QTN on Integrating STEM into Environmental Education Curriculum

Christian Alliance Cheng Wing Gee College

S.3 Biology – Fungiculture

Objectives

- **Environmental Education:**
  1. To appreciate the ecology and biodiversity of fungi as decomposers.
  2. To study the life cycle of mushrooms.
  3. To learn the practice and importance of fungiculture: **Reduction of organic wastes**.

- **STEM:** Coding (BBC micro:bit)

Schedule

Lesson	Content	Activity
#1	Ecology	Lecture
#2	Biodiversity	Microscope observations
#3	Fungiculture	Coding workshop

Lecture –

Ecology & Biodiversity of Fungi

1. **Cell biology of fungi**
2. **Anatomy of mushrooms**
3. **Life cycle of mushrooms:**

   Nutrition, Growth & Reproduction
4. **Roles of fungi as decomposers**

Coding Workshop –

Environmental Factors for Fungiculture

1. **Identify an abiotic factor:**

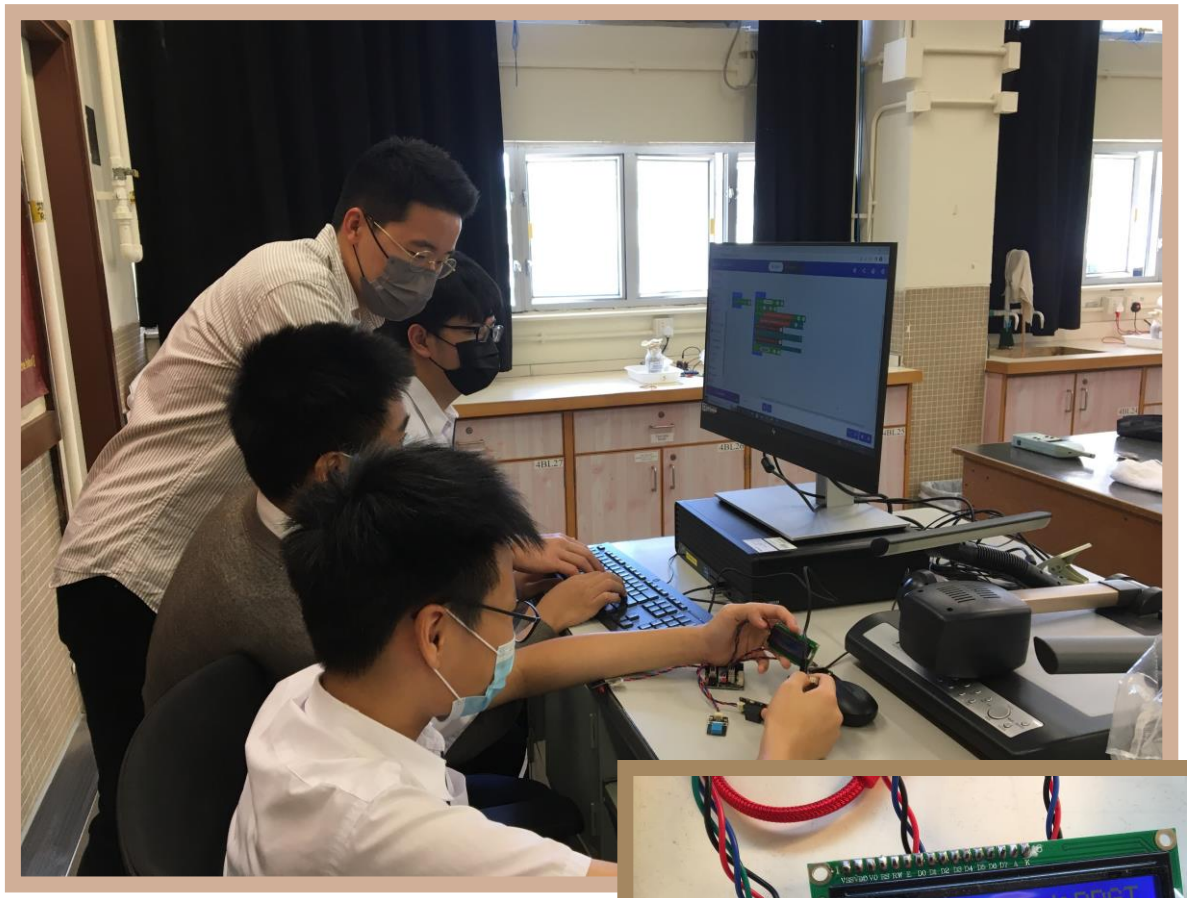
   Temperature, Light, Humidity & Air Movement

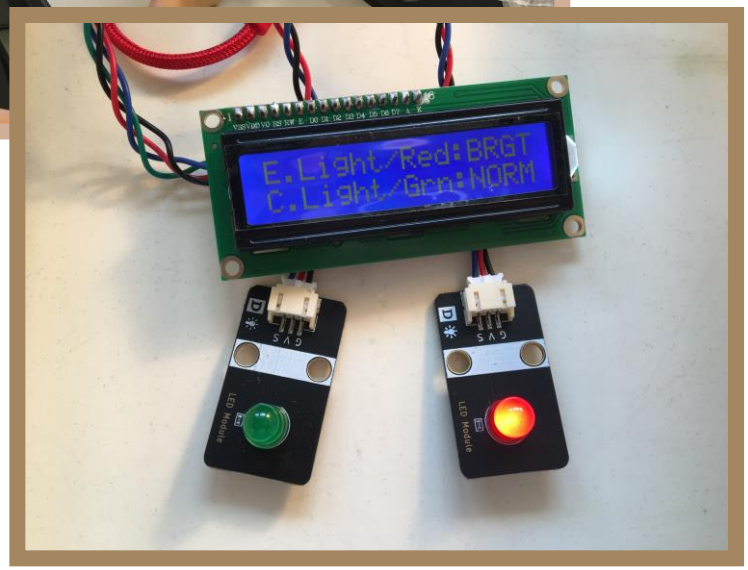
2. **Design the experimental and control set-ups**

