MELISSA

esa
European Space Agency

BORDER SESSIONS

MOBGEN | Accenture Interactive

PEZY GROUP innovation accelerators

SURF SARA

THREE OBJECTIVES

1. RESEARCH: Public data sets about plant growth
2. EDUCATE: Engaging a New Genaration of Urban and Space Farmers
3. INNOVATE: Open Source hydroponics plant lab infrastructure

AstroPlant v3

ASTROPLANT

I. RESEARCH:
MELiSSA (Micro-Ecological Life Support System Alternative)

Practical rationale

An artificial ecosystem to sustain life in closed environments for long periods. Mars mission: 1000 days in isolation.

- *5kg per day oxygen, food, etc per day per person*
  - *Crew of 6: 30 tons just for basic life support*
  - *Maximum payload is 9 tons*
- *Turning organic wastes to consumables*
- *Applications for earth; circular economy – energy, waste etc*

MELiSSA: turning metabolic waste into consumables

- Waste
  - CO2
  - Feces
  - Urine
  - Non-edible biomass
- Consumables
  - O2
  - Food
  - Water

Inspired by nature.

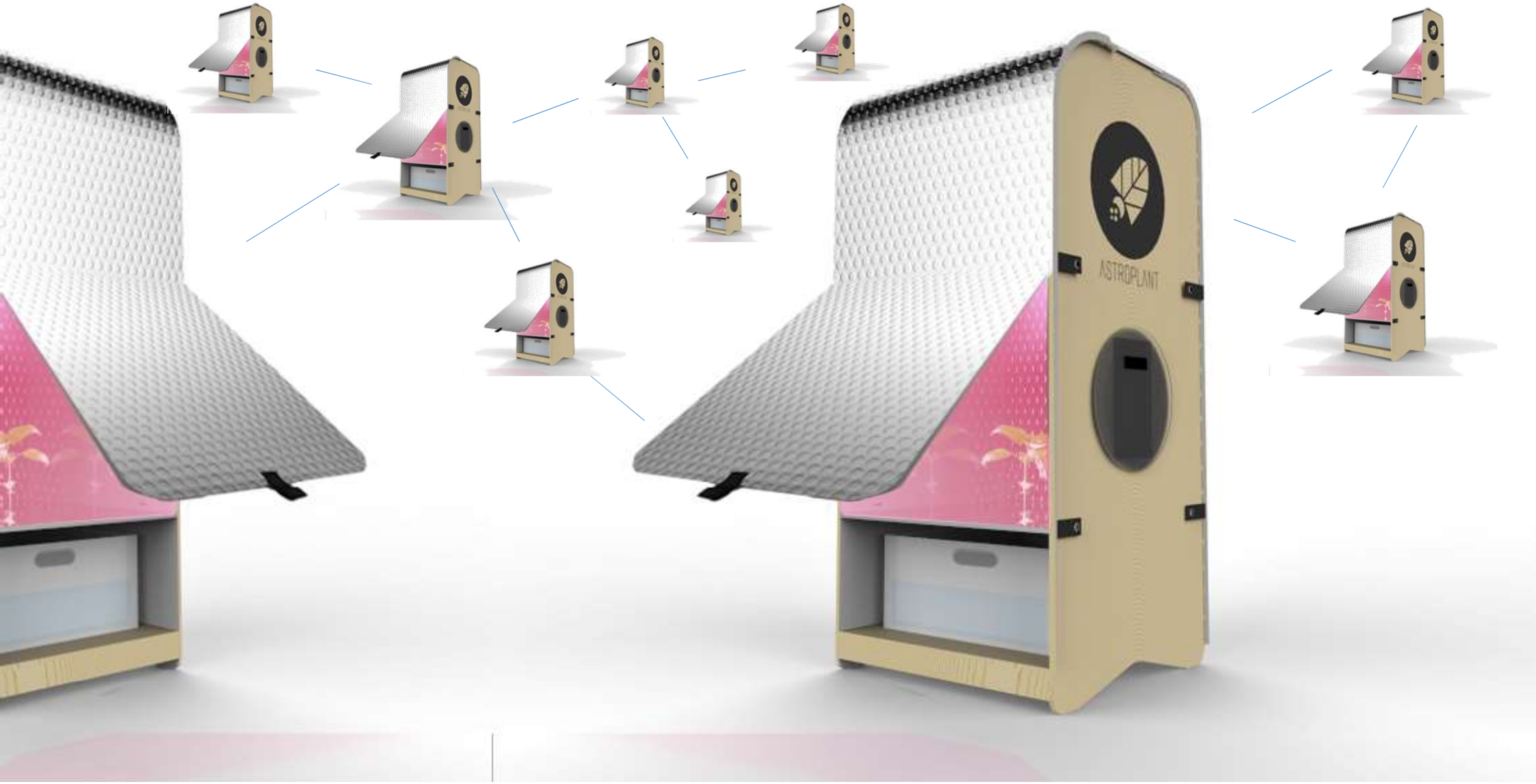
Scientific objective

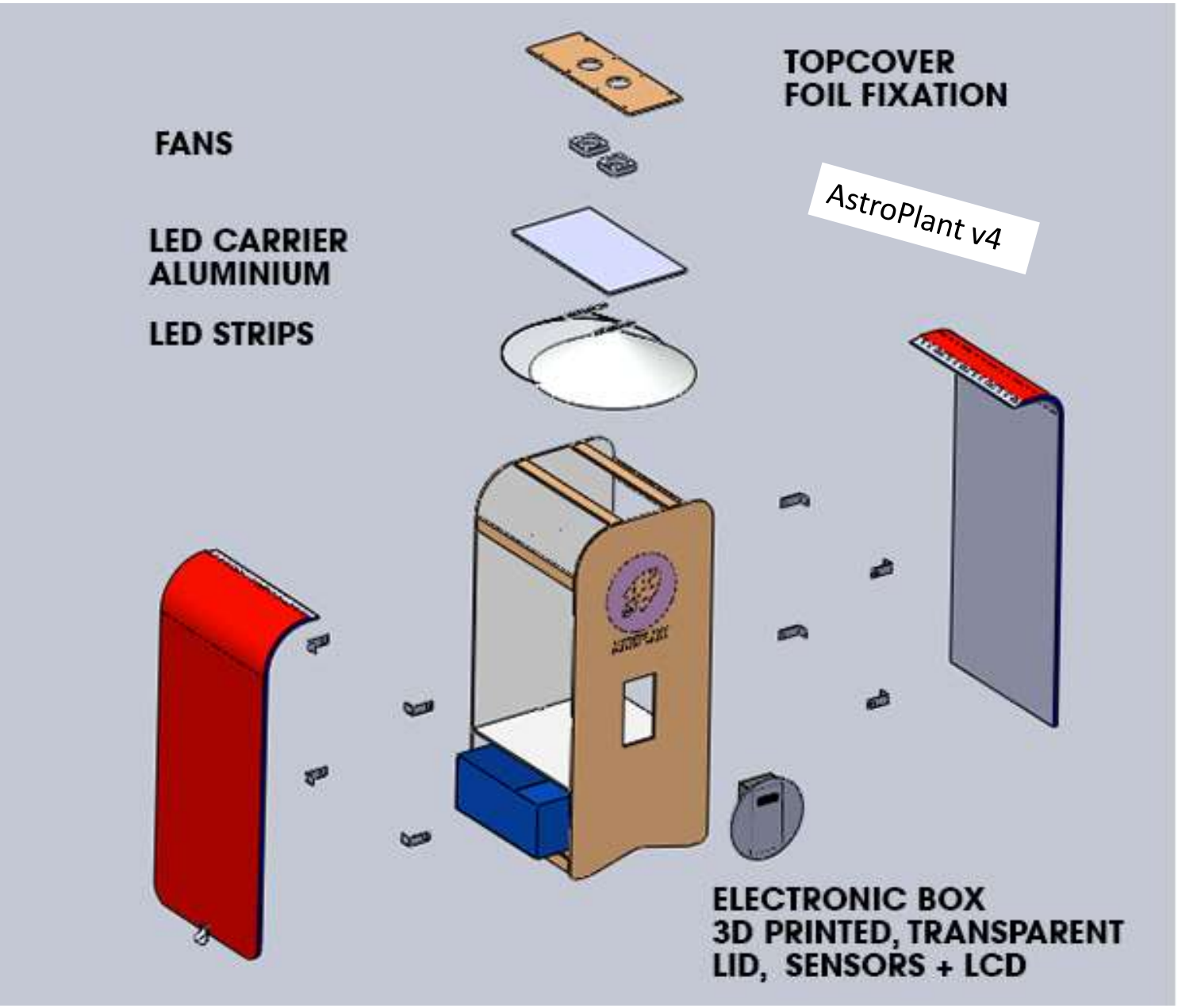
Helping to construct the basic models

Looking for desirable traits, e.g.

- high yield potential
- tolerance for drought and cold weather, salinity, biotic stresses
- coping with resistance agains parasitic weeds, fungi etcetera.

