Grow Tower 101

District 75 STEM
NYC Public Schools

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Plant
Learn
Grow

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Agenda

01 Set-up

02 Seed Starting

03 Maintenance and Troubleshooting

04 Harvest!

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What is Hydroponic Gardening?

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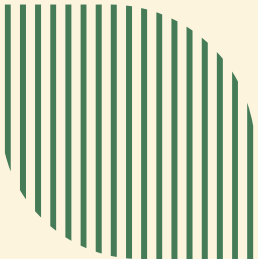
What is Hydroponic Gardening?

Simply put, hydroponics is the practice of growing plants using only water, nutrients, and a growing medium. The word hydroponics comes from the roots “hydro”, meaning water, and “ponos”, meaning labor. This method of gardening does not use soil.

- Epic Gardening

Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite.

- USDA



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What is Hydroponic Gardening?

A method of growing plants using nutrient enriched water.

4 Essential Ingredients:

- Light
- Water
- Nutrients
- Oxygen

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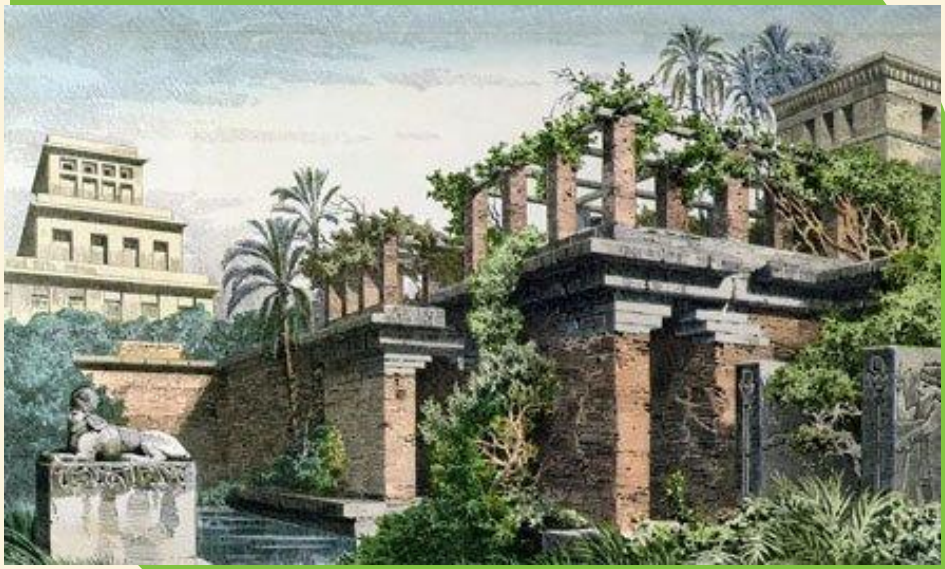
The earliest examples of hydroponics date back to the Hanging Gardens of Babylon (circa 600 BC) and the Aztec Floating Gardens (circa 10th Century). Hydroponics were also used in Ancient Egypt, China and Greece.



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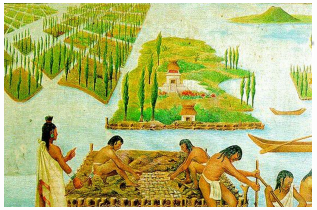
A Brief History of Hydroponics

Historical Timeline



600 B.C
Hanging Gardens of Babylon

10TH CENTURY
Aztec Floating Gardens

13TH CENTURY
Chinese Rice Fields

16TH CENTURY
Scientific Studies

1920-1930
Dr. William F. Gericke

1940-1950
Military Innovations

NOW
Agricultural Technology

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Benefits of Hydroponics

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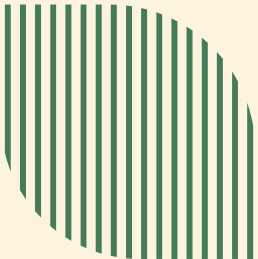
Benefits of Hydroponics

- Uses less water
- Crops grow faster
- Maximizes space
- Controlled climate (and micro-climates)
- Year-round growing
- Higher yields
- Less labor
- No weeding
- Shortened supply chain

Disadvantages?



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Challenges of Hydroponics

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Challenges of Hydroponics

- Higher electrical costs
- Higher upfront costs
- Cost of “inputs” ex. nutrient solutions
- Can require a steeper learning curve
- Waste water
- No carbon sink like soil

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What are you using your Grow Tower to teach?