3. **Code and take measurements on the factor**

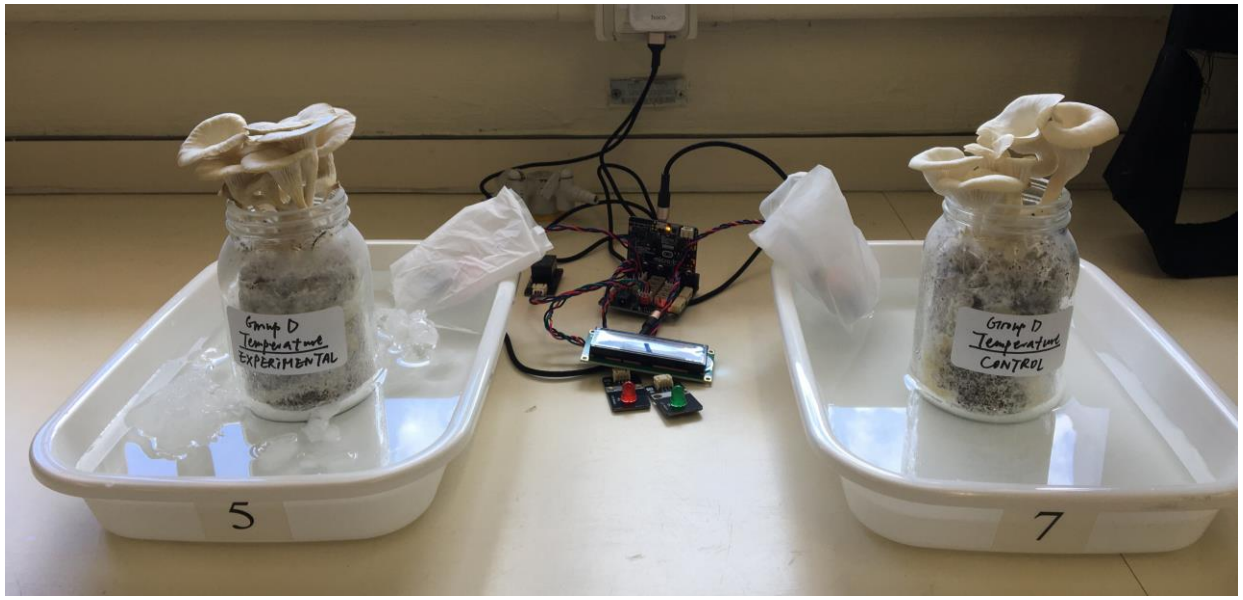
4. **Measure the growth:**

   Height, Size of cap & No. of fruiting bodies




E.Light/Red:BRGT
C.Light/Grn:NORM

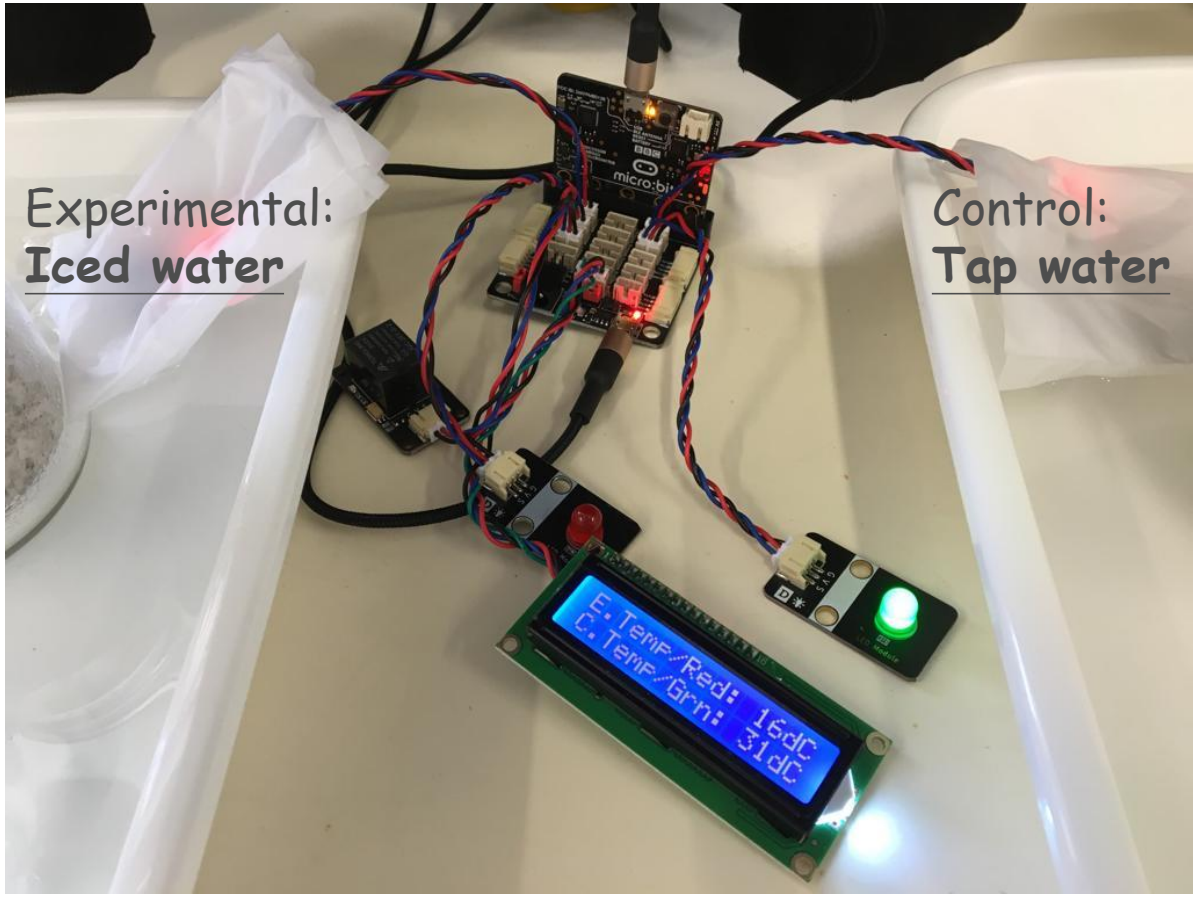
