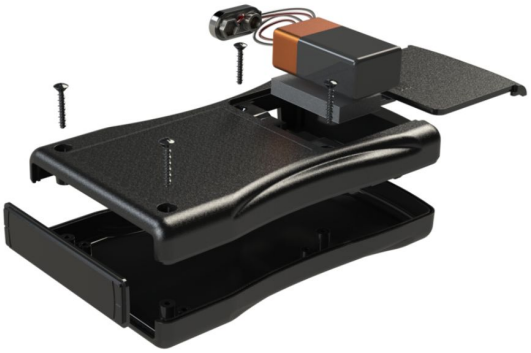
Air Quality Sensors and App Instructional Document

Section I. Contents of the Air Quality Sensor Kit

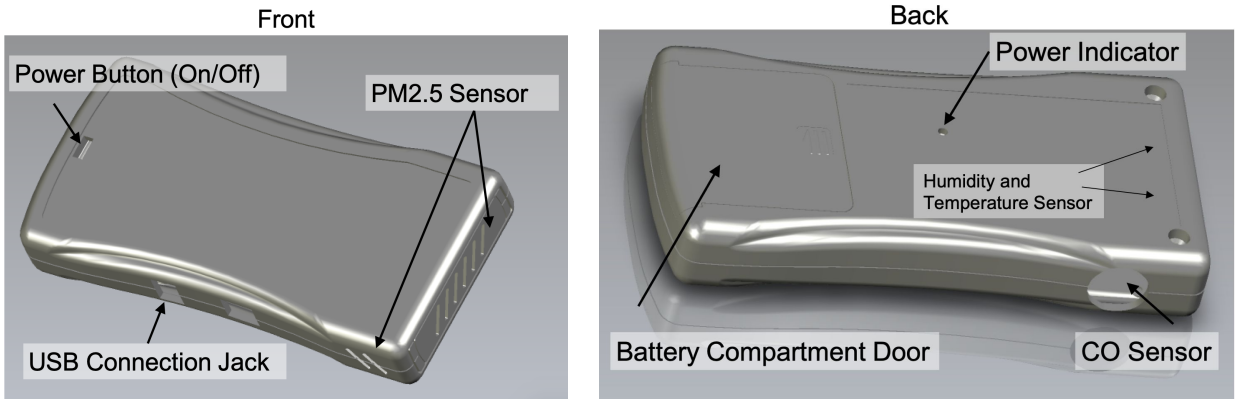
1. Phone - Samsung Galaxy J3 Orbit
2. Air quality sensor
3. Power adapter
4. Cable type USB 2.0 A (White color)
5. Cable type A/B (Blue color)
6. 9V rechargeable batteries
7. 9V battery charger

Section II. Introduction to the Air Quality Sensors



- The air quality sensors charge using a standard 9V battery and will operate for about 2-3 hours on one replacement.

- The power button is located next to the lanyard attachment points on top of the device. Located on the back of the case, the power indicator will turn red when the air quality sensors are on.



- The air quality sensors have an intake and exhaust port located on the bottom of the air quality sensor case. It is important when using the air quality sensors not to block the intake or exhaust ports and keep them free from any obstructions. When recording data, always keep the air quality sensors outside of your bag or pockets, and avoid exposure to water or rain.

Section III. Connecting Your Air Quality Sensors to Your Android Smartphone

The air quality sensors use your phone's Bluetooth connection to connect to your Android smartphone and transmit, display, and upload air quality data to your phone and the internet. To begin, follow these steps and corresponding pictures:

- Step 1 Power on your smartphone:
  The smartphone power button is located on the right side of the phone

- Step 2 Power on your sensor:
  Connect a battery to your air quality sensors.
  If you have paired with your air quality sensors in the past, you may immediately skip to step 7

- Step 3 Connect to the school Wi-Fi:
  Connect the smartphone to your school Wi-Fi.

