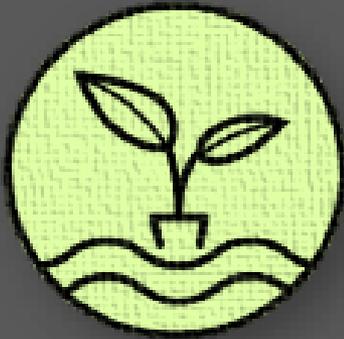


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Grow your Mind While Losing your Soil:

*Using Hydroponics
to bring Engagement and Hand on Learning*

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Welcome & Introduction

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A Little About Realityworks

- **DISTRIBUTION INTO EDUCATION**

- **62%** of school districts in the U.S.
- **90** countries worldwide
- **31,000** institutions
- **6,000,000** students served through the use of our products

- **EDUCATION PARTNER**

- Association for Career and Technical Education Member (NACTE)
- American Welding Society Member (AWS)
- National Association of Agriculture Educators Member (NAAE)
- 100+ education trade shows (local, state, national) per year

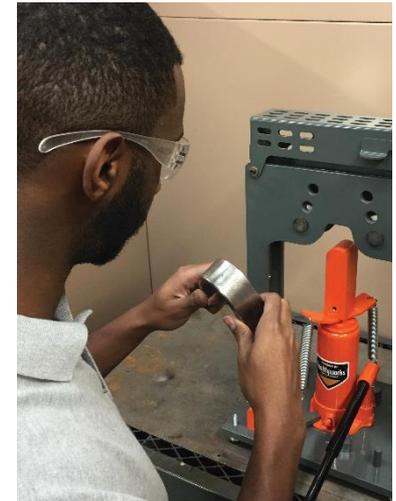
- **EDUCATIONAL FOCUS**

- Interactive Learning Aids and Curriculum

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Innovative Learning Tools for Skills Training

FACS | Health Sciences | Agriculture | Welding and Trade Skills



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MARKETING

- Marketing Communications
- Marketing Management
- Marketing Research
- Merchandising
- Professional Selling



HOSPITALITY & TOURISM

- Lodging
- Recreation, Amusements, and Attractions
- Restaurants and Food and Beverage Services
- Travel and Tourism



AGRICULTURE, FOOD, & NATURAL RESOURCES

- Agribusiness Systems
- Animal Systems
- Environmental Service Systems
- Food Products and Processing Systems
- Natural Resources Systems
- Plant Systems
- Power, Structural, and Technical Systems



ARTS, A/V TECHNOLOGY, & COMMUNICATIONS

- Audio/Video Technology and Film
- Journalism and Broadcasting
- Performing Arts
- Printing Technology
- Telecommunications
- Visual Arts



BUSINESS MANAGEMENT & ADMINISTRATION

- Administrative Services
- Business Information Management
- Operations Management
- Human Resources Management
- Management



FINANCE

- Accounting
- Banking Services
- Business Finance
- Securities and Investments
- Insurance



GOVERNMENT & PUBLIC ADMINISTRATION

- Foreign Service
- Governance
- National Security
- Planning
- Public Management and Administration
- Regulation
- Revenue and Taxation



HUMAN SERVICES

- Consumer Services
- Counseling and Mental Health Services
- Early Childhood Development and Services
- Family and Community Services
- Personal Care Services



LAW, PUBLIC SAFETY, CORRECTIONS, & SECURITY

- Correction Services
- Emergency and Fire Management Services
- Law Enforcement Services
- Legal Services
- Security and Protective Services



EDUCATION & TRAINING

- Administration and Administrative Support
- Professional Support Services
- Teaching/Training



HEALTH SCIENCES

- Biotechnology Research and Development
- Diagnostic Services
- Health Informatics
- Supportive Services
- Therapeutic Services



ARCHITECTURE & CONSTRUCTION

- Construction
- Design and Pre-construction
- Maintenance and Operations



TRANSPORTATION, DISTRIBUTION, & LOGISTICS

- Facility and Mobile Equipment Maintenance
- Health, Safety, and Environmental Management
- Logistics Planning and Management Services
- Sales and Services
- Transportation Operations
- Transportation/Systems Infrastructure Planning, Management, and Regulations
- Warehousing and Distribution Center Operations



