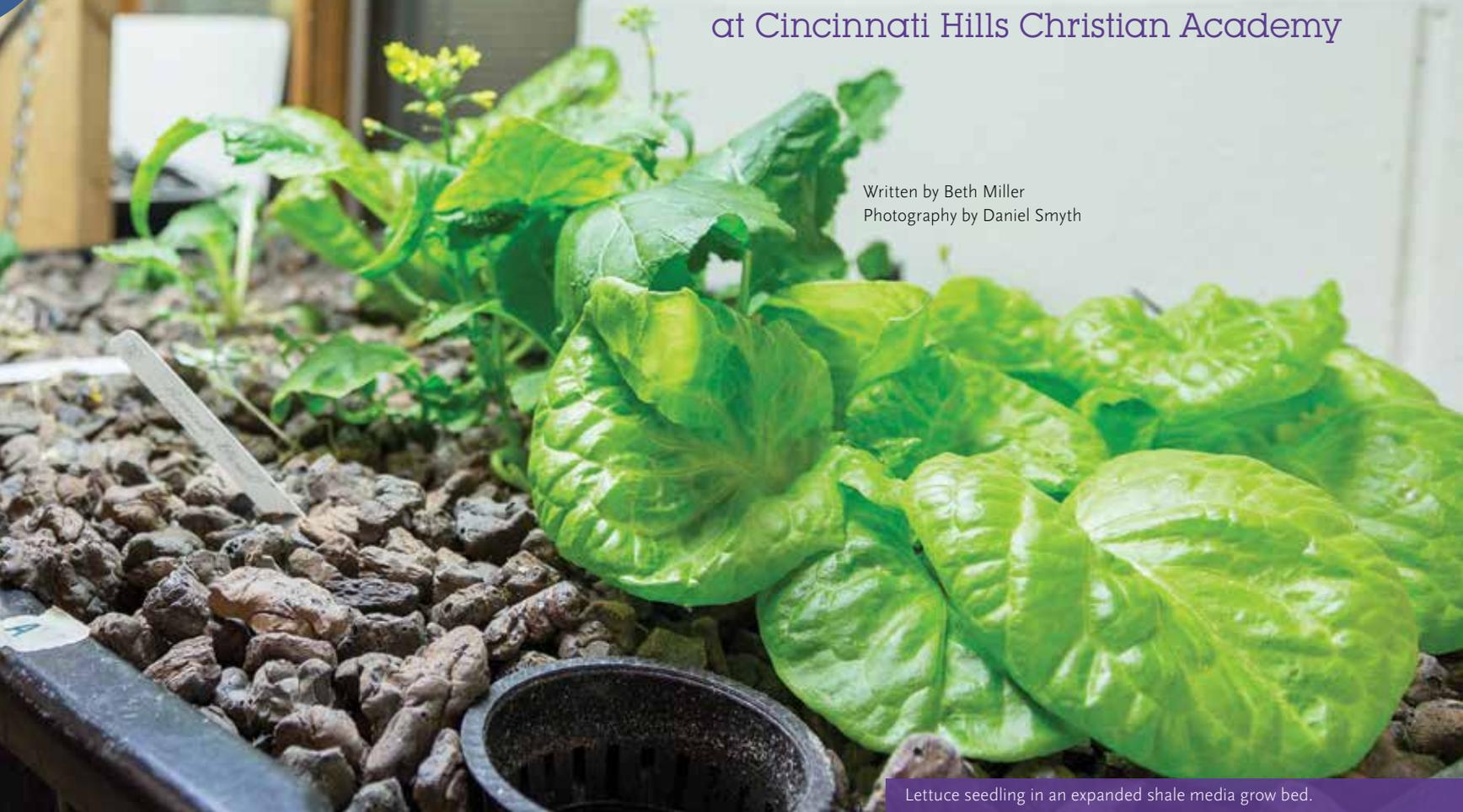


World Class Aquaponics Program Grows Beyond the Classroom

at Cincinnati Hills Christian Academy

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Photography by Daniel Smyth



Lettuce seedling in an expanded shale media grow bed.

At first glance, it looks like something out of a science fiction film, an experiment in the making with a concoction of tubes, containers and tilapia-filled water. Flats of leafy green plants float like miniature forests, their roots reaching into the water.

