THE EDUCATION FUND 40 YEARS

FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

2024
2025

Ideas with IMPACT

HEALTH & WELL-BEING

Microgreens by Hydroponics

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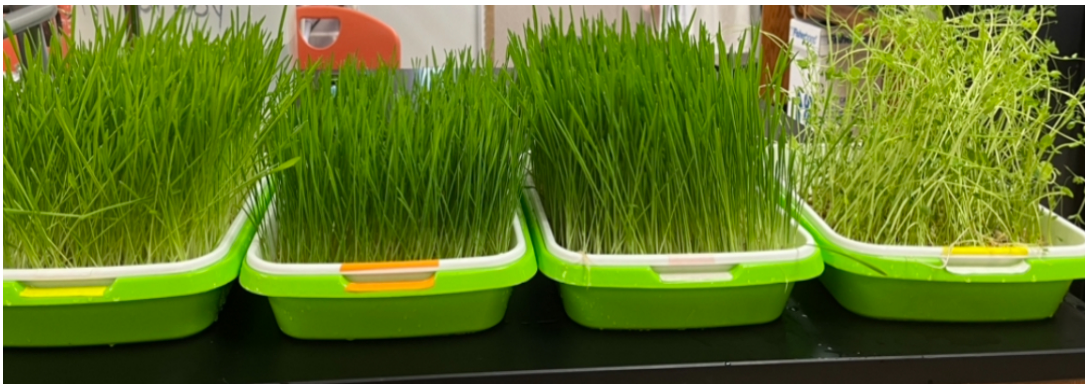
Microgreens by Hydroponics



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Goals and Objectives

This project applies hydroponic technology to grow the variety of microgreens. Microgreens are a very hot topic nowadays for people who care about their health. This project will use a very simple setup to grow all kinds of microgreens. The students will learn how to design a setup to grow microgreens by hydroponics and study how the microgreen seeds themselves, temperature, humidity and the amount of time for soaking them affect their growth.

This project is a hands-on project and can be done indoors or outdoors, which will help students' critical thinking and increase their learning motivation. Growing microgreens can also be beneficial to our communities. This project is suitable for all grade levels. It can be easily applied in STEM/STEAM.

The list below shows some ideas for how to apply this project to STEM/STEAM schools.

a) Science: the students can learn the photosynthesis

b) Technology: the students will use internet to understand the knowledge of hydroponics and microgreens and make PowerPoint presentations.

c) Engineering: The students will design a setup for growing the microgreens

d) Art: the students can design artistic microgreen patterns.

e) Math: the students can learn to measure the parts of the setup, or the heights of the grass, For the higher-level students, they can learn the growth rate of microgreens and their percentage yield et al.

Florida Standard

Standards: https://cpalms.org/public/search/Standard

STEAM 1.0 Science 	STEAM 2.0 Technology 	STEAM 3.0 Engineering 	STEAM 4.0 Art 	STEAM 5.0 Math 
SC.912.CS-CP.1.3 Analyze and manipulate data collected by a variety of data collection techniques to support a hypothesis **SC.8. L.18** A. Living things all share basic needs for life. B. Living organisms acquire the energy they need for life processes through various metabolic pathways (photosynthesis and cellular respiration). C. Matter and energy are recycled through cycles such as the carbon cycle.	**TD.912.F.1.1** Select the most appropriate tools and technology resources to solve problems and increase efficiency Name of the platform PowerPoint and Excel The students will create a digital presentation, excel will be used to analyze data Parameters The presentation must include title photos or videos graphs Conclusions	**EG912.A.1.2**. Apply the engineering design process to specify the criteria and constraints of a solution and to optimize the design solution based on the given criteria and constraints. Engineering design process **Real world problem and measurable goal** The students will design a setup for hydroponics to grow microgreens **Planning:** The students will create a blueprint for their prototype **prototyping:** the students will design physical hydroponics **testing:** the students will test the setup: **Redesign/improving** students will make modifications with their design based on their measurable goals **Communicate Finding:** students will summarize the process and findings in details in a presentation with a PowerPoint	**VA.68.O.1** Understanding the organizational structure of an art form provides a foundation for appreciation of artistic works and respect for the creative process. **VA.912.F.1** Creating, interpreting, and responding in the arts stimulate the imagination and encourage innovation and creative risk-taking.	**MA.912.S.2.1** Collect, organize, analyze and display data (including box plots and scatterplots) to solve problems. **MA.2.M.1** Measure the length of objects and solve problems involving length **MA.912.NSO.1.7** Generate equivalent expressions and perform operations with expressions involving exponents, radicals or logarithms. Given a numerical logarithmic expression, evaluate and generate equivalent numerical expressions using the properties of logarithms or exponents.
G.K.12.3.1.1b Cooperative Research-Understand: Demonstrate ethical leadership and/or teamwork within a research workgroup G.K12.5.3.3b-Technology-Understand: Demonstrate the ability to propose new uses for current technology				