1. Temperature on Growth



Experimental:
Iced water

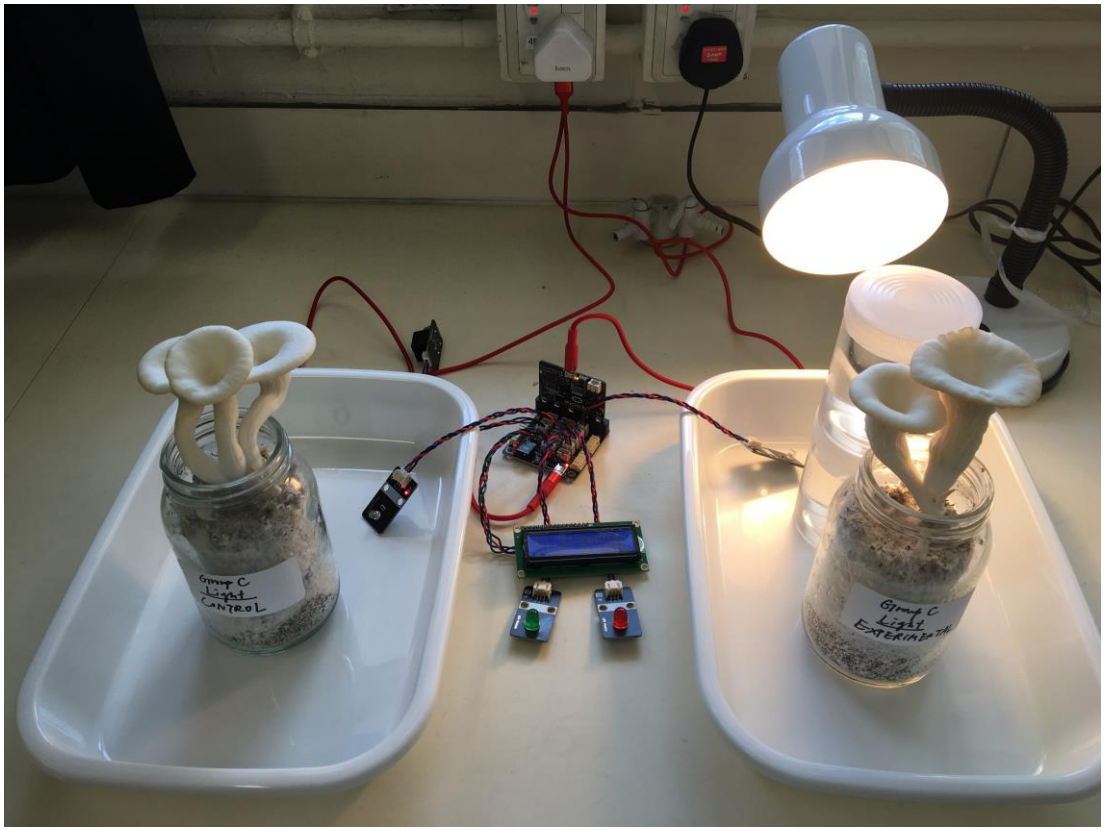
Control:
Tap water

1. Temperature on Growth



Stimulus (detection): **Temperature**
Response (effect): **LCD + Response lights**