AstroPlant: a small DIY plant lab stuffed with sensors





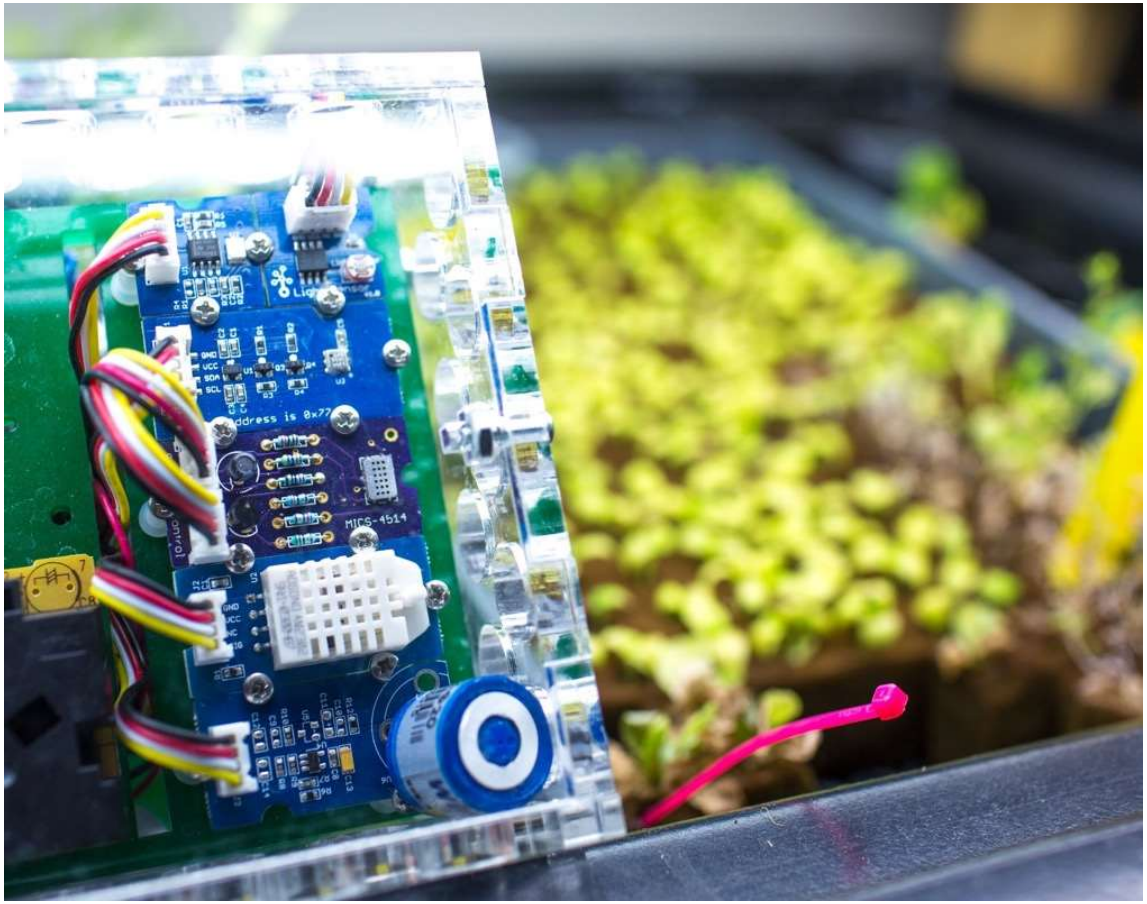
Semi-controlled growbox

- RaspberryPi + custom PCB
- Fully controllable custom growLED system (intensity + spectrum)
- Two or three fans
- Simple hydroponics system
- Sensors:
  - Temperature (air, water)
  - Humidity
  - CO2
  - Light
  - EC and pH*
  - Regular camera + multispectral camera*
- Manual input by citizen scientist:
  - Size of leaves
  - Weight of the plants
  - Root length
  - etcetera

II. EDUCATE → Citizen Science, Science Education, Creative Learning, Interdisciplinary

Educational projects

- Active pilot projects in the Netherlands, Belgium, Switzerland, Spain, Greece.
- Crowdfunding campaign focused on makers and maker spaces
- ESA Education is building a program for 10-12 year olds



