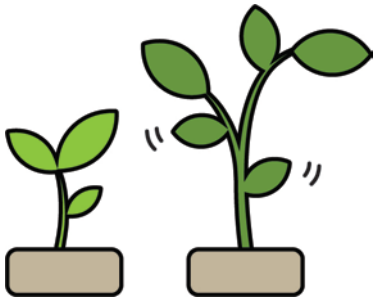
MICRO HYDROPONICS



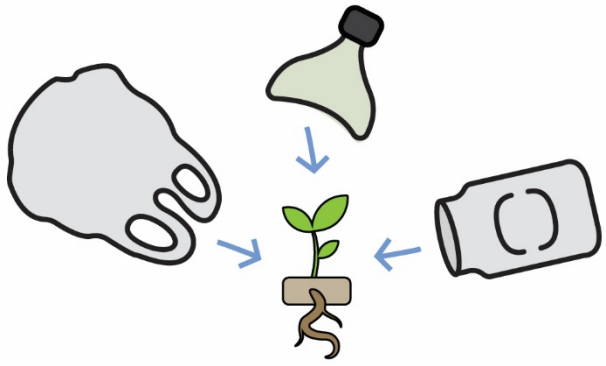
Challenge: Engineer your Hydroponic System to grow the tallest, healthiest plant.

Constraints: (rules and limits for your challenge)

- You must use a TeacherGeek Hydroponic System in your design.
- Plants may be grown only in the barrel – roots must stay contained.
- Plants may be watered only through the tubing or system.
- You may bring in materials for your system design, if they are:
  - Teacher Approved
  - Non-Hazardous (no sharp edges, harmful chemicals, etc.)
- This challenge will take place over a set amount of time.
  - You have _____ hours/days/weeks.

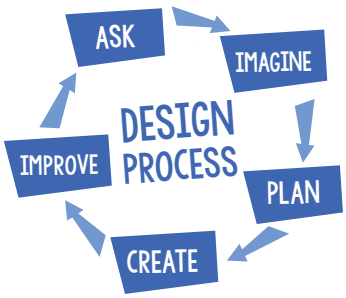
Challenge Supplies:

- Micro Hydroponic System
- Planted seedling in growing medium
- pH Test Kit or Litmus Strips - optional
- Container or cup for fluids
- Ruler, Tape, Scissors, Glue, String
- Spray Bottle for misting – optional
- Found/Recycled Materials

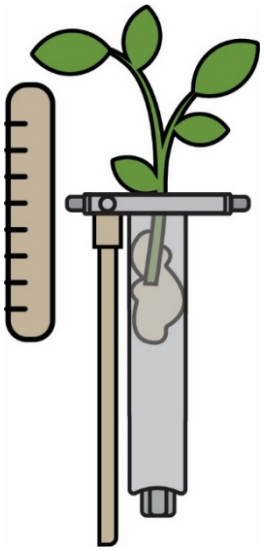


The Engineering Design Process:

You will be using the **Engineering Design Process**. What does that mean? Your design is never finished (it can always be improved). There is no such thing as a perfect design. Fill out a new *Engineering Notebook* page each time you design/redesign your **Hydroponic System**.



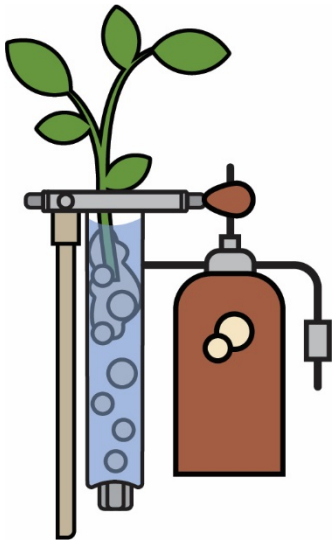
CHALLENGE IDEAS



To Such Great Heights

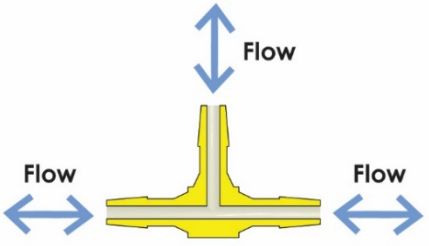
See who can grow the tallest plant in a set amount of time. Determine the **independent variable** you wish to change for each design. Perhaps the nutrient solution will be **aerated** or contain more **macro-nutrients**, or the drip system will use a longer length of tubing. Measure the plant height at the same time each day. Use a graph to plot changes over time.

Phototropism: the movement of plants towards a light source.
Does the light source change the direction of plant growth?

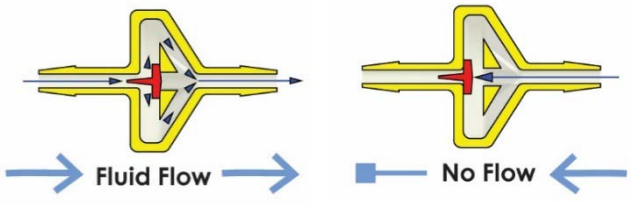


Pump It Up

Hydroponic Systems often use an **air pump** for water **aeration** (putting **oxygen** in water) and recirculation. Design your own micro air pump from **check valves**, **t-connectors** and **tubing**. Observe and record your plant's height, leaf color, and **pH**. Graph, and compare with a non-aerated plant as a **control**.
Can you adjust your pump to only push out air?
Can you adjust your pump to only draw water up?