- Science?
- ELA?
- Math?
- Vocational?
- Culinary?
- Speech and Language?

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01
Set-up

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Components

- Reservoir
- Dolly
- Rods
- Wingnuts, washers
- Seeds and seed starter tray
- Rockwool
- Vermiculite
- Net pots
- Pump (with timer)
- Tubing
- Shower Cap
- Medusa lights (with timer)
- Cage

Liquid Solutions

- Mineral Blends A and B
- pH Up And Down

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Set-up - Getting Started

Sample STEM Roles for Building

- Project Manager
- Builder
- Materials Manager
- Runner
- Inspector
- Time Keeper
- Recorder (document the building process via photos, video, etc.)

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Exploring the Materials

Rock wool

Net pot

Seeds

Exploring the Components

Wear gloves!

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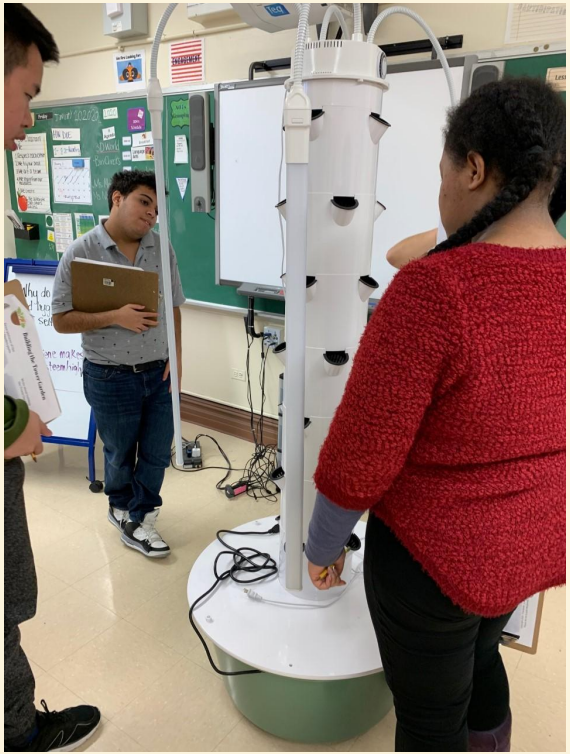
Exploring