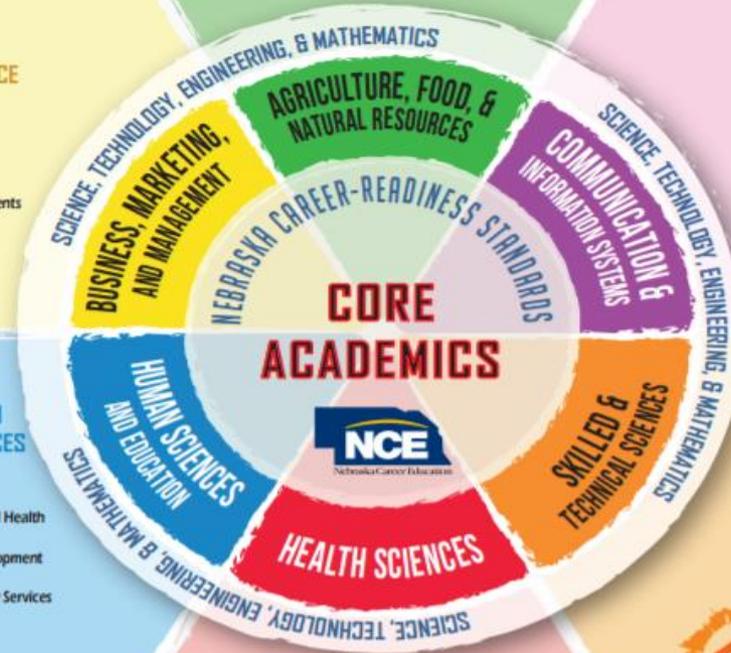
ENERGY & ENGINEERING

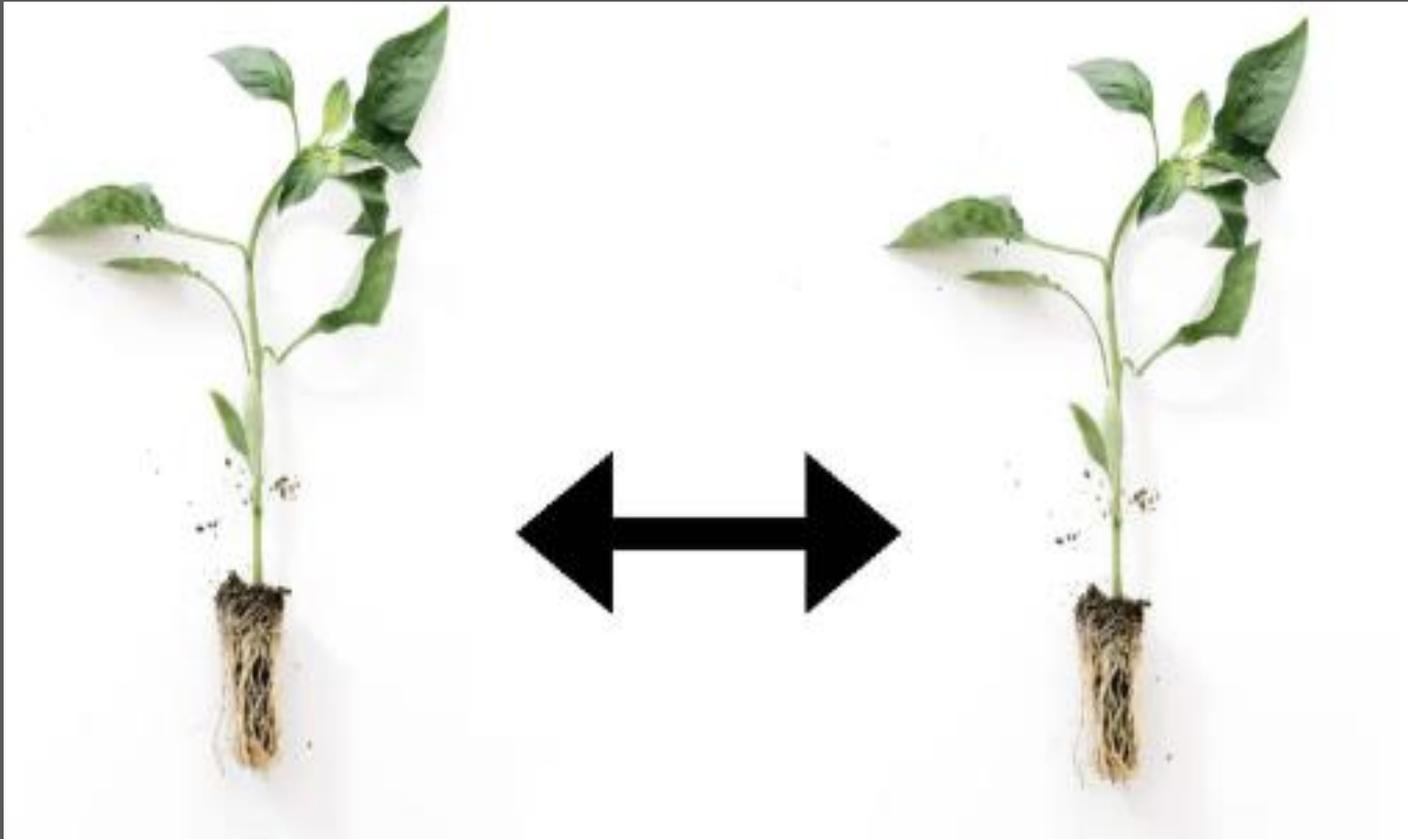
- Engineering and Technology
- Energy



MANUFACTURING

- Health, Safety, and Environmental Assurance
- Logistics and Inventory Control
- Manufacturing Production Process Development
- Maintenance, Installation, and Repair
- Production
- Quality Assurance





Keep your distance!

Getting Started Hydroponically Speaking

Our focus will be on the following:

- *Gain Understanding on the Importance of Hydroponics*
- *View 5 Steps to Starting a Program*
- *Learn about the Hydroponic Curriculum and Educational Systems from Realityworks*



Five Key Reasons for Hydroponics

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Why Grow With Hydroponics?

1. Limited Space:

- In many locations, especially cities, there isn't always enough space or soil available to grow plants in the ground
- Hydroponics allows people to grow gardens in limited space

Why Grow With Hydroponics?

2. Clean and Efficient:

- Hydroponic farming is a clean and efficient way to grow vegetables and other plants
- Hydroponic farming can happen in a closed environment for year-round growing

Why Grow With Hydroponics?

3. Solve food shortages and growing issues

- Hydroponic farming can help solve food shortages, especially in areas where drought and famine are issues