Cincinnati Hills Christian Academy's (CHCA) aquaponics program has been named by Seedstock, LLC as one of the top ten programs in the U.S. Under the direction of Upper School teacher Dr. Kevin Savage, the aquaponics lab is currently housed inside of CHCA's Martha S. Lindner Upper School 9-12 campus, but a new free-standing greenhouse is in the works and will be up and running by this fall. "This new greenhouse will allow the space and opportunity for students and faculty to further their innovation and research. New engineering models and labs will be incorporated into the space, allowing for further thought and leadership opportunities for CHCA in this ever-growing field of study," states Head of School Randy Brunk.

As physical food cultivating space here on this earth shrinks, opportunities in aquaponics continue to grow. "Population scientists say

we're on track to have 9 to 10 billion people by 2050, and we need to be actively considering how do we feed that growing population with very limited land and water resources?" Dr. Savage says. "I wouldn't say that aquaponics will solve all of the problems, but it will certainly be a key piece in the solution." Dr. Savage has a Ph.D. in Quaternary Geology from the University of Cincinnati and currently teaches chemistry, environmental science and sustainable and urban agriculture at CHCA.

Aquaponics is a marriage of aquaculture (fish farming) and hydroponics (soil-less growing of plants), thus growing fish and plants in an integrated self-sustaining system. Fish waste nourishes growing plants naturally, while the plants then filter the water for the fish to live in. Water is continually recycled so aquaponics uses about 10 percent of the water that is required for the same amount of space in a conventional soil-based planting system.

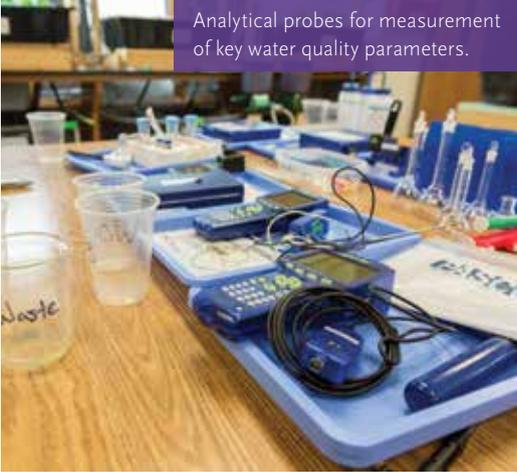
In 2011 Dr. Savage established the aquaponics program with students in his environmental science class. They crafted a vertical re-circulating system with recycled two-liter soda bottles, shale media and a



Waste solids separation and bacterial biofilter components of an aquaponic system.



Floating fish food at tilapia feeding time.



Analytical probes for measurement of key water quality parameters.



Basil seedling in an expanded shale media grow bed.

65-gallon aquarium. The program has grown significantly in the past five years, partnering with UC, The Cincinnati Zoo, and many industry experts, and shows no signs of slowing down.

CHCA students are given a unique hands-on learning experience that covers subjects including biology, math, physics and chemistry. Freshmen are introduced to aquaponics in their Biology classes to learn about aquatic ecosystems, basic microbiology and chemistry of natural waters. Sophomores use aquaponics in Chemistry to understand pH, oxidation-reduction reactions and multi-parameter water quality testing. Juniors and seniors are eligible to take an Environmental Science elective, which builds upon previous experiences with aquaponics through learning about plant and fish biology, microbiology and designs for various aquaponics system types.

“It’s been fun to regularly work in here and collect data,” says senior and National Merit Finalist Jeremy Devin. “As I consider exploring this kind of research in college and possibly as a future career, I am learning so much from the studies I’m engaged in here.”

Students plant, maintain the systems through water chemistry and take care of the fish up to the point of harvest. The students have grown lettuce, kale, hot and bell peppers, tomatoes, basil, tarragon and mint.

“It’s interesting to note the fluctuations in the water quality as we change things and switch up the plants,” says Jessica Boemker, also a National Merit Finalist and senior at CHCA. “We’re able to see how that affects the environment based on how the plants take up the nutrients.”



