RADIO WAVES

News you can use for license instruction and radio science education

2024 - Issue 1

ARRL The National Association for Amateur Radio®

Turn to the end of this issue to read a note from ARRL National Instructor Gordon West, WB6NOA!

In this issue...

How Third Graders Tracked NOAA Satellites

Kathy Lamont, KM4TAY
Submitted 2023

During the TI-2 workshop in 2022, each person was gifted an Arrow antenna, an FT-60 handheld, and an SDRPlay. When I returned home, I did some research on NOAA satellites to study weather. After experimenting and working with some local ham friends, I was able to share what I had learned with my third grade students in Virginia. Using the new tools I acquired from TI-2, my students and I were able to track the NOAA satellites and see our local weather in real time!

We used the SDRPlay to capture the sound from the NOAA satellites and the Audacity app to record the sounds. Some students sat outside with our computer to watch the waterfall on the SDRPlay, and others used the Arrow antenna and the FT-60 to listen to the sound. The handheld group could see how the sound they were tracking looked on the computer, and the computer group heard the sound from our handheld group. They were able to see how moving the Arrow antenna changed the sound they were receiving. They could also see how the sound degraded as the satellite reached LOS, and they could see the direction the Arrow antenna was facing, as well as the elevation, via a tracking app on my phone.

Next, we converted the sound waves in Audacity, and I showed the students that the sound waves contained the telemetry from the satellite. Using WXtoImg, we turned the telemetry into images so students could see clouds and weather from above our location. We looked at the highs, lows, and average temperatures for the week with our campus weather station. The students put these numbers into Excel by rounding the temperatures to whole numbers. They were able to learn about outlier data (as one high temperature was 108 Fahrenheit, but it was not accurate). These numbers were used to create a line graph in Excel.

We have listened to ARISS downlink contacts with the Arrow and the handheld. The students in my school have read off the questions and listened to the astronauts' answers.

"Boot Camp" Gets Results: Dayton Amateur Radio Association (DARA) Shares Their Radio Class Format

Robert Neben, K9BL
Submitted 2024

With only four license class meetings in a month, how successful can the class be? DARA students have achieved a pass rate in the 80 to 90 percent range, and several of our students are now part of our teaching staff. DARA has been teaching amateur radio classes of all three available levels in a boot camp-style class for the last several years. Let me tell you how we prepare for this task.

Instruction Resources: We pull resources from the ARRL website. The ARRL PowerPoint slides follow the chapters in the license manual, and the information on each slide leads us to a thorough discussion of each topic. We order the license manuals ahead of time.

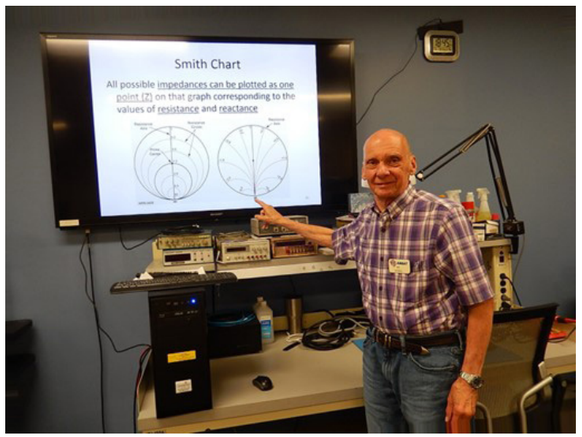
Preparation: We set up the classroom, recruit a cadre of instructors, order copies of the applicable ARRL license manual, display the ARRL PowerPoint slides, and quiz ourselves on the exam questions from the license manuals.

On-Site Location and Instructors: DARA is fortunate to have a clubhouse with tables and chairs for the students, a computer with a big TV that we use as a monitor, and a whiteboard to do our "chalk talks." Our instructors are all members of our club. They're not necessarily electrical engineers or college professors, but they are our club "Elmers," and they make a great teachers.

First Meeting: We discuss the art of studying and test-taking. We tell students to try not to memorize test questions — there are too many of them. Instead, we tell them to try to understand why the right answers are correct and why the incorrect answers are wrong. Next, we go through the questions in the back of each chapter that correspond to the master list of test questions. There's no fault in missing a question; we just want everyone familiar enough with the subject matter to be able to pass the actual exam when the time comes.

During the week following the last class, students take the exam administered by the Volunteer Examiners. We have new or upgraded hams in only 5 weeks. See below for a rough teaching schedule:

- Pre- assign: Chapters 1 – 3
- Read by 2nd class: Chapters 4 – 5
- Read by 3rd class: Chapters 6 – 7
- Read by 4th class: Chapter 8 – 10



K9BL teaches students at the DARA Clubhouse how to interpret a Smith Chart. He has been licensed since 1957 and holds an Amateur Extra-class license. He is an adjunct professor, a network engineer, a systems analyst, and a pilot. He is also a Volunteer Examiner.