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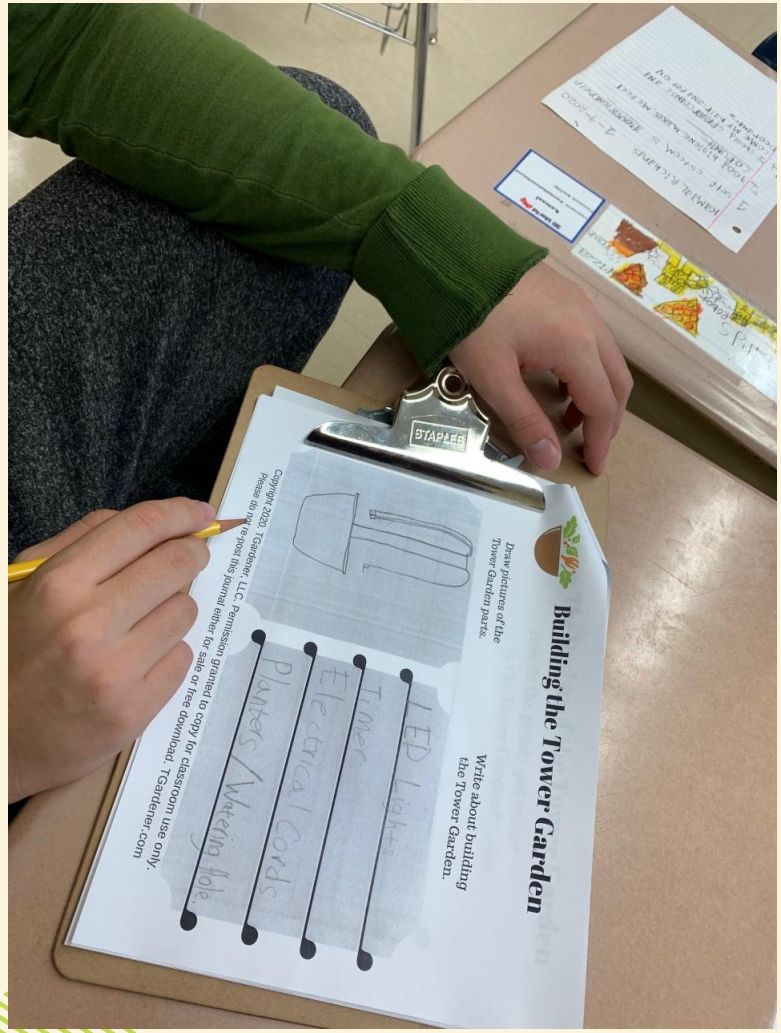
Building the Tower Garden
Draw pictures of the Tower Garden parts.
Write about building the Tower Garden.
LED Lights
Tower
Electrical Cords
Plants/Watering Hole
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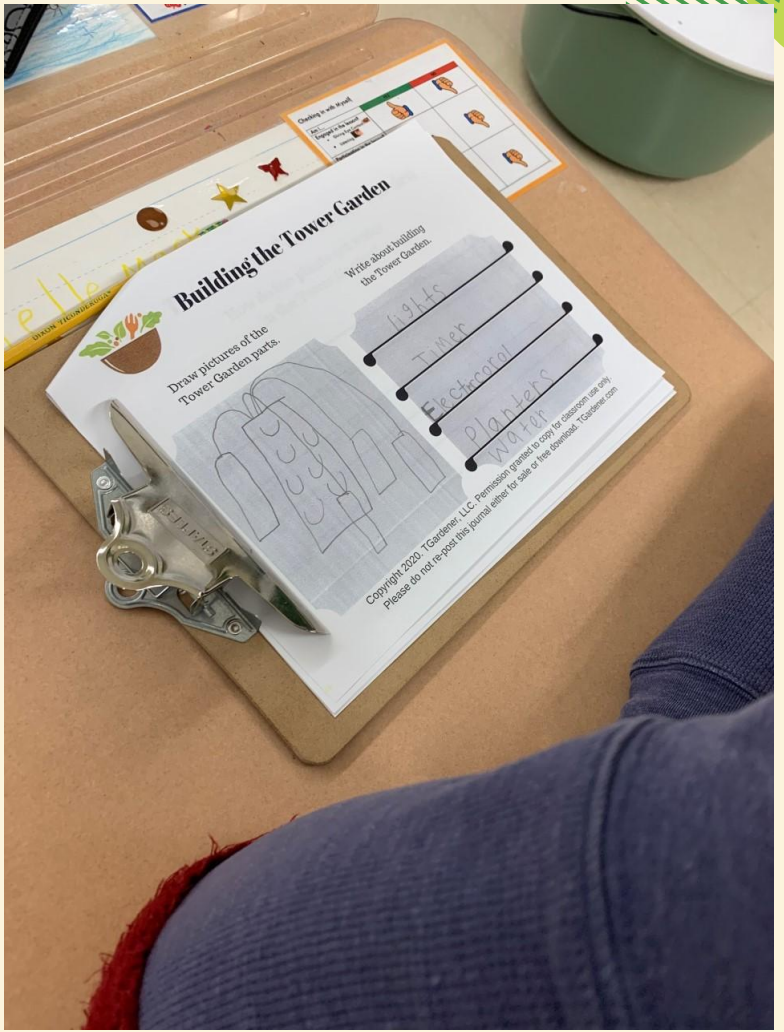
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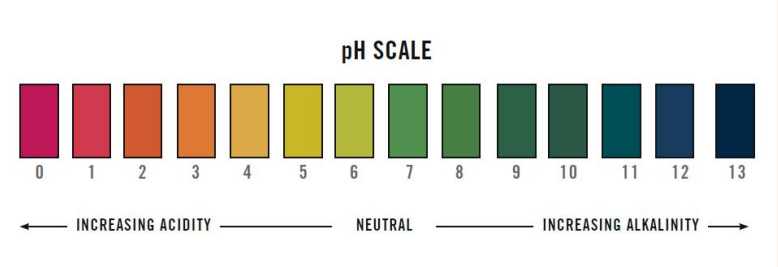
Tools

- Seed starting trays
- Measuring cup
- Large jug or gallon container
- Yard stick, rulers
- pH meter or strips/ drops



Liquid Solutions:

- pH Up +
- pH Down -
- Mineral Solution A
- Mineral Solution B

Optional:

- Fans
- Heat mat
- Digital pH Meter
- EC Meter

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Ancillary Supplies

Digital pH Meter

EC Meter

Heat Mat for Seed Starting

Clip-on fan

02
Seed Starting

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Seed Starting

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T5 GROW LIGHT 4.2
T5 GROW LIGHT 4.2
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T5 GROW LIGHT 4.2

