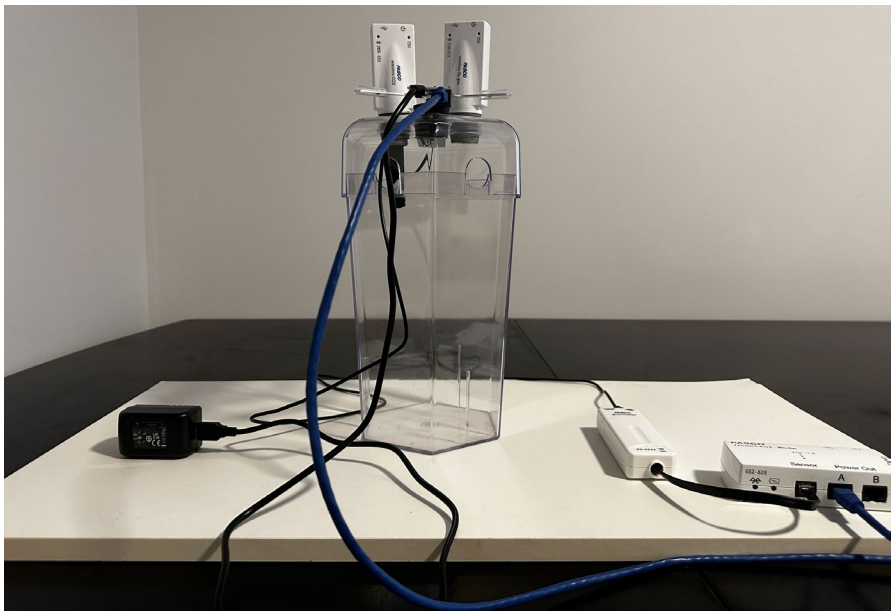
Greenhouse Assembly Guide for Climate Change Investigation

The following steps can be used to prepare the Pasco Greenhouse for the Climate Change Investigation. While many attachments are included in the box, not all are required for this investigation. This document will outline how to assemble only the components required for the Climate Change Investigation. Additional support is available at Ayva.ca.

The investigation will require:

- Ecochamber
- Control Node
- Greenhouse Sensor
- temperature / humidity sensor board
- the Grow Light
- ethernet cable
- micro-USB cable with AC wall attachment (black)
- micro-USB cable to change the Control Node
- cable to connect temperature board to Greenhouse Sensor
- 2-hole rubber stopper
- OPTIONAL, wireless O_2 sensor included in the box otherwise use a solid rubber stopper
- OPTIONAL, wireless CO_2 sensor (from previous equipment distribution) otherwise use a solid rubber stopper

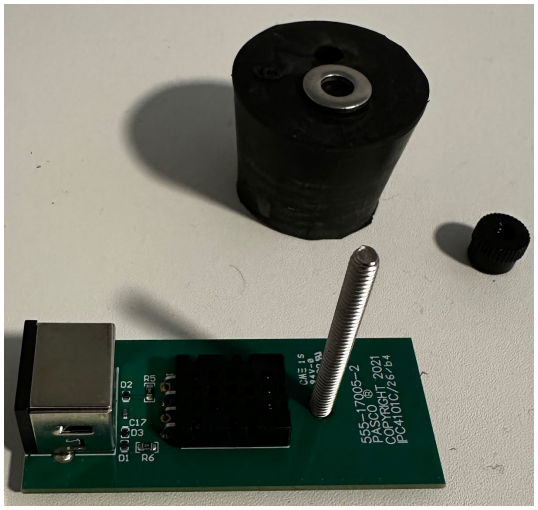
The final setup should look something like the image below:



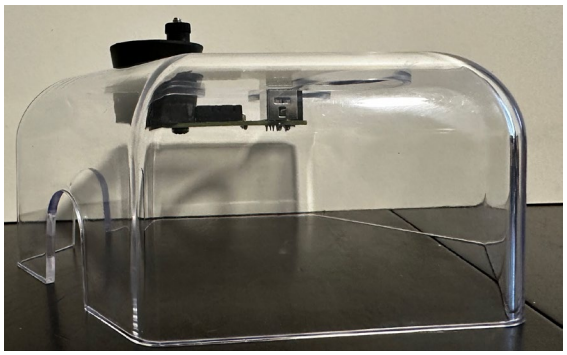
Greenhouse Assembly Step by Step Guide (for Climate Change Investigation)

1. Unpack the required components.
2. Locate the top piece of the Ecochamber. It has 3 equal size holes on top.

3. Locate the temperature / humidity sensor, a 2-holed stopper, screw and washer assembly.



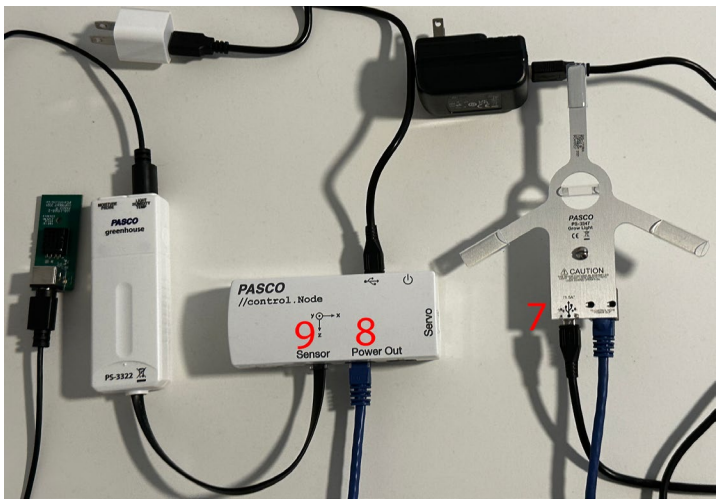
4. Place the temperature / humidity sensor board inside of the top piece of the Ecochamber underneath one of the holes. Push the 2-holed stopper through the top of the hole of the Ecochamber feeding the long screw up through the stopper. Secure the board to the stopper using the provided screw and washer. *It may be helpful to preconnect the temperature / humidity board to its cable before securing it to the stopper.*



5. Connect the other end of the cable to the Greenhouse Sensor.

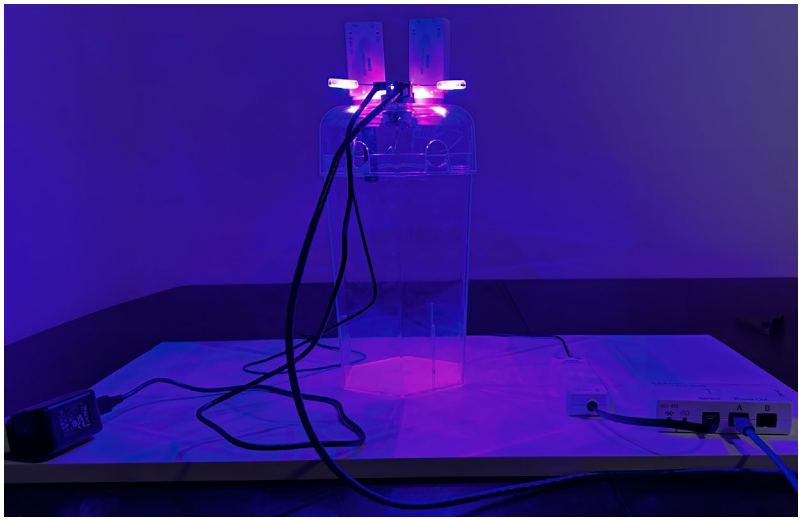
6. Feed the Grow Light's long screw down through the second hole of the 2-hole stopper.

7. Connect the micro-USB with the AC adapter to the Grow Light. DO NOT connect to power yet.
8. Connect the Grow Light to the Control Node at "Power Port A" using the ethernet cable.
9. Connect the Greenhouse Sensor to the "Sensor" port on the Control Node.