- Where weather conditions are unfavorable for large scale crop production, hydroponics can help overcome these weather variables

Why Grow With Hydroponics?

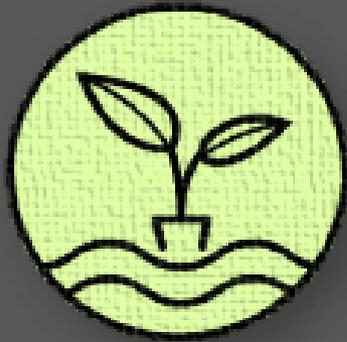
4. Increase growth rates and time to harvest

- Water and nutrients are continually made available to the plant roots, allowing plants to grow at the fastest possible rate
- It can reduce the time between planting and harvest by controlling the growing variables
- Biosecurity and environmental factors can help to grow food more readily

Why Grow With Hydroponics?

5. Learn and experiment with new ways to grow plants

- Test and experiment with the ability to adapt variables and make environmental changes easily
- Challenge ideas and growing methodology to find better ways to grow food



Five Keys to Starting a Hydroponics Program

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Stepping you through Start up

How to get started

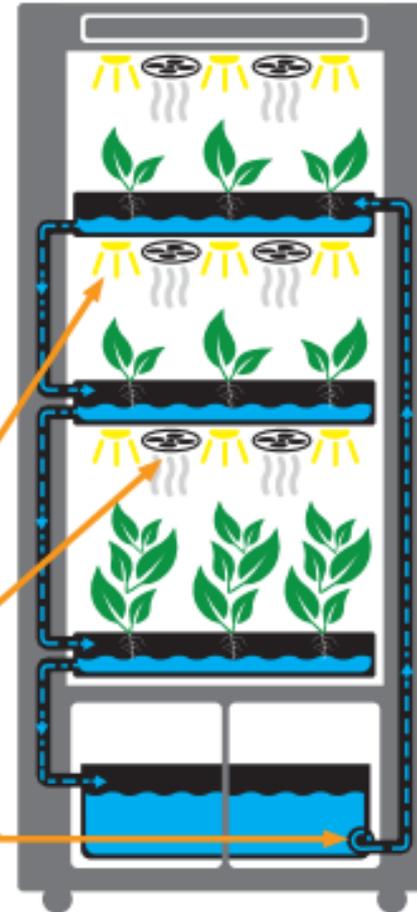
Materials needed:

- Seeds
- Nutrients
- Rock wool
- Growing tray



Hydroponics system parts:

- **Lights** — The LED light array mimics sunlight (including the red-and-blue light spectrum) to help the plants grow.
- **Fans** — The fans help strengthen and reduce injury and disease to the plants. They always run at a consistent speed.
- **Water pumps** — The water pumps circulate the water so that vital nutrients can move to the plant roots.