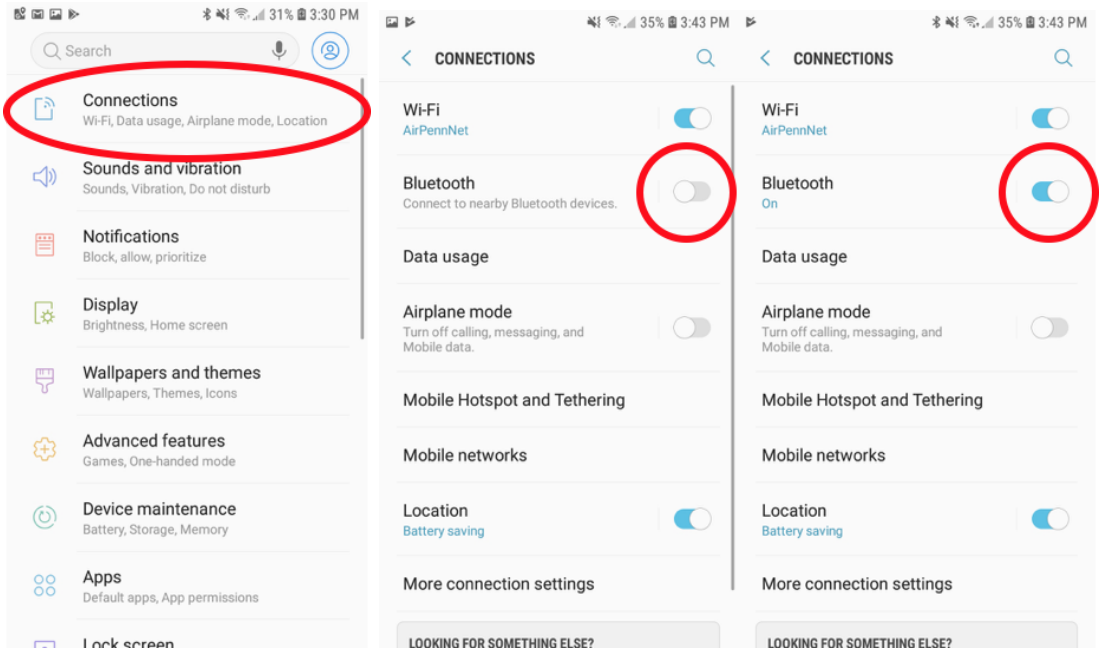
- Step 4 Determine the Bluetooth name of your sensor:
  Each sensor's Bluetooth name should match the phone you are connecting it to. For example, if your smartphone is labeled as "PENNGSE A1", the sensor's Bluetooth name should be "sensorA1". If your smartphone is labeled as "PENNGSE A2", the sensor's name will be "sensorA2". **(!) Do not connect with others' Bluetooth sensor.**

- Write down your Bluetooth name here: _____

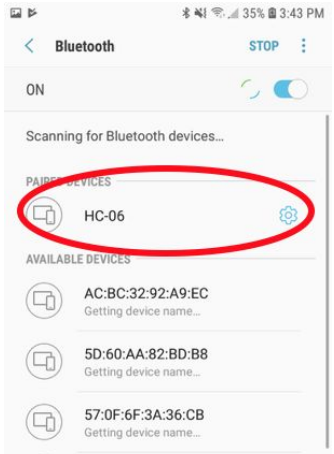
- <u>Step 5 Turn on your phones' Bluetooth:</u>

  Open the Settings app on the smartphone: 

, and find "Connections". Turn on your Android smartphone's Bluetooth by swiping the gray Bluetooth symbol (circled in red) to the right, turning it blue.



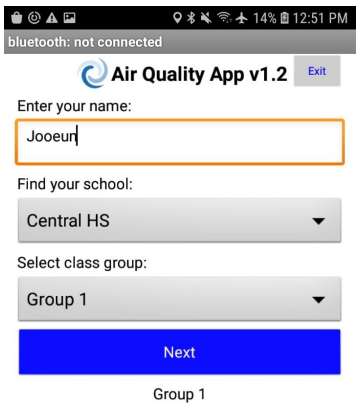
- <u>Step 6 Connect the phone to the sensor's Bluetooth signal:</u>
  On the same screen, pressing the word "Bluetooth" will bring you to the Bluetooth device finding page. The phone will now scan for Bluetooth devices automatically. Wait for a few seconds then find your sensors' Bluetooth name and select it.
  <u>(!) You must connect with your sensor's Bluetooth.</u>

