The Teacher's Guide

to Amateur Radio Instruction

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About the Author

Peter Kemp, KZ1Z, is an Extra class radio amateur with over 45 years of experience. He began his radio adventures the 1950's making crystal radios in elementary school and has been involved ever since.

Professionally Mr. Kemp received his Bachelor of Science Degree in Technology Education, a Masters of Science Degree in Educational Media, and a Professional Certificate of Advanced Graduate Studies in Educational Administration and Curriculum Development. He is retired from the Bethel Connecticut Public Schools and served on the Adjunct Faculty of Central Connecticut State University.

Mr. Kemp is the recipient of both the Herb S. Brier Volunteer Instructor of the Year and the Professional Teacher of the Year from the ARRL. He was a recipient of the Marconi Award from the Veteran Wireless Operators of America and Connecticut's Technology Teacher of the Year. Mr. Kemp serves as, and was the first, Educational Advisor to the ARRL. He was a co-author of the ARRL's popular series of Emergency Communications courses and numerous articles.

Introduction

Teachers are not just dispensers of knowledge, they are educational managers.

In the real world, teachers motivate, provide resources and are co-learners in the educational process.

Among educators there is an old adage, “a teacher never really learns their subject, until they have to teach it.” Teachers must understand how all of the pieces of the puzzle fit together in a logical sequence, so that the final picture is clear.

In life you meet many people. Some are experts in their respective professions and others wonder what happened. Having knowledge and being able to share it with others are different issues. Some individuals lack organizational skills or have a “different” type of personality, while others are “naturals.”

Many individuals have the traits to become excellent teachers. What they need is to take those qualities and develop them. This book will attempt to address the practical factors of conducting amateur radio classes. The basic principles presented are applicable to all types of amateur radio courses.

By understanding the educational process, you will be a more effective teacher. If you are willing to take on the challenge, then you have already taken the first step on the journey.

Watching a student’s eyes light up when they master a skill is the true joy of teaching. This spark will make all the hard work well worth the effort many times over.

"A teacher affects eternity; he can never tell, where his influence stops."
- Henry Brooks Adams

Contents

Class Organization

Classes are divided into a variety of segment plans. Their meeting frequency is usually based upon room or instructor availability. Traditionally courses meet anywhere between 8 and 16 times, once a week. For students carrying a fulltime job, school or family obligations, you don't want to overload them. In some cases classes may meet multiple times a week for shorter sessions. If possible, many small meetings are preferable, especially if school age students are participating. The fewer the class sessions, the longer each meeting will be. Fewer sessions requires more planning on the part of the instructor, so that the flow of information will remain smooth.

In recent years, the hybrid class has come into being. These are one or two full day sessions. To be successful, the students MUST prepare prior to the beginning of the sessions. This way some of the material and vocabulary will be familiar. This approach may cause sessions to be a bit more intense, in order to squeeze in all the material needed to be presented.

While a single instructor is most common for small classes, with larger classes, a team teaching approach is better. In so doing, instructors can teach to their areas of strength and experience. This approach is very effective in ARECC, Amateur Radio Emergency Communications Courses, as well as general licensing classes.

When using a Team Teaching concept, the students receive the added benefit of having their attention span extended. Switching off segments is less tiring for everybody.

If utilizing a single experienced instructor, consider having co-instructors to assist. This gives another ham the opportunity to experience the nuts and bolts aspects of amateur radio instruction. Using a professional model, this would be equivalent to a student teaching or a mentoring experience. This is a double benefit. The student gets a bonus instructor and the process helps to groom others for carrying on the fine art of amateur radio instruction.

Whether a traditional or hybrid type class, the theory of class organization is the same.

Structure is important to maximize the use of classroom time available. Teachers should develop a time line and syllabus. This will ensure the logical progression of information, so essential for class success.

Students appreciate an instructor who is prepared, with a clear vision of what is to be accomplished. Having a routine in class makes the students feel more comfortable.

When structuring the overall class, remember that information is best shared in small bites. This way the material may be digested slowly and appreciated. If too much material is shared too quickly, students may choke on the information.