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1. Do your Research

- Learn what is available
- Learn what your time and space limitations are
- Think about the outcome you are looking to accomplish



2. Create a Plan

- When do you want to start growing
- When do you want to harvest
- What materials do you need
- What jobs/expectations

Planting and Harvesting Cheat Sheet			
Plant	Direct Light Needed	Germination	Days to Maturation
Cabbages	Yes	4-10	65-85
Cucumbers		6-10	55-65
Green Beans		7-14	80-100
Kale	Yes	3-10	55-80
Leeks	Yes	7-12	80-90
Lettuce	Yes	4-10	35-65
Radishes	Yes	3-10	50-60
Swiss Chard	Yes	7-10	55-65
Tomatoes		6-14	55-90

EC and pH Values for Different Hydroponic Crops		
Plant	pH Range	EC (uS)
Cabbages	6.5-7.5	2500-3000
Cucumbers	6.0-7.0	1700-2500
Green Beans	5.5-6.0	2000-4000
Kale	6.0-7.5	800-1800
Leeks	6.0-6.8	1400-1800
Lettuce	6.0-6.5	800-1200
Radishes	6.0-7.0	1600-2200
Swiss Chard	6.2-6.8	1800-2300
Tomatoes	5.5-6.5	2000-5000

3. Expect Challenges and Triumphs

- Growth happens
- Expect Trial and Error
- What unexpected opportunities are available
- Share the experiences



4. Learn From Others

- Realityworks Lead Test Engineer
- Testing and Growing Engineer for the Plant Lab and Plant Producer Hydroponics Systems
- Growing with Hydroponics for past year – exclusively focusing on best Hydroponics techniques
- Plants include:
 - Butternut Lettuce
 - Kale
 - Sage
 - Cilantro
 - Ruby Red Lettuce
 - Roma Tomatoes
 - Cucumber
 - Jalapeno
 - Arugula
 - Sugar peas





Teacher Reactions

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Jennifer Hebert

Beau Chene High School, Beau Chene, Louisiana – FCS Teacher

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Did you have reservations on using a hydroponic system?



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How have your students reacted to growing hydroponic plants?



Jennifer Hebert Beau Chene High

2019-09-20 15:19:59

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John Hammond

Thomas Nelson High School, Nelson County, Kentucky – Agriculture Teacher

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What have like most about adding hydroponics into your school?



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How have your students engaged with Hydroponics systems in your school?

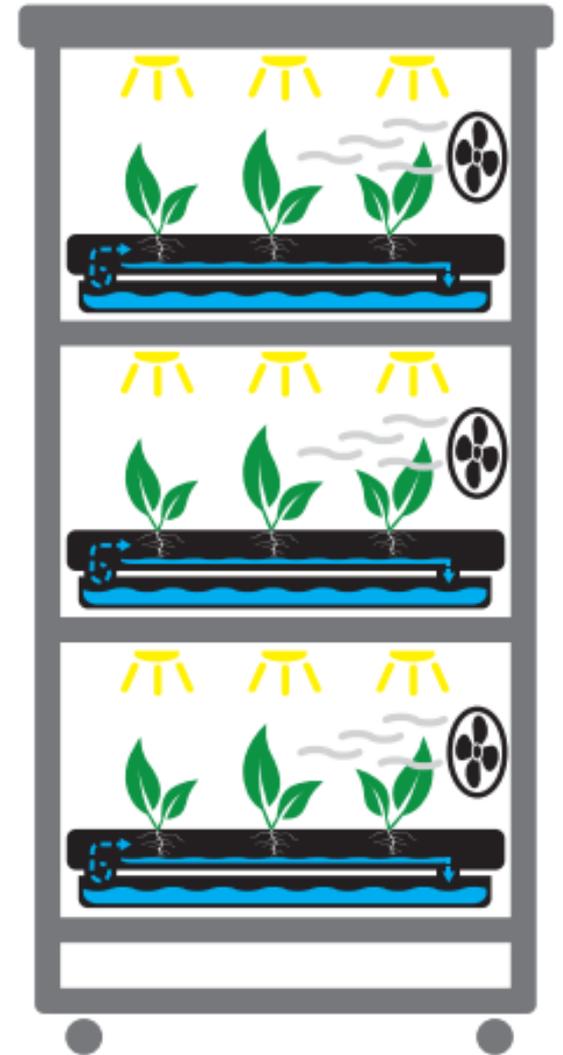


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5. DO IT!!!

- Start the process
- Create space to start growing
- Incorporate the hydroponic growing system
- Act on the plan!