Seed Starting Steps

Soak the seeds for 6-24 hours

Separate the rockwool pieces

Soak the rockwool and place in trays

Put 2-3 seeds in each hole - you may need tweezers

Cover seeds with vermiculite (optional)

Cover with clear plastic lid

Monitor daily; make sure there is water at the bottom

When seeds sprout, transplant to tower (in rockwool cube)

*Optional - use a heat mat to place under the tray

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The Muscular System
TOWER GARDEN


HYDROPONICS CENTER

03 Maintenance and Troubleshooting

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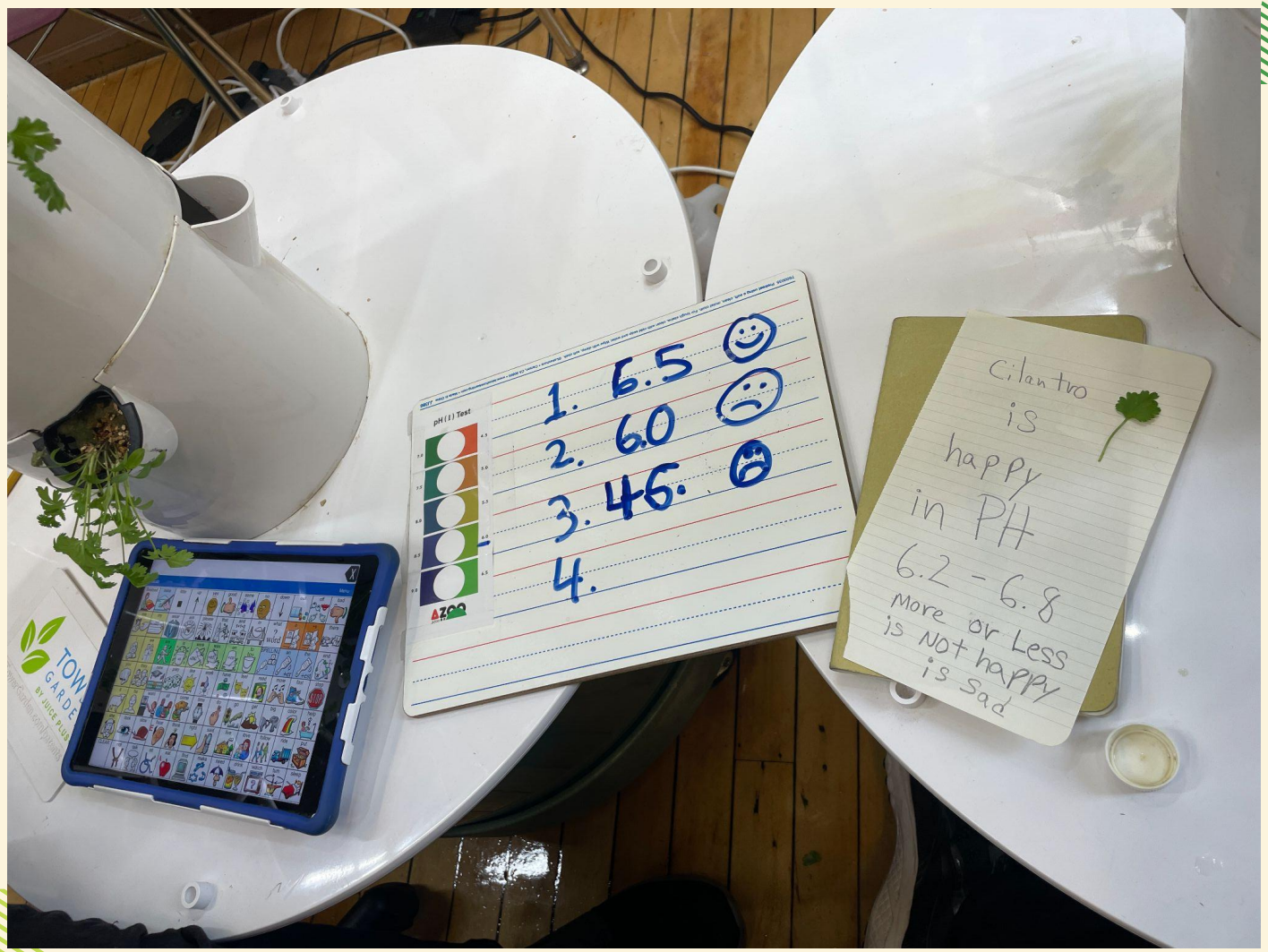
1. 6.5
2. 6.0
3. 46.
4.
Cilantro is happy in PH 6.2 - 6.8
More or Less is Not happy is Sad