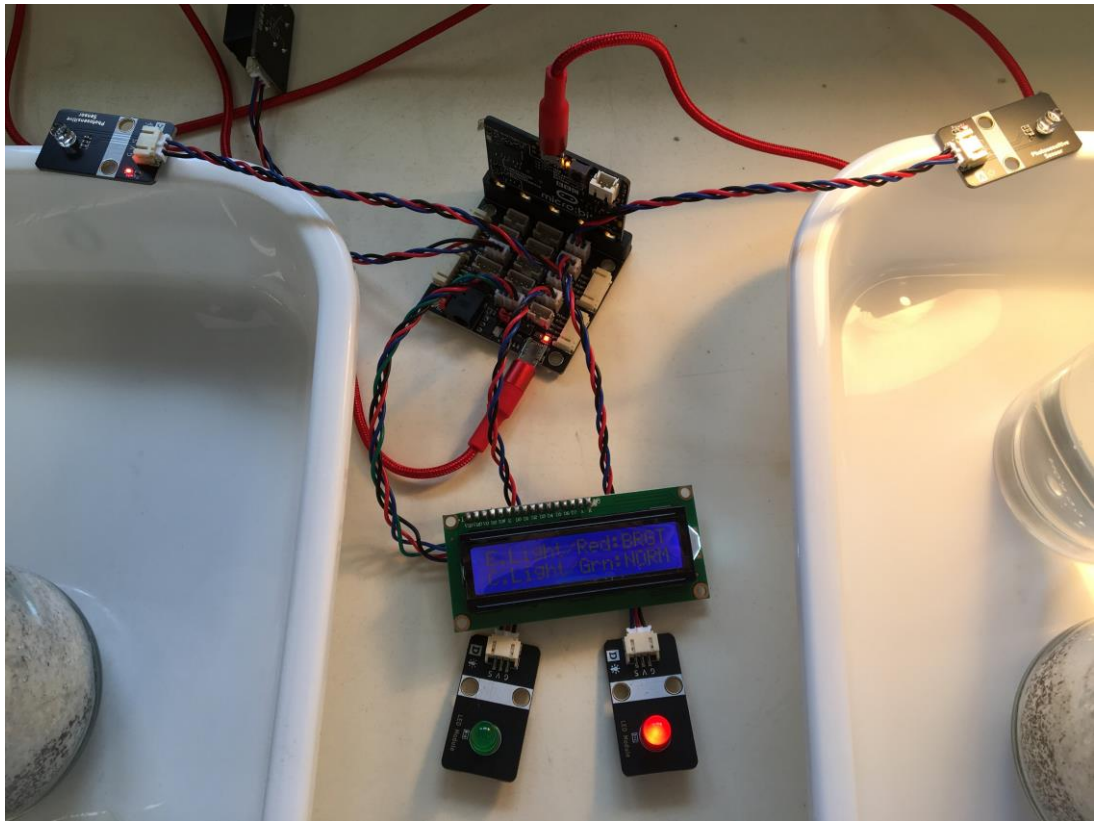
2. Light intensity on Growth



Control:
Indoor lighting

Experimental:
With lamp

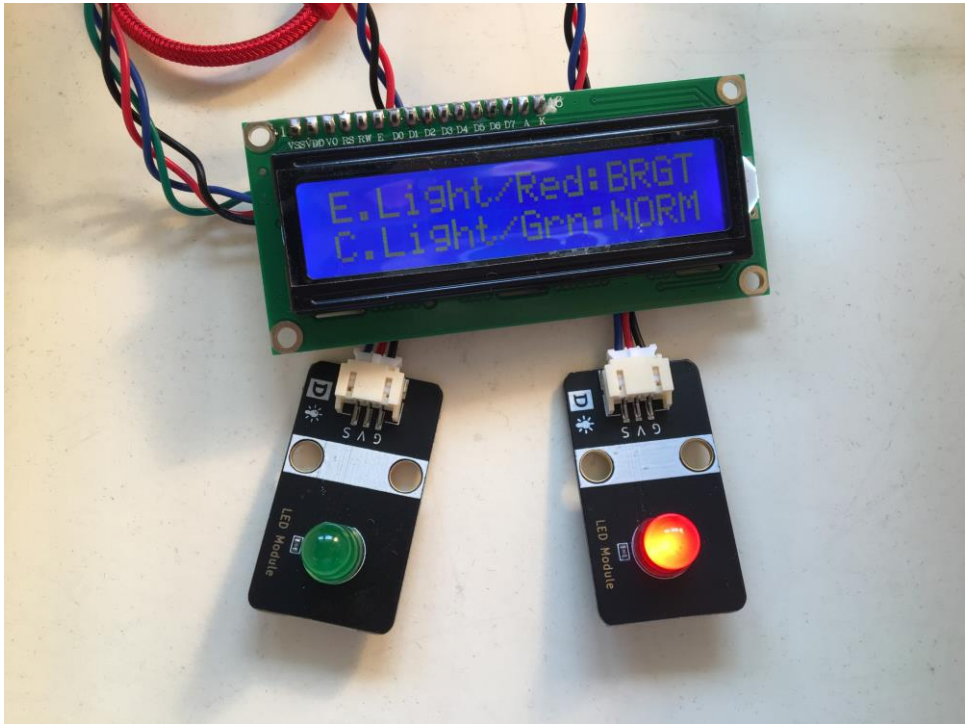
2. Light intensity on Growth