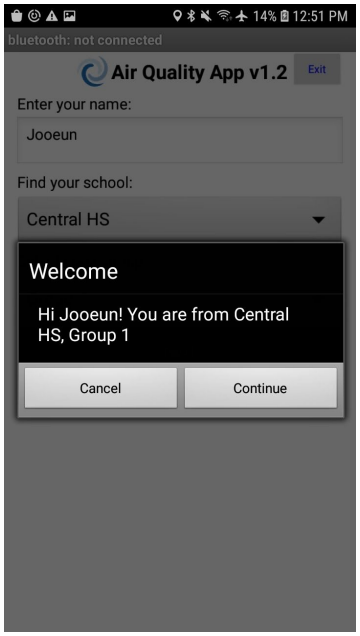


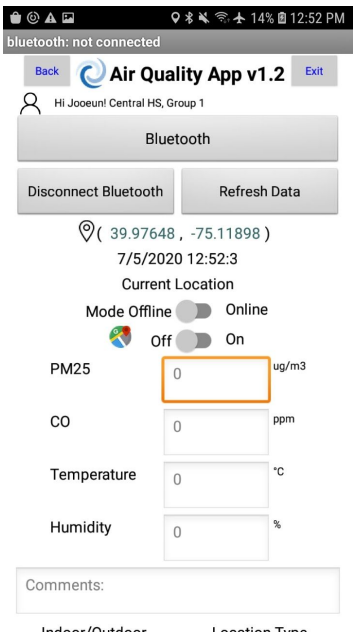
- Step 7 Open the air quality app:
  Press the “home” button on your Android smartphone. This will return you to the home Android screen. On this screen, open the air quality app by pressing the K12 Bioinfo app icon.

- Step 8 Log into the main screen of the app:
  If the air quality app has opened correctly, you should be on the screen 1, pictured below.
    - Enter your name. This needs to be something useful that you will remember. You will use it to identify your data later.
    - Choose your school from the drop-down menu.
    - Select your class group.

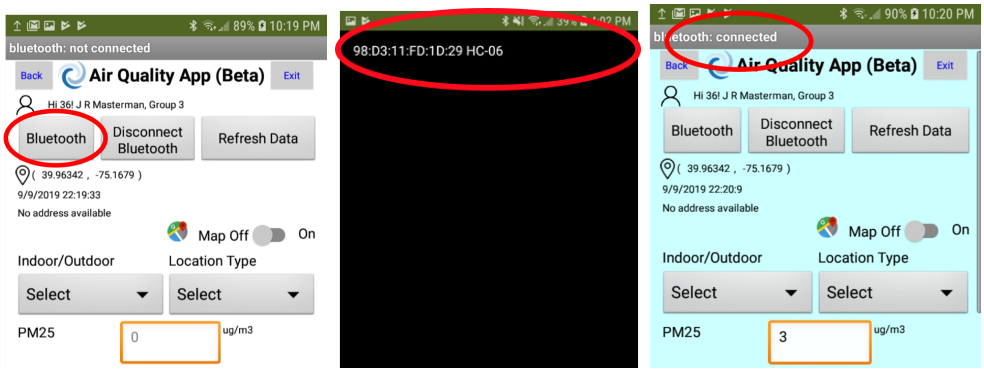
  Click the “Next” button. Then, you should be on the main screen. We will cover what you can do from this screen later in Section IV.







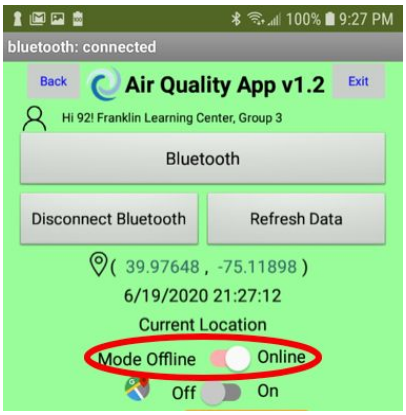
- Step 9 Connect app to Bluetooth
  Press and hold the “Bluetooth” button. This will open the Air Quality “Bluetooth” list menu. Select the HC-06 you paired with. Once you are connected to a Bluetooth device successfully, the screen title will show “Bluetooth: Connected” and the background color will change to blue for a few seconds.



