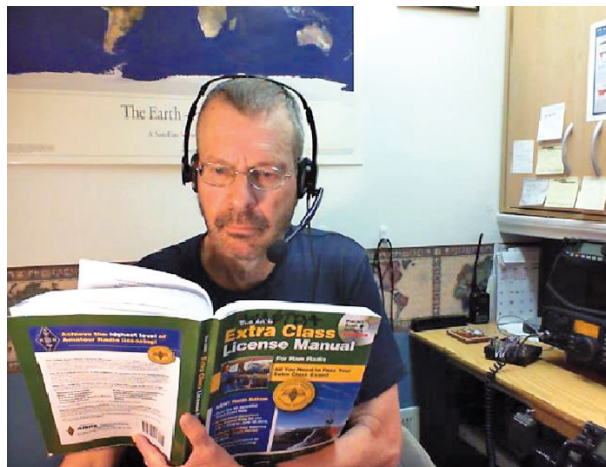


The Handiham Program: Ham Radio Learning for People with Disabilities

Technology gives hams with disabilities control over when, where, and how they study for their licenses or upgrades.



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In 1967, while I was a teenager, I decided to get my ham radio license. I could study on my own, using the ARRL Novice book, so I didn't need much help. In that same year, Ned Carman, W0ZSW, began acting upon his idea for helping people with disabilities — like blindness — to earn their licenses with one-on-one instruction, and created the Handiham Program.¹ I couldn't have imagined that one day I would be following in Ned's footsteps and teaching people with disabilities about Amateur Radio.

But that's what happened in 1991 when I took the job as the Handiham Program manager. At the time, the use of audio tapes put people with vision and mobility disabilities on par with everyone else by giving them control over when and where they study for their licenses or upgrades. Today, the cassette tapes the program had used are gone (see Figure 1), but in their place we have Library of Congress digital players, which are free to people with qualifying reading disabilities. We have the Internet, from which we can stream audio any time, to any place with an Internet connection. We have personal computers and smartphones, which are two of the finest assistive technology tools ever invented for people with disabilities.

How To Do It

Teaching is not simply reading from a book. It is my job as an instructor to facilitate learning, so I spend classroom time explaining concepts in an engaging and encour-

aging way. The best way to do this is by planning lessons around solid resources like *The ARRL Ham Radio License Manual*.²

Because many of my students are blind or have reading disabilities like dyslexia, I teach an audio course. In a sense, it's like explaining something to someone on the other end of a phone line or via a SSB contact — I sometimes need to paint a picture with words, and that takes a bit of practice. I explain visual diagrams by referencing common shapes and explaining them:

Imagine a circle. Draw a horizontal line to cut it into a top half and a bottom half. Now draw a short line from the middle of the horizontal line straight down to the bottom of the circle. You have a pie that is divided into three parts — a top half and two bottom quarters. Label the top half E, the lower left quarter I, and the lower right quarter R.

As you have guessed, this is how I can describe an Ohm's Law circle. Everyone knows what circles and lines are, as well as left and right and up and down, so I use these bits of universal knowledge to construct a verbal image. I don't use colors, because these are not universally recognized, given that some people do not see them. It is easy to explain concepts like an Ohm's Law circle, but sometimes I have to get creative with things like Smith charts or phase angles!

I look at a section in the chapter and decide how I want to explain the concepts. The style is friendly and informal. I don't read from the book, except to remind myself of the ideas that I want to convey. After that, I boil them down to an explanation that I find reasonable, making reference to examples from my own operating experience when I actually record the audio lectures.



Figure 1 — The cassette tapes the Handiham program used to use are gone, but in their place we have Library of Congress digital players.

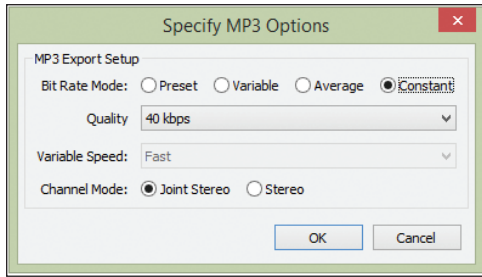


Figure 2 — A sample rate that balances audio quality with file size.

Reviews in the lecture series can come at intervals after each chapter, or at the end of each section as part of the audio lecture. I use the *ARRL Question Pool Supplement* published at arrrl.org because it follows the organization of the *License Manual*, which is available in Technician, General, and Amateur Extra class editions. Its organization into section-specific parts makes this a great review tool. I read each question verbatim, and then give only the correct answer, sometimes with further explanation if it is warranted.