We've found there are other club benefits to teaching classes. They help students pass their exams and serve as a technical review for the instructors. The club has gained more active licensed operators and club members. As a perk, we give our students who pass their exams a free 1-year membership in our club. If your club isn't growing, try running some classes. This will help get more new amateurs and upgrade some of your existing club members.

"After The Exam" Class at W8FT Helps New Hams Do More

Bill Kelsey, N8ET
Submitted 2024

After folks take their license exams at the Findlay Radio Club, W8FT, we never seem to hear from them again. Nowadays, folks often get their license and have never even heard a live QSO, so we decided to try a class for newly licensed hams. We sent emails to about 25 of our recent exam takers. I was pleasantly surprised when 6 people showed up to the first class. Here is how it went:

I had planned on discussing the many aspects of the ham radio hobby — CW, SSB, FM, EME, Em Comm, HF, VHF, what new (or used) radio to buy, etc. We did a quick review of some of the books we had in the club library. I talked briefly about organizations like ARRL, ARCI, RSGB, etc. I asked them to bring their questions to the group. I also asked them to bring their new radios or other pieces of equipment so we could help them understand how to operate them. The class that was scheduled from 2 – 4 PM went until 6:30 PM.

I was even more surprised when they all returned the next week, and several of them brought pieces of equipment. Over the next few weeks, we had equipment ranging from handhelds, DMR gear, a Microbitx, a new FT-991A, and a NanoVNA. We managed to get most of the equipment working. In another class, we even made a twinlead J-pole and sent it home with a newly licensed grandmother who had never even made a QSO. We also made a dual-band HF dipole and adjusted it for minimum SWR on both bands.

It became apparent that the answers I had for most of the ham questions started with, "It depends." Students learned very quickly that there are no cut-and-dry answers to most things in ham radio, and they can experiment and learn along the way. They are learning where they can find answers in ARRL books. The class is growing, and the original students keep coming back. Longtime members of the club are continuing to come and help out. We have great get-togethers on Sunday afternoons, and we all learn something.

Ham Radio Takes Off at ASCTE

Chris Brown, W9SBS
Submitted 2024

The Alabama School of Cyber Technology and Engineering (ASCTE) opened its doors in Huntsville, Alabama, in fall 2020. As a school focused on engineering, ham radio was a natural fit, and the ASCTE Amateur Radio Club began in fall 2022.

The meteoric rise of ASCTE's club is due in large part to a generous grant from ARRL and steadfast support from the Huntsville Amateur Radio Club (HARC). Grant funding allowed us to set up a VHF/UHF station based on an IC-9700. ARRL also provided a veritable library of amateur radio publications. By spring 2023, the club had its own call sign, N4CTE, and it had participated in its first School Club Roundup, amassing more than 400 points. At the end of the 2022 – 2023 school year, ASCTE was selected for an ARISS contact in 2024.

Engineering instructor and club sponsor Dr. Chris Brown, W9SBS was invited to attend the ARRL Teachers Institute in Dayton, Ohio, during summer 2023. Once again, the generosity of ARRL was a boon to the ASCTE club, as we gained a wealth of equipment and additional publications. This began the club's experience with foxhunting, which is now a favorite activity among the students. The club conducted several on-campus foxhunts that fall.

A generous loan of an IC-7300 from HARC has enabled the club to engage in exciting DX contacts. In our second School Club Roundup in October 2023, we scored more than

600 points. RF Engineering became an official school elective course during the winter, with 18 students participating and learning all about radio, as well as developing useful skills like soldering.

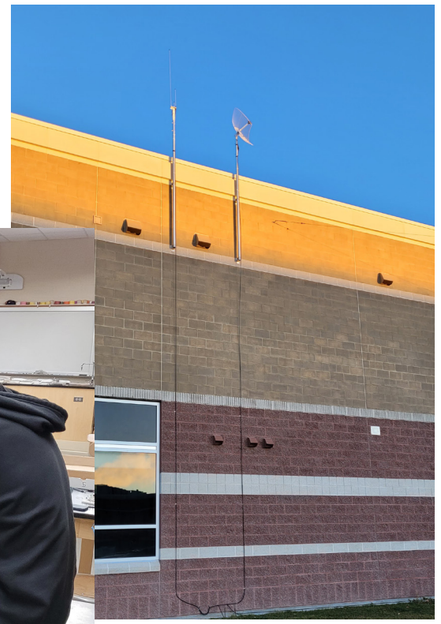
Currently, seven students hold Technician-class licenses, and the club sponsor has upgraded to an Amateur Extra-class license. There is so much interest in licensing, with 10 students and one staff member planning to test for their Technician license, and two students and one adult planning to test for their General license.

