

Aquaponics in STEM Education

A few of many possible examples of aquaponics in the Next Generation Science Standards:

- Students create models to explain from observation how matter cycles in the aquaponic ecosystem
- Students research and defend a comparison of cost-effectiveness, social and economic impact, safety, and reliability of alternative and conventional farming
- Students use mathematical equations to determine proper aquaponic efficiency and regulation
- Students evaluate competing design solutions for an aquaponic system based on available materials, the type of fish and plants being used, and the impact on the environment and culture



Students perform aquaponic system maintenance at IDEA PCS in Northeast DC

ANACOSTIA AQUAPONICS

Aquaponics is HANDS-ON and ENGAGING



Students
feed fish at
IDEA PCS

Students test
pH at J.O.
Wilson



ANACOSTIA AQUAPONICS

Students at IDEA PCS in Northeast DC grow lettuce in aquaponic and hydroponic systems that is served in the school cafeteria salad bar



2-pound Tilapia
in IDEA PCS
rooftop
aquaponic
system



Student
harvests lettuce
from vertical
hydroponic
grow tower

ANACOSTIA AQUAPONICS

What can you teach with one classroom aquaponic system?

Biology

- Photosynthesis and plant growth
- Respiration
- Fish health and growth
- Aerobic and anaerobic bacteria
- Insect and pest issues

Chemistry

- pH and water hardness
- Nitrification
- Aeration and dissolved oxygen
- Nutrient testing and supplementation

Physics

- Water pressure, head height, and friction
- Siphons
- Weight-bearing capacity
- Light wavelength and strength
- Greenhouse heating and thermal mass

Environmental Science

- Agricultural nutrient runoff and hypoxic zones
- Nutrient cycling through a system
- The Feed Conversion Ratio and efficiency of fish protein
- Food miles and the costs of our current food system

Economics

- Weighing costs vs revenue to set a crop price
- Vertical growing and production per square foot
- The economic impact of agriculture
- Starting a business and green entrepreneurship



Aquaponic System at Iona Senior Services in Northwest DC

Math

- Computing the size and production of an aquaponic system
- Calculating water flow rates
- Using formulas to balance fish feeding rates and plant growth
- Graphing pH and nutrient test results

Dietary Issues

- Nutrition and the importance of vegetables
- Fish protein vs. animal protein
- Food waste and nutrient depletion
- The cultural importance of food
- Food safety procedures and risks

ANACOSTIA AQUAPONICS

Vermicomposting

1-hr Vermicomposting
class and
demonstration at
Meridian PCS in
Northwest DC



Vermicompost class is conducted with a **live worm bin**. Students learn:

- The process of vermicomposting and how it differs from other composting methods
- The Red Wiggler Worm's life cycle, health, and environmental requirements
- Aerobic vs. Anaerobic bacteria and the microorganism community in a vermicompost bin
- The benefits of vermicompost on plant growth and the environment
- How to manage a worm-bin and make your own vermicompost
- How to brew and use vermicompost tea

We can even make a worm bin for you to keep in your classroom!!

ANACOSTIA AQUAPONICS

Services we offer:

- School aquaponic and hydroponic system design, installation, and operation
- Aquaponic, hydroponic, and vermicomposting teacher training and NGSS-aligned curriculum integration
- School garden design, construction, and management
- Student training for job skills in sustainability fields
- 1-hour “Intro to Aquaponics” presentation
- 1-hour “Intro to Vermicomposting” presentation and demonstration with live worms
- 1-hour “Introduction to Vertical Farming” presentation

Contact: brian@anacostiaaquaponics.org