



Students Experience Amateur Radio in a Hands-On STEM Camp

The Mercer County Amateur Radio Club (MCARC) and DX Engineering teamed up to show Ohio students ham radio basics by constructing antennas, receiving satellite signals, and more.

Joshua Reichard, K8KJR

This past spring, students from Youngstown, Ohio, felt the joy of amateur radio in a STEM camp focused on satellite communications. The Mercer County Amateur Radio Club (MCARC) and DX Engineering partnered with Valley Christian Schools and Mainline Education Foundation to host the week-long camp, which introduced students to basic radio theory, shortwave listening, and satellite operating on the 2-meter and 70-centimeter bands. The 12 students who participated each received their own Tecsun PL-600 SSB shortwave receiver, a pre-programmed Baofeng UV-5R (with transmit disabled), Ward Silver's *Ham Radio for Dummies*, and a variety of other take-home resources, including a Yagi antenna they built themselves.

The city of Youngstown has been ranked with one of the highest childhood poverty rates in the US, and its public school district has been in academic and fiscal

distress for more than 15 years. Providing amateur radio education and equipment to disadvantaged students gave them opportunities they may not have otherwise received. The camp was designed as an enrichment education activity to address learning loss due to school shutdowns during the pandemic. It was



Olivia Reichard is featured on local television as she checks the features of her radio.

funded by a federal grant and generous donations by DX Engineering (thanks to CEO Tim Duffy, K3LR) and individual donors.

Inspiring the Next Generation

This was the fourth annual STEM camp organized by Dr. Josh Reichard, K8KJR, former Assistant Superintendent at Valley Christian, and David Richardson, K3KDR, director of a local community computer lab. Tommy Gober, N5DUX, a professional STEM curriculum developer from the nonprofit CYBER.ORG, traveled from Houston, Texas, to lead the satellite portion of the camp — including the antenna build. “It was a pleasure to visit Youngstown, connect with friends in amateur radio, and spend time introducing students to the hobby,” said Gober. Dr. Reichard, Richardson, Duffy, Barney Scholl, K3LA, and Carol Scholl, K3LEA, also taught classroom portions of the camp. Local television station WKBN covered the event.

“I definitely plan to get licensed,” said Corban Ulery, a seventh grader at Valley Christian. “I have been listening to our local repeater every day and can’t wait to get on the air. I’m studying!” The Baofengs were pre-programmed with frequencies for local repeaters, weather, and satellites by MCARC member Al Sangregorio, N8GUY.

Roselyn Wade, an eighth grader, said her favorite part of the camp was “building something and actually seeing it work.” The students’ eyes lit up when they received their first signals from the International Space Station (ISS) repeater using their own homebrew

antennas. Students also experienced the frenetic nature of satellite contacts as they witnessed a live contact between Gober and Grace Papay, KE8RJJ, via Saudisat 1C (SO-50). Fortunately, satellite passes, including the ISS, were abundant during the week and students had several opportunities to receive signals.

Building the Tape Measure Yagi

In the most hands-on activity of the week, students constructed their own tape measure Yagi antennas. Various materials were donated and prepared in advance by Dr. Alex Cocco, W3XH, who also created a wooden jig to simplify cutting each element to the appropriate length. Stations were set up in the school’s physics lab, and volunteers manned the stations to assist students. “It was very rewarding to see the students build this antenna from start to finish,” said Dr. Cocco. DX Engineering donated the feed lines, and Duffy and Carol Scholl manned the soldering station. Cory Gibson, W3JL, and Jeff DeSalvo, N3JD, provided construction support. The design for the antenna is available on Gober’s website at www.n5dux.com/ham/tape-measure-yagi.

“Though the antennas worked for receiving satellite passes, they are not optimized for transmitting on 70 centimeters,” Duffy explained. “Once the students are licensed, we hope to help them build a dual-band antenna suitable for transceiving.” A diplexer, such as the simple design by Kent Britain, WA5VJB, may be useful for future builds. Adult volunteers made sure that students exercised caution with the tape measures, which had sharp edges, albeit notched and covered



Tommy Gober, N5DUX, demonstrates a satellite contact with the ISS repeater.



Students and volunteers participate in the SWL Scavenger Hunt.

Dr. Alex Cocco, W3XH, assists students as they test their antennas.



with electrical tape. The students were required to use safety equipment during construction, but the cut edges were an ongoing safety concern. Heat shrink wrap or Plasti Dip may better protect the sharp edges. Duffy also noted it might have been easier to pre-solder terminal lugs so students could easily connect the feed line with a screwdriver. Even though there is always room for improvement, the purpose of the activity was achieved: students experienced the wonder of building their own antennas, connecting them to radios, pointing them to the sky, and hearing signals.

Bright Futures for Student Hams

During the week, students also participated in an SWL Scavenger Hunt with their shortwave receivers. Using wire antennas in the school's parking lot, they heard stations in Europe, South America, and the Caribbean. This activity enabled them to learn about beacon stations, FT8 decoding, WWV time transmissions, grid squares, and the phonetic alphabet. Exploring the world of HF inspired students to persevere in the amateur radio hobby. In just a few hours, they experienced a breadth of topics firsthand, giving them an idea of just how much there is to learn and do in amateur radio.

"I'm working hard to upgrade to my General-class license by Field Day," said Liam Roberts, W8LBR, who was Valley Christian's salutatorian and a licensed Technician prior to the camp. Roberts attended Allegheny College the following fall with a full scholarship to study Environmental Science and Sustainability. "I can't thank Dr. Reichard enough for

introducing me to this amazing hobby. This is something I can do for the rest of my life," he enthusiastically reflected. Shortly after the camp's conclusion, Roberts' hard work paid off as he succeeded in earning his General license.

Another camp attendee and daughter of Dr. Reichard, Maria Reichard, KE8SPB, has since earned her Technician-class license. She has made contacts to 50 countries and counting on 10 and 6 meters, and continues to study for her General test. She is also a member of the Young Ladies Radio League (YLRL).

An outline and links to various resources utilized during the camp is available upon request on the MCRARC website at www.w3lif.org.

Dr. Joshua D. Reichard, K8KJR, is a lifetime educator, licensed school superintendent, and clinical sociologist. He is President of Omega Graduate School in Dayton, Tennessee. Reichard is also Senior Core Faculty of Doctoral Research at the American College of Education and Associate Faculty teaching computer science in the Forbes School of Business and Technology at the University of Arizona Global Campus.

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