



Radio Waves

News you can use for license instruction and radio science education

ARRL — The national association for AMATEUR RADIO

Fall 2014

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Coming Up...

The Richmond Amateur Radio Club in Richmond, Virginia, offers an intriguing structure to its license instruction, which also provides additional enrichment classes on electronics for hams, Morse code, and antenna modeling. Look for *Radio Waves*' writeup on the club in an upcoming issue.

Ham Radio and Integrated Learning in Albuquerque Public Schools

BY EDITH LENNON, N2ZRW

Dubbing her brainchild the “STEM Trajectory Initiative in Albuquerque Public Schools,” Alma Ripley, an assistant principal at a Title 1 elementary school in the district, created a dynamic team of partnering schools and the Amateur Radio-inspired non-profit New Mexico Space Studies (NMSS) group for project-based learning aligned with the Common Core State Standards. The recent culmination of her idea was a high-altitude (near-space) balloon launch. Best of all, the hands-on learning experience was shared, start to finish, by students from many different grade levels.

“I set out to ‘market’ a trajectory approach to STEM, beginning in elementary school, through mid-school and high school using the feeder school structure,” explains Ripley.

Supported by NMSS, Ripley also enlisted faculty and students from West Mesa High School (specifically its JROTC program), Valley High School, Sandia High School, and her own Carlos Rey Elementary School. Working with mentors, including local hams, students would design, troubleshoot, and assemble payloads for the mission, and then launch, track, recover, and analyze the balloon and its payload upon return to Earth.



Students ready payload for high-altitude balloon launch as part of STEM Trajectory Initiative in Albuquerque Public Schools. (Photo courtesy of APS JROTC)

The project, which was a resounding success, demonstrated Amateur Radio, computer, electronics, and physics-related technology to students from across grade levels in a thoroughly integrated way. “The STEM Initiative has ‘caught fire,’” says Ripley, and has grown from two to 12 schools participating.

To follow the progress of the STEM Trajectory Initiative, visit the website at www.stemtrajectory.com.

Edith Lennon, N2ZRW, is Contributing Editor to Radio Waves.

Licensing Classes and Learning Activities

The CARE Academy — Licensing And Beyond

Five years ago, with a mission to grow the hobby, the East Greenbush (NY) Amateur Radio Association (EGARA) began offering instruction in a classroom environment for people interested in getting their first amateur licenses. The instruction, which included demonstrations of HF operating stations and other equipment to help students better relate to the question pool material, was offered in a compressed weekend format to avoid attrition. Recommended preparation was for pre-study of 30 minutes a day for 30 days leading up to the class. In the first course, four instructors taught 10 students, all of whom passed their Technician test.

The model was a success, and it was further honed over the years through discussions after each class that led to continued improvements as instructors took their own lessons away (see “Lesson Learned” sidebar). Teacher availability, however, was becoming an issue. “Ultimately, it was decided that in order to grow we needed to go out on our own,” says Glenn Cooper, W2BK, “and Scott Haller, K2CK, and I created an independent organization, the Capital Area Radio Enthusiasts. Its purpose was to run more classes annually while attracting more individuals from other clubs who had an interest in instructing,” explains Cooper, a CARE lead instructor. With additional teachers from other clubs, five classes could be taught per year — up from two — reducing average class size, while allowing more students to take the course.

“We also expanded our activities by starting training courses,” Cooper says. “We called it the CARE Academy.”

Designed to provide greater depth on selected topics, the CARE Academy offered a four-hour Saturday program twice a year, with guest speakers invited to offer presentations, such as putting together a remote station, programming handhelds, soldering tips, high-altitude

balloon launches, foxhunting, and getting involved in public service.

“With limited advertising, we have minted over 110 new hams,” says Cooper. “We look to expand in other areas across the northeast, and another club has approached us to help them run a class using our format as well.”

To learn more, visit CARE’s website at <http://hamthatcare.com>.