Section IV. Collecting Data in Online Mode (Wi-Fi Connected)

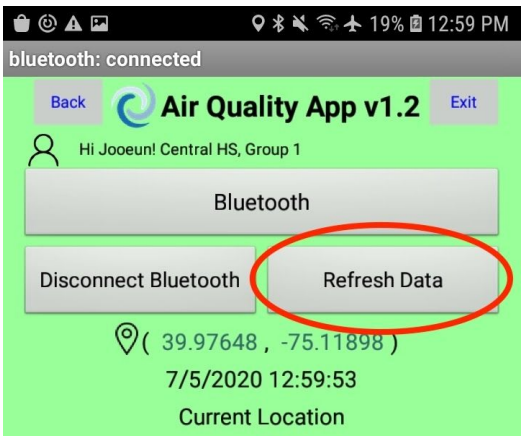
Now that you have connected your Android smartphone to the Air Quality sensor, you can start recording data on the air quality around your area. PM2.5 and CO data are color-coded so you can better understand pollutant values. Green means a low concentration, yellow is a moderate concentration, orange is an elevated concentration, and red is a high concentration.

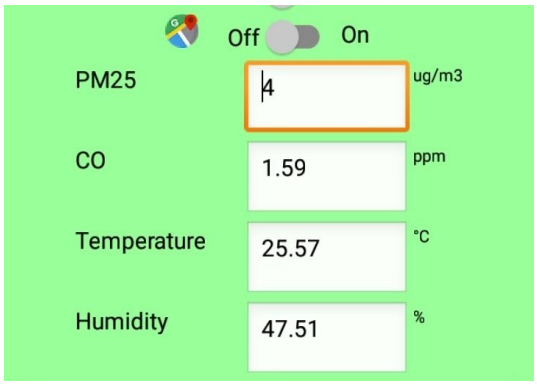
Make sure you toggle the Mode to "Online." This will turn the buttons at the bottom of the screen pink. See images below:



- Step 1 Read data

  To begin reading air quality data hit the "Refresh Data" button and the pre-read values will change to new values. When the app reads the data from the sensor, the background color will change to green. If the Latitude and Longitude do not appear right away, wait 1-2 minutes and they should load.

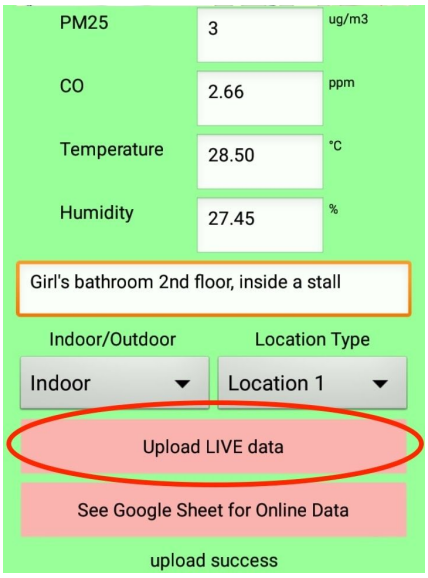


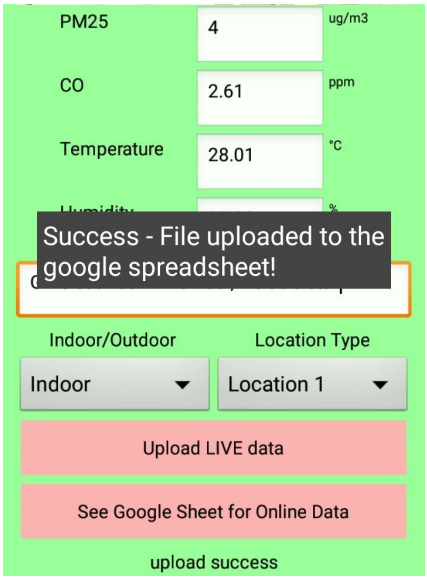


- Step 2 Fill in information about your location
  - Indoor/Outdoor: Use the drop down menu to select whether you are collecting data indoors or outdoors.

- Location Type: There are options for Location 1 - 5. This is very important when you are collecting data around the school or outside because it is what identifies where you collected the data.
- Comments: The name of your location and any important features (e.g., Girl's bathroom, 2nd floor, inside a stall OR Ms. Miller's classroom, back corner by the window).