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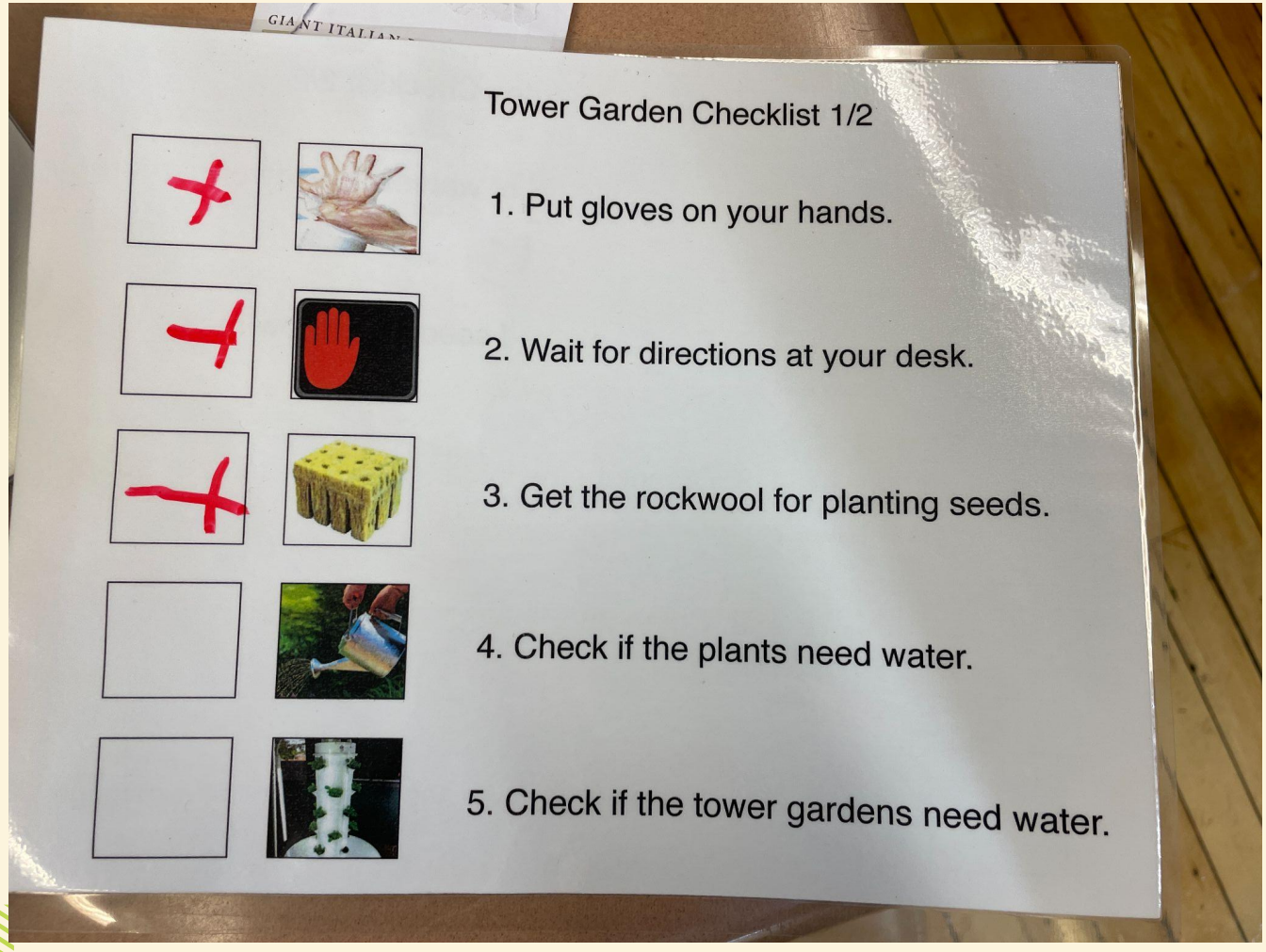