Materials needed

1) *Nursing trays (order them from amazon or self-designed)*

2) *Seeds (wheat, Barley, green beans et al)*

3) *Tap water (for soaking and watering the seeds)*

4) *Ruler (for measuring the height of the microgreens)*

5) **humidity and temperature sensor**

6) *Electronic Balance (for calculating percentage yield if it is available)*

7) *Nursing tray shelf (Optional)*

Course Outline and Overview

In order to know how we came up with the idea of growing microgreens by Hydroponics, we need to introduce hydroponics and microgreens first.

Hydroponics is the technique of growing plants using a water-based nutrient solution rather than soil. One of the advantages is that many veggies can grow at home either in the living room, or bathroom or kitchen et al. It is a fast-growing business, especially after covid 19.

Microgreens is Microgreens, a hypothesized term for the emerging food product developed from various commercial food crops, such as vegetables, grains, and herbs, consist of developed cotyledons and partially expanded true leaves. These immature plants are harvested between 7–21 days (depending on variety)

Microgreens have become increasingly popular in the past handful of years, and a great deal of ongoing research seeks to understand all the health benefits these tiny plants offer. Early research has indicated that microgreens contain up to 40% more phytochemicals (beneficial nutrients and components) than their full-grown counterparts. Though these little greens are small in stature, they contain extremely high levels of powerful vitamins, minerals, and health-supporting components.

Microgreens can lower blood pressure. Foods that are high in fiber and vitamin K can be helpful in maintaining a healthy blood pressure, and microgreens are high in both of these important elements as well as other vitamins and minerals.

Microgreens might help fight cancer. Research is ongoing into this subject, but some early evidence suggests that sulforaphane — a compound found at especially high levels in broccoli sprouts — may help fight cancer.

Some microgreens can help lower cholesterol. A study found that red cabbage microgreens lower levels of LDL cholesterol, liver cholesterol, and inflammatory cytokines — all factors that can increase your risk for heart disease.

Microgreens can support gut health. Foods that are high in dietary fiber, like microgreens, can ease constipation or other gastro-intestinal distress when eaten as part of a healthy, balanced diet. Research also indicates that dietary fiber serves as a " prebiotic," or material that provides an ideal environment for the "good" bacteria in the human microbiome to flourish.

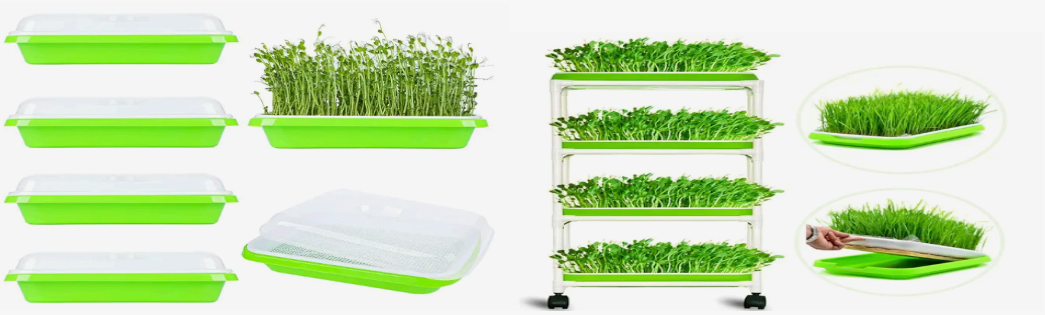
As a teacher, it will be a fascinating project for students in different grade levels to be involved in growing microgreens by hydroponic. This project can be applied in the classrooms for learning science, technology, engineering, art and math with hands-on activities (outdoors or indoors). This project will train the students to use critical/creative thinking to build the hydroponic setup, design the steps to collect research data and analyze the data to give a conclusion, in the end to give a presentation. What's more, the students could learn how to start a small business by selling microgreens or donating to the local communities.