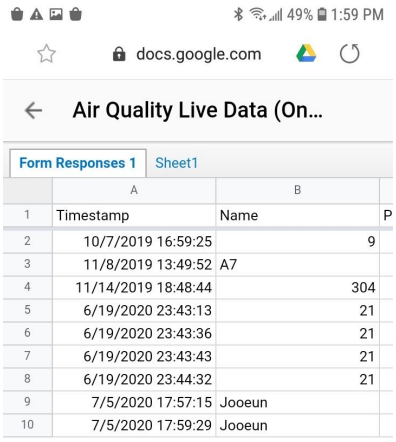
- Step 3 Upload data (Wifi-connected)
  When you have data updated in your textbox, you may press the "Upload LIVE date" button at the bottom of the main screen. This will save the data to the shared Google Spreadsheet. The app will tell you whether you have "upload success" or not. If it does not successfully upload you will not receive any prompt on the screen. In this case, you should wait for 5 seconds and press the "Upload LIVE data" button again.





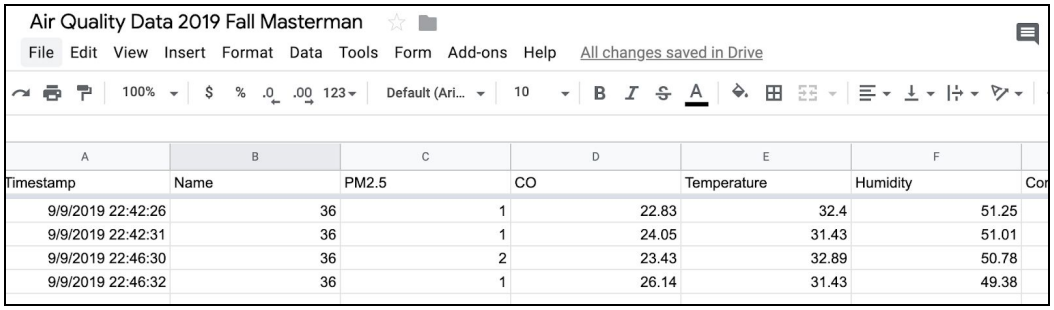
- Step 4 View Collected Data
  When you upload data, it will save your name, time, location, PM2.5 index, CO index, temperature, humidity, comments, site type, data collection time, location, school, class group, and location to a class Google Sheet.

  You can view the Google Sheet on your phone to make sure your data has recorded by pressing “See Google Sheet for Online Data.”

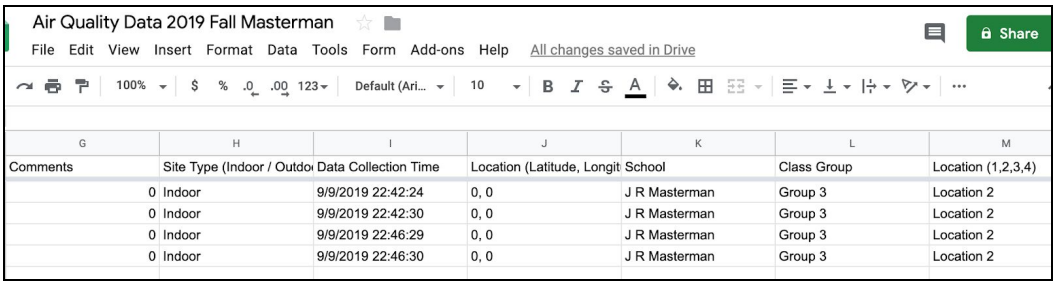


	A	B	
1	Timestamp	Name	P
2	10/7/2019 16:59:25	9	
3	11/8/2019 13:49:52	A7	
4	11/14/2019 18:48:44	304	
5	6/19/2020 23:43:13	21	
6	6/19/2020 23:43:36	21	
7	6/19/2020 23:43:43	21	
8	6/19/2020 23:44:32	21	
9	7/5/2020 17:57:15	Jooeun	
10	7/5/2020 17:59:29	Jooeun	

A shared Google Spreadsheet is a great place to view all of your and your classmates’ recorded air quality data for everyone to see and use. Be aware that all the data you collected is shared with everyone in your classroom. By sharing data, everyone can have a better idea of air quality in your area.



