

Unit 2: Aquaponics
Aquaculture and Resource Management
21 Classes

Rev. June 2019

Essential Questions

- How are fish and plants grown successfully together throughout the world?

Essential Understandings with Unit Goals

EU 1: Aquaponics systems can create a mutually beneficial environment for all aquatic organisms in a particular system

- Compare and contrast a variety of aquaponics systems that are used throughout the world

EU 2: If designed correctly, nearly any plant, aquatic or terrestrial, can be grown in an aquaponics system

- Design an aquaponics system to grow fish and terrestrial plants

Standards

Common Core State Standards

- **CCSS.ELA-Literacy.RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **CCSS.ELA-Literacy.RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Next Generation Science Standards

- **HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- **HS-ESS3-4.** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- **HS-ETS1-2.** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

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MSMHS Academic, Civic, and Social Competencies

- Competency 1:** Read and write effectively for a variety of purposes
Competency 2: Speak effectively with a variety of audiences in an accountable manner
Competency 3: Make decisions and solve problems independently and collaboratively
Competency 4: Apply scientific knowledge and concepts to a variety of investigative tasks
Competency 5: Contribute to a positive learning environment with respect and responsibility

Unit Content Overview

- Hydroponics
- Aquaponics
- Aquaponics Around the World
- Deep Water Systems
- NFT Systems
- Ebb & Flood Systems
- Plant Biology
- Filtration

Interdisciplinary Connections

- Biology
- Horticulture

Learning Objectives with *TWPS Activities*

Students will be able to...

- Compare Hydroponics & Aquaponics
 - *How are hydroponics and aquaponics different? How are they similar?*
- Analyze the various types of Aquaponics
 - *What are some of the different ways that plants can be grown in aquaponics systems?*
- Communicate the benefits of different types of aquaponics systems
 - *How might crops react to being grown in the different types of aquaponics system?*
- Research terrestrial plants that can be grown in aquaponics
 - *What characteristics would make a crop suitable to be grown in an aquaponics setting?*
- Discuss the best terrestrial plants that should be grown at MSMHS
 - *Which crop do you think would be the most suitable to run an experiment on? Why?*

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- Design an experiment that tests the growth of terrestrial plants at MSMHS
 - *What are some of the essential components to running a valid experiment?*
- Cultivate terrestrial plants in an Aquaponics system at MSMHS
 - *Which crop or plant would you most like to see grown at MSMHS and why?*
- Analyze the MSMHS aquaponics system
 - *What changes would you make to the current MSMHS aquaponics system to run more efficiently?*
- Maintain an Aquaponics system at MSMHS
 - *How is maintaining an aquaponics system different from other agricultural systems?*
- Research Aquaponics around the world
 - *How is aquaponics being used in different environments around the world?*
- Present research found on Aquaponics around the world
 - *Which countries do you believe are the most advanced in terms of aquaculture and why?*
- Identify the role that urban farming will play in the future
 - *What barriers stand in the way of delivering sustainable and healthy foods to urban populations?*
- Design an urban farm in a local area
 - *Which local areas would be the most suitable for the creation of an urban farm and why?*
- Analyze the financial impact and urban farm would have on a community
 - *In what ways would the creation of an urban farm benefit a community aside from fresh produce?*
- Communicate a proposal for an urban farm in a local area
 - *How would farming in an urban setting be different from a rural setting?*
- Record observations and data from aquaponics experiment
 - *What do the results of the growth experiment tell us so far about our progress?*
- Analyze data from aquaponics experiment
 - *What ways can data be manipulated to give a clearer picture of the results?*
- Identify the important aspects of a professional lab report
 - *How is scientific writing different from other forms of writing?*
- Edit and revise a scientific lab report using peer feedback
 - *What areas do you want to improve the most on in your lab report?*
- Communicate the growth of terrestrial plants grown in an aquaponics system at MSMHS
 - *What would you change about our experiment to improve its reliability and validity?*

Instructional Strategies/Differentiated Instruction

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- **HLP** Academically Productive Talk
- **HLP** Writing to Learn (TWPS)
- **HLP** Effective Feedback
- Warm up
- Teacher Modelling
- Small Group Discussions
- Independent reading
- Collaborative group activities
- Lectures and Note-taking
- Think, Pair, Share
- Personal Connections
- Accountable Talk

Assessments

FORMATIVE ASSESSMENTS:

- Warm Up Activities
- Exit Slips
- Summarizing relevant texts
- Homework Checks
- Daily Check-Ins
- Lab work
- MSMHS System Maintenance
- Aquaponics Experiment Design
 - MSMHS Rubric 4: Scientific Research
- Urban Farm Planning
 - MSMHS Rubric 3: Problem Solving

SUMMATIVE ASSESSMENTS:

- Quiz on EU 1
- Quiz on EU 2
- Aquaponics Experiment Design
- Aquaponics around the world discussion
- Unit Exam

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Unit Task
<p>Unit Task Name: Aquaponics Experiment</p> <p>Description: Students will use the skills and knowledge gathered throughout this unit to design an aquaponics experiment at MSMHS (EU 2). They will choose a specific terrestrial plant to grow in the system and will work as a class to plant, observe and record data over a predetermined period of time. After compiling their results, students will analyze the data and draw conclusions from their experiment to determine the efficiency of the aquaponics system in the form of a lab report (EU 1).</p> <p>Evaluation: MSMHS Rubric 4: Scientific Research</p>

Unit Resources
<ul style="list-style-type: none">• Internet databases• Laptops• Project O• MSMHS Aquaculture Lab