

THE IMPORTANCE OF TEACHING AQUAPONICS IN MIDDLE SCHOOL SCIENCE

Sam McCloud and Zoe Rodriguez

Department of Education, Carthage College

Celebration of Scholars 2017: Exposition of Student & Faculty Research, Scholarship & Creativity

Abstract:

With the ever changing environment and lack of natural resources, aquaponics is a growing practice that should be taught to students in the science curriculum. In a unit taught to a 5th grade classroom at KTEC, students were given a hands-on learning experience centered on the alternative gardening option – aquaponics. They were able to plant and harvest their own lettuce, research topics surrounding aquaponics, and create and present group posters. Aquaponics is an efficient, natural way to grow food using minimal resources and space. Aquaponics uses fish and plants to create symbiotic relationship that uses no land, minimal water, and little energy to create a garden. Teaching this in the middle school curriculum is beneficial to educate students on alternative ways to grow food. This was done by creating and implementing a unit plan to explore what aquaponics is, its benefits, and why it is so beneficial. Students were able to each plant lettuce and monitor its growth throughout the unit. They were split into groups of 5-6. Each group was given a topic related to aquaponics, and each student was given a subtopic to focus on. All students received rubrics, a list of websites for their topic, and task sheets with specific questions and expectations. Students became experts on their topics, and shared their knowledge with the rest of the class. The scores of the projects as well as a final assessment proved deep understanding of the material. Students walked away with increased curiosity and knowledge of the aquaponics unit and wanted to continue to share what they learned with others.

What is Aquaponics?

Aquaponics is a system in which the waste produced by fish supplies the nutrients for the plants. The waste from the plants supplies the nutrients for the fish. Aquaponics is simple to set up, and requires only a few, inexpensive items.

Materials:

- Fish and Fish Tank
- Fluorescent Grow Lights
- Growing Medium (Geolite and Rockwool)
- Seeds
- Air Pump and Tubing
- A Submersible Water Pump and Tubing



Why Teach It?

With increased urbanization and pollution, it is important to teach students about more sustainable agriculture **now**. Aquaponics is natural, sustainable, requires less land, uses less water and resources, and is faster than traditional agriculture methods!

Our Class:

This unit was taught in 5th grade class at KTEC West (Kenosha school of Technology Enhanced Curriculum). KTEC is a choice school in the Kenosha Unified School District that uses a lottery enrollment system. Our class consisted of 26 students, 17 of them being boys and 9 girls. We taught the unit over a 7 week period on Mondays and Wednesdays.



Our Unit

Part 1: Ecosystems

Part one of our unit consisted of lessons to teach the students about the different parts of the ecosystem. During this time they kept an “Ecosystem Journal” with all of the new information they received during the unit.

By the end of this unit students were able to:

- Define ecosystem
- Define biome
- Name the five major biomes and describe the biotic and abiotic features in each
- Define composer, decomposer, and producer and explain where on the food chain each fall
- Explain human impact on the environment (both positive and negative)
- Describe ways we can reduce our negative impact on the environment

Part 2: Aquaponics

This part of the unit began with an introduction describing what aquaponics is and a day to plant lettuce seeds in the aquaponics unit at KTEC. Once this was completed students were split into six groups to complete a research project to teach the class about a specific aspect of aquaponics. The group topics and subtopics were:

- Group 1: **How do plants grow in soil?** Each student in the group was given one of the following subtopics: photosynthesis, plant lifecycle, where nutrients come from, and how humans help plants and how plants help humans
 - Group 2: **How does the aquaponics system work?** Each student in the group was given one of the following subtopics: What is needed, how to set it up, aquaponics cycle (how aquaponics works), and system maintenance
 - Group 3: **The Carbon and Nitrogen Cycle.** Each student in the group was given one of the following subtopics: the nitrogen cycle, the carbon cycle, human effects on the cycle, and the carbon and nitrogen cycles in aquaponics
 - Group 4: **Fish Selection.** Each student in the group was given one of the following subtopics: characteristics of aquaponics fish, why you need fish, care of fish, which fish are ideal, and fish pests and diseases
 - Group 5: **Plant selection.** Each student in the group was given one of the following subtopics: Which plants are best, materials for planning, how to properly plant (seeding and harvesting), plant care, and plant pests and diseases
 - Group 6: **Benefits of aquaponics.** Each student in the group was given one of the following subtopics: regular growing vs. aquaponics, benefits to the environment, health and nutritional benefits, and economic benefits
- Each group was given their subtopics along with website links to help them in their research. They created trifold presentation boards with their group information and presented them to the class as the class filled out a guided notes sheet. On our last day students were able to harvest and try the lettuce they grew in the aquaponics system.



Acknowledgements:

This unit was made possible by the work of Dr. Angela Andersson, Dr. Prisca Moore, and Elizabeth Wittenborg. A special thanks goes to faculty advisor Dr. Lara Christoun.