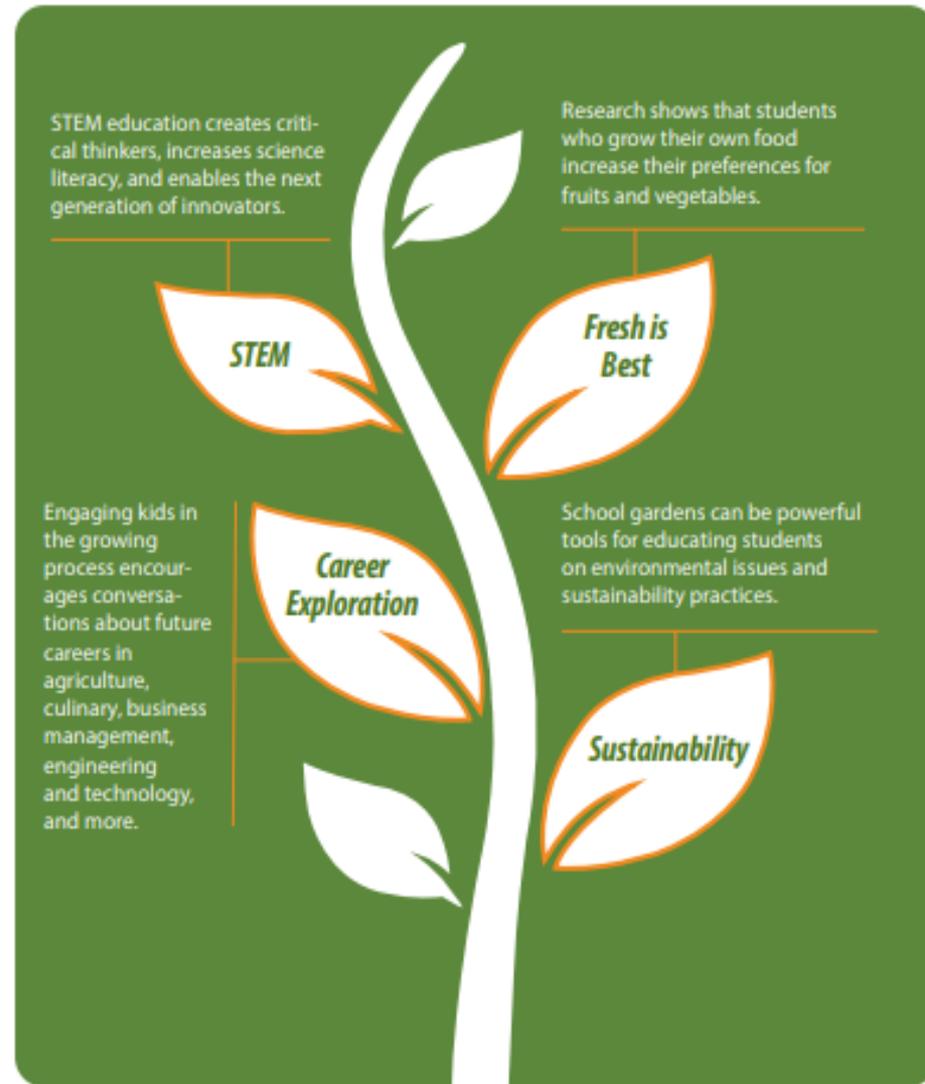


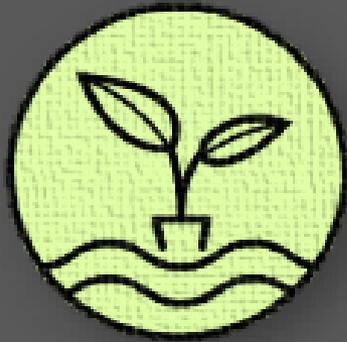
Learning Opportunities

- Career Exploration
- STEM
- Sustainability
- Farm to Table
- Nutrient Rich
- Learning Engagement

Grow your food. Grow your mind.

How growing plants can increase student engagement





Hydroponics Curriculum:

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Lesson Sections

Most lessons are designed for a 45-60-minute class

- FOCUS – Capture students' attention
- LEARN – The presentation mode chosen
- REVIEW – Review key points and assess



Curriculum: Intro to Hydroponics

- You can use our hydroponic curriculum for free at:
<https://www.realityworks.com/access-your-guides-and-curriculum/>

Introduction to Hydroponics Curriculum



www.realityworks.com

Lesson: Intro to Hydroponics

- FOCUS – What is Hydroponics
- LEARN – Types of Hydroponic Systems
- REVIEW – Main Parts of a Hydroponic System

FOCUS: What is Hydroponics

- FOCUS – Understanding the Process
- Email or pose the question online: What do you need to grow plants and/or produce?
- Discuss question orally and have discussion on how you can grow things, what variables are there – weather, climate, biodiversity, etc.



