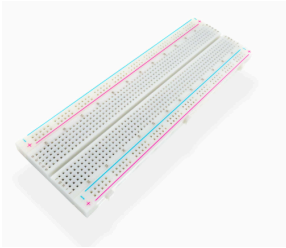
Smart Plant Care System

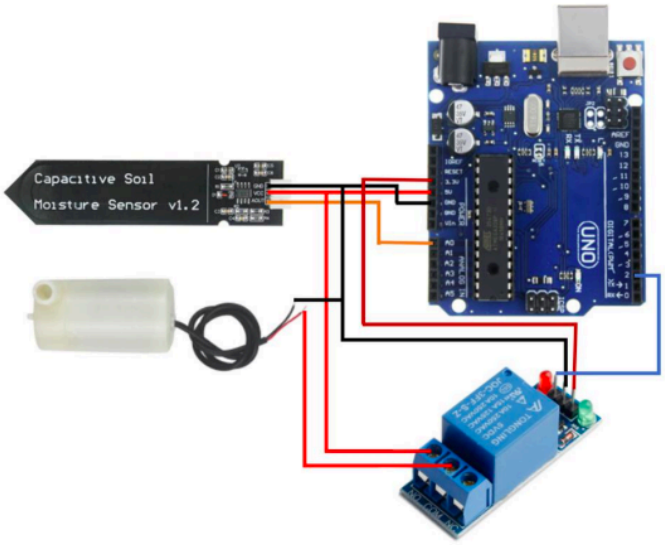
Nurture Your Plants, Effortlessly

Program Overview:

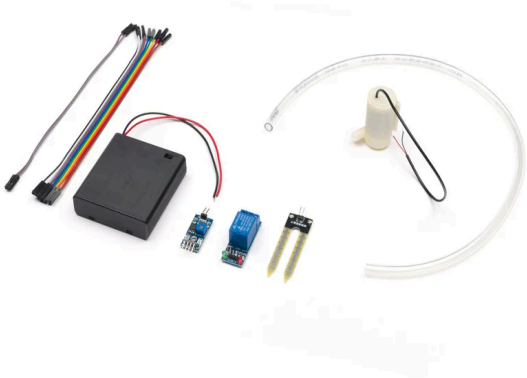
- **Target Audience:** Ages 8-10
- **Duration:** 6-8 hours (can be split into two days or extended)
- **Key Skills:** Problem-solving, critical thinking, 3D design, electronics, drag-and-drop coding

- **Note**:This program balances creativity, hands-on activities, and coding. By using drag-and-drop coding, kids can focus on logic and problem-solving without being overwhelmed by syntax.
- **Materials:**
    - **Hardware:** Arduino Uno, soil moisture sensor, LED, water pump (small DC pump), relay module, jumper wires, breadboard, 9V battery (for powering pump), Arduino-compatible USB cable.
    - **Software:** Tinkercad Circuits (drag-and-drop coding and circuit simulation) or Blockly for Arduino.
    - **CAD Tool:** Tinkercad for 3D design.





Our Plant Care System



Curriculum Breakdown:

1.Introduction & Challenge Overview (30-45 minutes)

- **Objective:** Introduce Arduino Uno, sensors, and the challenge.
- **Activities:**
    1. **Welcome and Icebreaker** (5-10 minutes): Quick introductions and icebreaker activity.
    2. **Introduction to Arduino Uno** (15-20 minutes):
        - Explain what Arduino Uno is and its purpose in simple terms.
        - Introduce the soil moisture sensor, LED, and water pump. Explain how they work together to automate plant watering.
        - Demo: Show a simple pre-built project where the soil sensor reads moisture and triggers the pump and LED.
    3. **Present the Challenge** (10-15 minutes):
        - Challenge: **Design and build a "Smart Plant Care System"** that detects dry soil and automatically waters the plant while lighting an LED as a notification.
        - **Goal:** Students will create the circuit, program it using drag-and-drop coding, and design a 3D-printed led holder and name tag for the system.

