types of data collection in agriscience?

Materials

Per pair of students:

- LabQuest2
- *LabQuest2 Quick Start Guide*
- Vernier temperature sensor

Per student:

- 2 250ml beakers
- Ice
- Hot and cold tap water

Per student:

- Pencil
- *Agriscience Notebook*

Procedure

You and a partner will investigate the temperature of water under differing conditions. To do this you will use LabQuest2 equipment. First, familiarize yourself with how LabQuest2 operates. After that, conduct tests to determine how the equipment can help you collect and record data.

Part One – Welcome to LabQuest2

This section provides a brief overview of the basic functions of LabQuest2. Throughout the course, you use LabQuest2 to collect different types of data; however, let's start with a few basic features. Follow the procedures to learn how to use LabQuest2.

1. Wake up your LabQuest2 by pressing the power button located at the left corner on the top of the LabQuest2. If your LabQuest2 does not wake, connect the LabQuest2 to its power adapter.
2. Locate each of the hardware features on pages 5 and 6 of the *Quick Start Guide* on the LabQuest2.
3. Press the **LabQuest App** logo that appears on the screen with your finger or the stylus.
4. Attach a temperature sensor to CH 1 in the upper edge of the LabQuest2 device.
5. Review the navigation of the LabQuest App as shown on pages 8 – 17 in the *Quick Start Guide*.
6. Notice a red box with a temperature reading appears on the screen. Use your finger or the stylus to press on the °C portion of the read out. A dropdown menu allowing you to change units will appear.
7. Press the start data collection button at the bottom left of the screen. Notice this automatically changes the menu screen to data collection and begins graphing collected data.

8. On the right-hand side of the graph, you will see the real-time temperature reading. Once the data is collected, the graph will automatically change to display the data in the best graph.
9. The last basic feature you will investigate is the function you use to analyze data. Select **Analyze** from the top of the data collection screen.
10. From the dropdown menu, press on **Statistics** and select temperature. On the right-hand side of the graph, basic statistics are shown including the sample minimum, maximum, and mean (average) temperature.
 - NOTE: Further use of data analyzing features will be specifically discussed for each LabQuest2 activity, but these basic statistics are important to know how to view and use for every activity.

Part Two – Gathering Data over Time

1. Place 100ml of tap water into one of the 250ml beakers. Add two ice cubes.
2. Connect the temperature sensor to LabQuest2 and choose **New** from the *File* menu.
3. On the *Meter* screen, tap **Rate**. Change the data-collection rate to 0.5 samples/second and the data-collection length to 60 seconds. Select **OK**.
4. Place the temperature sensor into the cold water and stir briefly. Then position the sensor in the cold-water beaker as shown in Figure 1.

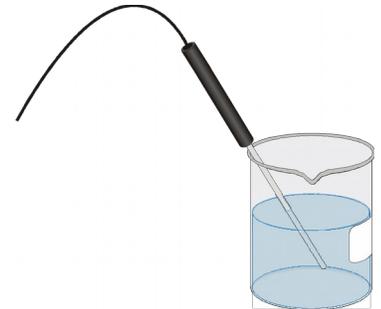


Figure 1. Experiment Setup

- Note: Make sure the beaker will not tip over from the weight of the temperature sensor.
5. Place 150ml of hot water into the second 250ml beaker.
 6. When everything is ready, start data collection. Do not stir or move the water.
 7. When exactly 10 seconds have gone by (when the fifth data point appears on the screen), quickly move the temperature sensor to the beaker containing hot water and allow data collection to continue. Do not stir the water or move the temperature sensor during the remainder of the data collection period.
 8. Data collection will stop automatically after 60 seconds.
 9. Remove the temperature sensor from the beaker and dry it with a paper towel.
 10. Determine the elapsed time when the highest temperature was reached.
 - When data collection is complete, a graph of *temperature vs. time* is displayed. To examine the data pairs on the displayed graph, tap any data point. As you tap each data point, the temperature and time values are displayed to the right of the graph. Find the highest temperature.
 - Record this temperature (round to the nearest 0.1°C) and the time when it was first reached in Table 1 on *Activity 3.2.2 Student Worksheet*.
 11. You can confirm the time when the highest temperature was reached by viewing the data lists directly.
 - Tap the **Table** tab on LabQuest2 to view the data lists. Find the time when the highest temperature was first reached. Did you have the same time recorded in Table 1?