Lesson Learned

Glenn Cooper, W2BK, of the Capital Area Radio Enthusiasts, tries to take away his own lesson from each radio class he teaches. One takeaway from his experience concerns the exploding popularity of inexpensive handheld radios from China. He’s grown to think they may actually do a disservice to newly minted hams.

“It’s my opinion the critical time for a new ham is the first 30 days after they get their license,” says Cooper. “If they have instant success, it generates excitement and staying power.” Unfortunately, he’s seen the low power these new radios generate result in discouraging signal reports for inexperienced operators, which can discourage new hams to the point where they get frustrated and drop out all together. “There is nothing wrong with owning one, but not as your primary means of communicating,” adds Cooper.

He hopes to illustrate this beginning with his club’s October class. “Our plan is to set up our usual HF station on Saturday for subelement T4,” says Cooper. “When we do subelement T2 on Sunday, I will have a 2 meter mobile station with an antenna set up and compare it to a handheld so students can see the difference.” Cooper explains that the club uses the HF station essentially to promote upgrading, as he feels real Amateur Radio enjoyment begins with the General license.

“One local ham proved me wrong to the extent that he has worked over 200 countries on 10 meters as a Technician,” says Cooper. “But if we lose new hams with the handheld problem, they will never make the attempt to get their General ticket.”

Update on Recent ARISS Activities

There was no summer vacation for the crew aboard the International Space Station, and many young people got to enjoy several successful contacts through the Amateur Radio on the International Space Station (ARISS) program (see below). For more contacts, event details, and links to audio/video files, visit www.ariss.org/news.html.

The **Boy Scouts of Raymore, Missouri**, Troop 32, were among the ARRL Field Day participants who worked NASA astronaut Reid Wiseman, KF5LKT, on June 28–29, 2014.

A telebridge contact via W6SRJ with Scouts at Space Jam 8, **Rantoul Airport & Chanute Aerospace Museum**, Rantoul, Illinois, was successful on August 8 at 12:23:19 UTC. Astronaut Wiseman answered 26 questions asked by the Scouts during the pass.

Students started the school year at **Zuni Hills Elementary School**, Sun City, Arizona, with a successful telebridge, via K6DUE, on August 22 at 17:47:05 UTC. with astronaut Wiseman.

A direct contact with students at **Winfree Bryant Middle School**, Lebanon, Tennessee, was successful on August 26 at 16:12:47 UTC. Astronaut Wiseman again fielded student questions, answering 16. (See “Maximizing the ARISS Learning Experience” on page 6.)

A direct contact was made by students at **Dorothy Grant Elementary School**, Fontana, California, on August 27 at 18:31:28 UTC. Astronaut Alexander Gerst, KF5ONO, answered seven questions.

A successful direct contact was made on September 3 between students at **Evansville Day School**, Evansville, Indiana, and astronaut Wiseman, who answered 17 questions.

Students at **St. Joan of Arc School**, Lisle, Illinois, made a successful contact via K9LEZ on September 8 at 18:34:45 UTC. Students interviewed astronaut Gerst.

A direct contact with students at **Lanier Middle School and Lanier Cluster Schools** in Sugar Hill, Georgia, was successful via W4GR on September 9 at 11:16:25 UTC.



Eric Archer, N6CV, NASA Jet Propulsion Laboratory engineer, assists a student during the Dorothy Grant Elementary School ARISS contact. (Photo courtesy of Huy Ho)



To find out about upcoming ARISS contacts, visit www.ariss.org/upcoming-contacts.html. You'll also find in-depth information on the new www.ARISS.org website, including a description of ISS stations and a link for their current operating status. Visit www.ariss.org/contact-the-iss.html.



A New ARISS Proposal Window Will Be Opening Soon!