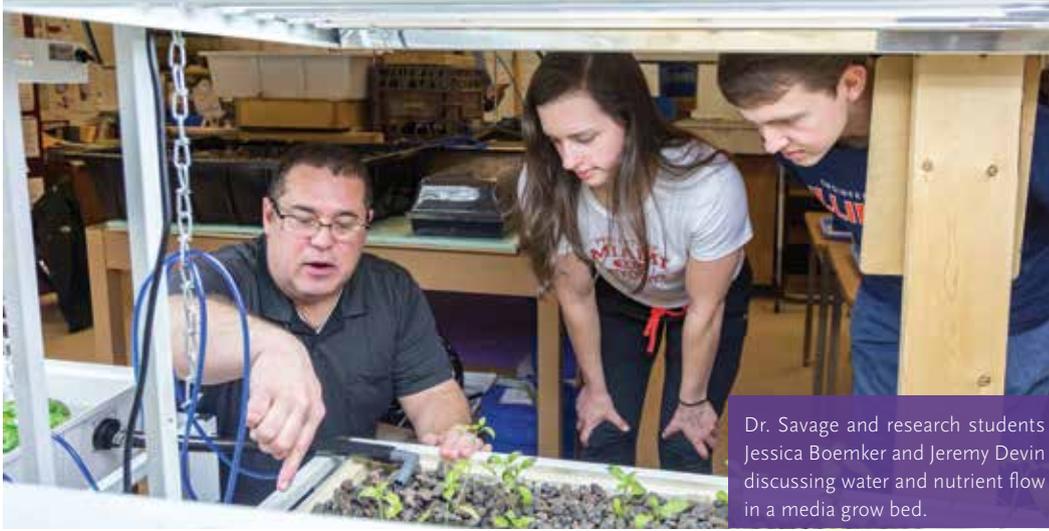
Students Alexis Bowden (left), '15 and Jada Kiner (right), '15 transplanting seedlings in the media grow bed portion of a “barrelponics” aquaponic system.



Student Grant Nam, '15 measuring the dissolved oxygen level of the fish tank in a “barrelponics” system.



Students Payne Vanderwoude (left), '15 and Chandler Meador (right), '15 harvesting lettuce, kale, and basil from a ZipGrow® vertical tower aquaponic system.



Dr. Savage and research students Jessica Boemker and Jeremy Devin discussing water and nutrient flow in a media grow bed.



The CHCA January 2016 Holy Land Intersession team with Daoud Nassar (front, center) and the completed aquaponic system at the Tent of Nations Nassar Farm near Bethlehem.

Several students were recently given the opportunity to put their knowledge of aquaponics to the test outside of the classroom – and the country – during an Intersession experience in Israel. Intersession is CHCA’s unique two-week annual experiential learning opportunity that allows students to ignite their passions in real world settings. Experiences come in a wide variety and the CHCA Intersession Scholarship Fund provides assistance to ensure a broad range of opportunities are available to students.

In January 2016, an Intersession group of CHCA faculty, students and parents traveled to Israel and together built an aquaponics system at the Nassar Farm, called the Tent of Nations, in Bethlehem, West Bank. The organic farm is owned by the Nassar family, which will greatly benefit from a self-sustaining gardening system given their limited land and resources.

CHCA Principal Dr. Dean Nicholas first learned about Tent of Nations and Daoud Nassar in March 2012. Upon learning of CHCA’s expertise in aquaponics, Nassar expressed interest in integrating an aquaponics system at his family’s farm. “In the struggle for keeping their land, the Nassar family has lost electricity, a water source and even had buildings taken away,” says Dr. Nicholas. “They want to be able to live off the grid and be self-sustaining, and aquaponics is a great solution for their lack of water.” The Intersession group built a robust system including a tank holding about 60 tilapia and three major grow beds.

The Nassar family will be able to plant in the spring and, having been taught how to build an aquaponics system, the farm can easily connect another tank and expand. “Seeing this mission come together was very rewarding,” Dr. Nicholas added. The 10-day Intersession included five days in Bethlehem installing the aquaponics system and concluded with a condensed tour of the Holy Land.

In addition to providing a hands-on interactive and innovative learning environment, students in their junior and senior years are able to delve further into aquaponics through CHCA’s research and leadership program. Students conduct research with the assistance of faculty and aquaponics industry professionals outside of the CHCA community. CHCA recently presented their current research at the World Aquaculture Society’s Triennial, the largest aquaculture meeting in the world.

There are many plans for aquaponics at CHCA, as the program continues to grow. Dr. Savage plans to incorporate a farmers market with the fresh produce harvested from the aquaponics systems. He also hopes the students and community will become more aware of and develop a deeper understanding of the critical nature of environmentally sustainable agriculture through exposure to aquaponics. ❖

Cincinnati Hills Christian Academy is located at 11525 Snider Road, Cincinnati, OH 45249. For more information, call 513.247.0900 or visit www.chca-oh.org.