10. Place the lid on top of the base of the Ecochamber.
11. Plug the 2 open holes in the lid of the Ecochamber with the CO_2 and O_2 sensors.

12. The final assembly should look like the image below when plugged into power. The lights will run at full intensity unless programmed to do otherwise using Sparkvue.



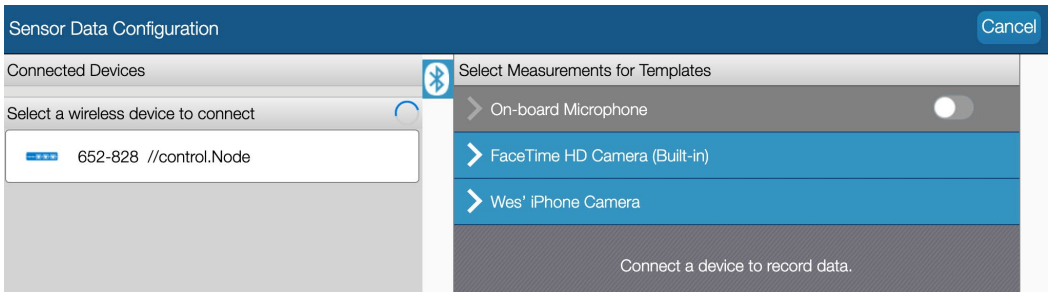
Additional information

- Batteries can be charged using the included micro-USB cable. For longer investigations, it may be necessary to power the Control Node, CO_2, and O_2 sensors using AC power.
- Further guides and useful links can be found at https://www.ayva.ca/sci/nova-scotia-science-gh/.

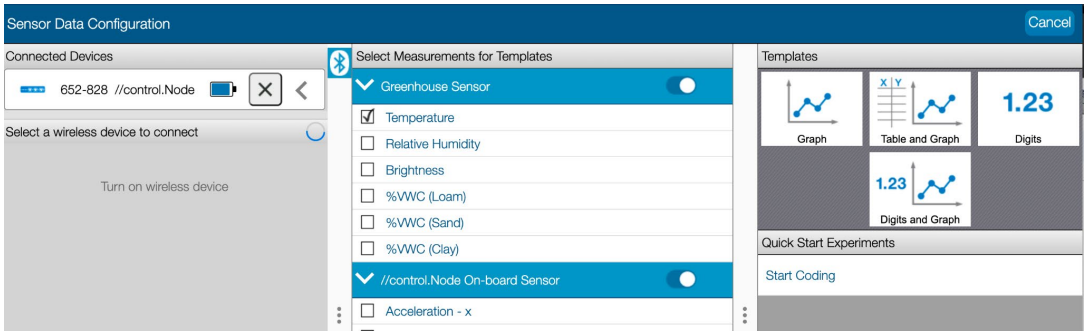
Connecting the Greenhouse to Sparkvue and Coding

The Greenhouse operates using Sparkvue and requires programming with Blockly. The interface for this programming language inside of Sparkvue and is very similar to Scratch. The following steps will connect the Greenhouse via Bluetooth to Sparkvue and locate the necessary code fragments to work through the Climate Change Investigation