Watch for details in ARRL news and on the ARRL website. Contact Debra Johnson, K1DMJ, ARRL ARISS Program Manager, at djohnson@arrl.org, if your school, local museum, or other educational organization is interested in participating in a scheduled ARISS contact in 2015. An educational plan describing the learning activities that will be provided for students leading up to and following the contact is necessary for consideration. To learn more about the ARISS program visit www.arrl.org/amateur-radio-on-the-international-space-station. Click on the link for ARISS Proposal Requirements for more information about the proposal process and up-to-date information about submitting a proposal.

Instructor Corner — News, Ideas, Support

List a Class, Find a Class with New ARRL Web Page Feature

The best way to promote your web-based licensing class is through a new feature of the ARRL website: a special location devoted to displaying listings of online classes. Joe Gomez, W2BMP, education chairman of the Long Island Mobile Amateur Radio Club, tells the League that he received 11 new inquiries overnight after listing his online Technician class. The demand is so great that he's planning an additional class on the heels of the one he listed for September.

The “Find an Amateur Radio License Class” page (www.arrl.org/find-an-amateur-radio-license-class) offers a link to the new online listings page, at www.arrl.org/license-classes-online, where prospective students can find the details.

Registered instructors are encouraged to list all classes and Webinars to help would-be hams find them. Point your browser to www.arrl.org/list-a-license-class to submit your listings.

More Free Content on Instructor Resource Page

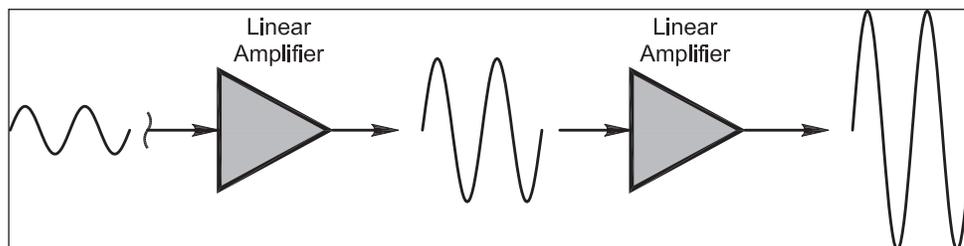
The ARRL continues to expand the material it makes available for free to Amateur Radio instructors via its “Resources for License Instruction” web page.

Fresh site content to aid in teaching radio-related topics includes “A Tutorial on the Decibel,” compiled by Ward Silver, NØAX, and an examina-

tion of impedance and pattern calculations by Steve Auyer, N2TKX.

Visit www.arrl.org/instruction-teaching-and-study-aids to access these and other free resources.

Instructors are encouraged to submit their own ideas, requests and suggestions for augmenting the resources posted.



Decibels are used to describe amplification, as depicted in this illustration from ARRL's *Understanding Basic Electronics*, 2nd edition, by Walter Banzhaf, WB1ANE.



Chris Linck, N2NEH, leading a CARE Amateur Radio course. (See story on page 2.) (Photo courtesy of Scott Haller, K2CK)

Reach Out to Outreach

The ARRL is requesting the assistance of its members for two education outreach initiatives:

- Identifying Girl Scout leaders/teachers who would be interested in working on resources for a GS patch
- Crowdsourcing to update the ARRL “Careers and Amateur Radio” web page (www.arrl.org/careers-and-amateur-radio)

If you can help, contact Debra Johnson, K1DMJ, ARRL Education Services Manager at djohnson@arrl.org.



Instruction Junction: Foolproof Dimensional Analysis

The Pamlico Amateur Radio Society (North Carolina) has had lots of problems over the past several years with the mathematical segment of our Technician classes. Students are unprepared even to begin to figure out how many millithings there are in a megathing. We have developed a solution that works in most cases.

It is called “dimensional analysis” in the serious math books. You simply start with the given problem; for instance, “Which frequency is in the 2-meter band? (a) 52.0 MHz (b) 146,430.0 kHz (c) 2.4 GHz (d) 28.430 Hz.”

The students have memorized that the 2 meter band includes frequencies in the 144–147 MHz range, but none of these appear in the answers. They panic.

