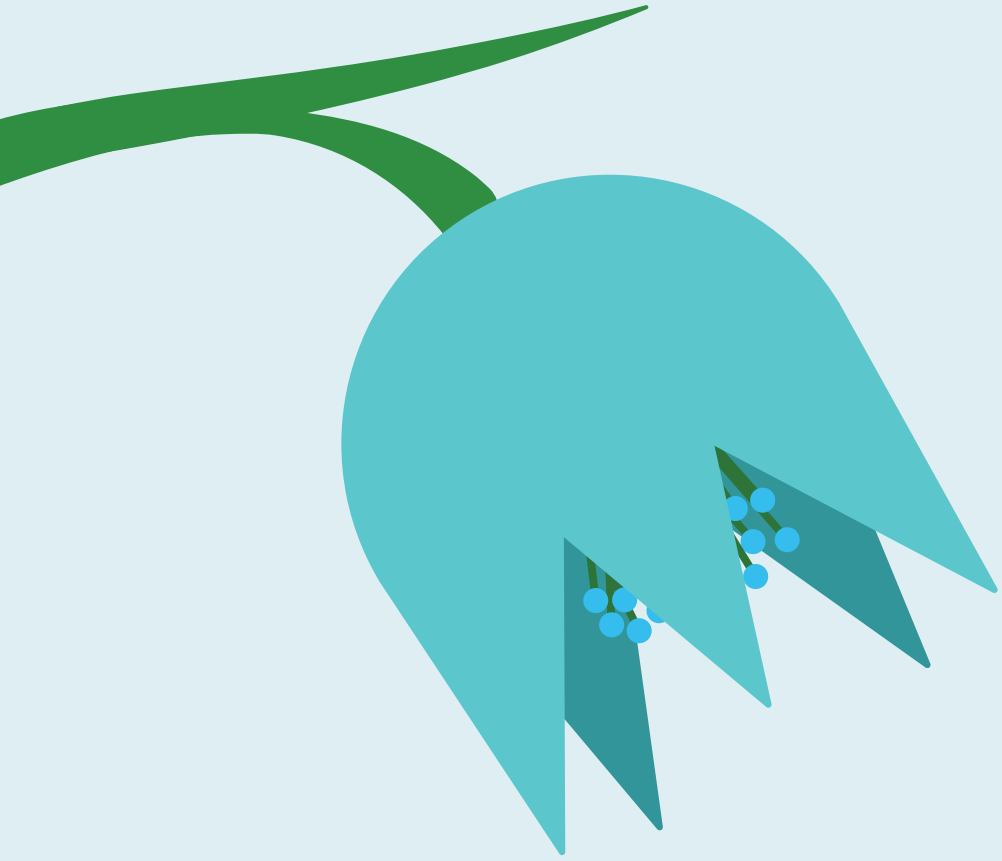
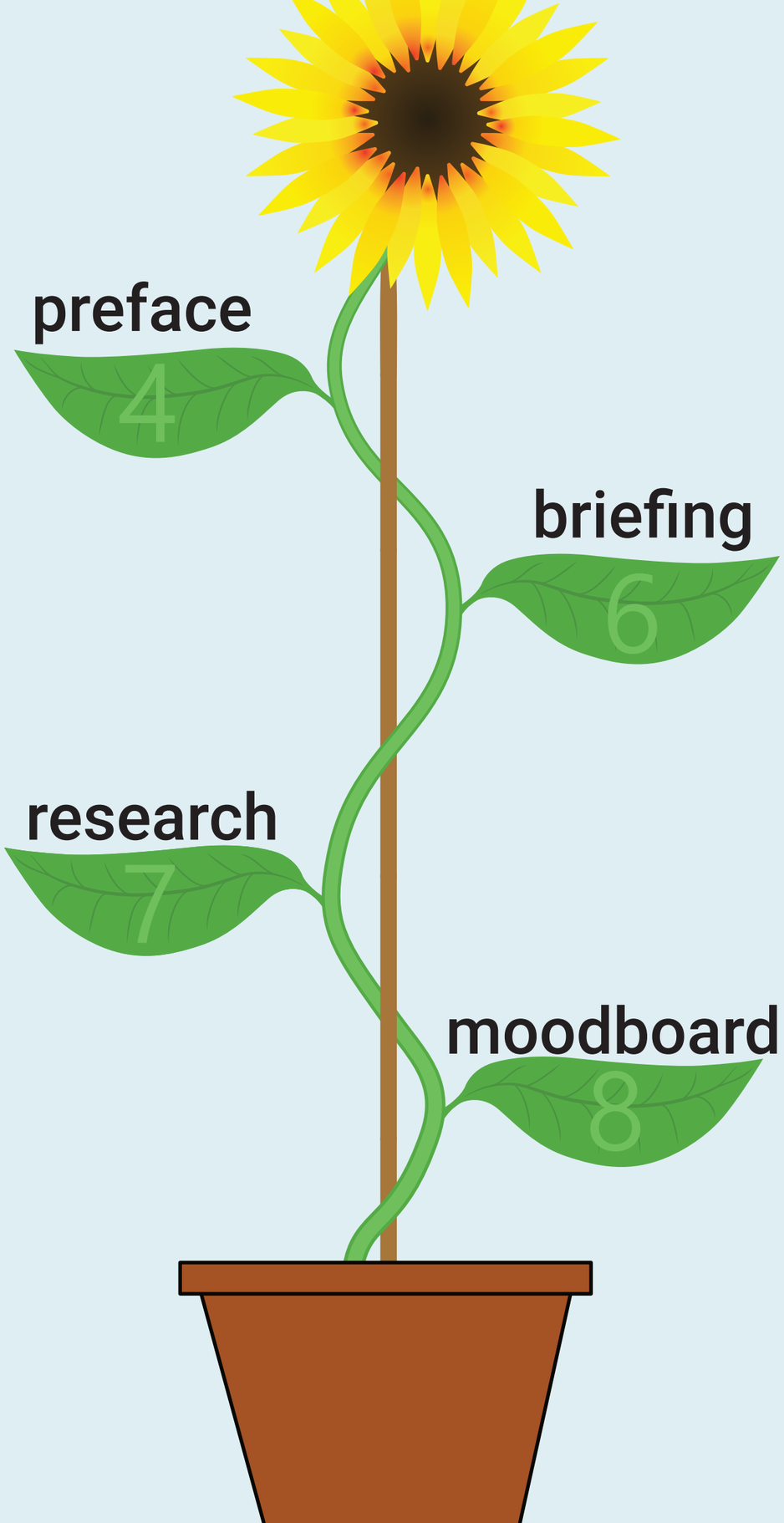


Smart Flowerpot

By: Jari Mortier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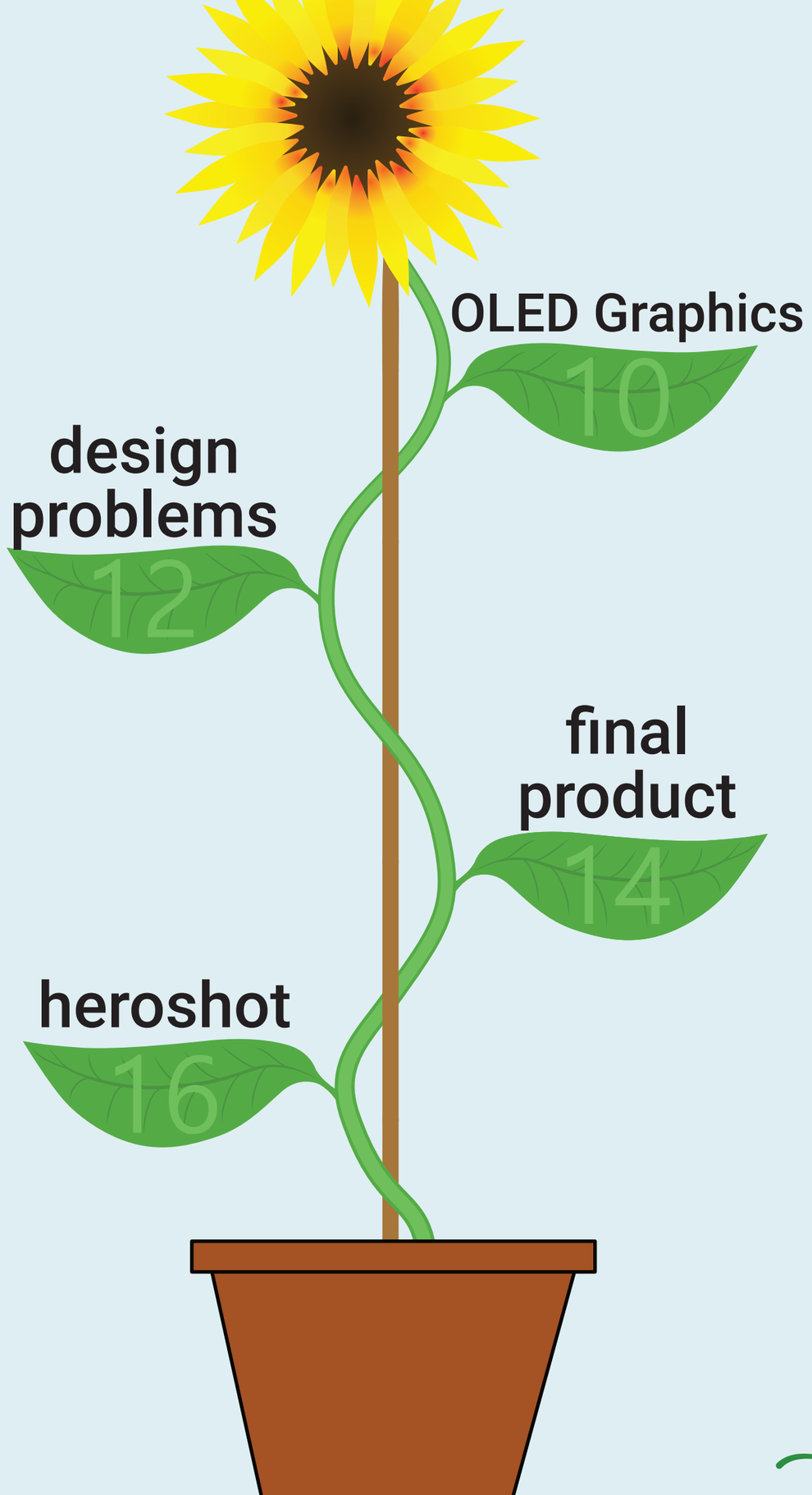
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Briefing

Leonard Muyze **Smart flowerpot assignment** - This year we are going to look at the ec... 1 Sept

Smart flowerpot assignment Inbox ×

Leonard Muyze <LMuyze@STEMschool.be> Tue, 1 Sept 2020, 13:45

to me

This year we are going to look at the ecological side of the world.
We are asking you to design and create a smart flowerpot.

You need to design a flowerpot with a water reservoir. The flowerpot needs to be able to support multiple plant types and provide water at the right moments.

It needs to be a closed-loop system as a whole. i.e.: Water poured into the flowerpot has to be caught in a reservoir after first passing through a filter, so it can be used again to water the plant.

In case of emergencies, the user needs to be notified on their smartphone.

Best of luck with this project.
Prof. Eng. Muyze

Reply Forward

Research

☑ How do plants **survive**?

- Photosynthesis: $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
- **Minerals** and **nutrients** in the earth

☑ How is data transmitted accross the **internet**?

- Protocols: **MQTT**, ~~HTML~~
- **IoT** for microcontrollers
- **Hosted servers** to make connections easy

☑ How are **moisture** and **temperature** measured?

- The **DHT11** measures both in a small form factor
- **Capacitive** moisture sensor for water level.

☑ How are users **notified** on their devices?

- **email**
- ~~smarthpone~~ **app**
- ~~website notifications~~

☑ What kind of **hardware** is required?

- **WiFi** connection
- microcontroller: ~~arduino~~ or **ESP32**
- **peristaltic pump** or ~~submersible pump~~
- battery: **Li-ion**

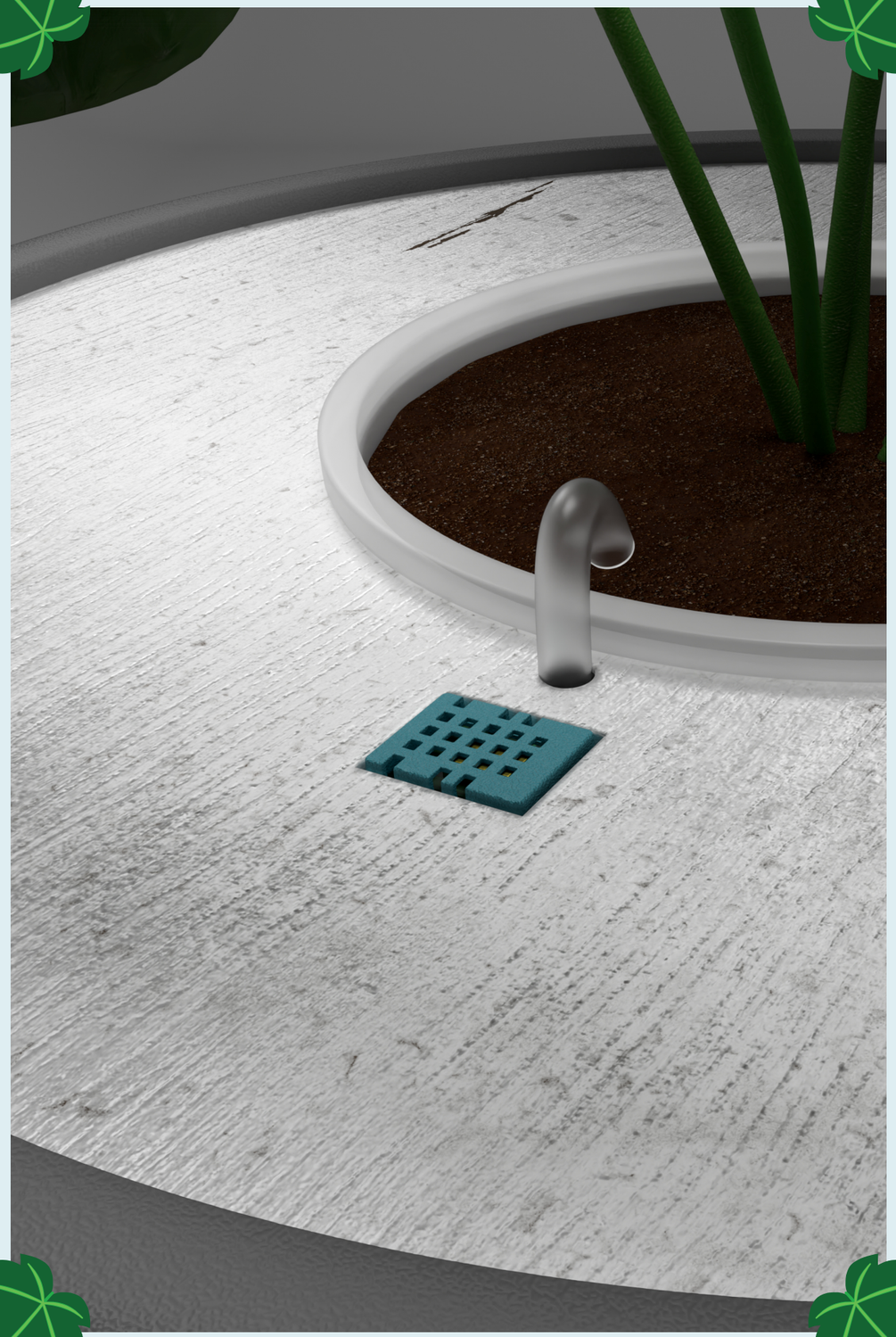
How it all began

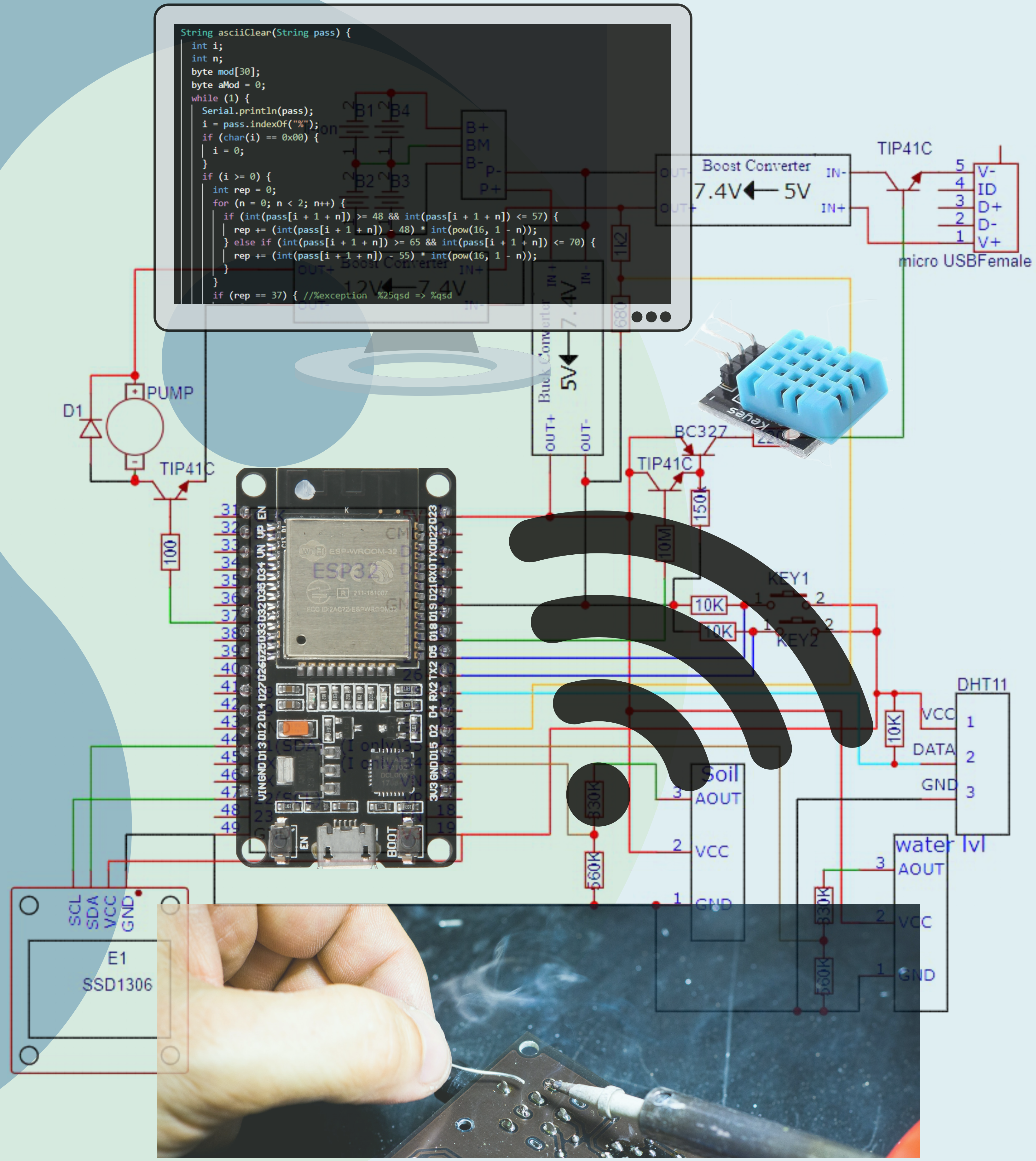
At the start of my last year in High school, I was tasked with designing a fully autonomous flowerpot.

At first I was not pleased at all: “Other years were allowed to choose their own project and our whole class had to make the same stupid thing?”.

But when looking back on this project, I did learn quite a few things.
I learned about internet connections and how webpages are sent to your phone, the difference between internet protocols and what devices are meant to use them.

So even while I didn’t fully enjoy designing this flowerpot, I did still learn a lot and I hope I can give you some insight on the journey I made in 2020 with the help of this booklet.





String asciiClear(String pass) {
int i;
int n;
byte mod[30];
byte aMod = 0;
while (1) {
Serial.println(pass);
i = pass.indexOf("%");
if (char(i) == 0x00) {
i = 0;
}
if (i >= 0) {
int rep = 0;
for (n = 0; n < 2; n++) {
if (int(pass[i + 1 + n]) >= 48 && int(pass[i + 1 + n]) <= 57) {
rep += (int(pass[i + 1 + n]) - 48) * int(pow(16, 1 - n));
} else if (int(pass[i + 1 + n]) >= 65 && int(pass[i + 1 + n]) <= 70) {
rep += (int(pass[i + 1 + n]) - 55) * int(pow(16, 1 - n));
}
}
if (rep == 37) { //%exception %25qsd => %qsd
Boost Converter
7.4V 5V
TIP41C
V-
ID
D+
D-
V+
micro USBFemale
PUMP
D1
TIP41C
100
1K2
680
Buck Converter
5V
BC327
TIP41C
150K
10M
KEY1
KEY2
10K
10K
ESP32
DHT11
VCC
DATA
GND
10K
Soil
AOUT
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AOUT
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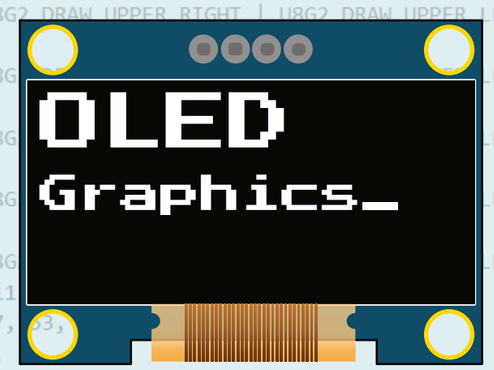
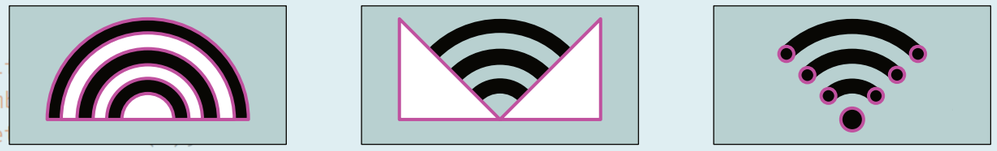
GND
SCL
SDA
VCC
GND
E1
SSD1306



Due to hardware **restrictions**, all graphics have to be build up out of **basic** shapes such as ellipses, triangles and rectangles.

The **real challenge** comes from creating more **complex** graphics.

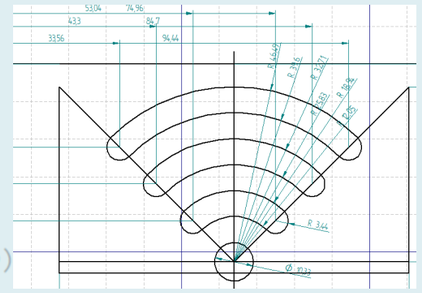
This is one way of creating the “No signal” icon.



By **layering** white on top of black shapes, you can easily **cut** basic shapes into more complex shapes.

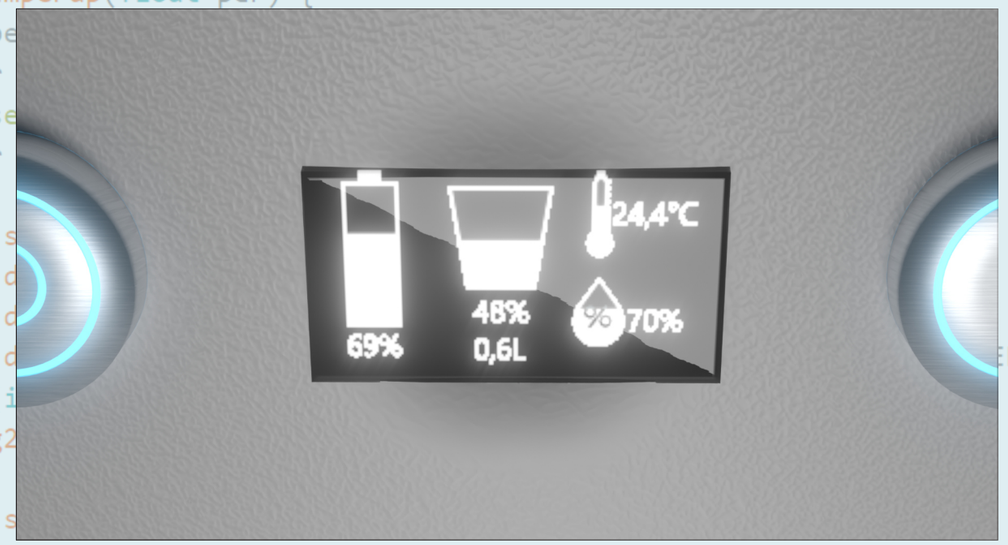
Tilted squares can be recreated using 2 **triangles**, once again using white for cutting.

This was then translated to coordinates for the program to use with a little bit of help from **CAD**-software.



The graphics used for displaying data to the client Need to be **adjustable**.

These **dynamic** graphics are perfect for providing all surface level **data** without the need to connect to the internet.



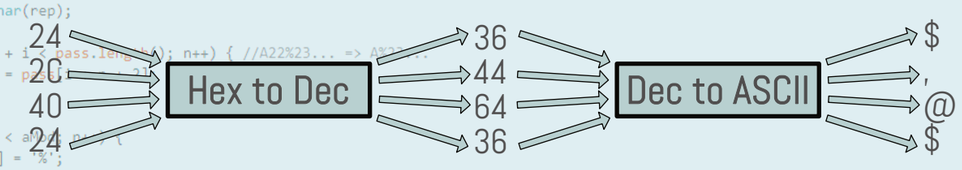
Design Problems

Certain ASCII-characters have a special code when entered as a GET-response.

>Solution: “Translate” the received response before use.

webserver.html?password%3A=%24ekUr3%2C.P_%40s%24

%24ekUr3%2C.P_%40s%24

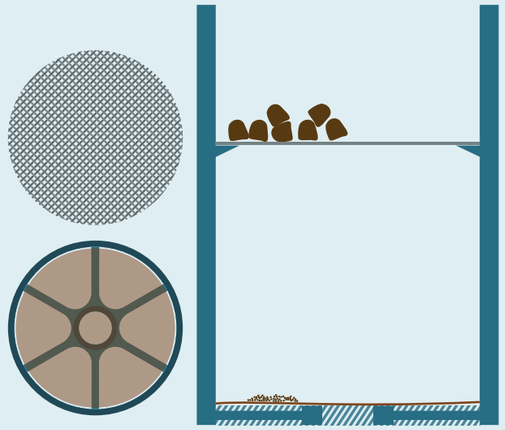


Password = "$ekUr3,.P_@s$"

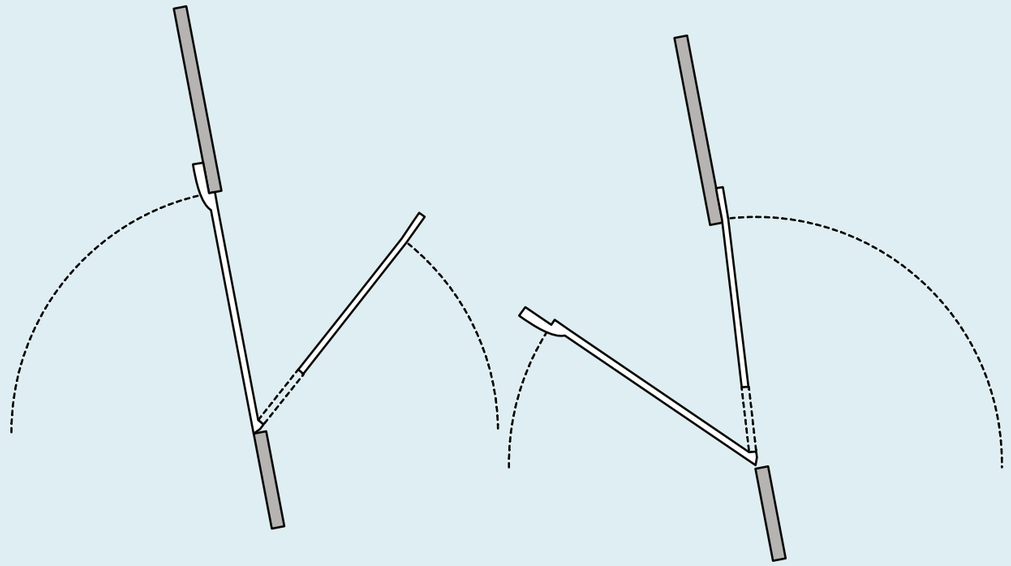
Changing the filter.

The **double layer** filter needs to be replaced **by hand**.

The first iteration didn’t account for this and made inserting the filter **impossible.**



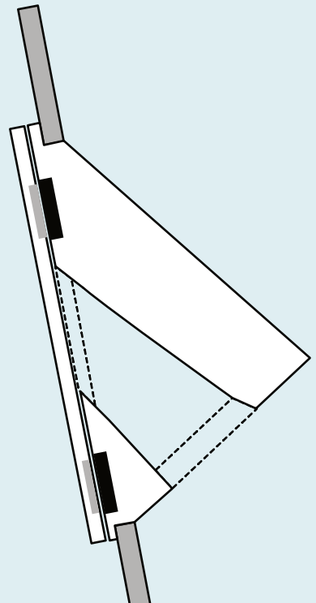
Adding water to the tank.



The original design had a pivoting mechanism to add water to the tank, this however did not work.

The water tube connecting the refilling station to the tank was not as flexible as foreseen, and pushed the door open as a side effect.

The problem was fixed by using a stationary station and magnets to hold onto the door.



Final Product

OLED screen & buttons

Tank refill

Pump


Mortier
Productions