Plant Sensors Practical

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Contents

What do plant sensors measure?

Light

Light is extremely important for plants. It is measured in terms of its intensity (lux) or the number of photons reaching a surface (photon flux density). For the data sensor practical, the value will be as a %, indicating the amount of light between direct sunlight and complete darkness.

For flower production, insufficient or too much light/heat can impact production and flower quality.

Insufficient light/heat

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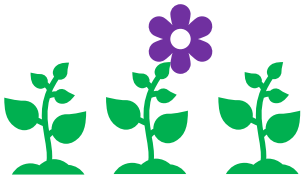
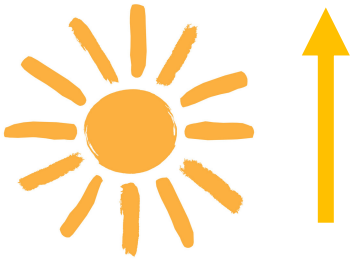


Plants grow too slowly, so use of space/greenhouse is not optimised, and cash flow and consumers can be affected.



Too much light/heat

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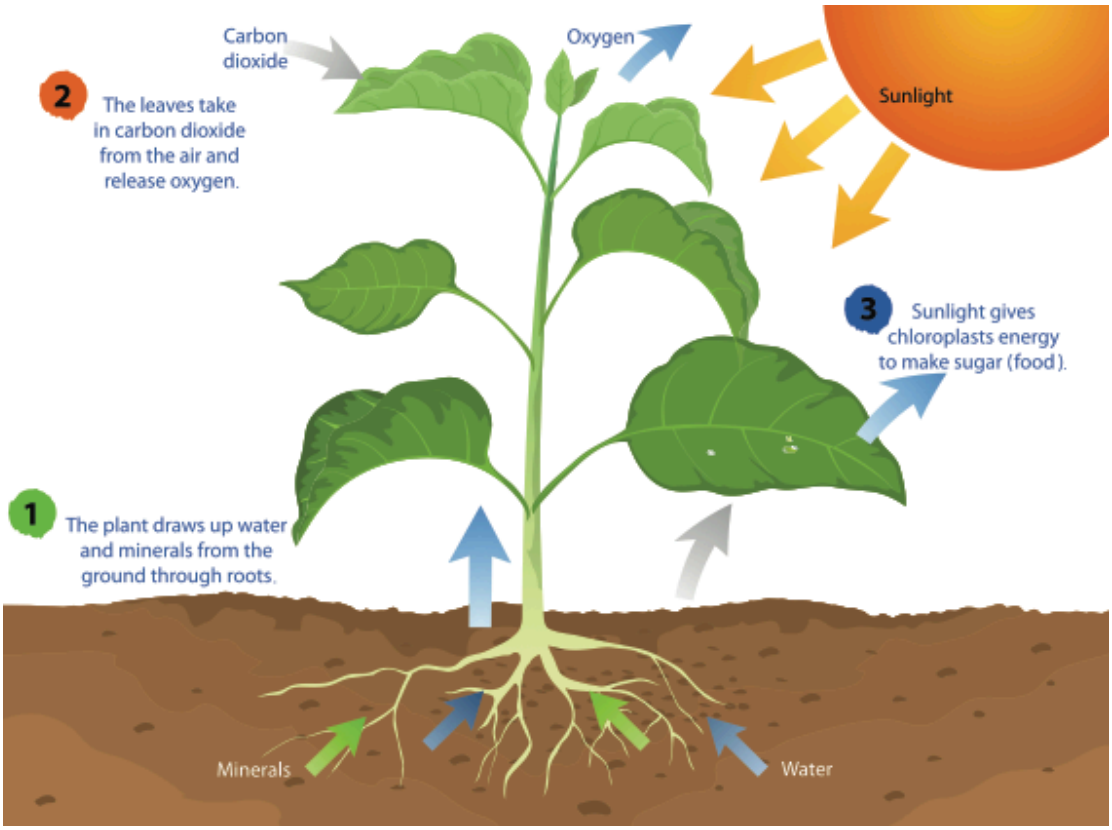
Insufficient photosynthesis to support plant growth, resulting in plants that go “soft” and eventually die

Photosynthesis reminder:



© https://ssec.si.edu/stemvisions-blog/what-photosynthesis

Why is light quantity, quality and duration important?

For flower production, it is the combination of light quantity, quality and duration, that is important for plant growth and flower development.

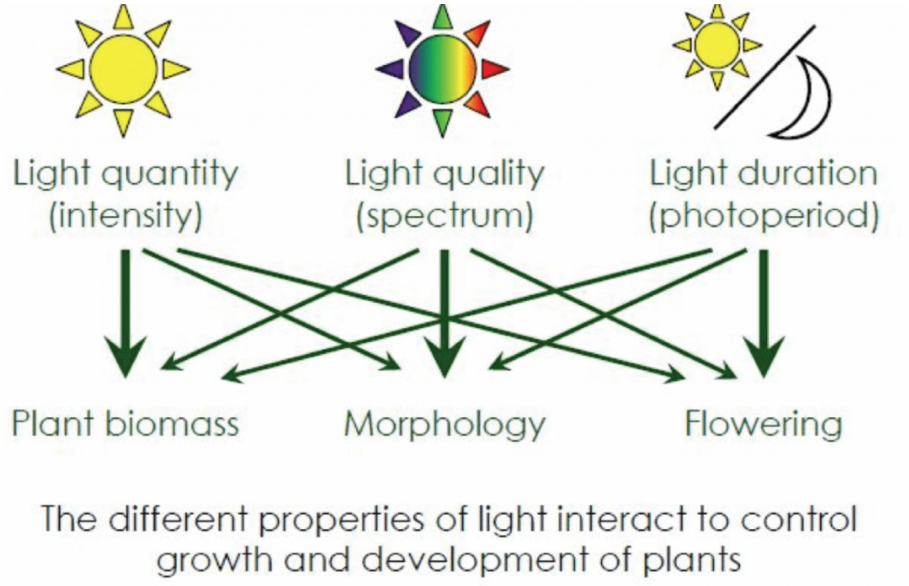


Image Credit: Erik Runkle, Professor / Floriculture Extension Specialist, Michigan State University

Humidity

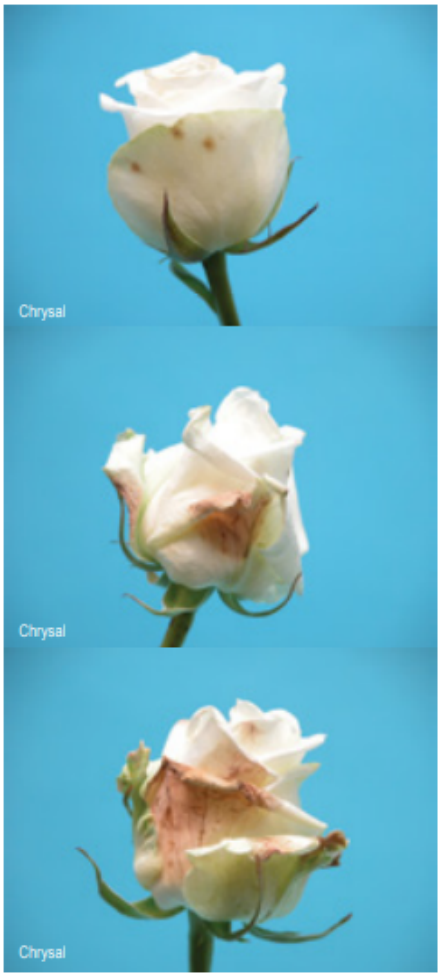
Humidity is the presence of water vapour in the air. For growers, humidity is important to:

A. Prevent fungal diseases.
B. Prevent tip burn

Fungal diseases

There are a variety of fungal diseases that are categorised by scabs, mould, rusts and blotches. This is highly undesirable for consumers and hence results in reduced production and profit for growers

Botrytis cinerea, or grey mould, is a fungal disease that affects cut flowers. It appears like brown patches on the flowers. This fungus will grow on dead or dying plants when conditions are favourable, either in the greenhouse or in transport containers.



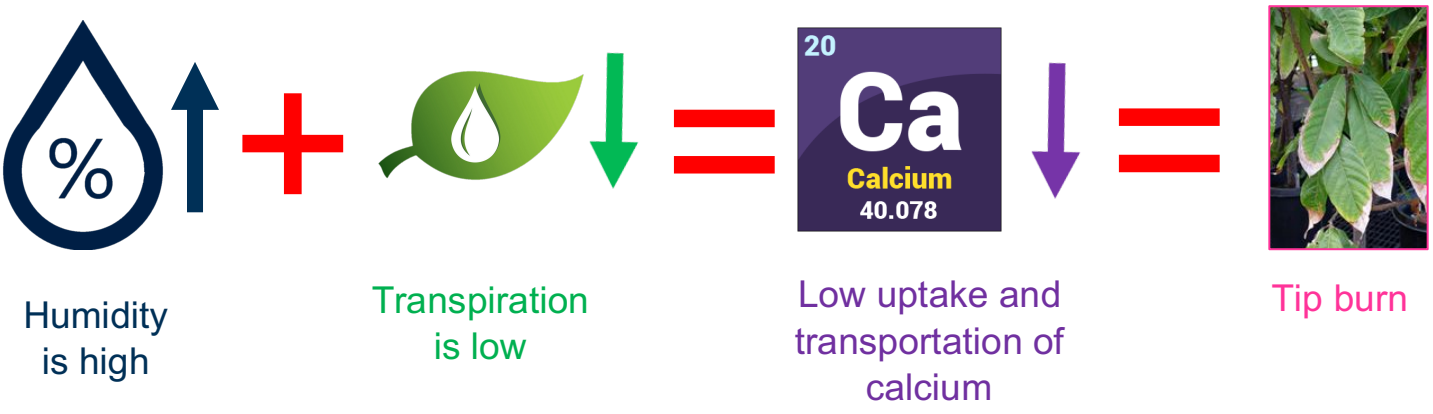
The photos to the left illustrate the progression of *Botrytis* (grey mould) infection over time, with small lesions on the petals enlarging to become large areas of damaged tissue. Under favourable conditions, *Botrytis* can develop quickly following harvest.

Taken from:

Thomas and Gollnow (2013). What cut flower is that? The essential care and handling guide for cut flower professionals.

Tip Burn

Tip burn occurs when there is a localised transient calcium deficiency. Calcium is transported in the xylem and is used in cell wall construction. When relative humidity is high, vapour pressure deficit is low and transpiration is low, causing low uptake and transportation of calcium to rapidly developing growing points.



For most cut flowers, high humidity is essential.

Cool rooms aim for a Relative Humidity of 95%.

Refrigeration without high humidity dehydrates flowers, which shortens vase life.

Temperature

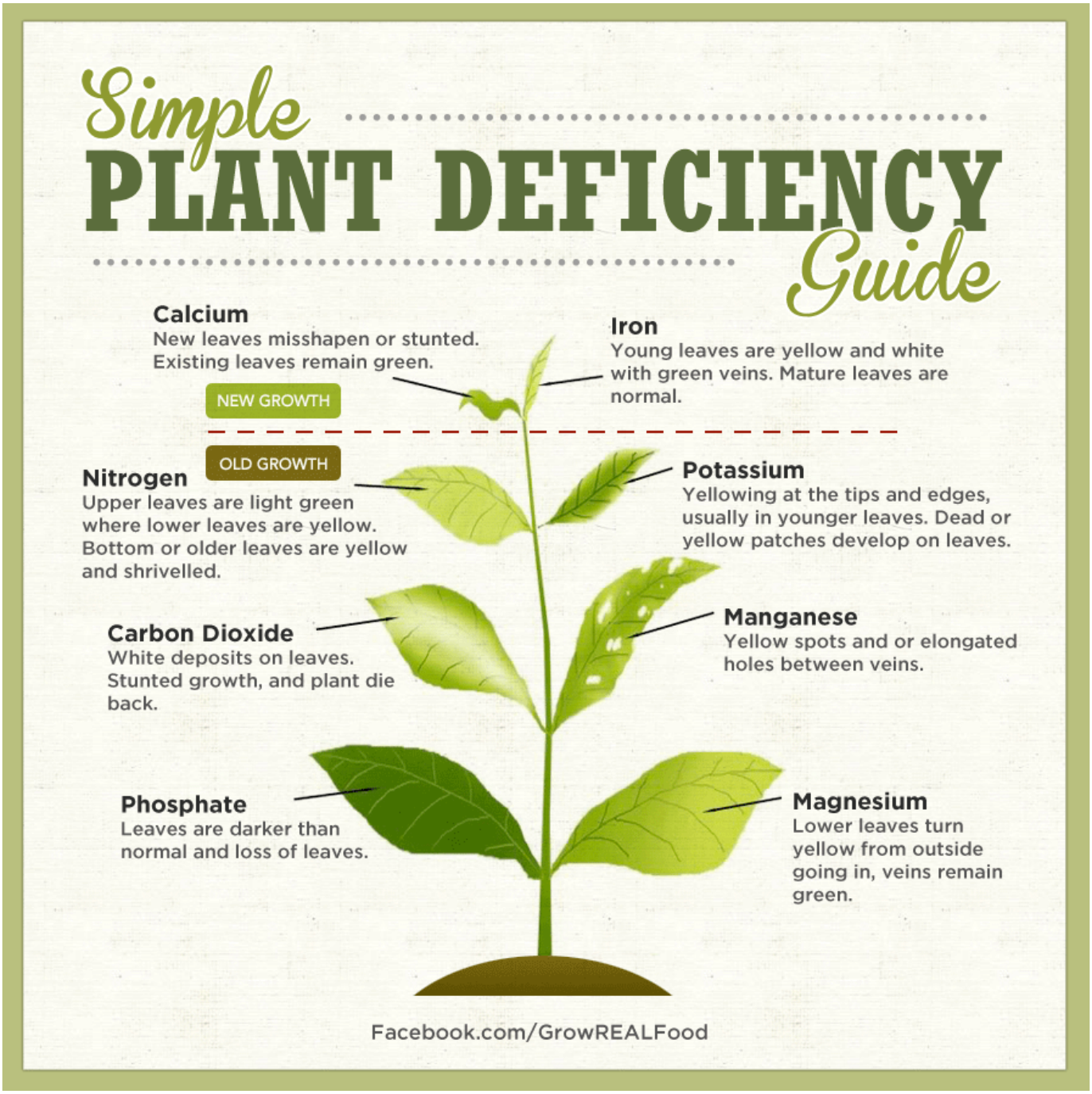
Temperature is described as the degree or intensity of heat present in a substance or object. Temperature is important for flower production as extremes (high and low) can inhibit plant growth.

Ideal holding temperatures according to climatic origin of species.

Plant origin	Recommended temperature range	Examples
Temperate climate	0–2 °C	Roses, lilies, waxflower
Subtropical climate	5–8 °C	Christmas bush
Tropical climate	12–15 °C	most orchids, ginger, *Anthurium*

Taken from Thomas and Gollnow (2013). What cut flower is that? The essential care and handling guide for cut flower professionals.

Plant deficiency overview



How to order and program your plant sensors

It is important to note that there are a wide variety of plant sensors, at differing price points that you can purchase to complete the plant sensor practical.

We have provided instructions on how to purchase and build the sensors that were utilised at the Victorian TeacherFX 2019 program.