Finding a Location

One of the biggest obstacles faced by clubs and individuals is finding a location to conduct classes. Commercial sites often charge a fee. This can add up and be out of line for a volunteer public service organization, especially a non-profit one.

Many companies make available meetings rooms as a public service, part of their being a good neighbor in the community. The broad cross section of members in any radio club will produce a number of potential leads. Some will pan out and others not, but don't be discouraged. You will be surprised what is available if you just ask.

Public service and town agencies have rooms available for public meetings. Amateur radio is a public service, so when approaching these people, stress the mutual benefits of such a cooperative effort. Check out Town Halls, Police and Fire Departments. Volunteer Fire Departments frequently rent out a meetings room. They will often waive the nominal fee for service groups. These rooms are frequently available during the week.

In many communities the Park & Recreation Department offers a full range of activities, not just the traditional sporting events. Senior citizens, youth group meeting locations also offer potential. Not only are there rooms for their activities, but the opportunity for additional students.

The Public Library many times will make a room available, during their business hours, as do Children's and Science oriented museums.

Public schools have facilities. The problems arise when using a room for an activity not sponsored by the school. There are often fees to be paid for custodians, producing proof of insurance and related paper work.

Consider fraternal and civic groups with halls, such as The American Legion or Kiwanis. Many of these groups stress public service work.

In all cases, the possibility of finding a location may be facilitated if you are willing to have them co-sponsor the course.

Remember, it is the teacher, not the facility that makes the class work

Dealing with Public and Private Schools

One traditional source of students, and locations for holding class, has been the public school system. Nearly all districts offer Adult Education courses in some form. In addition to the standard citizenship and diploma classes, a wide variety of enrichment courses are usually offered.

A little research will go a long way in saving time. Does the local school district offer Adult Education courses, or do they do provide a program regionally, in conjunction with neighboring districts? How is your local district organized? Who is charge of programming? The title of the person responsible will vary according to the size of the district. Titles such as director, coordinator or an assistant superintendent for instruction, may be identified. Contact the right person to schedule an appointment. An in-person meeting is always preferable to a blind letter.

Remember that often, the person in charge could be a fulltime teacher or part time employee. Due to the nature of the school day, you may have to flexible in scheduling a meeting with the proper staff member. Once you get the meeting schedule, be prepared. Think of this meeting as a sales call. Today's technology allows you to bring along a laptop with a brief presentation. Power Point presentations augmented with audio/video clips from the A.R.R.L. work nicely. Be sure to leave informative material with your contact for review and future consideration.

Organizing classes for an Adult Education program often requires up to 3 months of lead time. How is the system set up, a semester, tri-mester, or segmented another way? 5, 6, 8, 10 and 12 sessions are all common in different parts of the country.

Working with elementary and secondary schools requires some creativity. The first, and best way to go, is to have a licensed amateur radio operator on the staff. He or she could be approached about sponsoring a radio club or licensing class. This could also be a spouse of a ham or a subject area teacher, such as a technology education or science teacher, with an interest. Having a staff member running interference with the administration, filling out any required forms and smoothing the waters makes contributing in a co-curricular manner easier.

Often in schools, the Parent Teacher Organization sponsors enrichment programs for the students after school. Administrators like to maintain a good working relationship with parent groups and booster clubs. From their point of view, it keeps more people happy, is a potential source of additional revenue for student materials and volunteers contribute without any salary/benefits or other consideration.

School districts today are under a lot of pressure to teach to the test. An administrator's first response to anything, not directly related to the test, is usually "No." Administrators are burdened with a lot of paperwork. They really don't want to take on any more work unless there is an overwhelming benefit.

One very important consideration in schools today is security. Most states, towns and school districts have very strict regulations concerning non-staff members, on school property or in the school, that come into contact with students. In many cases, if you are working with students without the benefit of a certified staff member present, you may be required to have a background investigation and be finger printed. This may be at your own expense. It is nothing personal, just a requirement to help provide an added margin of safety for the students.