LEARN: Types of Systems

- LEARN - Example: Slide Presentation

Typical Types of Hydroponic Systems

- Deep Water Culture (DWC)
- Ebb and Flow (Flood and Drain)
- Drip System
- Nutrient Film Technique (NFT)
- Aeroponics
- Aquaponics

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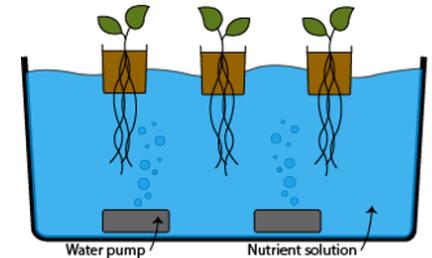
Introduction to Hydroponics
Curriculum

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Deep Water Culture (DWC)

- Plant roots are suspended in a nutrient solution
- Oxygen is released into the water to prevent the roots from drowning
- A variation of this is known as bubbleponics



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Curriculum

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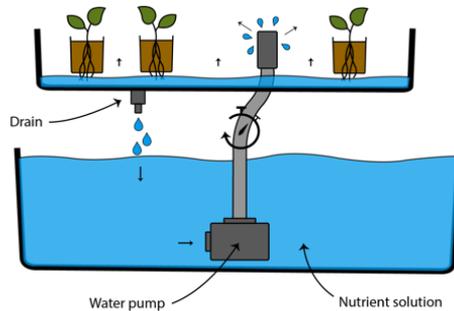
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LEARN: Types of Systems

- LEARN - Example: Slide Presentation

Ebb & Flow (Flood and Drain)

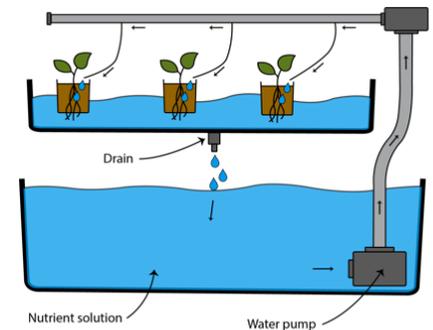
- Water pump on a timer periodically floods the plants with water that includes a nutrient solution
- Water slowly drains back into the nutrient solution



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Drip System

- Water pump draws water from a nutrient solution and drips it continuously on the plants
- The drain returns the water to the nutrient solution



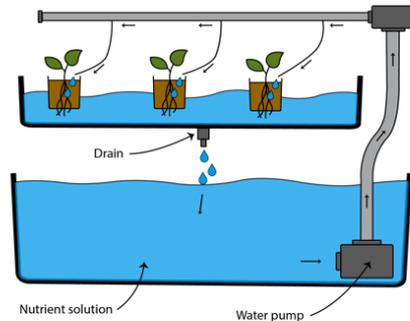
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LEARN: Types of Systems

- LEARN - Example: Slide Presentation

Drip System

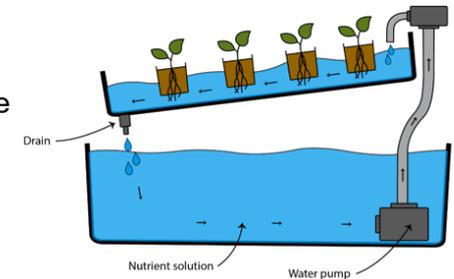
- Water pump draws water from a nutrient solution and drips it continuously on the plants
- The drain returns the water to the nutrient solution



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Nutrient Film Technique (NFT)

- Plants are secured to a ramp at a slight tilt and water is pumped onto the ramp from a nutrient solution
- Water flows down the ramp and drains into the bath, continuously bathing the plant roots



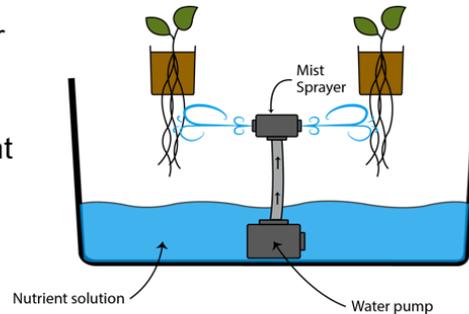
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LEARN: Types of Systems