We tell them to start with what they know. Take answer (a) first. It is in MHz, so that’s OK, but it isn’t in the range 144–147, so it’s out. Take answer (b), 146,430.0 kHz. Let’s make that into MHz so it can be compared with our knowledge base.

We know that 1 MHz = 1000 kHz. Expressed mathematically, the equation is $146430.0 \text{ kHz} \times 1 \text{ MHz}/1000 \text{ kHz}$. Always multiply. Arrange the terms so the desired one is on top. Cancel the kHz units just as if they were numbers (that’s the magic tip). Now read the result. It looks like (b) is the correct answer. Works every time!

That’s dimensional analysis, and it can be used for any conversion you can imagine — currency, electrical units, frequencies, even chemical measurements like moles. Our instructors have used this trick for several years with great success.

By the way, our last three years of classes have had a 100 percent pass rate.

—Thanks to Jamie King, KJ4JK, for this tip!

If you have any resources that you find helpful, or a strategy or tip that you find successful, please share them with us! Send your ideas to Debra Johnson, K1DMJ, ARRL Education Services Manager, at djohnson@arrl.org.



Teachers participating in the Teachers Institute at DARA HQ in Dayton, Ohio, this summer give the thumbs up after passing their license exams. They are (left to right) Mark Supal, KD8YZL; Bill Russo, KD8YRM; Tuyen Duddles, KD8YZK; Deborah Cullen, KK6HRD; Tanya Anderson, KD9BQZ; and Marc Allard, K6IOI. (Photo by Larry Kendall, K6NDL)

2014 Licensing Statistics

The following report of FCC licenses issued is supplied by Maria Somma, AB1FM, ARRL VEC Manager.

New and upgraded FCC license stats continue to amaze! Somma notes that license activity levels remain elevated through the end of August. New licensees increased by an incredible 21 percent over the same period from 2013 (23,963 in 2014 versus 19,823 in 2013). Upgraded licenses were up by 16 percent over 2013 (7,488 in 2014 versus 6,490 in 2013).

FCC RESULTS THROUGH AUGUST			
License Action	2013	2014	% Change
New Licenses	19,823	23,963	21%
Upgraded Licenses	6,490	7,488	16%

In The Classroom



Amateur Radio volunteers (seated under projection) assist with the Winfree Bryant Middle School ARISS contact. (Photo by Carmen Gregson)



For more ideas on how to prepare for an ARISS contact, visit:

www.arrl.org/preparation-for-an-ariss-contact.

Maximizing the ARISS Learning Experience

BY TAMMY SHEPPARD

The Winfree Bryant ARISS Education team developed daily lessons and provided them to the entire Winfree Bryant Middle School (Lebanon, Tennessee) for its long anticipated August 26 contact with the International Space Station.

The lessons focused on daily living activities astronauts engaged in on the ISS, such as eating, washing hair, brushing teeth, sleeping, and going to the restroom. Students took a tour of the ISS, looked at the Apollo missions, and discovered the new Orion spacecraft. They researched Robonaut 2 and became robotic engineers as they tried

to maneuver a rover on the Robotic Exploration Rover game located on the student page NASA's website.

Students also researched astronaut Reid Wiseman, KF5LKT, to get a better understanding of who they would be talking with aboard the ISS. All lessons were accessed via www.nasa.gov and YouTube. Our rocketry team made daily morning announcements concerning NASA facts and events. On the mornings of August 27 and 28 we held drawings for NASA prizes like LEGO® kits, astronaut ice cream, and posters.

Before the contact began, Daniel Cavender, Propulsion Engineer from

Marshall Space Flight Center, performed a demonstration on rockets, propulsion, and manned space flight. The Tennessee and Wilson County Amateur Radio League also demonstrated ham radio with a display in the school lobby. Students were able to take turns visiting the booth, using the ham radio, and asking questions about the hobby.