	A	B	C	D	E	F	
1	Timestamp	Name	PM2.5	CO	Temperature	Humidity	Cor
2	9/9/2019 22:42:26	36	1	22.83	32.4	51.25	
3	9/9/2019 22:42:31	36	1	24.05	31.43	51.01	
4	9/9/2019 22:46:30	36	2	23.43	32.89	50.78	
5	9/9/2019 22:46:32	36	1	26.14	31.43	49.38	

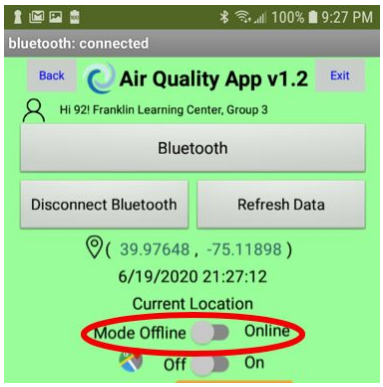


	G	H	I	J	K	L	M
1	Comments	Site Type (Indoor / Outdo	Data Collection Time	Location (Latitude, Longit	School	Class Group	Location (1,2,3,4)
2	0	Indoor	9/9/2019 22:42:24	0, 0	J R Masterman	Group 3	Location 2
3	0	Indoor	9/9/2019 22:42:30	0, 0	J R Masterman	Group 3	Location 2
4	0	Indoor	9/9/2019 22:46:29	0, 0	J R Masterman	Group 3	Location 2
5	0	Indoor	9/9/2019 22:46:30	0, 0	J R Masterman	Group 3	Location 2

Section V. Collecting Data in Offline Mode (No Wi-Fi-Connection)

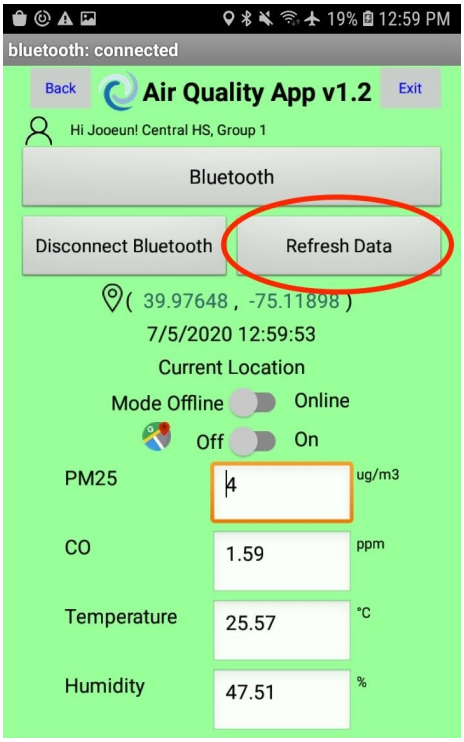
The Air Quality app can also save all PM2.5, CO, temperature, and humidity data to your Android device's storage and then upload them later to a shared Google Spreadsheet when you are connected to the Wi-Fi again.

Make sure you toggle the Mode to "Offline." This will turn the buttons at the bottom of the screen blue. See images below:

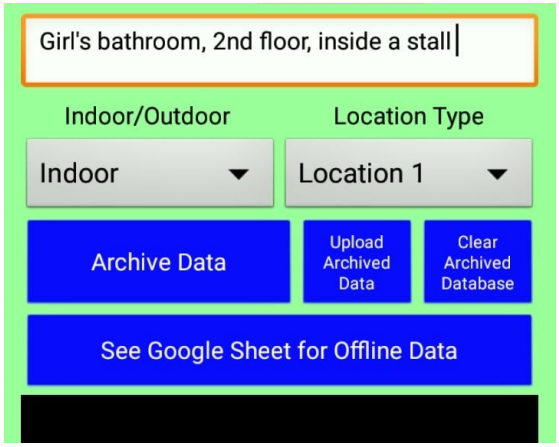


- Step 1 Read data

  Make sure that your app is connected to the Air Quality sensor. Click the "Refresh Data" button to get new values, as shown in the picture below.