Part Three – Collecting Multiple Points of Data

1. Partner up with two other groups so you have six people working together.
2. Power down two of the LabQuest2s, you will only need one LabQuest2 per group for Part Three.

3. Arrange the members of your group by age. Write the oldest group member in line 1 of Table 2 on *Activity 3.2.2 Student Worksheet* and continue entering names with the next oldest group member until all names are recorded.
4. On the screen of the LabQuest2 you will be using, tap the **Meter** tab.
5. Set up the data-collection mode.
 - On the *Meter* screen, tap **Mode**. Change the data-collection mode to *Events with Entry*.
 - In the Name area, enter *Hand Temp* and leave the Units field blank.
 - Select **OK**.
6. Start data collection by tapping on the green arrow.
7. Measure the hand temperature of the first group member.
 - Group member number one should pick up the temperature sensor and hold its tip in the palm of his or her hand as shown in Figure 2.
 - Watch the live temperature readout. When the temperature stops rising, tap **Keep**.
 - You will be prompted to enter a number. Enter 1 as the student's group member number, then select **OK**. The temperature and group member number have been saved.
8. Cool the temperature sensor down by placing it in the cold water from Part Two. Monitor the temperature on the screen and remove it from the water when the temperature reaches 25°C.
9. Pass the temperature sensor to the second group member and repeat Step 7 – 8, entering 2 for the group member number.
10. Repeat Steps 7–9 until every group member has his or her hand temperature recorded. Enter the corresponding number for each group member.
11. Stop data collection.
12. Determine each person's hand temperature by using one of the methods described in Steps 10 and 11 of Part Two. Record the values in Table 2 on *Activity 3.2.2 Student Worksheet*.
13. Calculate the average hand temperature of the group by adding all values and dividing by the number of people in your group. Record in Table 2.
14. Graph your results on your worksheet.
 - Label the x-axis, or horizontal axis, of the graph Group Members (see Figure 3).
 - Label the y-axis, or vertical axis, of the graph Temperature (see Figure 3).
 - Plot the points for hand temperature for each person in your group.

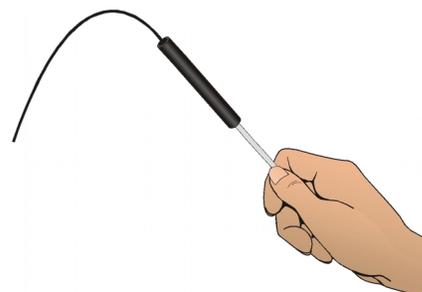


Figure 2. Proper Holding Position

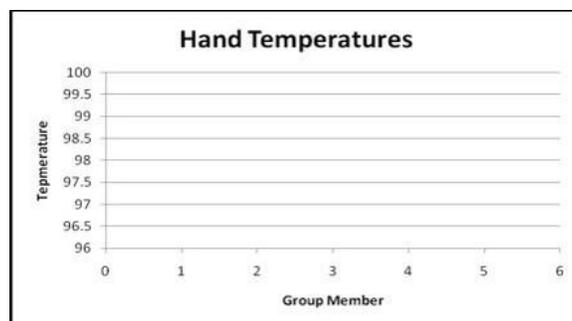


Figure 3. Sample Graph

Conclusion

1. Why is accurate data collection important to scientific experiments?

so you know what you need to do

2. Would you rather use a standard thermometer or the LabQuest2 with a temperature sensor to collect data? Why?

Standard thermometer because it is easier for me to understand and read compared to the labquest2.

Source: Johnson, R. L., Stahmer-DeMoss, G., & Sorensen, R. (2007). *Earth Science with Vernier*. Beaverton, OR: Vernier Software & Technology.

Name _____

Activity 3.2.2 Student Worksheet

Table 1. Temperature Data

Maximum Temperature (°C)	Elapsed Time (s)
40°C	48s

Table 2. Group Data

Group Member Number	Group Member Name	Maximum temperature (°C)
1	lizzy	31.3°C
2	lauren	30.3°C
3	keegan	33.0°C
4	alyse	34.0°C
5	laine	33.6°C
6		
Group Average		32.44°C

Label the x-axis of the graph Group Members and the y-axis Temperature. Plot the points for hand temperature for each of your group mates.

