

NC ACCESS BEST PRACTICES



Office of Charter Schools
NC ACCESS PROGRAM
NC Department of Public Instruction

School Culture

Student Engagement

Aquaponics In School

Implementation Description

During the 2021-22 school year, teachers of Bonnie Cone Classical Academy (BCCA) partnered with 100 Gardens to develop a student-run, profitable Aquaponics program. The STEM based experience provided novel learning experiences for students and made an impact on the local community.

BCCA's partnership with 100 Gardens began in 2019, when two of their teachers were selected to be a part of the [Kenan Fellowship](#) experience. As part of the program, the teachers completed a summer internship with 100 Gardens, "a Charlotte nonprofit that implements aquaponics gardening programs in schools, institutions, and communities of need" (Solano, 2020). As an outcome of their experience, the teachers developed a four-week unit for middle school students that ties to state standards in literacy, math, science, and health. Throughout the lessons, students received hands-on experience in the greenhouse and learned how their experiences connect to the real world. BCCA piloted this new curriculum during the 2021 summer jumpstart program and have since expanded it to include their fifth graders.



An aquaponic system involves both fish and plants, providing a great opportunity for students to learn about both organisms and how they can benefit each other when combined into one system. The school acquired funding for the initial project through the generous support of 100 Gardens and the Kenan Fellows Program. As the program grew, the school used

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About This School

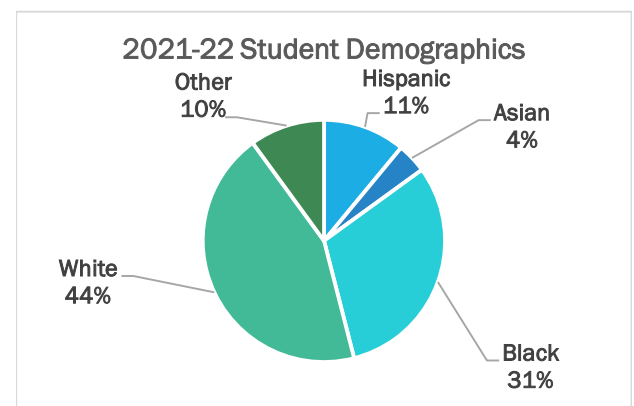
Bonnie Cone Classical Academy

Bonnie Cone Classical Academy will equip students with the tools to think critically, reason effectively, and communicate persuasively through the rigors of a classical education. BCCA offers one school where students can attend for their entire K-8 career. This school model creates an atmosphere of academic excellence through a cohesive and consistent K-8 curriculum on one campus. The lasting relationships formed among staff and students created by this model facilitate accountability and mentoring which are not feasible with segmented education.

Year School Opened: 2019-20

Grant Awarded: 2019-2020

Initial Grade Levels Served: K-5



% ED Student Population: 14.5%

Urbanicity: Urban / Huntersville, NC

Persons in Poverty (Mecklenburg)⁵: 11.0%

NC ACCESS funds to purchase two additional grow beds resulting in the current system containing three grow beds and one 200-250 gallon fish tank. Fifth grade scholars developed daily routines for monitoring fish tank conditions, which included reading and adjusting the pH levels for the tank, recording daily temperature and water condition, and carefully measuring and feeding the tilapia each day. Over the course of the year, scholars became more observant and aware of the health and needs of the fish, especially the tilapia's habits from feeding to simply moving about the tank. The students collected their data each day on the tank conditions, chemicals added, health of the fish, and harvesting. They submitted a [google form](#) with the information, which was then sent to their partners at 100 Gardens.

After students had a well-established routine for caring for the fish, they began growing their hydroponic lettuce. They learned how to plant seeds in a hydroponics bed and mix the correct amounts of fertilizer to maximize their harvest. In approximately two weeks the seeds were divided into individual plants and transplanted into the floating aquaponics beds. Over the next few weeks, scholars made observations and collected data related to plant growth to determine when a produce could be harvested. When it was time to harvest, the scholars pulled the plants from the bed, detached the roots, weighed the plants and bagged the lettuce crop for sale.