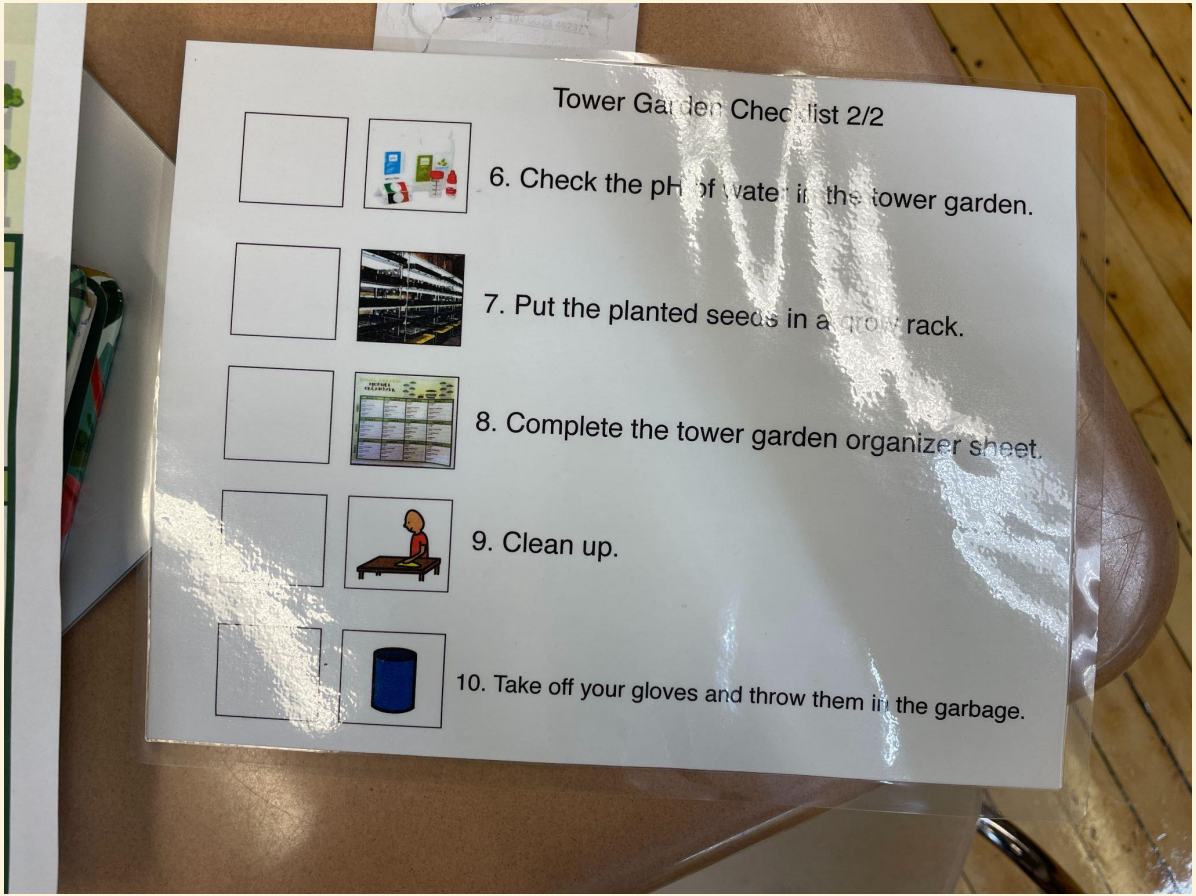
Tower Garden Checklist 1/2