- LEARN - Example: Slide Presentation

Aeroponics

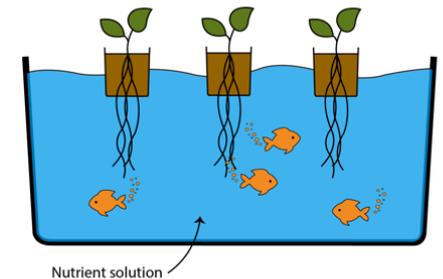
- Water pump draws water out of a nutrient solution and sprays mist directly onto the roots of the plant



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Aquaponics

- Nutrients in the fish waste are converted from ammonia to nitrogen and provide nutrients for the plants
- Plants filter the water to keep the fish healthy



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REVIEW: Parts of a Hydroponic System

- REVIEW – What do you need to grow plants/produce

Main Parts for Hydroponics to Grow

- Lights
- Plants
- Grow medium
- Water and nutrients
- Water movement and oxygenation
- Wind and air flow



Plants

- Some of the best plants to grow hydroponically:
 - Lettuce
 - Tomatoes
 - Radishes
 - Kale
 - Cucumbers
 - Spinach
 - Beans
 - Chives
 - Basil
 - Mints
 - Strawberries
 - Blueberries
 - Peppers



Lights

- Sunlight contains all colors of the spectrum of light
- Plants use little light from the green and yellow parts of the light spectrum
- Grow lights can be full-spectrum lighting, but the light most used by plants is that of the red and blue light spectrum



Grow Medium

- Commonly used to grow plants in for stability and to create a foundation for the plant



Water and Nutrients

- Nutrients definition: the mineral qualities that plants need to obtain optimum growth
- Nutrient solution: the replacement of solid in a medium that supplies the plant with nitrogen, phosphorus (P), potassium (K), and Phosphorus (P)

Wind and Air Flow

- Wind or air flow allows for plants, especially seedlings, to grow sturdy
- Air flow is important to strengthening the plants as well for gas exchange, moving the carbon dioxide to the leaves, and transporting away water (transpiration)

Water Movement and Oxygenation

- Water Movement
 - Creates oxygenation
 - The amount of flow affects the amount of oxygen in the water
 - The more flow (faster moving) the more diffusion of oxygen into the water
- Oxygenation
 - Helps the plant grow
 - Keeps algae and other growths from being as dominant

- Use Slide Presentation & Models to help reinforce concepts on this quiz.
- Discuss orally or have students answer and turn in for participation

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Hydroponics Educational Systems

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Realityworks Hydroponics

- Awarded the Fast Company's 2020 World Changing Ideas Award – Honorable Mention
- Two options for two varied growing options



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Plant Lab Unit

Plant Lab Educational Hydroponics System

Experiment with varying quantities of greens while addressing key plant science, STEM and sustainability efforts with the Plant Lab Educational Hydroponics System. Its three vertical shelves connect to individual water sources, enabling experimentation with plants, water levels and nutrients on each level.

System includes:

- Plant sites: 33
- LED grow lights
- Fans
- Water pump
- 2-gallon water tank/shelf
- Reusable grow cups
- Germination tray, seeds, and rockwool
- 1-year limited warranty

Specifications:

- Plant sites: 33
- Dimensions: 56" x 28" x 15"
- Shelf spacing (grow height): 10"
- Weight: 75 lbs.
- Water capacity: Three 2-gallon tanks, one per shelf
- Fans: one fan per shelf unit
- Voltage: 120v, 60Hz



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Plant Producer Unit

Plant Producer Educational Hydroponics System

Grow production-level quantities of greens while addressing key plant science, STEM and sustainability efforts with the Plant Producer Educational Hydroponics System. Its three vertical shelves connect to a single water source, enabling equal nutrient allotment and concentrated growth on each level.

System includes:

- System control panel with sensor monitoring
- Plant sites: 42
- LED grow lights
- Fans
- Water pump
- 7-gallon water tank
- Reusable grow cups
- Germination tray, seeds, and rockwool
- 1-year limited warranty

Specifications:

- Dimensions: 74" x 31" x 15"
- Shelf spacing (grow height): 20" bottom, 12" middle, 12" top
- Weight: 100 lbs.
- Water capacity: one 7-gallon tank
- Fans: two fans per shelf unit
- Voltage: 120v, 60Hz



System control panel with sensor monitoring



How to get these resources

www.realityworks.com

Now What?