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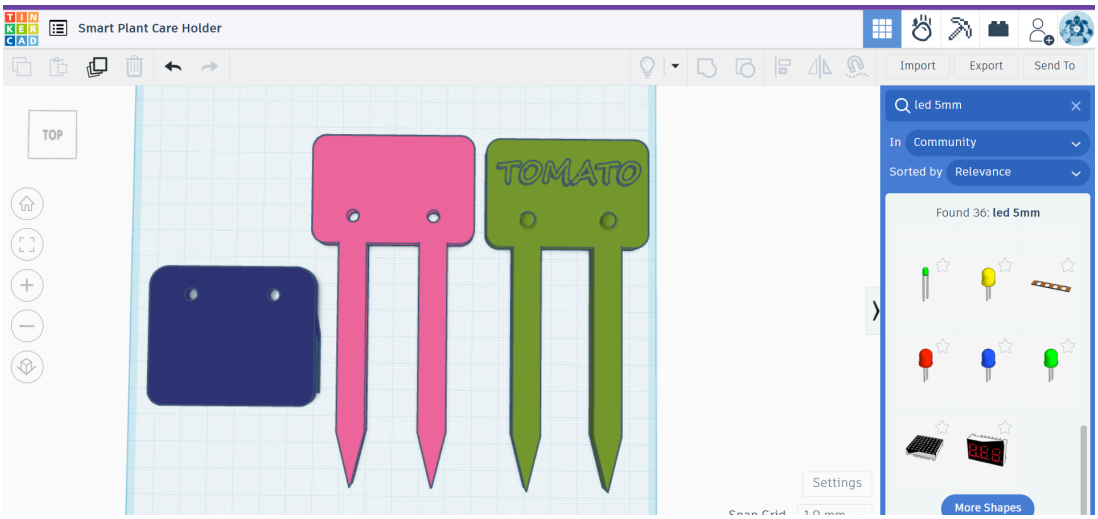
2. Designing the 3D Components (1.5 hours)

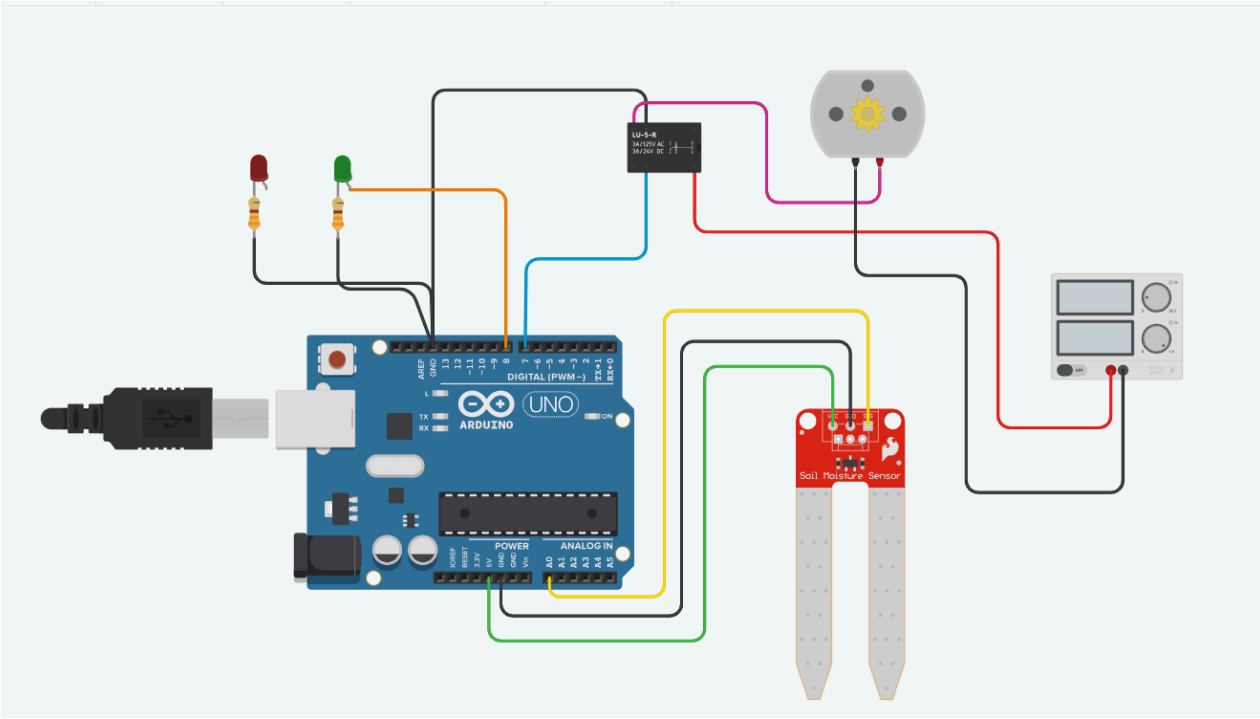


Find stl here
https://drive.google.com/drive/folders/1LvMZjCR3w66nualakGWXFRp086SqVZd1?usp=drive_link

- **Objective:** Teach students the basics of 3D design for the system's led and housing and name tag.
- **Activities:**

1. **Introduction to 3D Design Tools** (15 minutes): Show how to use **Tinkercad** for 3D modeling.
2. **Hands-on Design Activity** (1 hour):
    - Students design their name tags and then the 2 led holders for their plant care system.
3. **Saving & Preparing for Printing** (15 minutes):
    - Save designs in STL format for printing.
    - Explain the basics of 3D printing settings (e.g., layer height, infill percentage).