1. Put gloves on your hands.
2. Wait for directions at your desk.
3. Get the rockwool for planting seeds.
4. Check if the plants need water.
5. Check if the tower gardens need water.



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Data Sheets

- Measure water level
- pH before
- Temp in the room
- Amount of water added
- pH Up or Down added?
- Amount of mineral solutions added
- pH after (30 mins)
- Name of person collecting data
- date/ time
- Cleaning/ wipe-down

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Data Sheets/ Maintenance Log

Date	pH Level	Water Level	Water Added	Mineral Solution Added	Room Temp	Water Temp	Class #	Initials
1/7/26	4.5	18	4 gal	Y	72	64	V05	CC

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TG #1

Step 1: Fill out chart (Date, time)
Step 2: Fill water
Step 3: Check water/ add nutrients
Step 4: Test pH - Should be between 5.0 and 7.0
Step 5:
Step 6:
Step 7:

Date	Time	Water added	Nutrients added	Temperature in the room	Wipe down?(Y/N)	Notes

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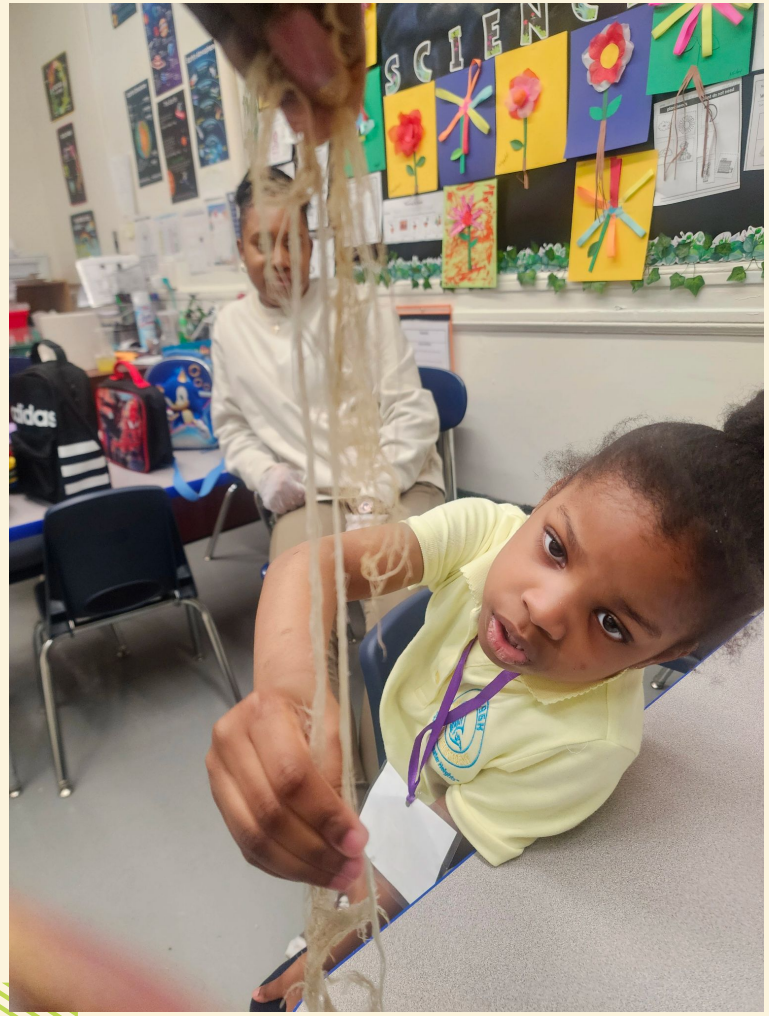

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Data Sheets

More Measurements, more Math...

- Count leaves on each plant
- Measure Size of leaves (length and width)
- Measure length of stems
- Measure the roots

Predictions:

- Will we be more successful growing oranges or lettuce?
- How many days do you think it will take for the kale to be ready to harvest?

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Maintenance and Troubleshooting

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Cleaning the Tower

Once every 3-4 months or as needed and after harvest:

- Unplug all electrical components (lights & pump)
- Remove all the remaining plants, mesh cups, & plugs.
- Disassemble the Tower Garden
- Place towels (preferably cloth but paper will work)
- Use warm water, dish detergent, and coarse sponge to get rid of all of the nutrient residue.
- Rinse all the pieces
- Scrub the pump and make sure the hose is clear
- Dry everything (either overnight or with extra rags/cloths)
- Reassemble Tower Garden

5 Ways to Grow Successfully

- Adjust lights/ lighting settings
- Decrease watering frequency
- Find an ideal location for your Tower Garden.
- Grow leafy greens, lettuce or herbs.*
- Start with strong seedlings.

*Try growing arugula, Asian greens, basil, chives, cilantro, cress, cutting celery, dill, kale, mint, lettuce, mustard greens, parsley, sage, spinach and/or swiss chard.

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Tips for the timer

The digital display will show “I” when set to indoor mode and “O” when set to outdoor mode.

Once the Timer is unplugged, it will automatically

reset as “O”. Make sure you press the

center button one more time to set it to “I”.

For “I” indoor mode, the water runs 5 mins on,

45 mins off.