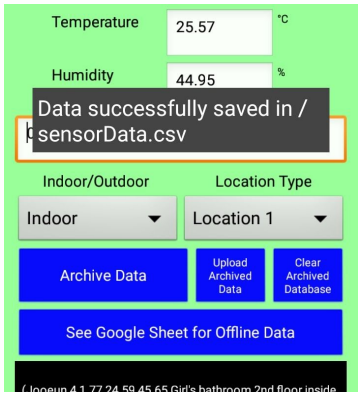


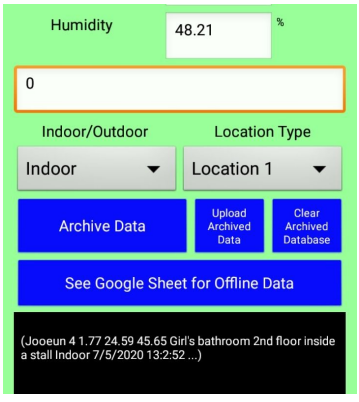
- Step 2 Fill in information about your location
    - Indoor/Outdoor: Use the drop down menu to select whether you are collecting data indoors or outdoors.
    - Location Type: There are options for Location 1 - 5. This is very important when you are collecting data around the school or outside because it is what identifies where you collected the data.
    - Comments: The name of your location and any important features (e.g., Girl's bathroom, 2nd floor, inside a stall OR Ms. Miller's classroom, back corner by the window).



- Step 3 Save data in local database

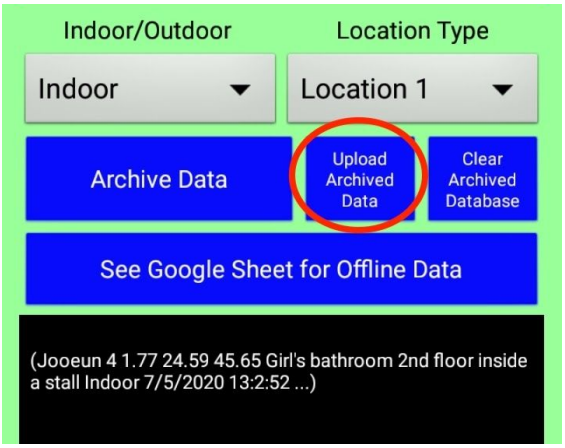
  When you are outside or do not have a Wi-Fi connection, you will not be able to upload live data to the spreadsheet. Instead, click the "Archive Data" button to save data on the smartphone in a .csv file, as shown in the picture below. Every time you click the "Archive Data" button, the app will create a new row of data. You can see the data at the bottom of the screen.

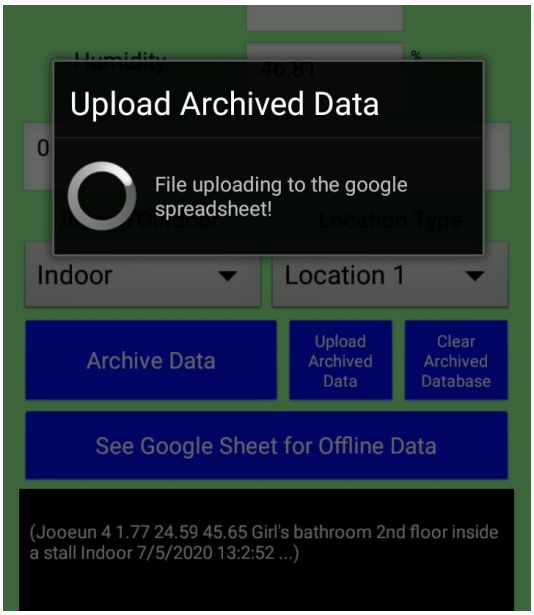




- Step 4 Upload data

  In order to work with data collected in offline mode in Google Sheets, you will need to connect to the Wi-Fi when you return to the classroom. Once you are connected to Wi-Fi, press the “Upload Archived Data” button in the middle, next to the “Archive Data” button. This will upload all data that has been saved locally on the phone to a shared Google Sheet. The app will tell you whether data is “successfully uploaded.” If it does not successfully upload you will not receive any prompt on the screen. In this case, you should wait for 5 seconds and press the "Upload Archived Data" button again.
  DO NOT PRESS THE “Clear Archived Database” AS THIS WILL DELETE ALL YOUR DATA.





Make sure you upload all the data that is saved in your device before you turn off the app.

Summary

Link to the Air Quality Live Data Google Sheet:

Link to the Air Quality Archived Data Google Sheet: