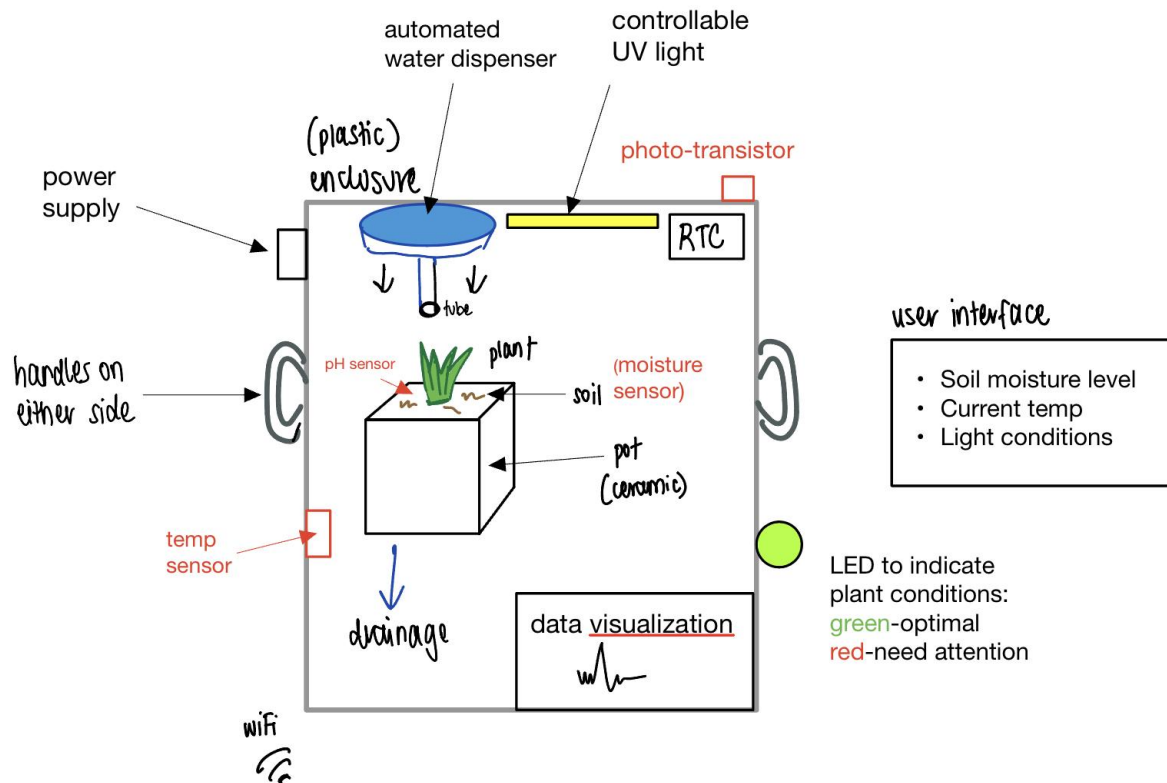


# Project Proposal



## Written Description

The "Plant Communicator" is an indoor plant care system that not only monitors plant conditions but also communicates with them through automated actions such as watering, and light adjustment. It features onboard logging, user-friendly onboarding, and internet connectivity through Microcontrollers like ESP 32s, enabling remote monitoring and control. It ensures the well-being of plants and notifies users of their needs through text alerts and data visualization. This system can potentially be powered by solar energy, utilizing a compact board for efficient voltage conversion, contributing to sustainability.

## High level design

- Sensors
  - Moisture Sensor:
    - This sensor will provide real-time data, and a green/red light indicator will be used to display the plant's hydration status.
    - The moisture sensor will be embedded in the plant's pot close to the roots to ensure accurate readings
    - <https://www.instructables.com/Plant-Moisture-Sensor-W-Arduino/>
  - Temperature and Phototransistor Sensors: Store-bought temperature and phototransistor sensors will be used to monitor environmental conditions -

temperature and light levels. These sensors will help determine the plant's ideal conditions.

