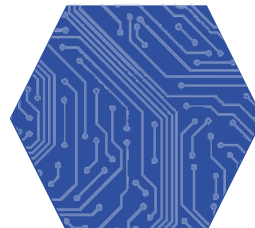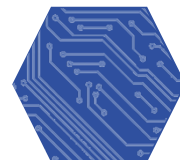# Activity 3

## Adding Temperature and Humidity

## Step 1: Add the DHT11 Shield

The first thing you will need to do is add the DHT11 shield to your D1 mini. Disconnect your D1 mini from the computer, then remove the jumper wires. Now you just need to line up the pins of the shield with the headers of the D1 mini and press the two boards together (make sure you don't get it back-to-front).
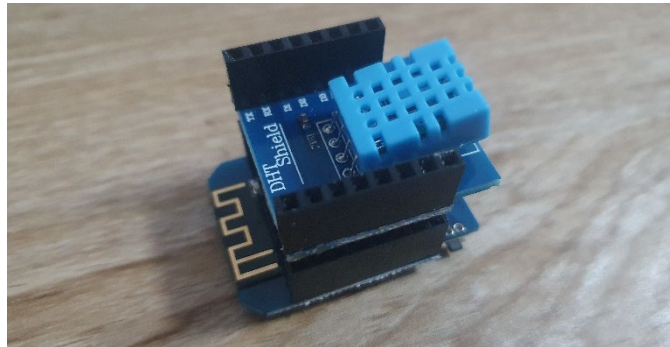


The advantage of using a shield is that it has already done some of the wiring for you! The DHT11 temperature humidity sensor is the light blue rectangular prism, and the shield has already provided the connections to power and to the signal pin, D4 (note the 'D' – this sensor is digital and will directly output a temperature in degrees Celsius and humidity as a percentage).

Now we need to reconnect the soil moisture sensor. This is the same as before:

- Connect "S" on the soil moisture sensor to "A0" on the DHT11 shield
- Connect "+" on the soil moisture sensor to "3V3" on the DHT11 shield
- Connect "-" on the soil moisture sensor to "GND" on the DHT11 shield
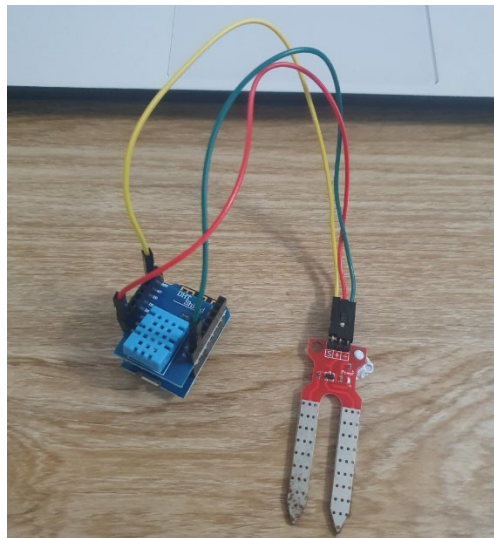


At this stage, it's a good idea to plug your board back into power and check that your soil moisture data is still streaming to ThingSpeak. Upload your code, then wait for a few seconds to check that ThingSpeak is receiving new data (you can also check that the soil moisture is still being displayed in Serial Monitor).

## Step 2: Reading temperature and humidity data

There are several libraries that can help with reading data from the DHT11. The one we will use is called "SimpleDHT". Go to Tools > Manage Libraries and search for "SimpleDHT", then install it.
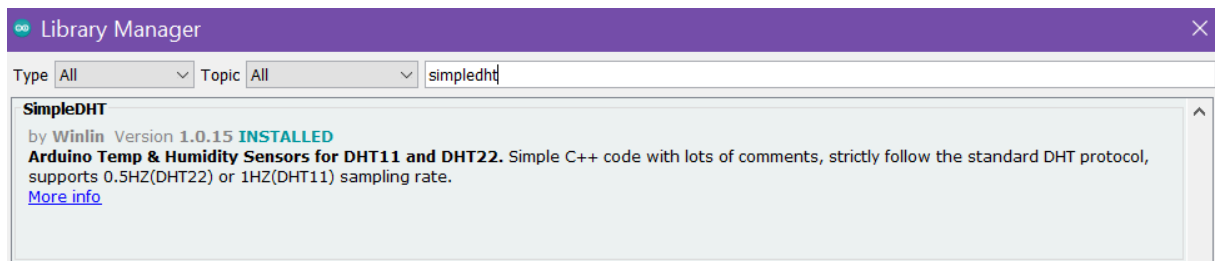


Head up to the top of your code and "include" the new library:

```
1  // Include libraries
2  #include <ESP8266WiFi.h>
3  #include "ThingSpeak.h"
4  #include <SimpleDHT.h>
```

You will then need to set up the pin information, similar to what you did for the soil moisture sensor:

```
19  // Set up the DHT sensor info
20  int dht11Pin = 2; // D4 is GPIO2
21  SimpleDHT11 dht11(dht11Pin);
22  byte temperature = 0;
23  byte humidity = 0;
```

The "SimpleDHT11" command lets the D1 mini know what type of DHT sensor is being used. The 'byte' keyword for temperature and humidity lets the D1 mini know that only whole numbers between 0-255 will be stored for these values.