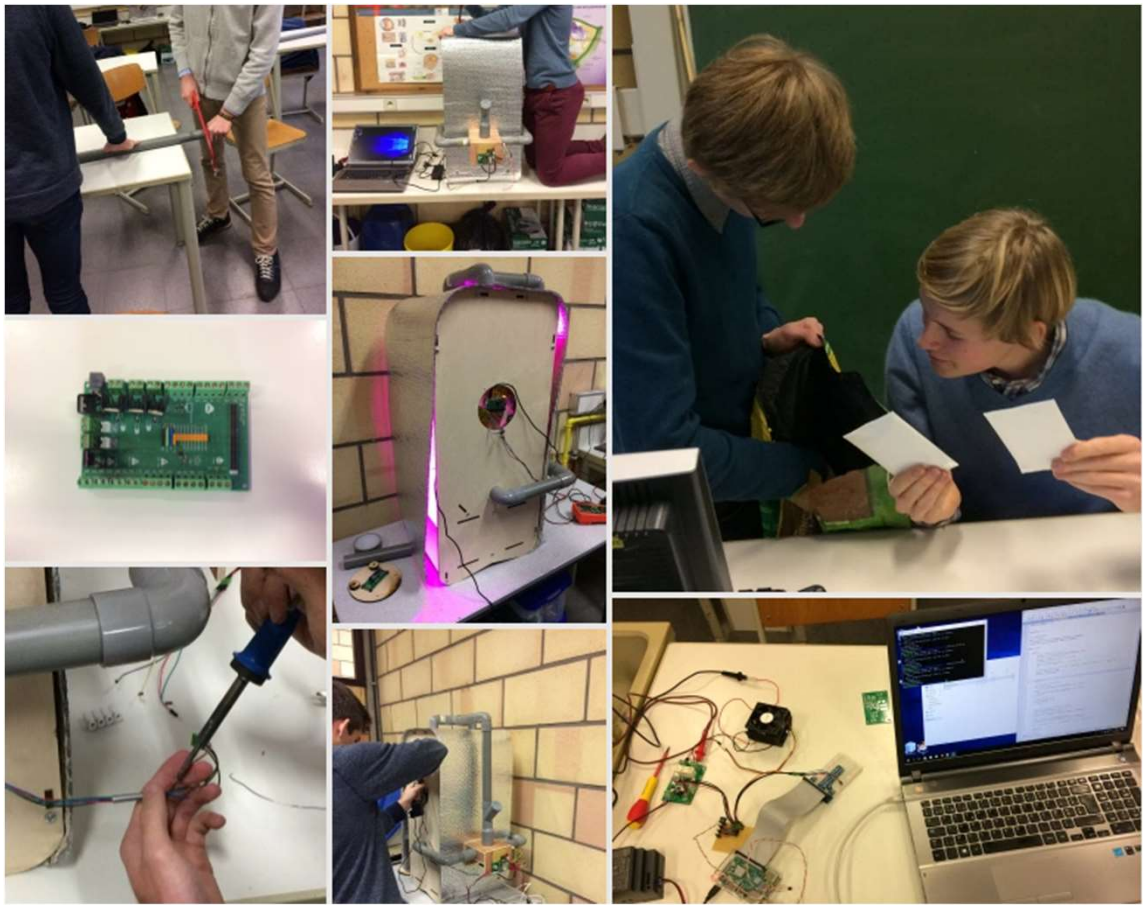
Example project: Ghent

Project based learning

- 2 months preparation: research design
- 4 months executing research

Topics:

- Effects of IR on plant growth (soy bean)
- Tech development: controlling temperature
- Science communication