Control:
Indoor lighting

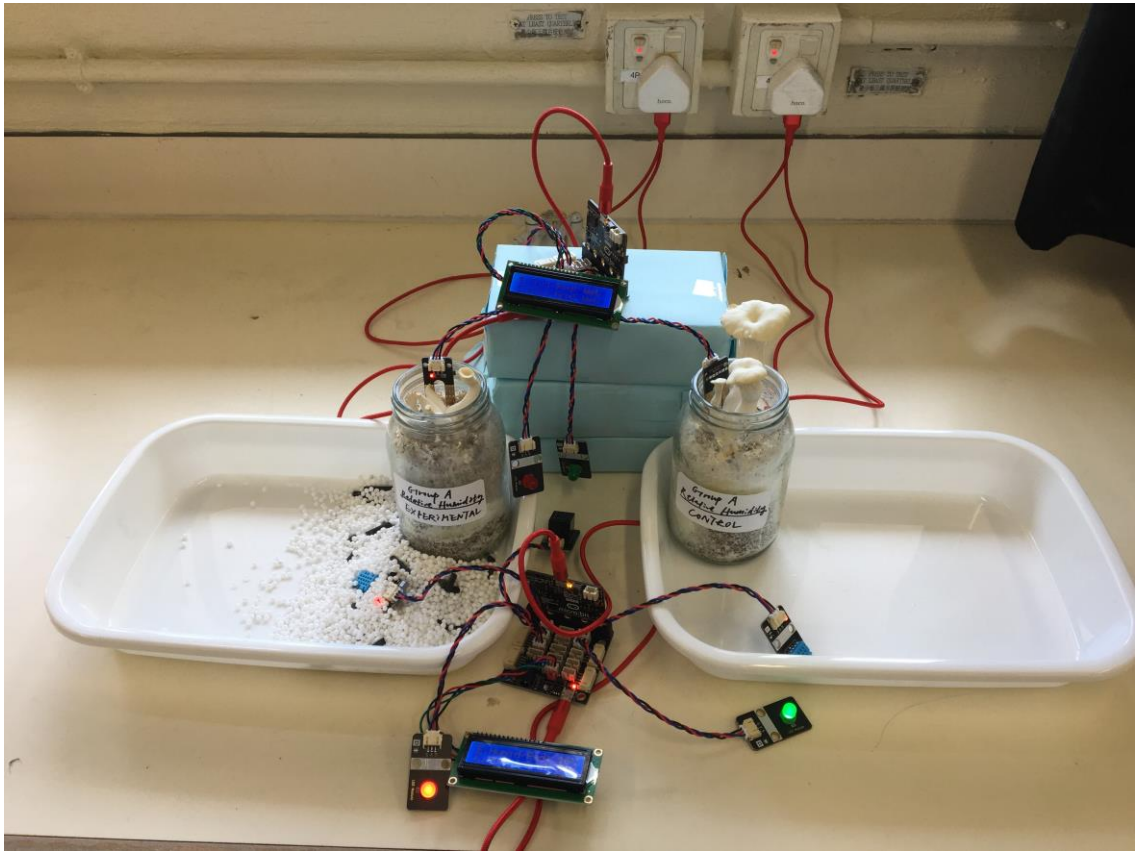
Experimental:
With lamp

2. Light intensity on Growth



Stimulus (detection): **Light**
Response (effect): **LCD + Response lights**