- Acidity Sensor (Stretch Goal): If feasible, we will explore integrating an acidity sensor to monitor soil pH levels. This will provide a more holistic view of the plant's health
- Real-Time Clock (RTC) Integration:
  - We will incorporate an RTC module into the system to allow for scheduled monitoring at specified intervals. This will enable us to schedule periodic sensor readings and watering times, optimizing the care routine for each plant
  - This will be a store bought RTC
- Water dispensing system:
  - We will use a DC water pump for precise and controlled watering. To find the ideal water pump we will test with various sizes and flow rates to determine the ideal water flow for each plant. An H-bridge motor driver module will control the water pump's operation
  - The arduino code will be based on the soil moisture data provided by moisture sensor output and a moisture threshold that will be defined based on experimentation and further research about ideal moisture levels in house plants
  - Tubing will be used to direct water to the plant's base
  - We will need more than 5V of power supply so we will need an external power supply. Our stretch goal is to use solar power to power the system if time allows
  - <https://www.youtube.com/watch?v=qjhrVsBs0nM>
- Physical Enclosure: We will use a clear material to enclose the entire system to monitor light conditions

## Links to Resources

1. Plant communicator using arduino microcontroller and sensors + starter code:  
<https://docs.arduino.cc/tutorials/iot-bundle/plant-communicator>
2. Tutorial on the usage of a moisture sensor and how to set it up:  
<https://www.electronicweekly.com/blogs/gadget-master/arduino/build-plant-monitor-arduino-2016-09/>
3. Example Simple Build :  
[https://www.youtube.com/watch?v=OL7TNx9RquE&ab\\_channel=ViralScience-ThehomeofCreativity](https://www.youtube.com/watch?v=OL7TNx9RquE&ab_channel=ViralScience-ThehomeofCreativity)
4. Additional Example Simple Build with labeled parts:  
[https://www.youtube.com/watch?v=PTJ9sAk2c2I&ab\\_channel=ViralScience-ThehomeofCreativity](https://www.youtube.com/watch?v=PTJ9sAk2c2I&ab_channel=ViralScience-ThehomeofCreativity)
5. Potential Artificial UV Light to toggle with arduino:  
<https://hydrobuilder.com/learn/uv-light-for-plants/>
6. Temperature Sensor:  
<https://sensorkit.arduino.cc/sensorkit/module/lessons/lesson/08-the-temperature-sensor>
7. Moisture Sensor:  
<https://www.amazon.com/HiLetgo-Moisture-Automatic-Watering-Arduino/dp/B01DKISKL>

[O/ref=sr\\_1\\_1\\_sspa?keywords=arduino+moisture+sensor&qid=1698106592&sr=8-1-spons&sp\\_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1](https://www.amazon.com/s?k=small+dc+water+pump)

8. Ph Sensor (potential stretch goal):  
<https://how2electronics.com/diy-soil-ph-meter-using-soil-ph-sensor-arduino/>
9. Water Pump (DC):  
<https://www.amazon.com/small-dc-water-pump/s?k=small+dc+water+pump>
10. Moisture Sensor for soil moisture measurement- [link](#)
11. TMP36 Temperature Sensor for ambient temperature monitoring- [link](#)
12. Phototransistor to measure light conditions around the plant- [link](#)

### **Parts we're considering using**

1. Solid Core wires
2. 3 x Breadboards (for modularizing our hardware)
3. DC Water Pump (Could potentially make this from scratch for added complexity)
4. Moisture Sensor
5. Temperature Sensor
6. Light sensor
7. (MAYBE) Laser Cutter to design the enclosing structure.

### **Goals**

#### Expected Accomplishments for an 'A' Grade:

- Successfully implement soil moisture, temperature, and light monitoring using sensors
- Develop a working automated water dispenser system based on moisture sensor data
- Establish a WiFi connection for real-time communication and notifications
- Create a data visualization system to display plant health data (Arduino Cloud)
- Implement automated actions based on sensor data, such as watering and light adjustments
- Achieve power efficiency and potentially implement solar power conversion
- Enclose the system within a protective casing for indoor use (as seen in the diagram)
- A hard deliverable for the mid-project review would be demonstrating the soil moisture monitoring and notification system.

#### Stretch Goals:

- Integration of a color sensor for pH measurement
- Enhanced data visualization with historical data tracking
- Incorporation of user-defined plant care preferences
- Mobile app for remote monitoring and control