Private schools have a bit more flexibility. The principal, director, or institutional leader usually controls all aspects of life within the facility. Depending on the sponsoring entity, such as religious, private prep or charter school, additional regulations may be in place. Private residential schools offer additional opportunities, as these schools are often looking for enrichment opportunities to keep their students' schedules full.

Another potential pool of students, and class locations, include the Home school Movement. Students that are homeschooled have less of an opportunity for social interaction and to participate in a wide selection enrichment activities. Amateur radio is ideal to fill this void, as it can readily be a co-curricular activity, able to be joined with all subject areas. To contact Homeschooled students, many communities have Home School Associations. These groups help participants to share curriculum and resources. If unable to locate a local group, contact the National Home School Association at www.americanhomeschoolassociation.org

Working with students is very rewarding, so don't give up trying. The future of amateur radio, the community and the career paths of many students, will depend upon these experiences.

Teacher Qualities

First impressions are lasting ones. What qualities do classroom participants, or clubs, look for in an ideal instructor?

Appearance and Bearing – Be well groomed and properly attired, as well as mindful of your posture. Having good health reflecting vitality and energy.

Voice - Having a clear, pleasant and natural sounding voice, varying modulation and pitch, with enthusiasm and emphasis as appropriate.

Speech - Articulation and enunciates clearly, with a proper command of the language, with an expressive vocabulary.

Platform Manner - Gestures, always natural, meaningful, decisive and emphatic. Eye contact smooth and continuous, direct, encompassing the entire class. Free from distracting mannerisms or movements.

Teaching Personality - Emotionally well balanced, always courteous and poised, objectively decisive, considerate of the students, friendly, but not overly familiar, displaying an appropriate sense of humor and confidence.

Knowledge of Subject Matter – Demonstrates a mastery of the subject, able to resource material and well organized.

Preparation and Planning – Shows imagination and ingenuity in the selection of training materials, integrating them into the unit, making the material crystallize for the students.

Classroom Management

Effective classroom management is essential for success. Time limitations are the primary enemy. You only have a set period of time to transfer information to the students. To be successful, a teacher must be efficient and well prepared to maximize student contact time.

Having a set routine is of value for all. Many administrative tasks may be accomplished just prior to the official start of class, so you can hit the ground running.

Always arrive to class early. Arriving late sets a poor standard, which, if emulated, will be a time waster and a distraction to all. Dashing into the classroom, papers flying, looking like you just ran ten miles at top speed does not engender confidence.

When you arrive to class, immediately arrange the physical conditions of the classroom to enhance the delivery of information. Have students sit where they are comfortable, being able to view and hear the lecture, without any extra movement or distraction. Set up any demonstrations, training aids or handout materials.

Amateur radio classes are voluntary. There is no need to seat students in alphabetical order by row. That technique, from the little red school house days, has long since passed. Many students come with family members or friends to share the experience. A good teacher will take advantage of this energy during a class.

One advantage of being a voluntary course is that students are there because they want to be. They are self motivated, arriving with a goal and a positive attitude. Disciplinary situations are extremely rare.

Welcome each student to class as they arrive. This will help you learn their names, making you approachable. While you are setting up, a student may have a question concerning a point developed in a previous lecture or something in their preparation for today's class that is unclear to them. Some students are a bit shy naturally. They are reluctant to pose a question, with others near by, for fear of being thought of as foolish. In truth, others probably have the same question. They will often interact with you during pre and post class times. Remember the questions, as they may be used when reviewing, or to set-up a future lesson.

The general format of a class shows the following elements:

Administrative – sharing information of importance, such as where to purchase study materials, resources on the internet, upcoming amateur radio club meetings or hamfests.

Introduction – setting up the topic, to develop an excitement for the subject to be covered.

Body - The basic body of knowledge is presented via lectures, demonstrations and hands-on experiences.

Summary – Tie together the material presented. Remember, this is a review, do not introduce new subject material in to this segment.

Evaluation - This does not mean a series of paper and pencil quizzes exclusively. Effective questioning techniques will provide you with feedback very efficiently

The Wrap up - Prepare the class for what will be coming up in the next unit. Students may reflect upon what was learned today and put it in context for the next unit. Be sure to reinforce the availability of resources to support the material covered class or for next week's preparation.