To see our classroom resources, go to www.Realityworks.com



More product information, videos and pricing can also be found at our website under the Agriculture link:
<https://www.realityworks.com/product-category/agriculture/>



For free curriculum, on Agriculture Science, click on the following link:
<https://www.realityworks.com/access-your-guides-and-curriculum/>



AGRICULTURE



TRADE SKILLS



FCS



HEALTH SCIENCE



COVID-19 RESPONSE

Our partnership with educators will continue during the COVID-19 pandemic

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Resources and ideas for continued learning

Webinars

We offer free webinar recordings on various teaching topics to help bring lessons to life in the classroom. Look for upcoming sessions as well as our archived, on-demand presentations:

[🔗 WEBINARS](#)

Free Lesson Plans

Looking for lesson plans on career exploration or soft skill development? Check out our variety of free lesson plans to engage students in topics related to our skills training tools:

[🔗 FREE LESSON PLANS](#)

Program Resources

Currently using Realityworks products and need to access curriculum or cleaning instructions? Visit our all-access resource page and search for your products to access all necessary materials:

[🔗 GUIDES AND CURRICULUM](#)

Professional Development Opportunities

Our subject matter experts have created on-demand presentations to fit various organizational needs. These opportunities include 40-minute online presentations as well as certificates of completions for participation. View all option in the drop-down menu on our PD page:

[🔗 ON DEMAND PROFESSIONAL DEVELOPMENT OPPORTUNITIES](#)

Access Your Guides and Curriculum Agriculture

+ Hydroponics and Plant Science:

- Bovine and Swine Skills:

[🔗 BOVINE AI CERVIX KIT](#)

[🔗 BOVINE BREEDER ARTIFICIAL INSEMINATION SIMULATOR](#)

[🔗 BOVINE INJECTION SIMULATOR](#)

[🔗 BOVINE MILKING UDDER SIMULATOR](#)

+ Animal Models:

+ 3D Classroom Posters:

Family and Consumer Science

Agriculture – Bovine Breeder AI Simulator Downloads

Below you will find downloads for the Bovine Breeder:

Quick Start Guide

■ QUICK START GUIDE-DOWNLOAD

Click on the Quick Start Guide button to download

*This guide now includes the startup instructions for pregnancy palpation

Curriculum

📄 CURRICULUM-DOWNLOAD

Click on the above button to download the Bovine Breeder curriculum zip file.

*This curriculum now includes pregnancy palpation

Completion Certificate

📄 CERTIFICATE DOWNLOAD

Also...

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HYDROPONICS

Created in response to educator requests for interactive growing systems that could be easily used in classroom settings, Realityworks now offers two options for hydroponics instruction: our Plant Lab Educational Hydroponics System and our Plant Producer Educational Hydroponics System.

[HYDROPONICS EDUCATION IMPLEMENTATION](#)

Products

Agriculture

- 2020 New AG Products
- Accessories & Supplies
- Animal & Veterinary Sciences
- Employability
- Hydroponics
- Pathway Packages
- Plant Science
- Professional Development

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Showing all 2 results

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Plant Lab Educational Hydroponics System



Plant Producer Educational Hydroponics System



Hydroponics: Know How to Grow

Tips & Tricks for Starting Out



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PRODUCTS RESOURCES SUPPORT

Hydroponics Educational Systems

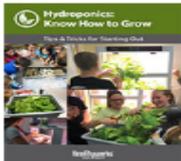


High-tech training tools to increase student engagement and develop valuable skills

Created in response to educator requests for interactive growing systems that could be easily used in classroom settings, Realityworks now offers two options for hydroponics instruction: our **Plant Lab Educational Hydroponics System** and our **Plant Producer Educational Hydroponics System**. These award-winning

systems come with curricula and PowerPoints to teach students what hydroponics is and how it can be used to grow food. Starter kit materials and user guides are included so you can begin growing right away. Use our hydroponics educational systems to engage more students in agriculture, FCS and science programs; incorporate STEM concepts into your curriculum; and teach the relevant, in-demand skills that today's careers require.

Use the links on this page to learn more about these products, how others are using them, request a personalized quote and more.



Hydroponics: Know How to Grow

Use this guide to learn the benefits of hydroponics, how hydroponics systems work and what you need to start growing fresh, healthy food in your classroom. The guide also includes a free poster on the impact of classroom gardens.

[HYDROPONICS: KNOW HOW TO GROW GUIDE – DOWNLOAD](#)

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<https://www.realityworks.com/hydroponics-educational-systems/>

Q&A

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For more information please contact Realityworks, Inc.
through email at information@realityworks.com
or call toll free at 800.830.1416

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