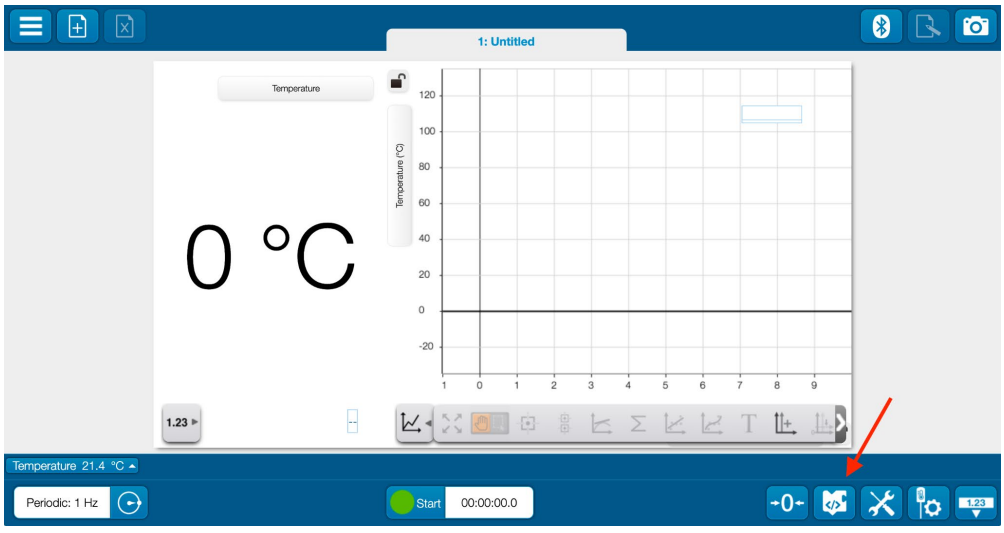
13. Ensure you have the most up-to-date copy of Sparkvue installed on your machine if running Windows or macOS. GNSPES-linked Chromebooks will automatically have the latest version installed.
14. Power on your Control Node (note the ID number), open Sparkvue, select Sensor Data, and connect to your Control Node.



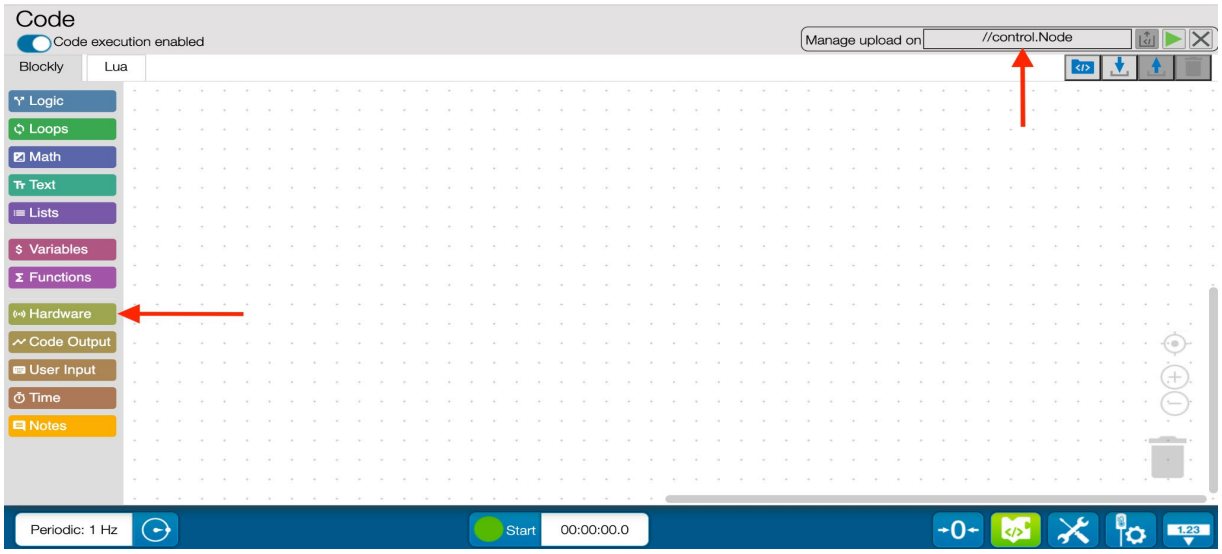
15. Check "Temperature" under the Greenhouse Sensor menu then select a data display Template. For the purposes of this guide we will select Digits and Graph.