The instructions will go through the process of ordering the Printed Circuit Board (PCB) required for this project and purchasing the sensors and additional components required to assemble this kit.

There are 3 Steps required to get your kit ready to go:

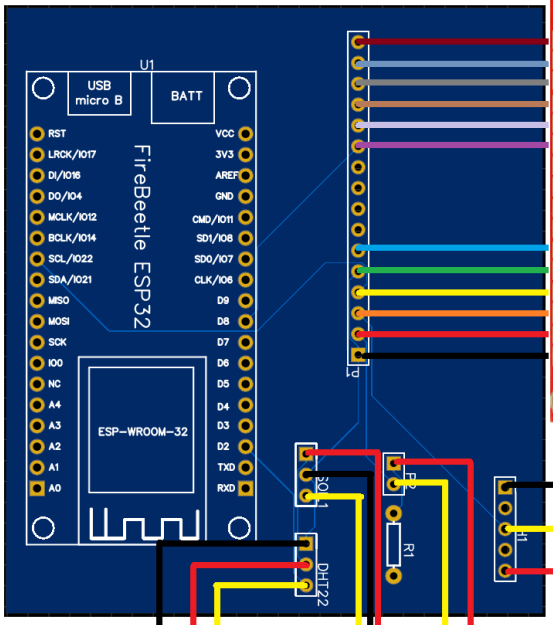
- Order the equipment
- Assembly
- Programming
-

You can find these instructions (which will be updated as necessary) at the link below:
https://github.com/TeacherFX/Classroom/wiki

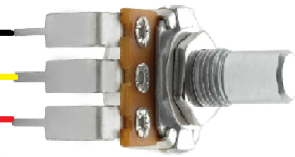
How to set up plant sensors

The following are all of the components for the plant sensors data practical:

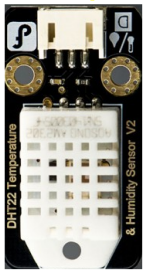
PCB (Printed Circuit Board)- this contains all of the wiring for the electronics, so that the sensors can communicate with one another