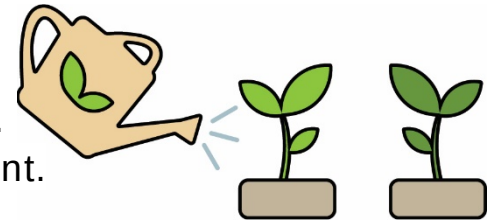
T-Connectors: allow fluid to flow between three **ports** (openings).



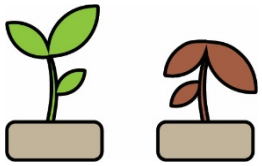
Check Valves: allow **fluid** flow (liquid or gas) in one direction.

VARIABLES

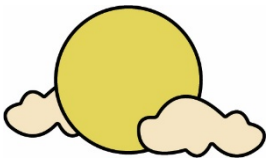
Independent Variable: The thing you change in the experiment, to test how it affects the DV. There should only be one IV for each experiment.



Dependent Variable: the thing being tested and measured as a result of the IV. There should only be one DV for each experiment.



Control: Things that should not change in an experiment. There can be many controls for each experiment.



1. What variables can you change in your Micro Hydroponic System?
   (e.g. Light, Growing Medium) _____
   _____
   _____
   _____

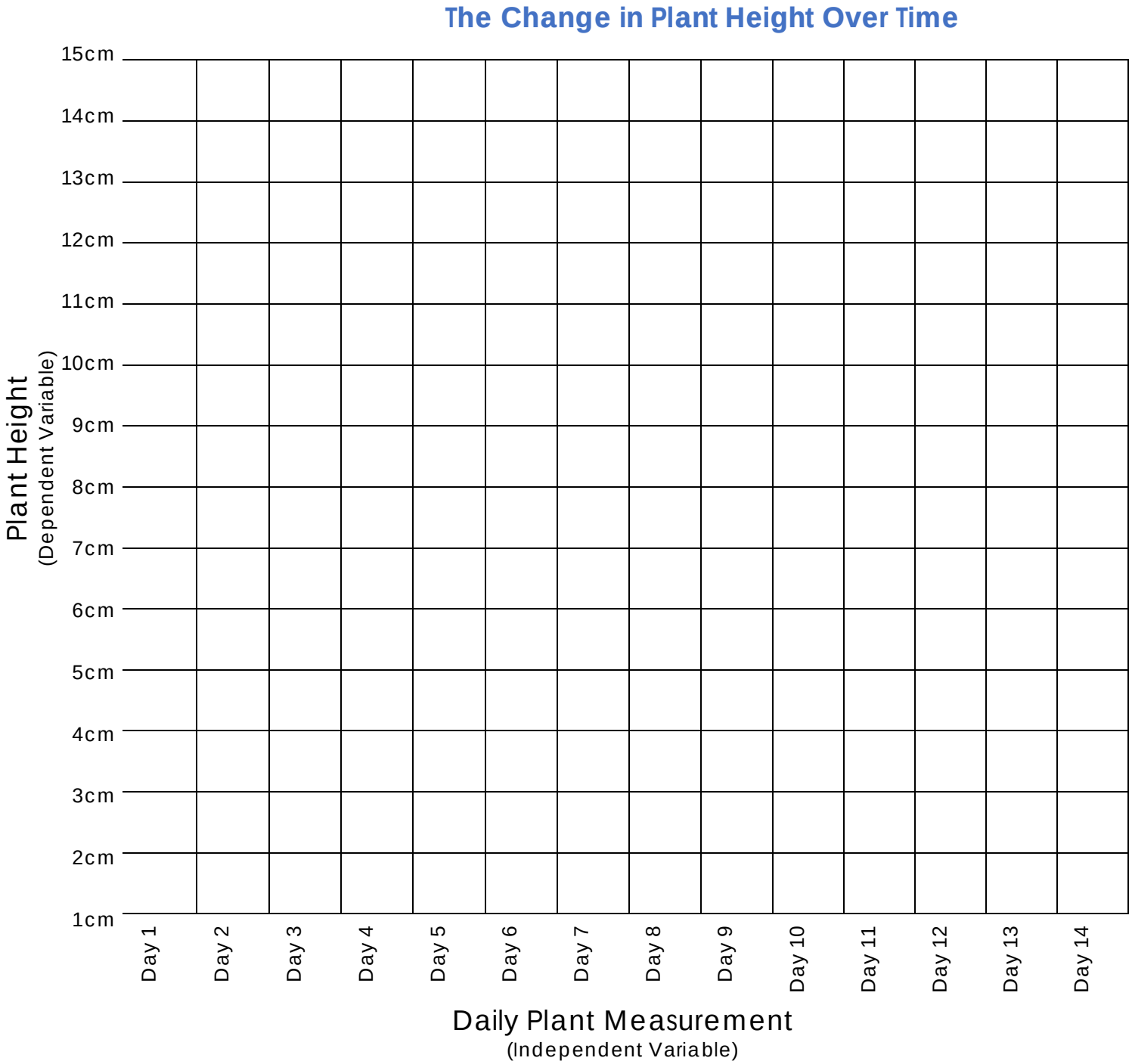
2. What things may change as a result of these Independent Variables?
   (e.g. Height, Plant Color) _____
   _____
   _____
   _____

3. What things would be controls in your Micro Hydroponic System?
   (e.g. Type of Seed Planted) _____
   _____
   _____

Set: ____
Name(s): _____

GROWTH CHART

Plot the height of your plant on the graph below.
Your **independent variable** for this design is:
_____



Name(s): _____

Set: _____

Record the height and pH measurement of your aerated plants. Grow a non-aerated plant as a control.

Group Name	Design #1	Design #2	Design #3	Design #4	Control