Dismissal - Encourage students to mingle and ask questions informally.

Setting the Learning Environment

For students to learn productively they need a proper learning environment. When students feel comfortable and distractions are minimized everyone's time will be better spent.

Room Temperature

Too hot and the students will be nodding, or too cold they will be freezing, being more concerned with staying warm. Having spent time attending classes in a Quonset Hut in the Pacific, where it was hot, humid, and the hard afternoon rains sounded like BBs pelting the tin roof is not fun. Counter this with trying to teach a class in a room at 55 degrees, during the oil shortage, in the early 1970s, and you have an extra challenge. You want to be comfortable.

Noise

Focus is important. Noise within the room and outside the classroom walls is a distraction. With a broad cross section of students, some will just tune it out and move on; they have good DX and Net Control potential. Other students can become a bit more distracted.

Also in the noise category are cell phones. Students may have cell phones on, but set them to vibrate, so others in class will NOT be disturbed.

Lighting

If your class is being conducted at certain times of the day, the sun may be streaming into the room at an angle, causing the students to squint, or see reflections off of a white board, chalk board, projection or monitor screen. If you are using these learning tools, their ability to do the job required will be compromised.

Seating

Students will, in general, take a seat where they feel comfortable. A teacher may enhance learning by maximizing a room's qualities. Sitting in rows one behind the other does not facilitate discussion. This arrangement has the potential to block the view of some students. Depending on the numbers in a class, rearranging the chairs and desks will be a big benefit. The semi-circle is very effective. Everyone can see each other, enhancing the interaction between the instructor and the class. Be aware if any students may have special needs, for example, poor vision or a degree of deafness.

Smoking

Most facilities have strong regulations against the consumption of tobacco. The bottom line is NEVER allow smoking in a classroom. It is not just unhealthy, but the smell and visual distraction are uncomfortable for others.

Alcohol and Drugs

Under no circumstances may alcohol or drugs of any sort be tolerated. This could lead to a myriad of other issues, legal and otherwise. This will impair the learning process for the student and others in class. While you should be mindful, the odds of such a situation are slight, so don't stress out on this aspect of setting the learning environment.

Security

In today's world, one's personal security is a concern. You can't conduct a class when a student is distracted by gang activity or marching band practice outside the window, or if students express an uneasy feeling going to and from the parking area. This includes the safety of their vehicles while they are in class. This does not mean you are responsible for any situation that may occur. Don't conduct a class in an area where you know detrimental conditions may exist. Many schools, libraries and public buildings today have security personnel, roving and at specific locations. Some buildings have telephones, panic buttons in the classrooms, hallways or meeting areas. Know where these devices and people are located.

Be aware of Fire evacuation procedures for your area.

Having an HT handy or a cell phone is worthy of consideration for personal safety.

Learning Styles

Students learn in a variety of different styles and combinations. Some are more visual, others auditory and others tactile, hands on. Students that are involved learn more quickly. Those who reinforce a concept through demonstrations and hands-on class segments are more successful, as the students are using more of their senses to absorb the information.

Teachers should encourage a learning environment that fosters active and passive learning. In active participation the student is physically performing a task. Passive participation may be interpreted through note taking, or focusing upon your every word.

Most students have a dominate style and combinations of the others. While teaching you want to aim for the middle and make adjustments for individuals as needed. This is important when dealing with an individual having difficulty understanding a particular concept.

VARK: a guide to learning styles

The acronym VARK stands for Visual, Aural, Read/write, and Kinesthetic sensory modalities that are used for learning information. Fleming and Mills (1992) suggested four categories that seemed to reflect the experiences of their students.

Visual (V)

This preference includes the depiction of information in charts, graphs, flow charts, and all the symbolic arrows, circles, hierarchies and other devices that instructors use to represent what could have been presented in words.

Aural / Auditory (A)

This perceptual mode describes a preference for information that is "heard." Students with this modality report that they learn best from lectures, tutorials, tapes, group discussion, speaking, web chat, talking things through.