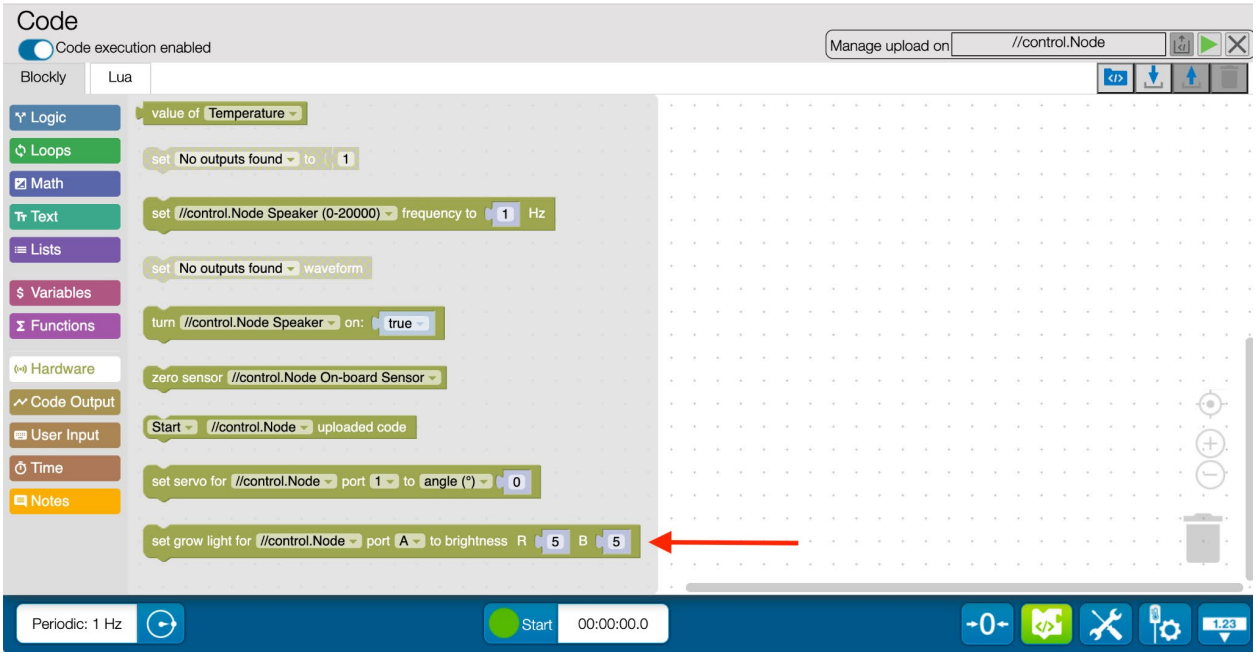
16. Click on the coding block (puzzle piece), on the bottom right hand side of the window.