LCD data screen – you will see the data appear here

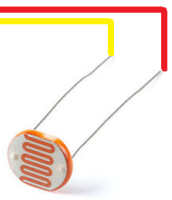


This adjusts the brightness of the LCD screen



Temperature and humidity sensor

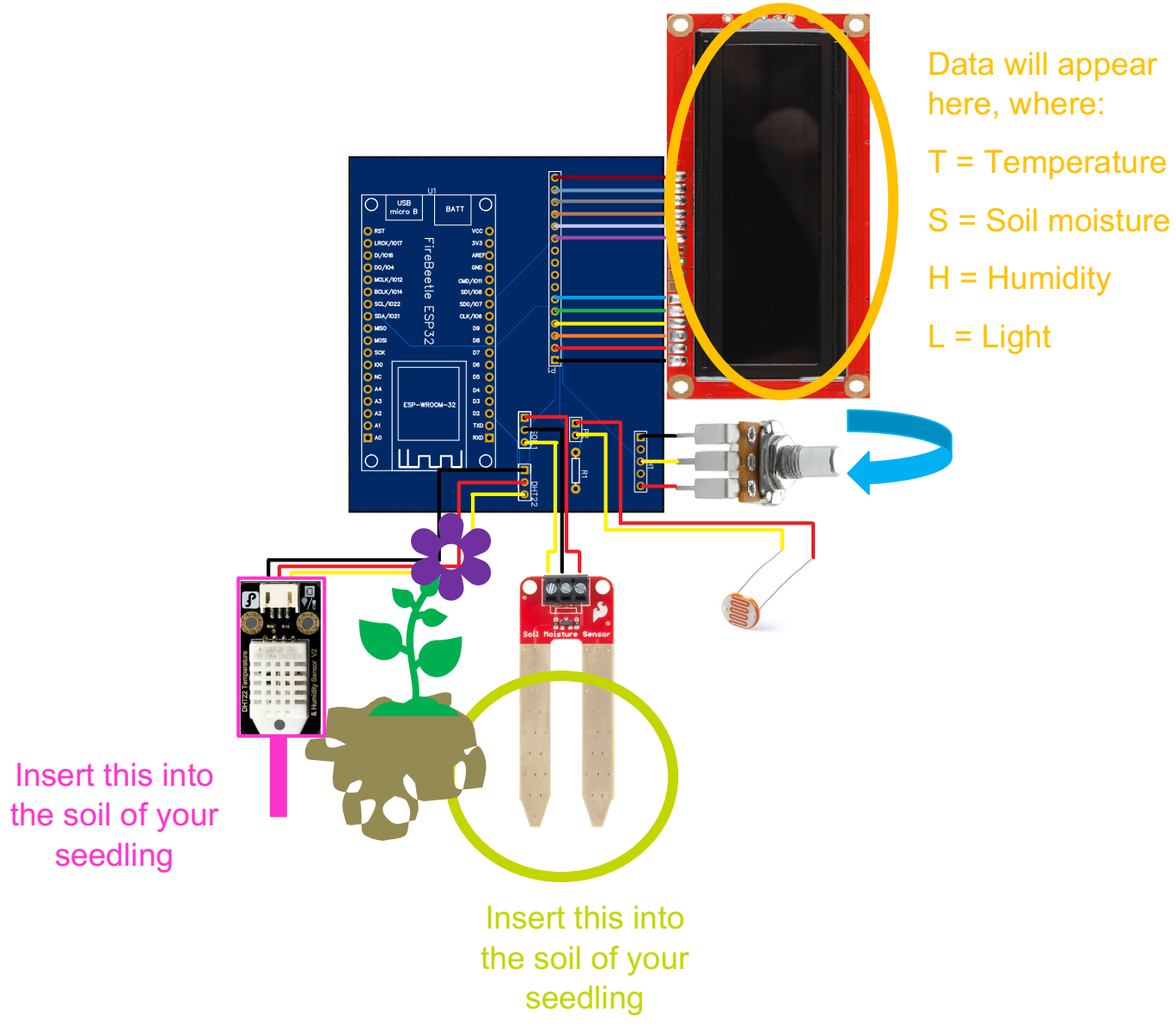
Soil moisture sensor



Light sensor

Data analysis

Working in small groups, set up your equipment with your seedling, by inserting the soil moisture sensor (circled) a few cms deep into the soil of your seedling. Insert your temperature and humidity sensor into the soil of your seedling as well. If you have set this up correctly, data will appear on the LCD screen. If not, you will need to adjust the brightness of the LCD screen, by rotating the knob.