Audio Tools

Since all recording is done at a computer, I need to use a headset microphone for consistent audio. A USB headset is preferable since I can set the audio levels for the USB “sound card” as a separate set of controls. *Audacity*, the free, open-source cross-platform recording software is a good choice for anyone with a *Windows* PC, Mac, or *Linux* machine.³ It can be downloaded at audacity.sourceforge.net/download/.

I open *Audacity* once I have developed my lesson plan, and then create a filename that does two things:

- 1) Keeps the files in the proper order, and
- 2) Tells me and my students what the file is about.

Many of my students will be using computers or other assistive technology devices to read these file names, so files need to be named in a way that allows these devices to navigate through the lecture series easily.

Audio editing with *Audacity* is easy (see Figures 2 and 3), because I can stop the recording at any time if the dog barks or the phone rings, and I just select and delete the part of the waveform that I don’t want and re-record it. I can pause to think about what I’m going to say, then say it and let the software remove the pauses later. Lev-

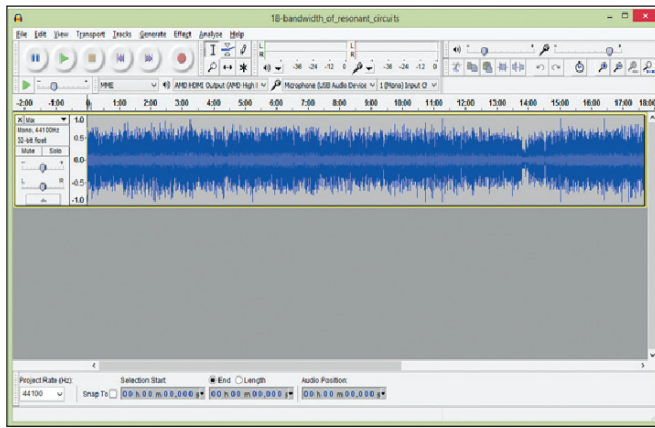


Figure 3 — Screenshot of a file in *Audacity* that has been processed and is ready for export to MP3 format.

els can be adjusted, too. I never read from a scripted text while teaching. It is the same as if I am working with my students in front of a class or as part of a small group.

Access to the Instructor

No matter what level course I’m teaching, I cannot assume that everyone will understand everything. I invite questions by giving my contact information in the audio and in e-mail reminders about upcoming lectures. A student can ask a question as easily at 4:00 AM as another can at 7:00 PM.

To make it easy for my students to contact me, I keep regular “office hours” and structure my week to include regular e-mail reminders to my students. I use a mailing list to manage this weekly contact, and have set the “reply” to return to my own e-mail address in case a student has a question about the material. The point is to make it easy to contact me.

Distribution of Materials

Some e-mail services limit attachment size while others allow large files. It is almost always best to place the files on a server somewhere and then to simply reference them in an e-mail message or on the club website with a path to the file. Some users have limited bandwidth, especially if they are getting their Internet via a smartphone or tablet through a cellular carrier. Those users will not appreciate getting huge file attachments that slow down their messaging and burn through their data plans (see Figure 4). It is better to send an e-mail with a link, which they can follow when they can connect via their home network.

Having a web page allows me to write

| | |
|-------------------------------------|------------|
| 07-Volunteer_Examiner_Program.mp3 | 10,989 KiB |
| 08-Grab_Bag_of_Regulations.mp3 | 10,685 KiB |
| 09-Review_of_math_concepts.mp3 | 8,238 KiB |
| 10-Energy_Storage_and_Discharge.mp3 | 15,496 KiB |
| 11-RL_Time_Constants.mp3 | 6,924 KiB |
| 12-Phase_Angle.mp3 | 9,764 KiB |

Figure 4 — Most MP3 audio files will be too large to send as file attachments, as you can see in this screen capture taken from a secure FTP session.

“friendly URLs,” which might read “We learn about diodes,” instead of a long link. Long links must be avoided in e-mail reminders because they will word-wrap and be broken, resulting in students replying to say that the links do not work.

Speaking of “friendly links,” it’s important to keep in mind that blind computer users will have screenreading software, which voices websites in a linear fashion. Blind users have to listen to the content from top to bottom, which can be time-consuming on a busy, complicated web page. The goal is to get students to the study material as efficiently as possible, so there is no point in creating a web page that has lots of graphics, sidebars, or widgets. Links are explanatory, so that anyone reading only the links (such as a blind student reading with screenreading software) can easily tell what they mean.

A helpful link might say something like, “In our fifth audio lecture, we learn about three types of station control.” A link that says simply, “Click here,” isn’t going to be helpful to a student with a visual impairment.

Resources

Check each license manual’s web page on arrrl.org for links to extras like the question

Doorway to the World

Getting a ham ticket presents many challenges for any student, but as this article shows, for students with disabilities there are additional trials that must be overcome. Once that Amateur Radio license is in a Handiham member's hands, however, significant challenges still remain.