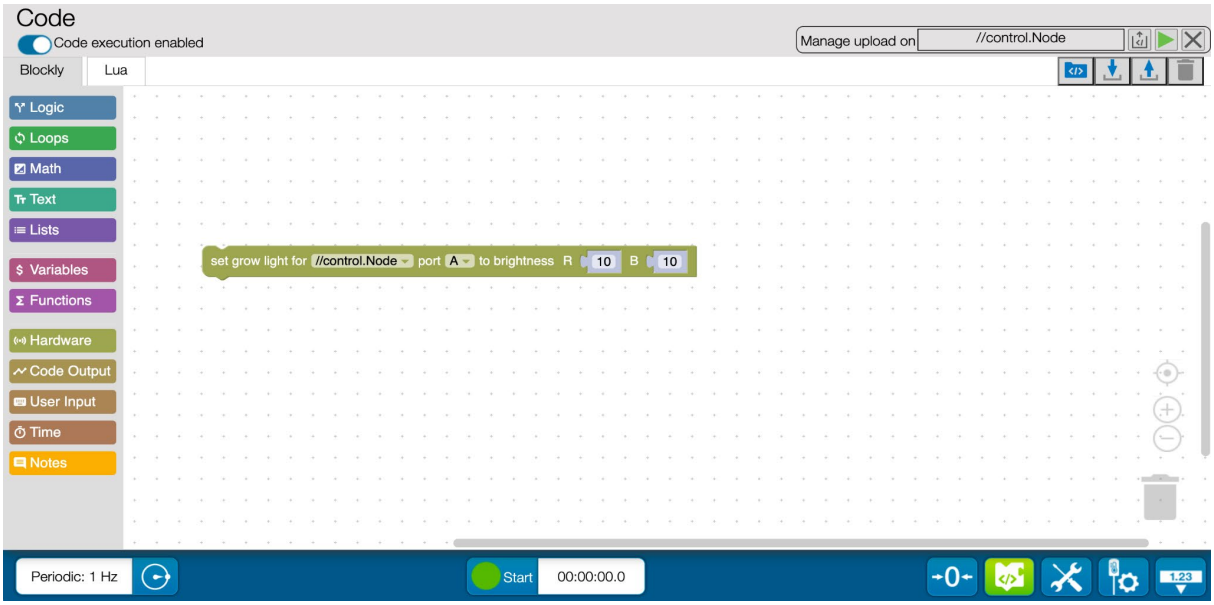
17. Notice //control.Node in the upper right corner indicating that Sparkvue is connected to the Control Node. Locate the code fragment to enable the lights under the Hardware tab on the left of the window.



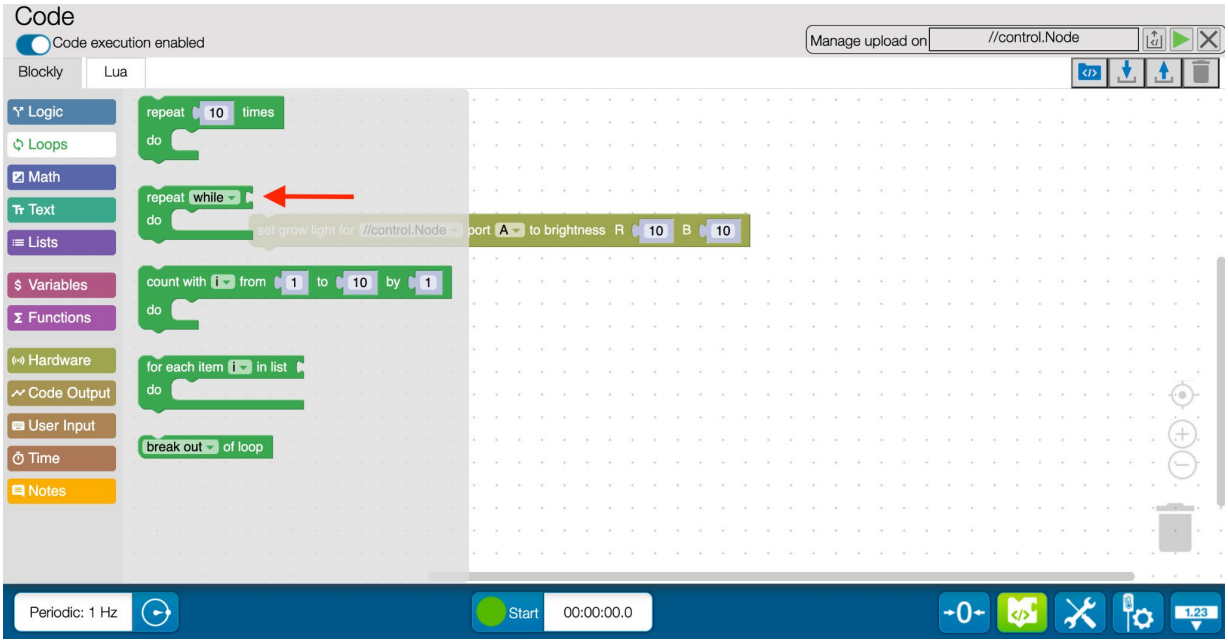
18. Select the grow light fragment. Check that the Power Out port is set to A (as indicated in the set up step 8). Notice also that R and B are both set to "5" (Red (R) and Blue (B) lights operate at half intensity). Change these numbers both to 10 to complete the Climate Change Investigation as written.