With the support of ARRL and the local amateur radio community, ham radio has taken off at

ASCTE and is becoming one of the most talked about activities on campus. Among all the exciting developments, there is no doubt a live talk with an astronaut aboard the International Space Station will be the highlight of our year.

Documenting the Ups and Downs of a High School Radio Club

Ronald Call, KE7CR
Submitted 2024



I participated in ARRL's Teachers Institute 1 several years ago, and TI-2 during summer 2022. TI-2 especially kick-started me into incorporating more radio in my intermediate and advanced electronics courses for my high school students. With grant money, I was able to get a lot of equipment in order to try out the following activities.

Last year, some students worked to configure and deploy remote sensor packages using APRS. It was more difficult than I had anticipated. We had problems getting the Arduino to communicate correctly with the Radio Shield 2 module we were using for APRS. It provided lots of troubleshooting experience for the students, but they got frustrated with so many issues. I'm planning to get this year's students to work on them again.

I had also bought a few Yaesu FT-60 dual-band handhelds and Arrow antennas, and we tried doing satellite contacts. Students thought it was cool, but it wasn't easy! It wasn't easy to find a time when an FM satellite was passing over at a good elevation during class. Students had more fun making 2-meter tape-measure Yagi antennas and doing foxhunts.

This year, we made a quantum leap! Students have been on the air more, and they are becoming more motivated to upgrade their licenses to General class so they can operate on more HF frequencies. With a grant we received, we bought a new Yaesu FTDX 10 MP transceiver for the NR-7RX Madison High School Radio Club station. It is now the flagship HF rig, and we have an older Kenwood TS-570 as a backup rig. Both stations are set up for SSB, CW, and digital modes.

I bought a couple of CW Hotline kits for students, and they loved building them and operating CW. Several of my electronics students have started learning CW; students like this "retro" mode. I have introduced it to them using the CW Hotline kits and the lcwo.net website. We also purchased a Yaesu FTM-500D VHF/UHF radio with a power supply as our base station at the school. Students helped construct and put up a J-pole antenna.

Even with all this fantastic gear, students were not getting on the air much. Students have so many activities and interests competing for their time. Additionally, getting on the air is still intimidating for many of them. Most students get pretty nervous talking on the air. The phonetic alphabet is difficult for them at first.

This fall, I thought of a way to encourage them to get on the air more, and it has been a huge success. I introduced club contests! I set up a contest schedule and used some grant money to buy awards like t-shirts, hats, mugs, a microcontroller, sensor kits, CW Hotline kits, and (the most coveted) handheld VHF/UHF radios.

Awards include "Break the Ice," "Break Morse Ice," "Repeater Hog," "Hog on the Air," "Simplex Super Hero," and"Digital Dominator."

In addition, students participated last fall in the ARRL School Club Roundup contest, making 13 contacts. Students studying and testing together at local exam sessions rather than online has been most successful. The competition with each other and having a test deadline motivates them to prepare better. Testing locally also introduces them to hams from the local club. Constant efforts to recruit students into the hobby are needed, and competition for their time is intense, but those who get involved have a wonderful experience. The hobby they are introduced to keeps them involved in technology and helps them continue a lifetime of learning new things.

Launching an Amateur Radio Club With Assistance After Teachers Institute

Kay Orr, K5ORR, and Leslie Reese, KI5ISS
Submitted 2024

How do we compete for time and interest with so many options available to high school students? Pair up with ARRL and your local amateur radio club to set up a display of radios and antennas to pique their curiosity!

The foundation for this ambitious project was laid last summer when engineering teacher Leslie Reese, KI5ISS, and instructional technology specialist Kay Orr, K5ORR, attended Teachers Institute-1 at ARRL Headquarters in Newington, Connecticut. The Institute equipped them with insights into integrating amateur radio into existing curricula and establishing a campus-based club. Their commitment to the project was further fueled by the strong support of ARRL, which generously provided both hardware (radios, test equipment, hands-on kits, etc.) and curriculum integration materials for attending teachers.

The Rockwall Amateur Radio Club (RARC) invited Leslie and Kay to formally share their Teachers Institute experience with a presentation to the club. Collaboration with RARC has been a significant step toward creating a dynamic learning environment for students. RARC, known for its commitment to promoting amateur radio activities in the community, is contributing not only expertise, but also generously donated equipment and time. With the new high school club, RARC will be instrumental in providing license instruction, study sessions, and exam opportunities for students. Collaboration between the two groups actually dates back several years, when RARC members assisted with a direct-contact International Space Station (ISS) event at Celia Hays Elementary in February 2020.