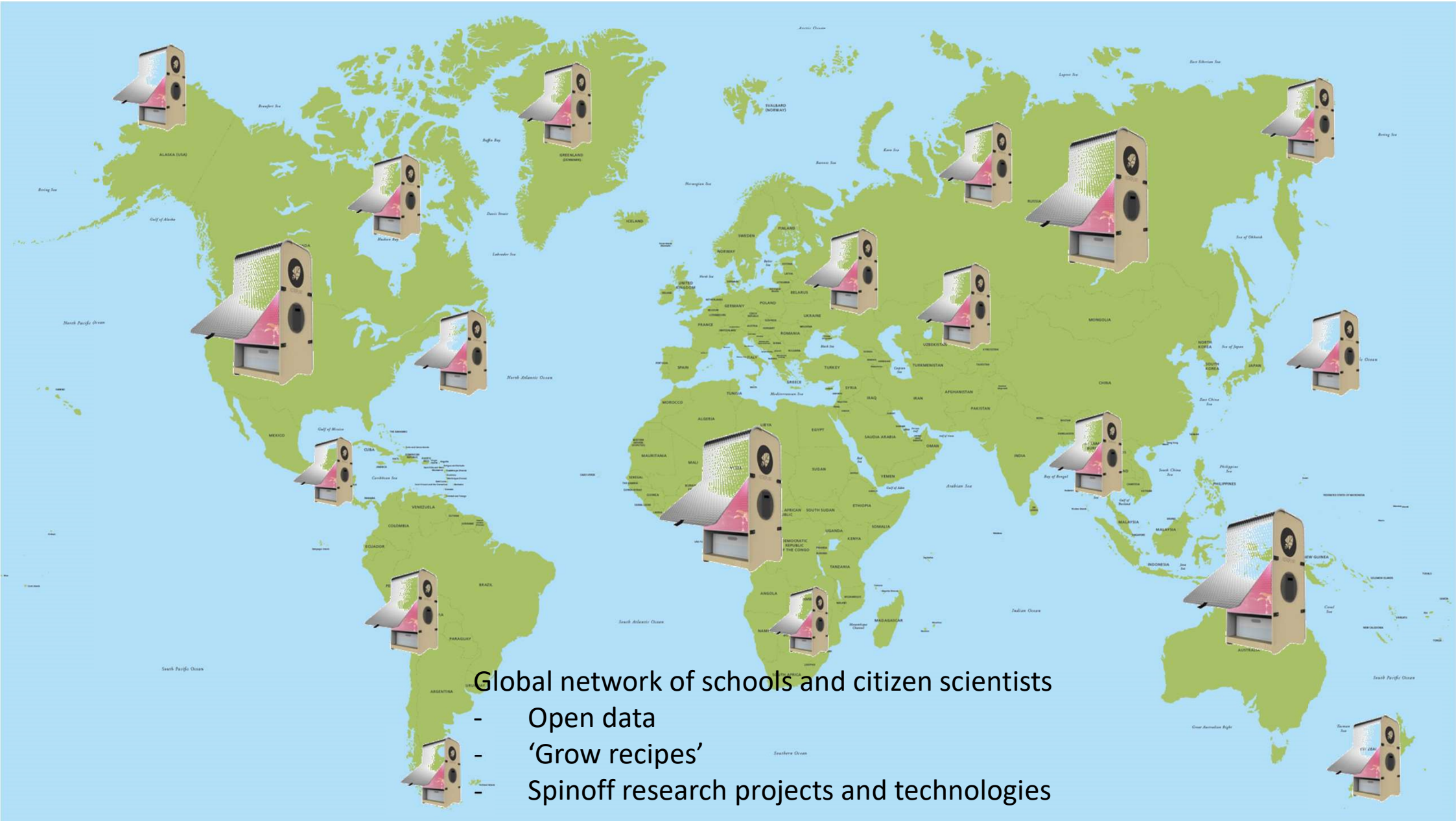
Example project: Groningen

Project based learning

- Anthropics experiment (urine)
- Won lots of prizes

Topics:

- Can you use urine as fertilizer?
- Technical development: pump and nutrition system

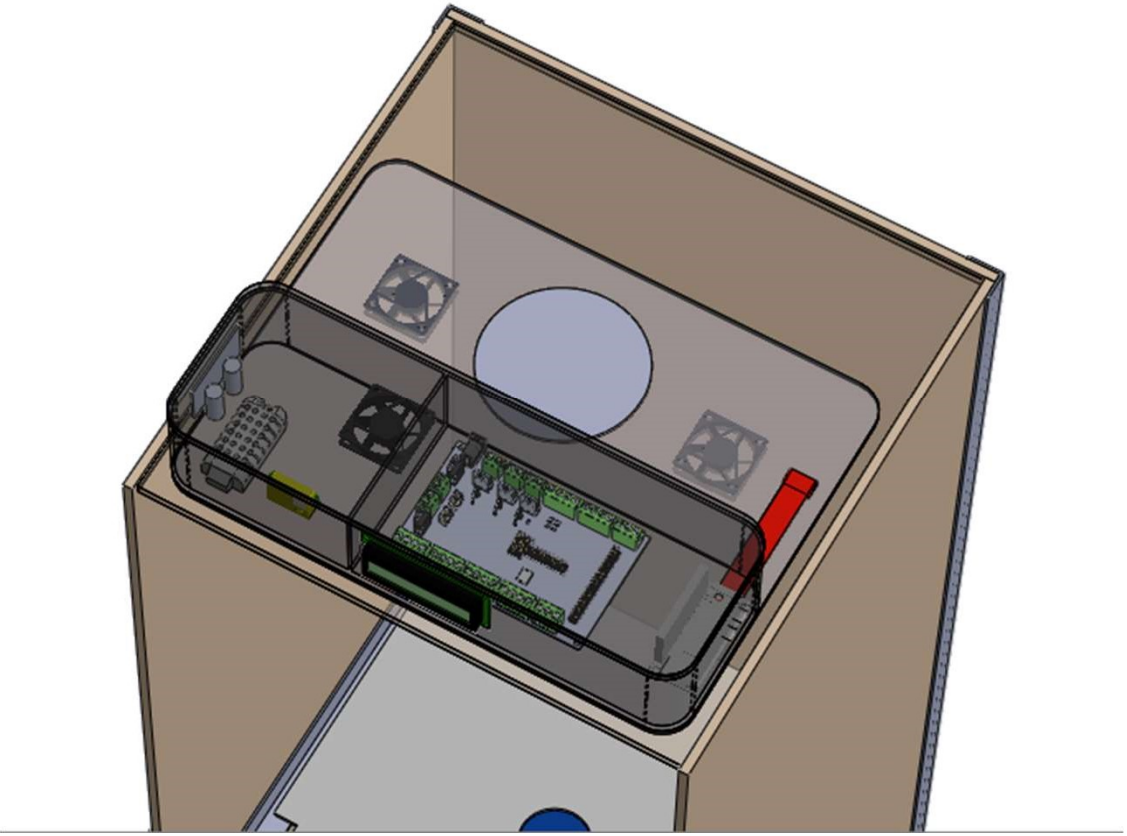

Global network of schools and citizen scientists
- Open data
- ‘Grow recipes’
- Spinoff research projects and technologies

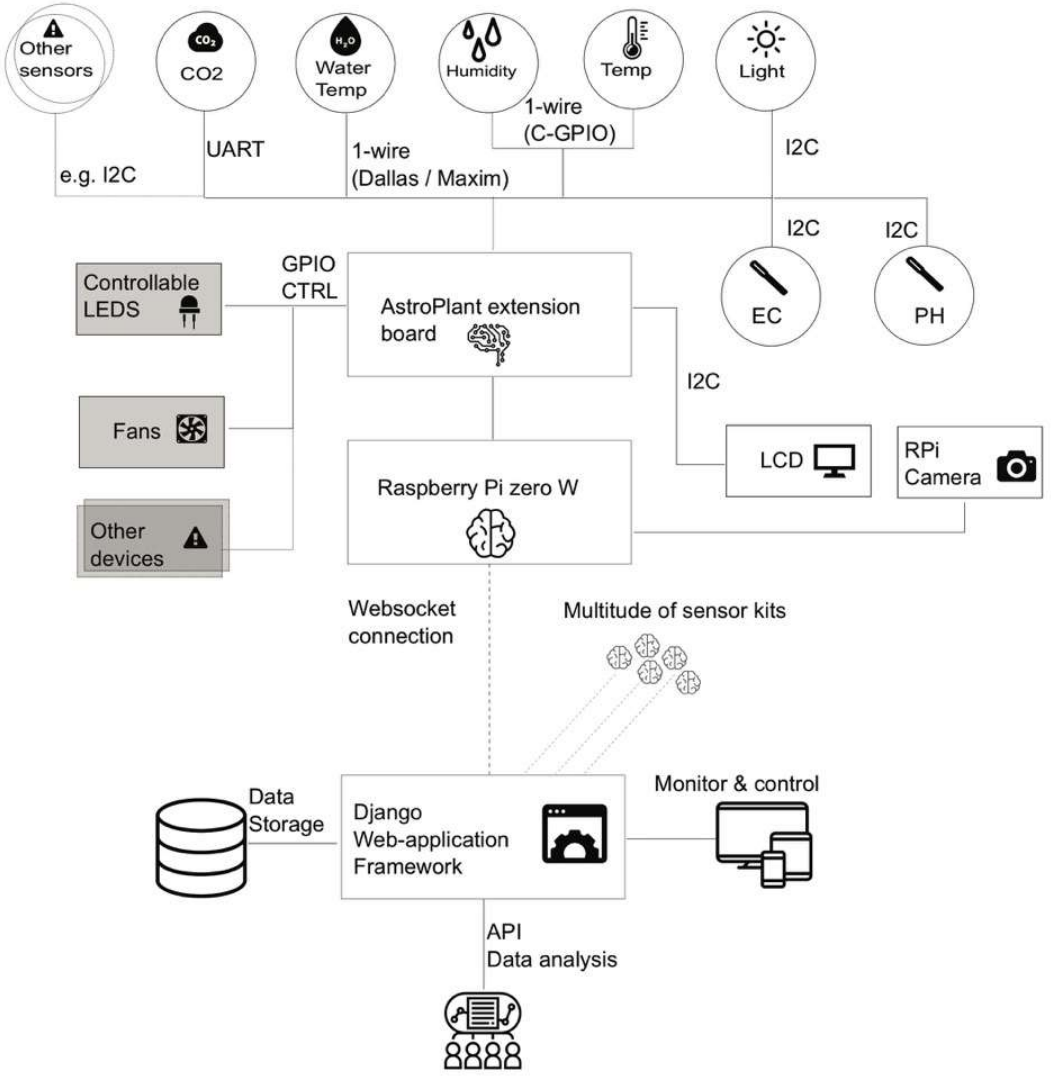
Exhibition: Nemo Science Museum

- Food for Tomorrow. (until October 6th)
- Much interest (visitors and media)
- Sensemakers helping with set-up and support
- Issues found we can help to improve

III. INNOVATE → Open Source Technology, Open Data, Open Education

You want to hack AstroPlant? You can.