3. Building the Electronics (1.5 hours)

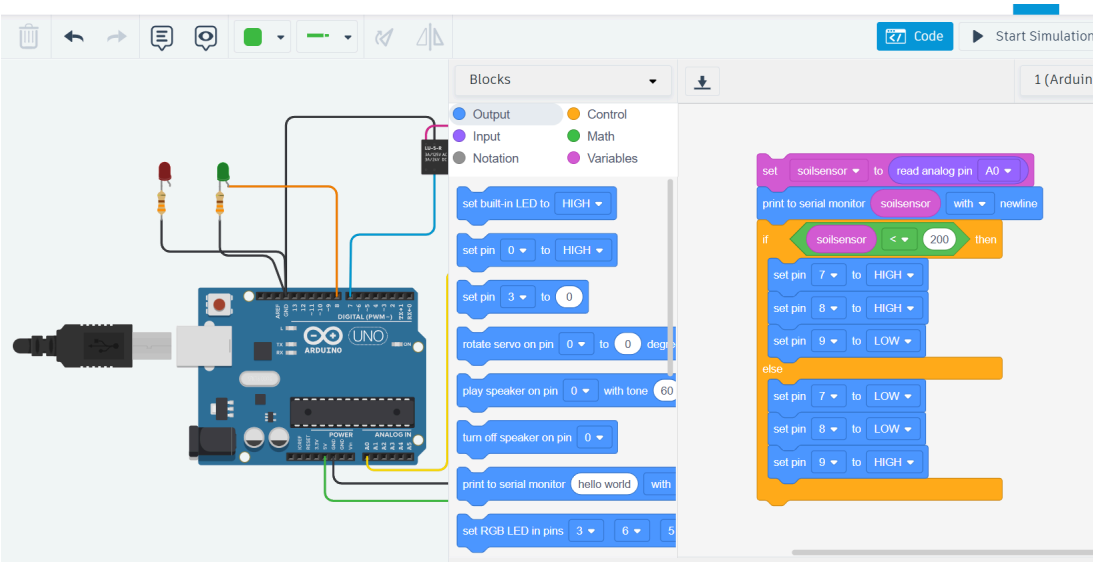


- **Objective:** Teach students how to assemble the circuit with the Arduino Uno.
- **Activities:**
    1. **Introduction to Basic Electronics** (15 minutes):
        - Explain circuits, breadboards, and how components (sensors, LED, relay, pump) are connected to the Arduino.
    2. **Hands-on Circuit Assembly** (1 hour):
        - Connect the soil moisture sensor to the Arduino.
        - Connect the LED and water pump using a relay module (for safety).

- Power the Arduino and pump with separate power sources (e.g., USB for Arduino, 9V battery for the pump).