Needless to say, this was a once-in-a-lifetime experience that the students, staff, and parents of Winfree Bryant Middle School will never forget.

Tammy Sheppard is an eighth grade teacher and rocketry coach at Winfree Bryant Middle School.

ISS + Amateur Radio = Life Saved

Ham engineers working on ARISS antennas responded to the call to develop an antenna for the ISS Automatic Identification System (AIS) installed on the Columbus module of the ISS, which has been tracking ship positions since 2010. A NASA video posted on the web shows how the system saved "the sole surviving crewmember of a fishing vessel after it overturned in the North Atlantic" in 2012. You can watch the video [here](#).

The STEM Two-Step

Step 1: Interest Teachers in Ham Radio

Step 2: Show Them How to Use It with a Workshop!



Workshop leader Chuck Catledge, AE4CW, shows Windy Levesque, a Heards Ferry Elementary School teacher (front), and Sydney Lee, an elementary school teacher, how to use Amateur Radio concepts in teaching electricity and magnetism.

(Photo by Martha Muir, W4MSA)

After tantalizing teachers at its booth at this year's Atlanta Science Festival Exploration Expo, the North Fulton Amateur Radio League club capitalized on that interest with a how-to workshop.

On Saturday, May 3, NFARL members met at Mill Springs Academy (MSA) in Alpharetta, Georgia, with public school teachers for a day-long series of sessions to show them why and how to incorporate ham radio concepts into their classes.

Program organizer, Chuck Catledge, AE4CW, presented "Electricity Is Magnetic," a session showing the relationship between electricity and magnetism. Jim Stafford, W4QO, followed with "What Makes Radios Tick?," an intro to the basic concepts and components of radios and antennas. Wes Lamboley, W3WL, presented "Ham Radio = Science," which correlated the Georgia Performance Standards, the state curriculum require-

ments for science classes, to ham radio.

During lunch, teachers made radio contacts using the transceiver and other equipment awarded to MSA by the ARRL Education & Technology Program grant. Next up was "Ham Radio Is Digital," during which Mike Cohen, AD4MC, demonstrated the newest technology integrating radio and computers. John Kludt, K4SQC, then talked about ham radio satellite communications, showing a video of the ARISS contact at MSA last September as well as a model of the AMSAT-UK FUNcube satellite that flies with a materials science experiment payload. ARRL Teachers Institute veterans Martha Muir, W4MSA, and Jim Wingate, WA2EIU, were on hand to answer questions.

The day wrapped up with a presentation of various resources teachers can use to find information, support, lesson plans, and inspiration to help them integrate Amateur Radio into their classrooms. The club will repeat the workshop for private school teachers in November at the Georgia Independent School Association's Annual Conference.



Eddie Green, KK4YTT, operating from the Chesapeake Center for Science and Technology with a new handheld given to him by the K4AMG club. (Photo by Melvin Gardner)

A Club Leads in Chesapeake

For 10 years, the K4AMG Memorial Amateur Radio Club has been dedicated to guiding students into great careers in electronics and wireless communications. Its efforts have led to a strengthening Amateur Radio presence in Virginia's Chesapeake Public School system.

This non-profit, ARRL affiliate club introduces educators to Amateur's Radio's natural fit with the STEM curriculum, and over 200 science and

math teachers attended its recent presentation on Amateur Radio and satellite communications. The club has also addressed the school board.

With the club's support, district electronics shop teacher John Bowser, W4ARMY, will be developing a prototype curriculum for next semester, including state standards and the ARRL's *Ham Radio License Manual*. Look for the upcoming feature on K4AMG's school outreach in *QST*.

Education & Technology Program News

2014 Teachers Institute Summer Sessions

Three sessions of the 2014 Teachers Institutes wrapped up on July 25 with 34 enthusiastic teachers, ranging from elementary through college level, returning to their classrooms with fresh ideas and resources for engaging students in electronics and radio science. Some teachers had previously participated in the Amateur Radio on the International Space Station (ARISS) program or were laying the groundwork to do so; ten had attended the foundational “Introduction to Wireless Technology” (TI-1) and came back to attend the TI-2 “Remote Sensing and Data Gathering.”