Passing the test brings with it the joy of success. This is quickly followed by the next big problem — setting up that first station, which involves buying a radio and raising an antenna. For hams with disabilities, these activities present a much greater level of difficulty.

Ned Carman, W0ZSW (SK), the founder of the Handiham Program, worked for a clinic. His work required him to visit people with severe physical disabilities, who often had few opportunities to leave their homes. It was observing these limitations that motivated him to start the Handiham Program.

The most significant problem for many Handiham members is that they live in situations that make it impossible for them to put up outdoor antennas. Then there are those whose level of care requires them to reside in larger group facilities where even obtaining space for a station can be difficult. How do you raise an antenna when just going out to the backyard can be a major undertaking? How do you set up a station in a building you don't own?

Remote Operating

To solve this problem, members of the Handiham Program have access to two remote-controlled ham stations. W0ZSW, located at Courage North, Lake George, Minnesota, honors Ned Carman by keeping his call sign on the air. The second station is W0EQO located in Woodbury, Minnesota.

The radio at W0ZSW is a Kenwood TS-590S transceiver controlled by *ARCP-590* software. A secondary Icom IC-7200 transceiver is available controlled by *W4MQ* software. The radio at W0EQO is a Kenwood TS-480SAT transceiver. The radios are equipped with Kenwood's VGS-1 Voice Guide option, which provides speech readout of frequency for blind members and is enabled by default.

W0ZSW currently uses a 270-foot extended double Zepp antenna that can be tuned on 160 – 6 meters. It is fed with ladder line and a current balun, and is mounted at 45 feet. W0EQO uses a G5RV, which is located in an RF-quiet area that is very effective. However, it does have limitations and can't transmit on 160, 60, and 6 meters. Transmitting is possible on all other HF bands. Receive-only operation is also possible, including control of the receive frequency through EchoLink.

W4MQ Software

The *W4MQ* remote control software was originally developed by Stan Schretter, W4MQ, who graciously allows the Handiham Program to host it and work on updates. These updates to the *W4MQ* software have made it more accessible and responsive, and, as Stan originally intended, it remains absolutely free of charge for Amateur Radio operators to download and use.

To access the remote stations, a Handiham member needs a computer running *Windows XP, Vista, Windows 7, or Windows 8/8.1*, and the operating system's *.NET* framework must be up to date. A sound card with speakers and microphone or USB headset/mic, an Internet connection (faster is better), and a *Skype* application to port audio are the remaining requirements.

While the license is the key to ham radio, these remote stations are the doorway for many hams with disabilities to step through into the ham radio world. These two stations provide those doorways and they are extensively used, which has led to an interest in expanding the remote station system.

Help Open Another Door

Would your radio club be interested in hosting a remote base station for the use of your club members and Handiham users? The Handiham Program is looking especially for locations outside the upper Midwest in order to expand coverage and provide more opportunities for experiencing HF propagation from different parts of the country. The Program can help with equipment as part of a joint project to increase the number of remote stations on the air. Your club's members and Handiham members will benefit by having more HF options. *W4MQ* software may be used, as may several other rig control options, depending on the station equipment and your club's preferences. Please contact the Handiham Program if your club would like to consider this kind of shared resource.

pools that are arranged to follow the books. I can't emphasize enough how useful these are, both for you as you prepare audio lectures, and to your students as they study!

¹Handiham Program:

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426-3442, Nancy.Meydell@Allina.com

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<https://handiham.org>.

²Available from your ARRL dealer or from the ARRL Store. The ARRL order numbers for the three manuals are: Technician, 0222; General, 1904, and Amateur Extra, 5170. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; www.arrl.org/shop/; pubsales@arrl.org.

³*Audacity* open-source audio recording and editing software, audacity.sourceforge.net/.

All photos courtesy of the author.

Patrick Tice was first licensed as WN0TDA in 1967 as a teenager. Pat served a term as president of the Minnesota State University Mankato ARC, and after college held VP7DT and then C6ADT in the Bahama Islands.

In 1976, Don Newcomb, W0DN (SK), and Pat hatched the plan to form an antenna company, Butternut Electronics.

In 1991, he joined Courage Center, a nonprofit rehabilitation center, to run the Handiham Program. The program helps people with disabilities to earn their ham radio licenses and get on the air.

Today, Pat holds an Amateur Extra class license and enjoys almost daily operation of some type on various modes, mostly casual friendly contacts or touching base on HF and VHF social nets. His station can be remotely controlled, and he enjoys the convenience of taking ham radio along when travelling. Pat holds an FCC Commercial license and has also done contract broadcast engineering.

He is a co-editor of his local radio club newsletter and enjoys teaching classes for the club and participating as a VE. He believes that we are all here to help each other succeed.