To bring their vision to life, Leslie and Kay secured funding through an ARRL Education & Technology Program (ETP) grant. This grant enabled the purchase of essential equipment, ensuring that the new station would have the necessary resources to operate effectively.

Dr. Gene Burton College & Career Academy is set to launch the first-ever amateur radio club in the Rockwall Independent School District (ISD). Partnering with our local ARRL affiliated RARC, the Academy aims to provide students with a unique opportunity to explore the world of amateur radio. Our goal is to foster skills in electronics, technology, coding, and communication. These skills translate directly into today's and tomorrow's workforce.

The high school's amateur radio club is designed to include students from various disciplines/courses, such as engineering, aerospace, robotics, emergency medical technician (EMT), and law. This diverse mix of academic backgrounds reflects the interdisciplinary nature of amateur radio, offering students a unique learning experience. The club's twice-monthly meetings will feature engaging hands-on learning activities, on-air sessions, and licensing instruction guided by both teachers and RARC mentors. The core goal is to encourage students to pursue licensing exams, providing them with

official recognition for their skills in amateur radio operation. The licensing process not only imparts technical knowledge, but it also instills a sense of responsibility and adherence to regulations.

As the amateur radio club gets off the ground at Dr. Gene Burton College & Career Academy, the students involved will not only develop technical skills, but they will also learn the value of teamwork, communication, and problem-solving. Future planned events include satellite tracking, foxhunts, balloon tracking (APRS), software-defined radio (SDR), participation in ARRL Field Day, and the goal of hosting another ISS contact! The club has plans to branch out and share their enthusiasm with students in younger grades and outside organizations. The initiative serves as a model for other educational institutions, illustrating the potential for integrating amateur radio into diverse curricula and inspiring a new generation of radio enthusiasts.

A Note from ARRL National Instructor Gordon West, WB6NOA

Fellow ham radio volunteer instructors, the ARRL instructor program is going QRO — high power! I am honored to have been selected to represent you, our valued volunteers, at club levels, over the internet training sites, and on your own, offering training classes.

The first mission for us is an update on your status, and to add fellow Elmers to our new list of ARRL active volunteer ham radio presenters.

Visit https://www.arrl.org/gordon-west for ARRL's free training materials that I have chosen, which will be posted and rotated regularly in their expansive Learning Center. Just a click away!

The first thing to do on this site is get registered again as an instructor. Your ARRL membership allows full access for the Learning Center's instructor materials library, in addition to what I have posted on the page mentioned above.

Once you are a registered ARRL instructor, check out some of the materials on the "GW" site first before you enter the Learning Center. Your students will enjoy on the air sounds of ham radio at each level.

Head for the Gordon West page now and get registered again. You can check that page for monthly news and my great Learning Center picks, from PowerPoint presentations to student pre-study quizzes, to discounts on ARRL books, class dates for the public, and tons more to help you and us to support your class, whether it's live or on the internet!

Steve and I welcome you back, and my many thanks to the ARRL for bringing me, and my test prep books, as the lead volunteer to support YOU as an ARRL registered instructor!

Gordon West
WB6NOA

50 (!) years of ARRL membership
Submitted 2024

As seen in this issue of Radio Waves...

We are excited to relaunch this educational newsletter this year! A big thank you to all those who made this edition possible.

Radio Waves aims to showcase how educators and license class instructors are getting their students and local communities involved in ham radio. These efforts deserve to be documented and shared. The contributors are teachers and instructors who are currently bringing amateur radio into the classrooms and beyond, just like you.

Many instructors and teachers made mention of materials and resources created by ARRL. Click any bullet to learn more about the item.

- ***ARRL Teachers Institute***
- ***ARRL ETP Grant Applications***
- ***ARRL Scholarships***
- ***ARRL Instructor Resources***
- ***ARRL Teaching Lesson Plans***

Add Your Voice: Write a short narrative about a specific teaching struggle, success, or learning breakthrough. We are seeking submissions of 300 – 500 words, and you are highly encouraged to send any pictures of yourself, your students, and the activities you introduced. Submit writing to our email: radiowaves@arrl.org. Please use our Model Release Form for photos. Explore our previous publications.

By submitting writing or photographs with completed model release forms, you grant permission for ARRL to edit and use these materials for any publication purpose.

Producer: Eliza Croarkin, KC1TAP
Editors: Becky Schoenfeld, W1BXY, and Samantha Shaner, KE1SAM