You might also note that the pin "D4" is written down as pin 2. That might be a little confusing, but it's because D4 is alternatively called GPIO2 by Arduino (standing for 'general input/output pin). Here's a diagram of the GPIO pin numbers on the D1 mini:
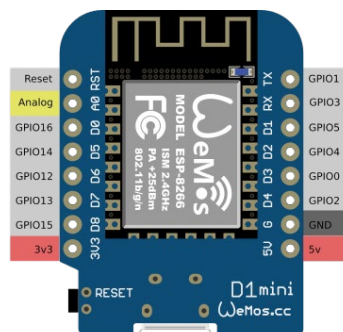


Now that we've told the D1 mini what pin to look at and what sort of data it will be storing, we are ready to read from the DHT11 sensor! Find where you read the soil moisture sensor data previously, and add the following code underneath:

```
54  // Read the temperature and humidity
55  dht11.read(&temperature, &humidity, NULL);
56  Serial.println("Temperature = " + String(temperature));
57  Serial.println("Humidity = " + String(humidity));
```

The first line of code tells the D1 mini that it's reading two values from a DHT11 sensor – the first value is stored in the 'temperature' variable, and the second is stored in the 'humidity' variable.

The next two lines of code will display messages in the Serial Monitor in a neat format. You might want to change your Serial.println code for the soil moisture sensor to have a similar format.

This is a good point to test your code! Click "Upload". Once the upload is finished, open Serial Monitor. You should see something like this:



As you will notice, temperature is in degrees Celsius. Humidity is measured as a percentage.

### Step 3: Streaming temperature and humidity to ThingSpeak

This one is going to be a challenge largely left to you! Have a look at the code we previously wrote for sending information to ThingSpeak:

```
59    // Write data to ThingSpeak
60    ThingSpeak.setField(1, soilValue);
61    int x = ThingSpeak.writeFields(THINGSPEAK_CHANNEL_NUM, THINGSPEAK_WRITE_KEY);
```

Which of these lines of code told the D1 mini where to put the soil value? Can you write your own code to let ThingSpeak know where to put the temperature and humidity data? Hint: you will only need to add two lines of code!

Once you think you've got it, upload it to your board. If you get stuck, ask one of the instructors for help 😊

If your code is working correctly, you will see data streaming to all three fields of your channel:
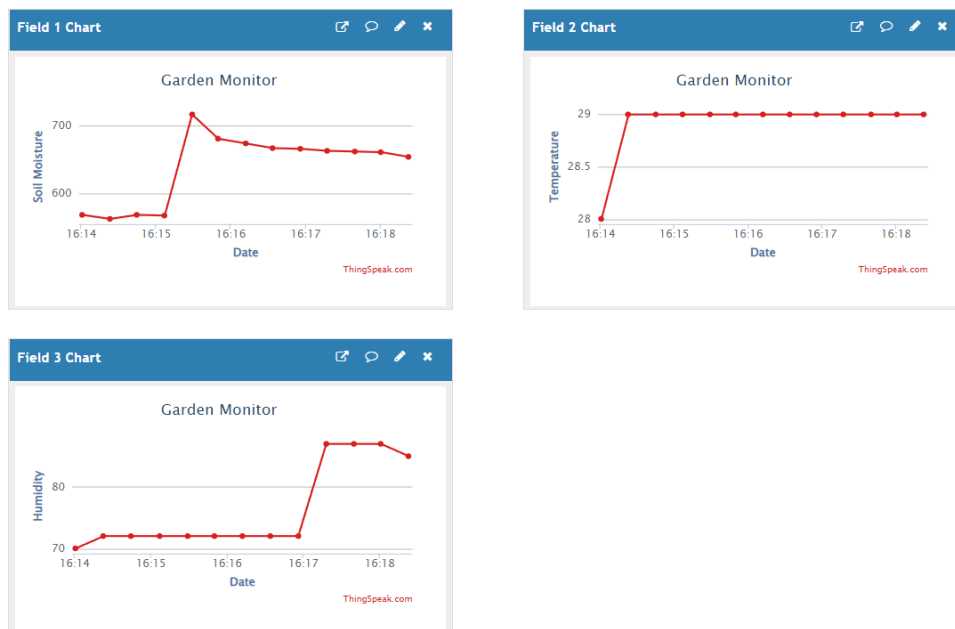


*(Can you tell where I added water to my soil? Sprayed water into the air near the DHT sensor?)*

You are now ready to move on to the challenge activities! Choose between making your device battery powered and receiving alerts when your garden needs attention.