Read/write (R)

This preference is for information displayed as words. Not surprisingly, many academics have a strong preference for this modality. This preference emphasizes text-based input and output — reading and writing in all its forms.

Kinesthetic (K)

By definition, this modality refers to the "perceptual preference related to the use of experience and practice (simulated or real)." Although such an experience may invoke other modalities, the key is that the student is connected to reality, "either through experience, example, practice or simulation"

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Breaking Down the Material

Using the course syllabus (see example) as a guide, an instructor should consider:

The complexity of the material to be covered

The amount of time available to cover the subject

The academic background of the students

The learning styles of the students

The technical nature of the amateur radio theory has a tendency to be written at a higher reading level. This can be an obstacle to younger students, or those with a more limited academic experience. This does not preclude all students from being successful or understanding a concept.

When approaching new material, look at the vocabulary. For example, the word pecuniary is not an easy one. This word shows up all the time in amateur radio courses, yet is rarely heard in general conversation or read in a newspaper. When introducing an unfamiliar word, define it. What is it? What does it mean? An instructor should explain what the word means. In this case, pecuniary relates to or involves money. Follow-up with concrete examples to clarify this word's application. The concept of pecuniary is a simple one that can be readily understood by everyone, regardless of background. You don't want any word to fall into the category of egress, simply being used confuse others.

Always be practical. Theory is only theory, unless it can be applied, made real, to the student. Pepper your instruction with examples, so the student can relate to the concepts presented.

Sample Entry Level License Syllabus

Nature of Amateur Radio

- Know that the amateur license is for self-training in radio communications and is of a non-commercial nature.

Technical Basics and Vocabulary

- Units of, and abbreviations for voltage, current, power, resistance. Prefixes milli, kilo, and Mega.
- Know the relationship between voltage, current, and power.
- Know that resistance is the opposition to current flow.
- Know what is meant by the terms AC and DC.
- Know that a battery provides voltage and that a circuit is needed to allow current to flow.
- Know the definitions of radio and audio frequencies.
- Know the definitions of frequency, wavelength, and amplitude.
- Possess a basic understanding of what capacitors and inductors do.
- Know basic circuit diagram symbols.

Licensing Conditions

- Know the types of amateur licenses.

Transmitter and Receiver Basics

- State the items of a basic station as depicted in a block diagram.
- Know that the frequency generation stage in a transmitter defines the frequency on which the transmitter operates. Know that incorrect setting of these stages can result in operation outside the amateur frequency allocation and could cause interference to other users.
- Know that the RF power output of a transmitter must be connected to a correctly matched antenna to work properly and that use of the wrong antenna could result in damage to the transmitter.
- Understand that excessive modulation can cause distorted output and could interfere with users of adjacent channels.
- Know the basic capabilities of the modes of operations: PSK31, RTTY, Packet, PACTOR, CW, SSB, FM, and AM.

Antennas and Feed-lines

- Know the correct cable to use for RF signals.
- Know that the purpose of an antenna is to covert electrical signals into radio waves, and vice-versa.
- Recognize a dipole, ground plane, and yagi are types of antennas that are used for different purposes and situations.
- Know that omni-directional antennas transmit radio wave energy equally in all directions.
- Know that a beam antenna is directional and has apparent gain because of its focusing ability.
- Know that an antenna system must be suitable for the frequency of the transmitted signal.
- Know that if an antenna is not correctly designed for the frequency it will not match the transmitter and will not work effectively.
- Know that an antenna-tuning unit makes it possible for an antenna that does not match the transmitter to accept power from the transmitter.
- Know that an antenna-tuning unit does not correct an improperly designed antenna situation.
- Know that an SWR meter shows whether an antenna presents the correct match to the transmitter.
- Know that a high SWR is an indication of a fault in the antenna or feed line.
- Know that a "dummy load" is a device that allows the transmitter to be operated without radiating a signal for test and tune-up purposes.
- Know how to diagnose problems with antennas and transmission lines.