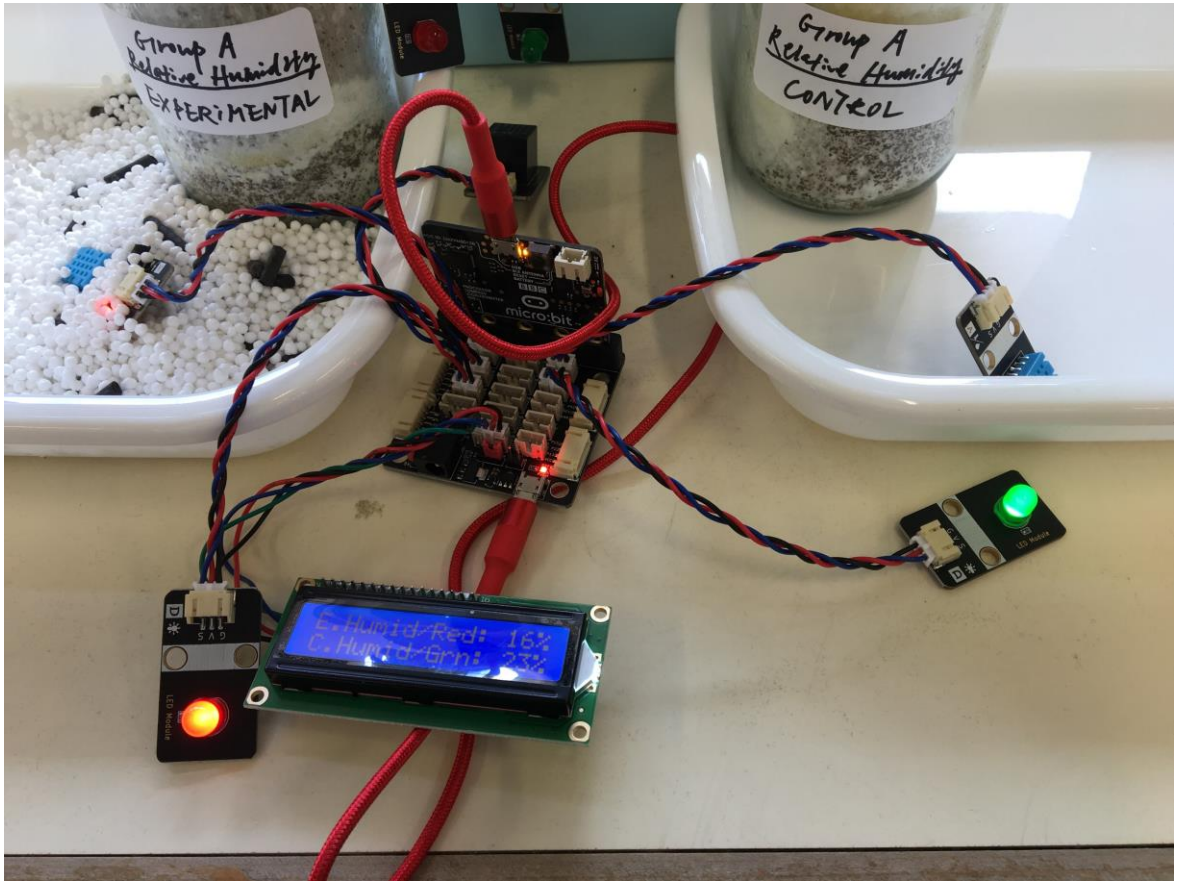
3. Humidity on Growth



Experimental:
With desiccating agents

Control:
Indoor

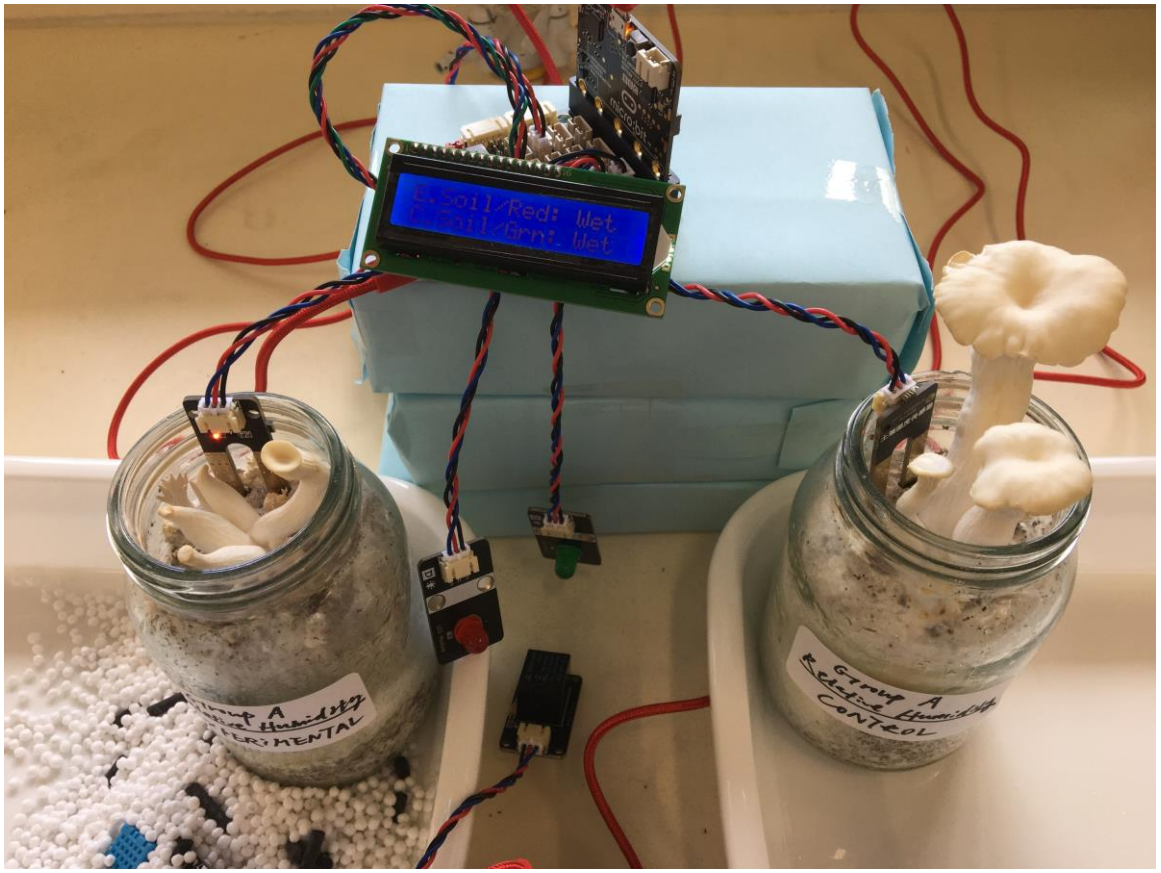
3. Humidity (Atmospheric)