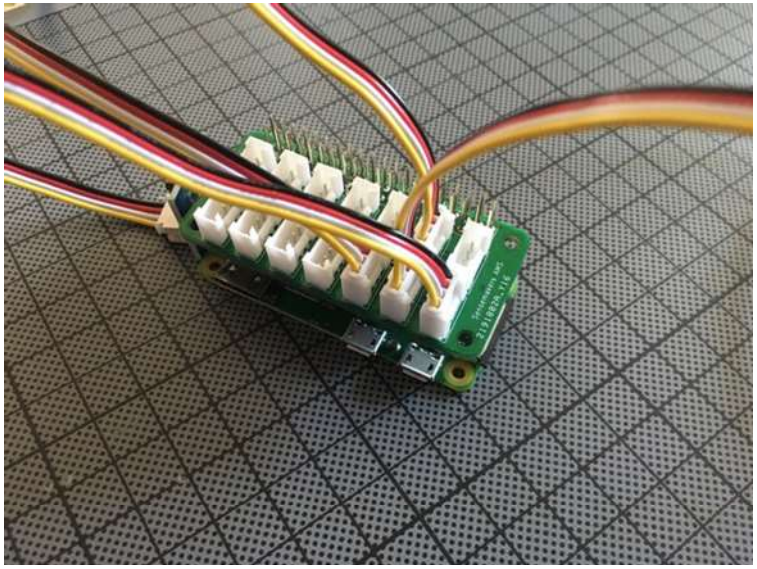


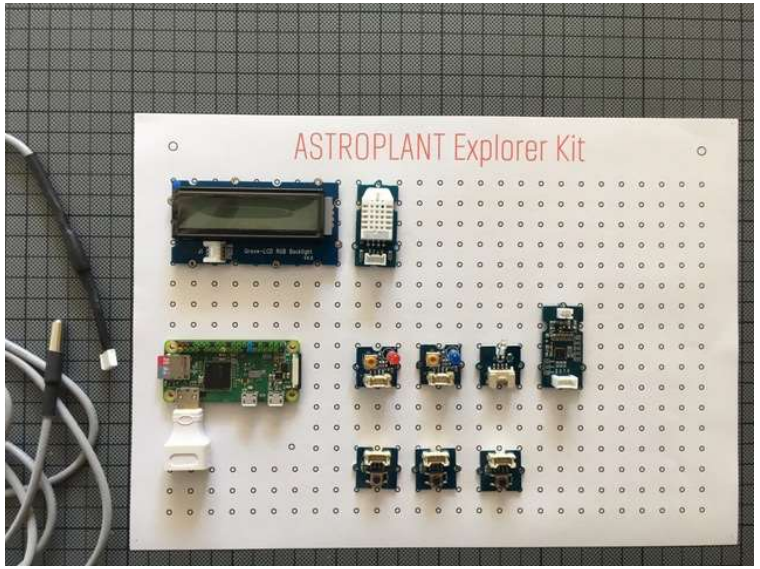
Basics first

- Not everybody will feel familiar with the hardware and software used
- And not everybody will have EUR 500 or has the space / intention to get a grow box at home.

Sensemakers Astroplant Explorer Kit

- Easy learning
- Affordable participation





- Full functionalities (out of the box)
- Easy to enhance

Learning modules

1. Basics (LEDs, Buttons, PWM)
2. Sensors (Air temp, hum, CO2, water temp, light)
3. Actuators (Relais, LED drivers, motor drivers)
4. Overall control (python & cron)
5. Communicating with back-end (including data visualization & analysis)

How to go from here?

- How many Sensemakers want to actively participate?
- Who is good at what?
- Who wants to help with the Explorer Kit?
- Other ideas?

My plan for tonight

- Make some boards (lasercutter)
- Solder some more connector boards
- Build 5 kits together (with the components we have)
- Start with documentation (5 ‘lesson’ modules)

Next month

- Sidney & Thomas will tell about their developments (including NDVI camera and other sensors)
- Finish the basic explorer kits & learning materials
- Build our ‘official’ kit?
- Decide on next steps