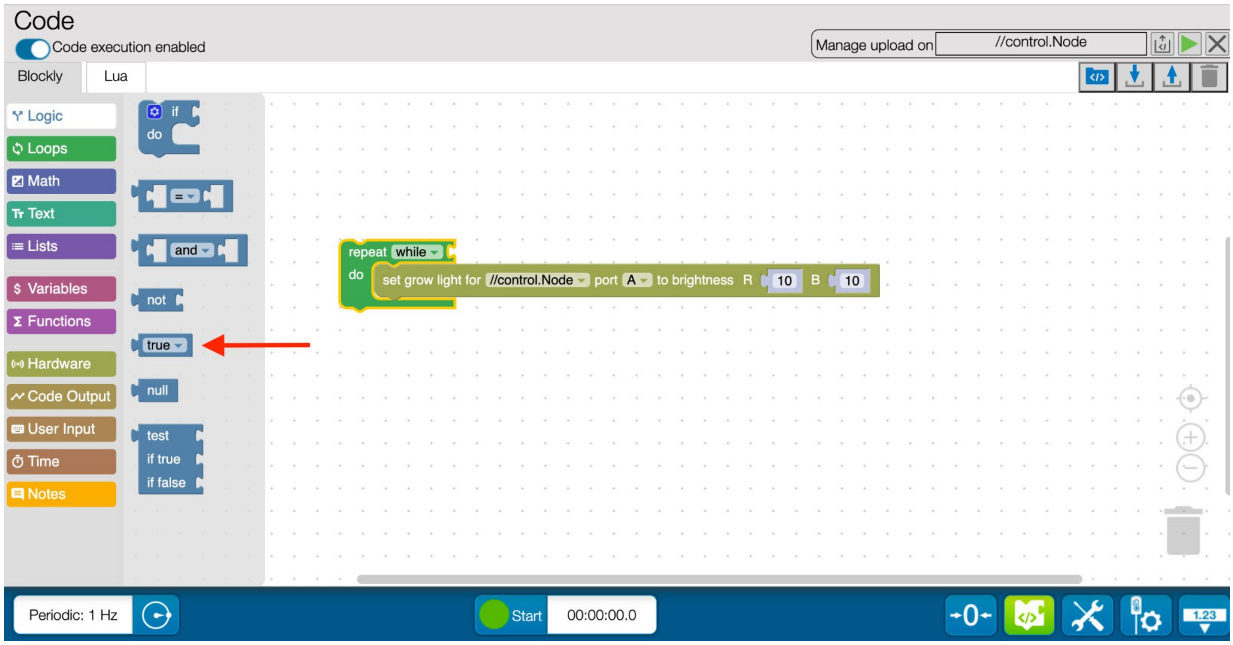
19. The coding screen should now look like the diagram below.



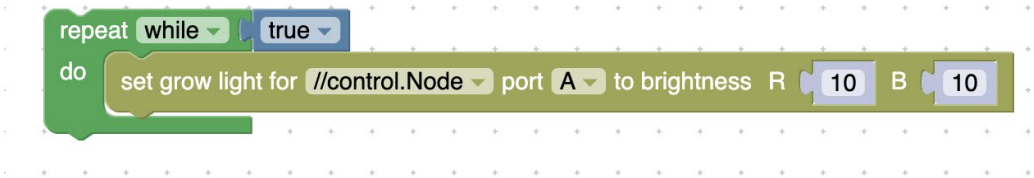
20. Test that the code works by pressing the Start button. The lights should blink on and then back off. In order to make the Grow Light run “forever” open the Loops container and select a While Loop.