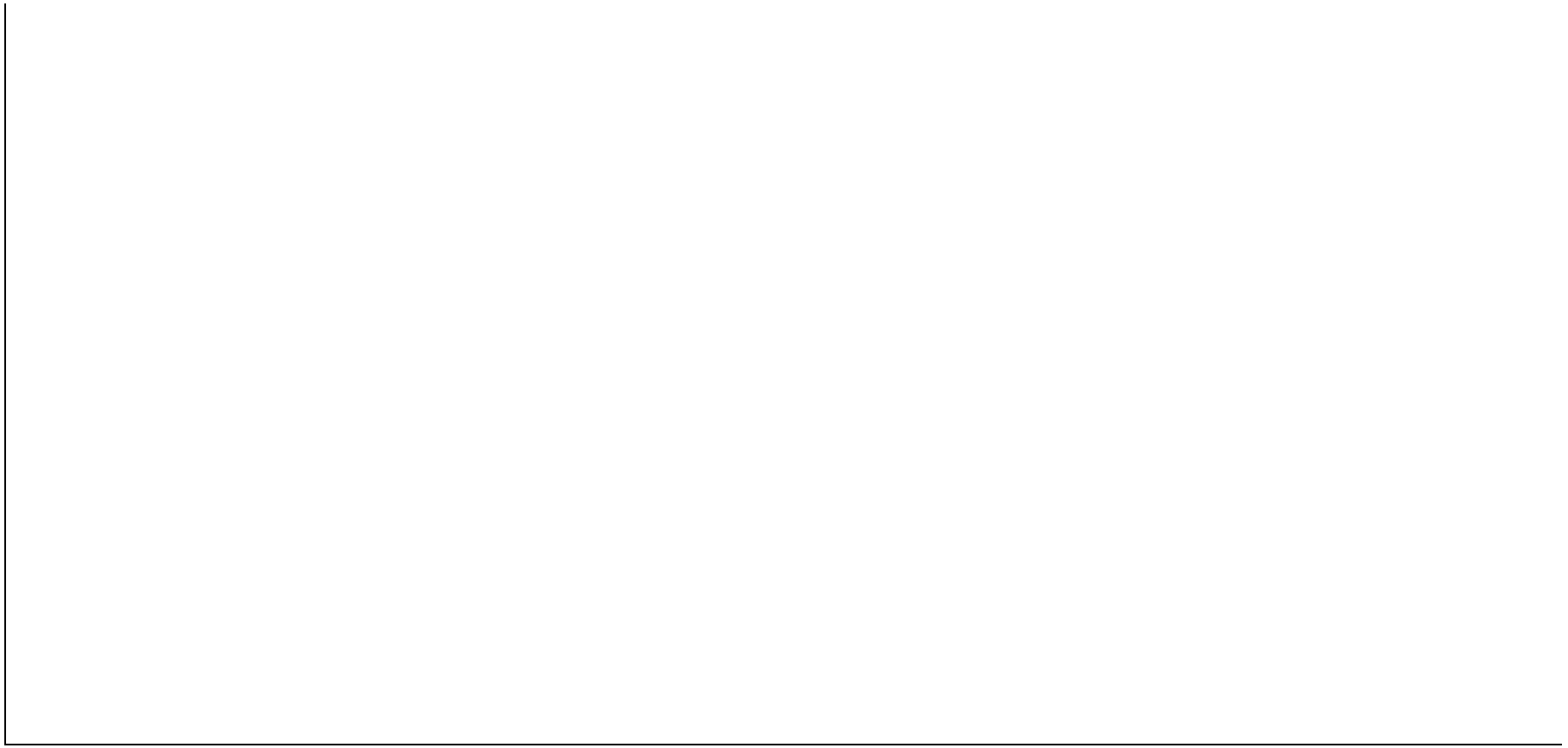
Record information every 30 seconds for your dry plant and fill in the table below.

Water your plant and wait 30 seconds.

Continue recording information every 30 seconds on your watered plant.

Variable	Time (seconds)								
	Dry plant				Water your plant and wait 30 seconds	Watered plant			
	30 sec	60 sec	90 sec	120 sec		30 sec	60 sec	90 sec	120 sec
Temperature (T; °C)									
Humidity (H; %)									
Soil moisture (S; %)									
Light (L; %)									

QUESTION: Graph your **soil moisture results** for the dry plant vs. watered plant.



QUESTION: Were there any fluctuations in the short time of logging data? If so, why?

QUESTION: Were there any obvious correlations with any of the variables? If so, what?

QUESTION: What was the average of the below variables for the dry vs. watered plant?

Variable	**Dry plant**	**Watered plant**
	Average	**Average**
Temperature		
Humidity		
Soil moisture		
Light		

Now try putting your sensors somewhere new (roof/somewhere hot, fridge or perhaps breathe on it).

QUESTION: Where did you put your sensors?

_____

QUESTION: What was your hypothesis?

_____

QUESTION: List some observations

_____

_____

_____

_____

QUESTION: Fill in the table below

Variable	
Temperature	
Humidity	
Soil moisture	
Light	

QUESTION: Was your hypothesis correct?

_____