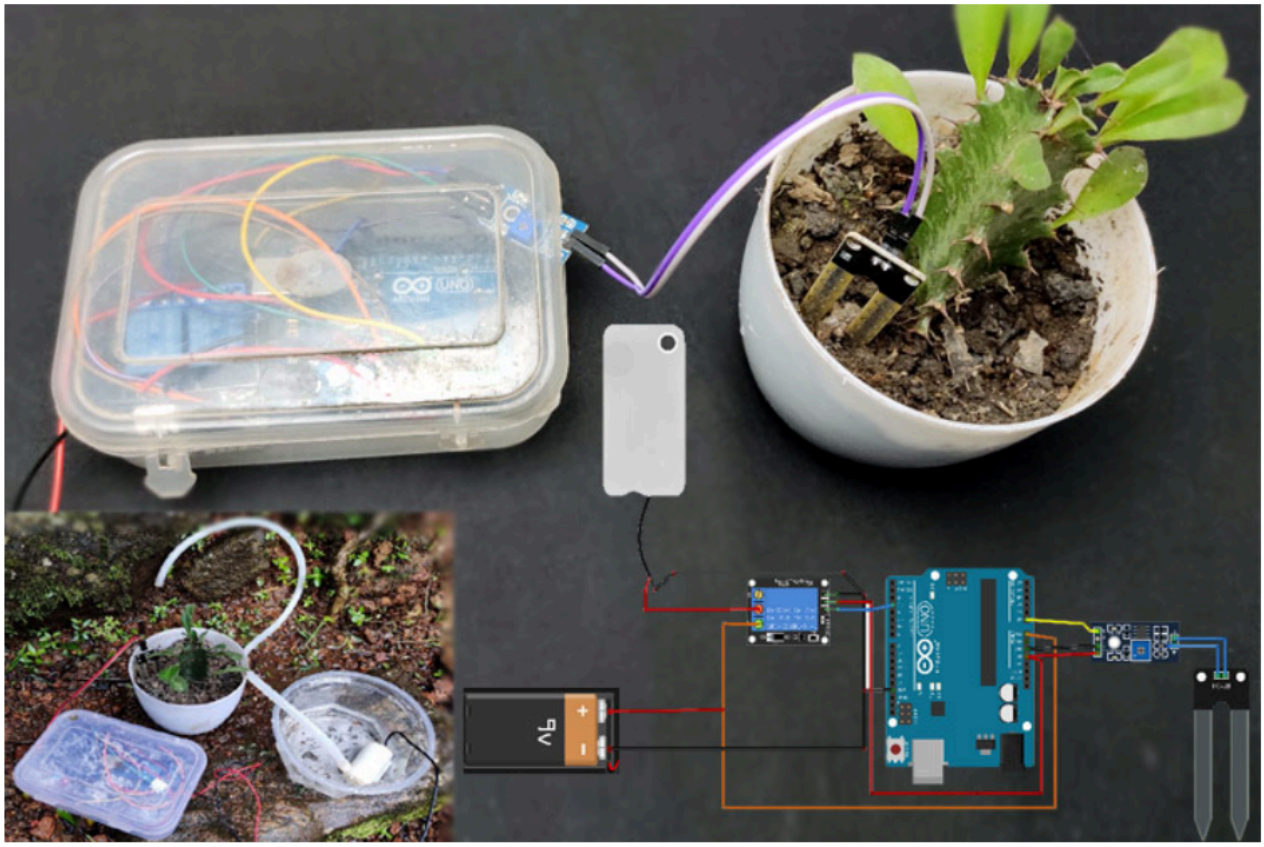
3. **Testing Connections** (15 minutes):
   - Test the soil moisture sensor's output using Tinkercad Circuits simulation or directly with the Arduino.

4. Drag-and-Drop Coding with Arduino (1.5 hours)



- **Objective:** Teach students to use drag-and-drop coding platforms to program the Arduino.
- **Activities:**
  1. **Introduction to Drag-and-Drop Coding** (15 minutes):
     - Demonstrate Tinkercad Circuits or Blockly for Arduino.
     - Show how to create a simple program to read the soil moisture level and control the LED and pump.
  2. **Programming the System** (45 minutes):
     - Write a program where:
       - The soil moisture sensor reads the soil condition.
       - If soil is dry, the pump activates to water the plant.
       - The LED lights up as an indicator.
     - Use drag-and-drop coding blocks to create this logic.
  3. **Upload and Test Code** (30 minutes):
     - Upload the code to the Arduino Uno.
     - Test and troubleshoot if necessary.

5. Assembling and Finalizing (1.5 hours)



- **Objective:** Combine the hardware and 3D-printed parts to complete the project.
- **Activities:**
    1. **Printing the Printed Parts** (45 minutes):
        - While the 3D designs are printing, guide students on assembly instructions.
        - Explain the importance of alignment and securing parts properly.
    2. **Assembling Components** (45 minutes):

6. Reflection, Presentation, and Wrap-Up (45 minutes)

- **Objective:** Reflect on the project and share learnings.
- **Activities:**
    1. **Project Presentations** (30 minutes):
        - Each student presents their "Smart Plant Care System."
        - They explain how it works and discuss any challenges they face.
    2. **Wrap-Up Discussion** (15 minutes):
        - Reflect on what they learned about 3D design, electronics, and coding.
        - Discuss potential future improvements or applications for their system.

Learning Outcomes:

- Learn the basics of electronics and Arduino Uno.
- Understand how to use drag-and-drop coding platforms for programming.
- Gain hands-on experience with 3D design and printing.
- Build problem-solving and teamwork skills while tackling a real-world challenge.