Lesson Plan

Title: Microgreens by Hydroponics

Step 1: Design the hydroponic setup including growing creative microgreens patterns

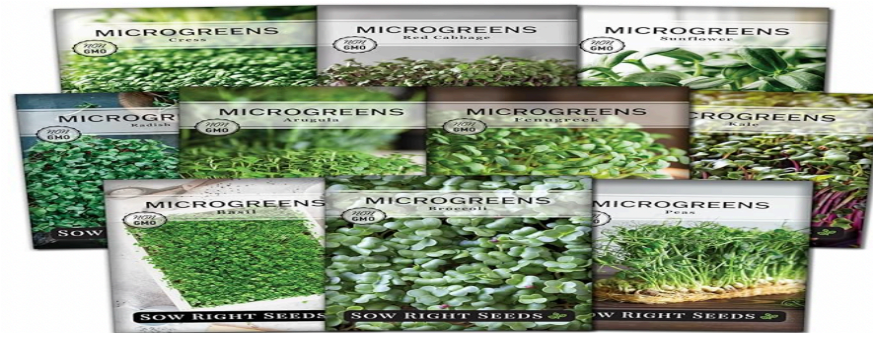
1) **The teacher can purchase Microgreen Nursing Trays from amazon, the pictures below are an example.**



2) The students can design their own Hydroponics for Microgreens.

3) Decide what types of microgreens to choose to grow

The seeds can be purchased from Amazon.



Step 2: Purchase the materials and set up the hydroponic system.

Step 3: Grow microgreens with the seeds you chose (2-3 different types of seeds) in the hydroponics, to monitor the quality of the microgreens until they are harvested.

i) Make sure the nursing trays are clean
ii) Add the seeds in the trays to soak for 4-6 hours (the seeds on the separator)
iii) Leave the amount of water in the tray right below the separator. Cover the tray
Iv) Record the data in the table below (the total days depend on the type of seeds), each table for one type of seeds)
v) Do the experiment 3 times at least for each type of seeds

Data Collection Table

Seed	Soak time (hrs)	Days	Heights of the microgreens	Temperature	humidity	sunlight	Observation	Take a picture	Recorded by
		Day1							
		Day2							
		Day3							
		Day4							
		Day5							
		Day6							
		Day7							
		Day8							
		Day9							
		Day10-							
The total days and the soaking time can be variable based on the different types of seeds									

Step 4 After collecting the data. analyze the data, draw conclusions. The teacher may give the students different assignments based on the grade levels:

a) For elementary/middle school students:
   I) record the information into the table
   ii) discussion how the temperature, humidity, sunlight affect the growth of microgreens.
   iii) compare how the different types of seeds grow in different speeds
   Iv) the teacher and the students can decide to donate the microgreens to the community or sell them to the community.
   v) if they decided to sell to the community, the students could calculate the profits from this sale.
b) For middle/high school students:
   I) record the information into the table
   ii) discuss how the temperature, humidity, sunlight affect the growth of microgreens.
   iii) use excel to draw graphs to analyze the data and compare the growth rate of the microgreens from the different types of seeds.
   Iv) the teacher and the students can decide to either donate the microgreens to the local communities or sell them to the communities.
   v) if they decided to sell to the community, the students could calculate the profits from this sale. The students can come up with their own business plans.
   Vi) the students can also calculate the percentage yield of the microgreens if the classroom has a balance to weigh the seeds before they were soaked and to weigh the harvested microgreens.

Step 5 To make a PowerPoint Presentation for this project of microgreens by hydroponics

Accommodations

Ensure the students knows how to do the task

- Use computer assisted instruction
- Recruit and train a peer helper to repeat and explain directions and give assistance when they teacher is unavailable
- Group Project: group leader guides the group
- Extended time for assignment

Resources:

[1] https://www.nal.usda.gov/farms-and-agricultural-production-systems

[2] https://www.canr.msu.edu/hrt/about-us/horticulture_is#:~:text=Horticulture%20is%20the%20science%20and,Decorative%20indoor%20plants%20and

[3] https://microgreensfarmer.com/what-is-microgreens-farming/

[4] https://www.allthatgrows.in/blogs/posts/microgreen-farming#:~:text=Urban%20vertical%20farming%20is%20a,with%20the%20help%20of%20water.

[5] https://www.healthline.com/nutrition/microgreens#what-are-they