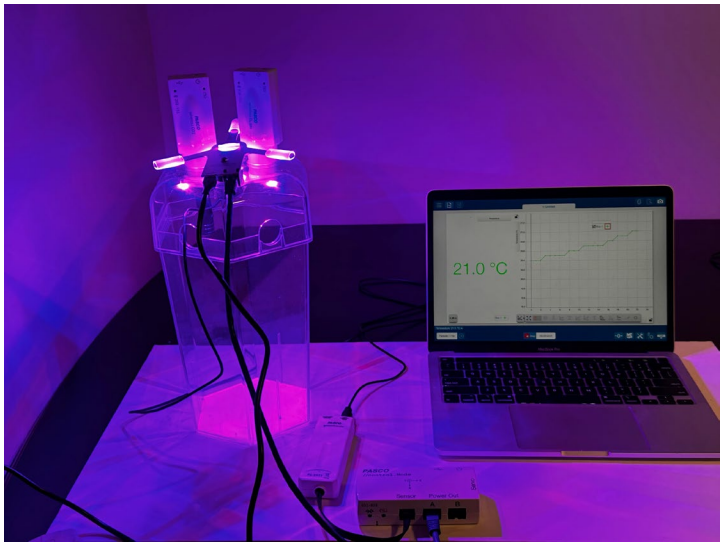
21. Move the grow light block inside of the loop. It will fit like a puzzle piece. In order to make the light stay on for as long as the program runs, drag the block that says “true” from the Logic container and connect it to the loop.



22. The program should now look like the image below.

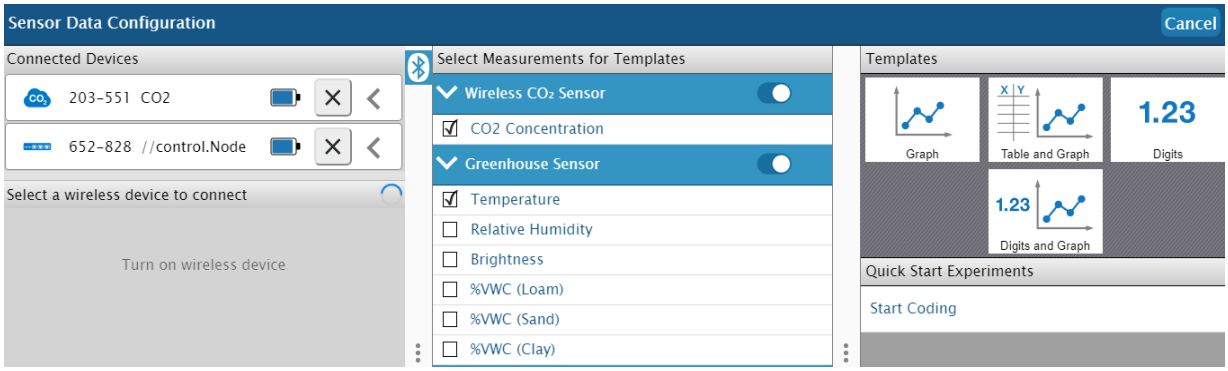


23. Click the puzzle piece icon at the bottom right of the screen to return to the Sensor Data window and display the Digits and Graph. Press Start to run the lights at full intensity, until the experiment is stopped.
24. The Greenhouse is now able to run and collect data for the Climate Change Investigation.



Notes

- The default is to collect a temperature data point once every second (1 Hz). This can be adjusted at the bottom left of the Sensor Data screen before pressing start the same as for any other Pasco-based investigation.
- Instructions and support materials including videos for additional components (e.g. fan, soil moisture probe and water pump) can be found on the website: https://www.ayva.ca/sci/nova-scotia-science-gh/.
- Should you wish to enable data collection with the CO_2 sensor in addition to the temperature sensor return to Step 14. Connect both the Control Node and the CO_2 sensor.



- With both the Control Node and CO_2 sensor connected, the final screen display will look like the image below.