Experimental:
With desiccating agents

Control:
Indoor

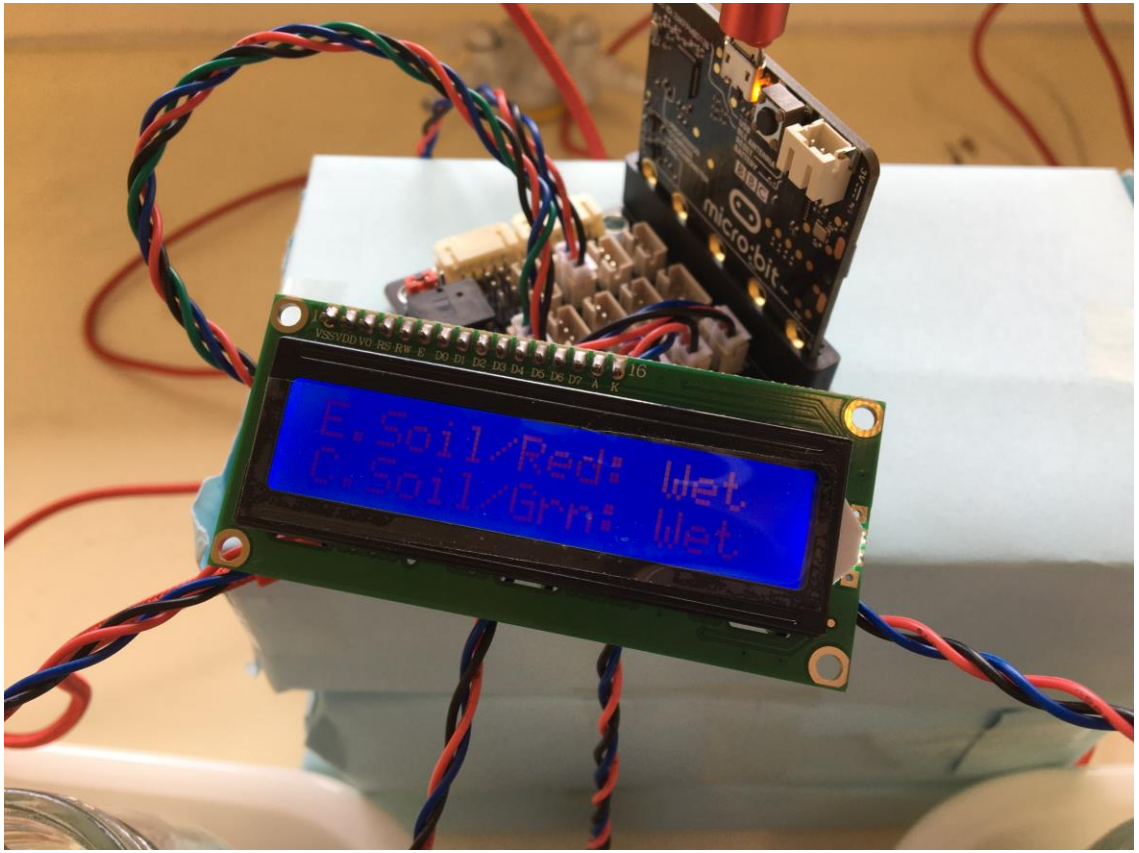
3. Humidity (Soil)



Experimental:
With desiccating agents

Control:
Indoor

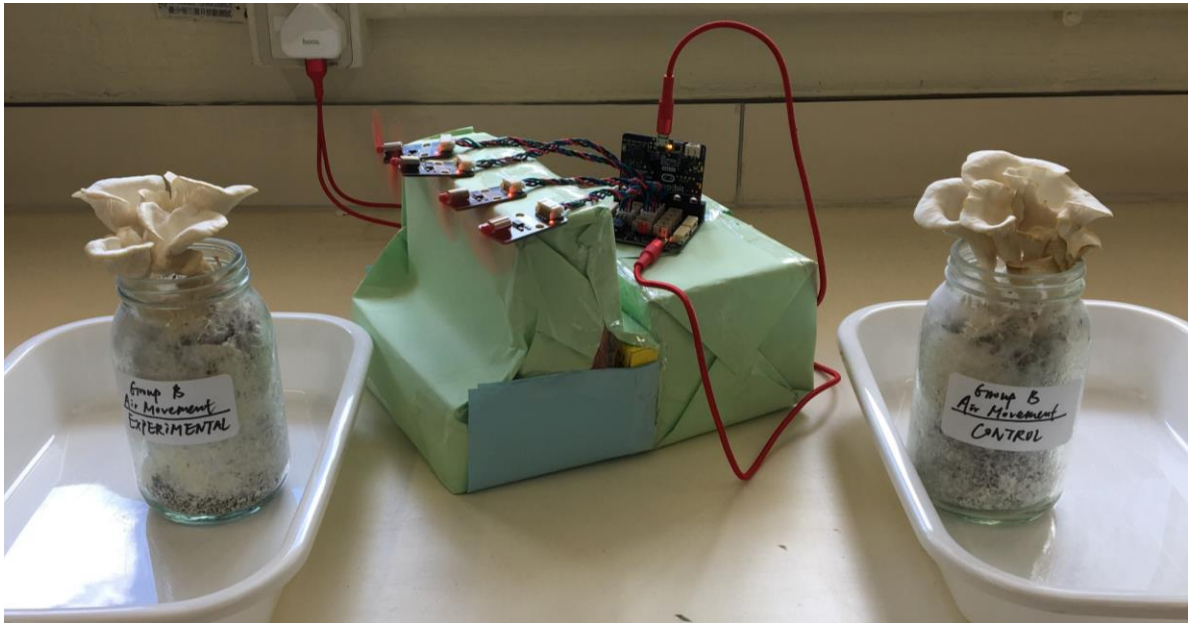
3. Humidity (Soil)