TI-2 participant Vin Urbanowski, KB1YNR, summed up his experience this way, “This was a wonderful conference of ‘kick-butt’ content in the company of committed, sharp and inspiring teachers.”

This year’s TI-2 focused on the sensor package and delivery system of a marine buoy. Here are a few of the ideas inspired by the TI-2 curriculum:

- Explain how a cell phone or processor in a phone translates voice into a series of 1s and 0s
- Envision a MAREA (Mars Lander Amateur Radio Robotics Exploration Activity) Mars Lander Rescue Mission
- Study heat absorption using temperature sensors and data
- Triangulate position on Earth using NEMA (National Marine Electronics Association) information from a GPS tracker.

Find out more about these lesson ideas at www.arrl.org/lesson-ideas-and-learning-activities. Details on the 2014 Teachers Institute can be found on the TI website [here](#) and in the ARRL news story recap [here](#).



TI-2 participants with assembled marine buoys deployed in buckets. (Photo by Bill Richardson, N5VEI)



The application deadline for grants offered by the ARRL Education & Technology Program is **November 1**.

Find the current guidelines and application at www.arrl.org/etp-grants.

Support the Teachers Institute and the ETP Financially

The ARRL is raising funds to support the TI and ETP in 2015. Funds donated to the Education & Technology Fund are entirely dedicated to support this program. Amateur Radio clubs that wish to bring electronics and ham radio to the next generation might consider funding a seat for a teacher to attend the Teachers Institute each year. Educating and motivating a teacher to bring this content into his or her classroom can be a very effective force multiplier for a club’s investment. Please direct donations to www.arrl.org/education-and-technology-fund.

The ARRL Foundation, which is a separate 501(c)(3) non-profit organization from the ARRL, offers individual student scholarships and some other grants for ham radio activities, but donations to the ARRL Foundation do not support the Teachers Institute or the Education & Technology Program. Visit www.arrl.org/the-arrl-foundation for more information about ARRL Foundation programs.

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ARISS Program:

www.arri.org/amateur-radio-on-the-international-space-station

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Announcements

The 2014 Herb S. Brier Instructor of the Year Award Winners have been announced. They are Brad Amacker, N5MZ, information technology teacher at Petal High School, Petal, Mississippi, and Bill Finnegan, NR8I, of Marion, Ohio. Amacker has taught license instruction classes that resulted in some 100 students becoming Amateur Radio licensees and has continued to mentor students post-licensing. Finnegan has taught classes that resulted in 60 new ham radio licensees and was cited for “his patience with students, especially those struggling with comprehension of more difficult radio theory.” For information on the Herb S. Brier Award, including requirements and procedures, visit www.arri.org/herb-s-brier-award.

The 2014 ARRL Foundation Scholarship Winners were published in the September 2014 issue of *QST*, which can be found [here](#). A separate feature story about the Goldfarb scholarship winner, Pdraig Lysandrou, KC9UUS, of Bloomington, Indiana, can be found on the ARRL website [here](#).

2014 Upcoming Events, Opportunities and Deadlines

Fall Radio Operating Events for Youth— Start planning for these upcoming challenges:

- Jamboree on the Air (JOTA): October 17 – 19, 2014 (www.arri.org/jamboree-on-the-air-jota)
- School Club Roundup: October 20 – 24, 2014 (www.arri.org/school-club-roundup)

The 2014 ARRL Foundation Scholarship application period will be open from October 1 – February 1. Get more information at www.arri.org/scholarship-program.

ETP Deadline — Applications for grants for the 2014–2015 school year are due in to the Education & Technology Program November 1. Information and the current application form can be found at www.arri.org/etp-grants.

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