In preparation for sale of the lettuce, the fifth graders partnered with the BCCA National Junior Honor Society 7th/8th graders to develop a business plan to sell the lettuce to the community in the school's afternoon car rider line. Additionally, some produce was donated to a non-profit for homeless refugees. The profits from the lettuce sales will be reinvested for future aquaponics project expenses. By the end of the 2021-22 school year, scholars were familiar with the operation of a small aquaponic farm system and were even able to teach the younger scholars in the building.

The aquaponics program at Bonnie Cone has been a meaningful learning experience for their students. View [this video](#) to learn more about the process from a student. They have responded well to hands-on learning which has been shown to improve student retention and achievement (Arnholz, 2019). The students have commented that this has been one of their favorite memories of the school year, and they will likely retain the knowledge gained from this project for many years to come.



Results

BCCA conducted 4 lettuce sales and raised about \$500 which will be used to purchase future aquaponics supplies, such as a cooler for harvested lettuce.

The students were highly engaged in the project and developed many of the soft skills employers emphasize, such as communication and teamwork. Many students remarked that Aquaponics was their favorite part of the day.

Challenges

As with anything new, there are bound to be a few challenges. BCCA experienced two major system failures this year and lost fish due to stress.

With the support of their partners at 100 Gardens and the school administration, they were able to overcome these setbacks.

Future Modifications

In the upcoming year, Aquaponics will be an elective for Middle School Science. As an addition to the curriculum, students will apply technology skills in a real world scenario by tracking income and expenses with an Excel balance sheet.

As most of the older students were exposed to the system last year, they will become guides and mentors to younger students. The school plans to garner interest in the program by providing introductory aquaponics classes for the younger students utilizing the curriculum created by Bonnie Cone Teachers. Over time, BCCA plans to expand the program by growing other crops, such as herbs and other vegetables.

As lettuce production increases, it will be important to purchase a cooler to store the harvest prior to sale.

Critical Components

Getting Started

This strategy highlights one example of how a partnership with a local business or organization can provide an outstanding educational experience for students. It is important to seek out organizations who are willing to partner with schools, such as the NC Farm Bureau, the NC Electric Cooperatives, agricultural extension offices and local businesses.

In launching this program, it is vital to have administrative support and flexibility, especially when inevitable challenges arise. When BCCA experienced two major system failures, the administration continued to support the program, which enabled teachers to persevere.

The teachers heavily relied on the experienced aquaponics professionals to guide them and answer questions as they arose. Their knowledge base has proven to be invaluable.

Ongoing Supports

BCCA will maintain an ongoing partnership with aquaponics professionals who can provide state of the art information and support as the school's program continues to grow.

Equity Connections

Historically, educationally disadvantaged students have the least access to engaging, real world learning experiences. Often, the lessons are teacher driven and lack opportunities for students to gain critical thinking skills. However, educationally disadvantaged students have more to gain from having access to these experiences. One study compared a teacher driven lesson with a student driven, hands on lesson at a high poverty school. The researchers found that more learning goals were addressed with the hands-on approach. Additionally, the children used higher academic vocabulary and were more descriptive in their explanations after the student-driven unit (Dresdan & Lee, 2007). Bonnie Cone's commitment to quality hands-on learning experiences benefits students in poverty by providing them with rich opportunities to problem solve and ultimately receive an educational experience equitable to that of their peers. These early STEM learning experiences can provide "critical opportunities to build early interest and mastery" (Change the Equation).

Research

1. Arnholz, J. (2019, February 12). *"Is Hands-On Learning Better?"*. Retrieved September 25, 2020, from <https://www.byf.org/news-item/is-hands-on-learning-better/>
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5. United States Census Bureau, *"Quick Facts North Carolina"*. Retrieved from <https://www.census.gov/quickfacts/fact/table/NC/PST045219>