Stimuli (detection): **Relative humidity sensor & Soil moisture sensor**

Response (effect): **LCD + Response lights**

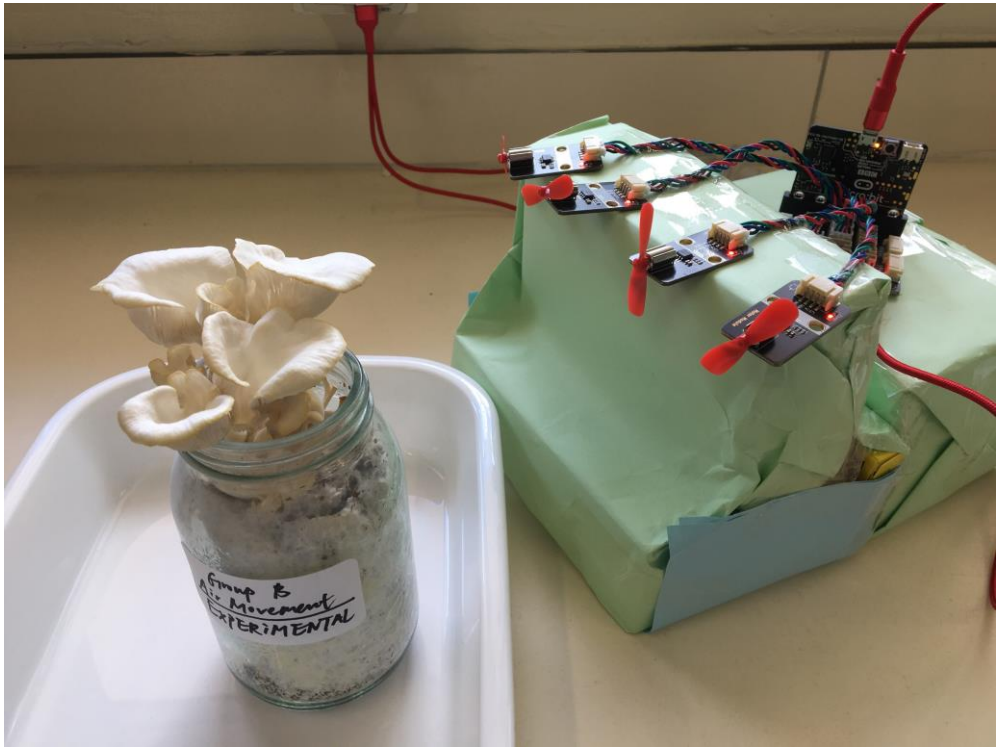
4. Air Movement on Growth



Experimental:
With mini-fans

Control:
Indoor

4. Air Movement on Growth



Stimuli (detection): **Nil**
Response (effect): **4 mini-fans**

Results & Discussion

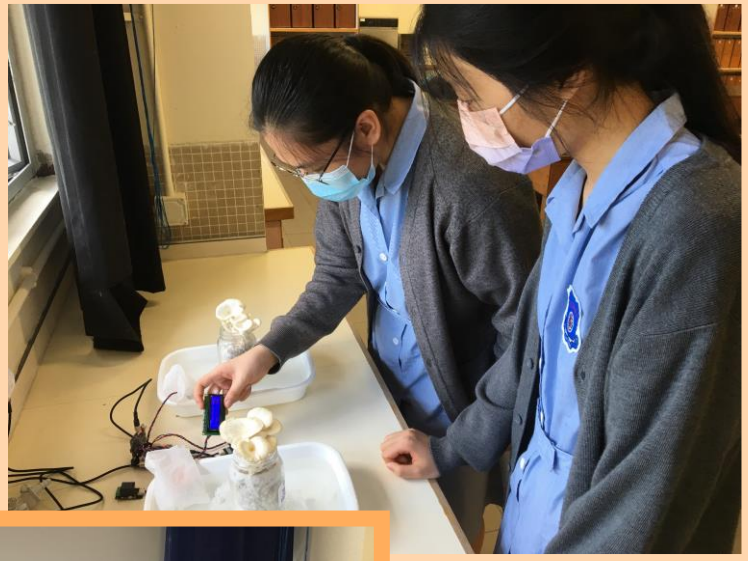
- **Mushrooms grew <u>better</u>** (faster with larger caps, moister) **in the control set-ups than in the experimental ones.**
- **Low reliability of data.**
- **High maintenance/monitoring cost with the current designs.**

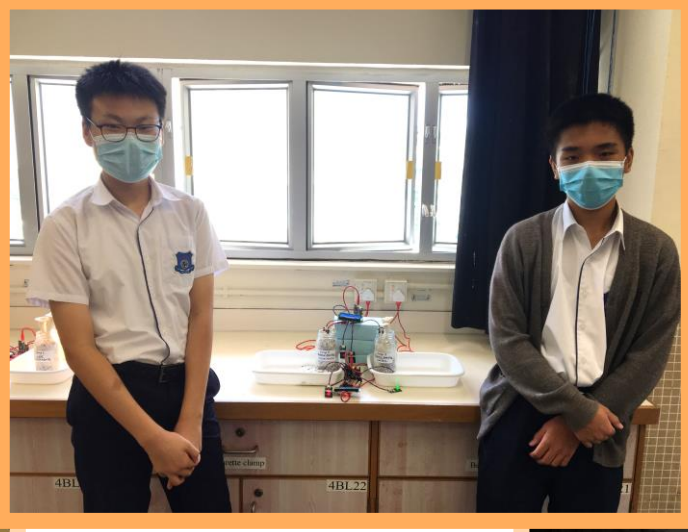
Results & Discussion

- Mushrooms grew better (faster with larger caps, moister) in the control set-ups than in the experimental ones.
  More other experimental designs.

- Low reliability of data.
  Increase the sample size.

- High maintenance/monitoring cost with the current designs.
  Automation.





Looking Forward…

- 4-lesson teaching schedule with all S.3 classes with collaborations with ICT.
- A field trip to observe fungal species in nature.
- Automated systems to respond to the changes of environmental stimuli.
- A fungiculturing lab – Recycling of organic wastes.