For “O” outdoor mode, the water runs 3 mins on, 12 mins off

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Troubleshooting - first steps

- Check power supply
- Check timers
- Check pump
- Check pH
- Mineral Solutions
- Flush system
- Cleaning

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Troubleshooting Resources

- Facebook Tower Gardeners User Exchange
- Keep it Watered website - Tower Garden Curriculum for Classrooms
- Tower Garden Youtube Channel

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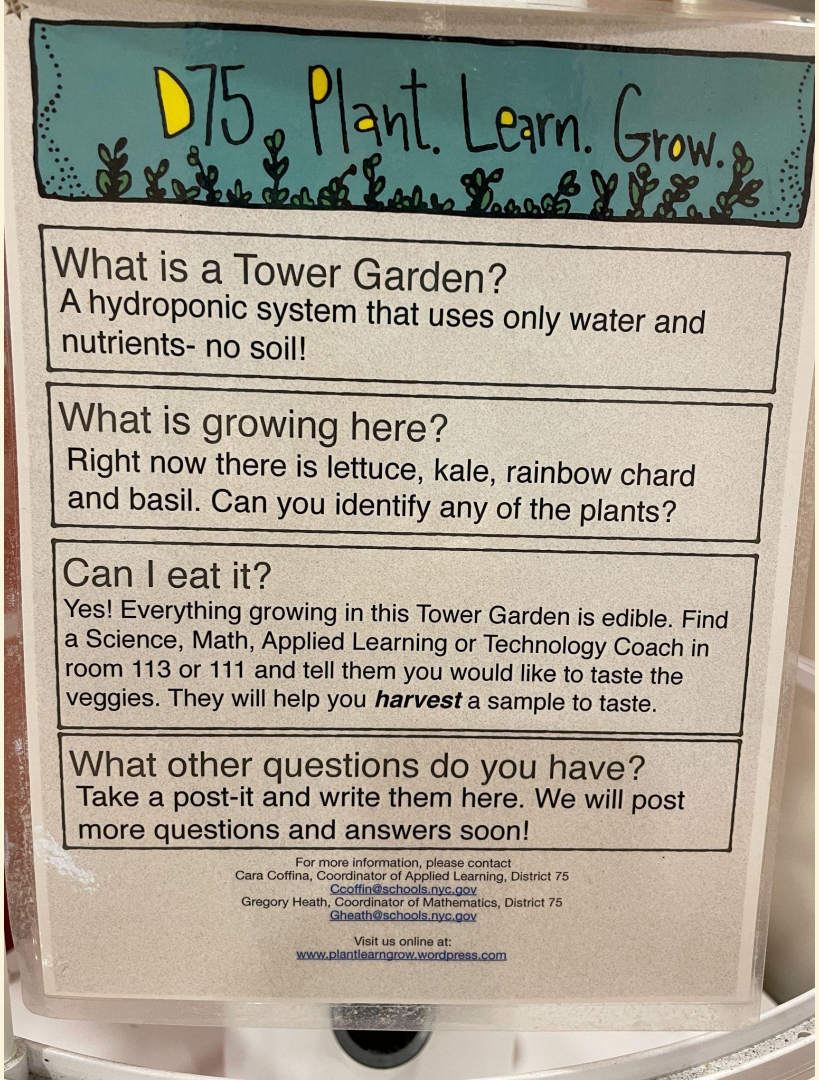
Signage



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Signage


D75 Plant. Learn. Grow.
What is a Tower Garden?
A hydroponic system that uses only water and nutrients- no soil!
What is growing here?
Right now there is lettuce, kale, rainbow chard and basil. Can you identify any of the plants?
Can I eat it?
Yes! Everything growing in this Tower Garden is edible. Find a Science, Math, Applied Learning or Technology Coach in room 113 or 111 and tell them you would like to taste the veggies. They will help you harvest a sample to taste.
What other questions do you have?
Take a post-it and write them here. We will post more questions and answers soon!

04
Harvest!

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Harvest!

- How to harvest
- When to harvest
- What to make with your harvest

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proud
upset

Harvest

Harvest

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Safety Precautions from the Office of Energy & Sustainability

- **Tower Gardens should be plugged into a dedicated 120 volt outlet** that is only used for that purpose (each Tower Garden has two plugs: 1 for light kit + 1 for pump). It is imperative the outlet is not used for any other purpose as it could cause excessive plug load, creating a fire hazard.

- **Periodically check electrical cords** for any wear and potential for tripping hazard.

- **Electricity and water do not mix.** While this unit is designed with this in mind, do not get lighting unit, plugs, and other electrical components wet.

- **Do not buy any aftermarket parts** to retrofit your Tower Garden as these could pose safety hazards (ex: light kits or accessories made by a different company)

- **Monitor liquid levels weekly** and be mindful of adding extra fluids before extended breaks and vacation time. The pump must be fully submerged in water when in operation; failure to do so could result in overheating, posing a fire risk.

THANKS!

Cara Coffina
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Please share your feedback

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