Propagation

- Know that radio waves travel in straight lines, unless diffracted or reflected.
- Know that radio waves get weaker as they spread out.
- Know that the ionosphere comprises layers of "conductive gas" at heights between 70 and 400 km above the earth's surface.
- Know that on HF, almost all long distance communication relies on the waves being reflected by the ionosphere.
- Know what conditions affect propagation on HF and VHF/UHF.

Operating Practices and Procedures

- Know to listen before calling and to ask if the frequency is in use.
- Know how to initiate a contact on HF and VHF/UHF repeaters.
- Know the function of, and how to use, a repeater, need for CTCSS tones, and frequency offset.
- Be able to determine frequency privileges by referring to a standardized frequency allocation chart.
- Know why band-plans are used. Be able to identify items on a standardized band-plan chart.
- Know how to initiate a call for emergency help.

- Know how to interrupt and join in an on-going conversation.

Rules and Regulations

- Know the format for callsigns.
- Know the requirements for station identification.
- Know the requirements to allow "third party" communication.
- Know that secret codes are not permitted.
- Know that broadcasting is not permitted except in special circumstances.
- Know that the transmission of music is not permitted.
- Know the requirements and responsibilities of a station control operator.

Interference Mitigation

- Know that radio transmitters can cause interference to nearby electronic and radio equipment.
- Know that radio receivers can also suffer from interference from local sources.
- Know that interference occurs through local radio transmissions being conveyed to the affected equipment through pick-up in house wiring, TV antennas and antenna feed-lines, telephone wiring, and directly by pick-up in the internal circuits of the affected equipment itself.
- Know that interference problems can be minimized by proper transmitter operation, lowering output power, sighting antennas as far away from the affected equipment as possible, and filtering.
- Know that interference problems have the potential for causing neighbor disputes. Understand the need for diplomacy.

Safety

- Know that high voltages carry a risk of electrocution and high currents carry the risk of overheating and fire.
- Know that proper electrical grounding is essential to safe operation of electrical circuits.
- Know that a correct fuse must be installed in electrical equipment.
- Know only to work inside of equipment after it is disconnected from the power source.
- Know how to correctly wire a 3-pin electrical plug.
- Know the need to clearly mark power on/off switches for all station equipment in case of emergency.
- Know that in the event of an accident involving electricity, the first action is to turn off the power switch.
- Know that antennas must be located away from overhead power lines.
- Know that antennas should not be touched while the transmitter is operating.
- Know that antennas may need special protection against lightening.

Lesson Building Blocks

A class lesson has three basic parts: *introduction, lesson development* and *summary*. The breakdown of an individual unit will be discussed in the next chapter.

Introduction – Secure and maintain the immediate attention of your students. Define the purpose and objects of the unit clearly and fully. If a follow up lesson, tie in the previous lesson so the students will see the relationship of the material they are about to be presented with. Sell the importance of the information. Provide an interesting scope of what is to be covered during the unit. Always relate the material to the student in such a way that they can identify with a pervious experience and feel part of the lesson.

Lesson Development – A good lesson flows from one segment into another, slowly developing a concept. This may be accomplished through a variety of teaching methods. Consider hands on demonstrations, audio visual materials, effective questioning techniques and exploiting student's contributions. Make your examples realistic and vivid. Paint pictures in the minds of your students by utilizing a rich vocabulary.

Lesson Summary – Use creativity and imagination in concluding a lesson. Review the material, checking for understanding. This is an opportunity to emphasize the bullet points of the lesson, pulling all the elements together. Employ a strong closing statement. A teacher always wants to leave their students on an academic high, in anticipation of the next unit, drawing the concepts together.

Lesson Plans

Instructor's Guides are available from the ARRL to assist with the basic flow of material. These curriculum guides offer scope (what is to be covered) and sequence (in what order the information will be presented.) What are the lesson's objectives? How will they build upon each other?

Lesson plans come in various formats, but the basic information they contain are universal.

Title:
What is the subject of the lecture?

Objectives:
What do you hope to accomplish?
These are sometimes referred to as Behavioral or Student Objectives. Well written objects contain three basic parts: Who, What they must do and to what level of achievement?

For example: The student will be able to correctly identify fifteen schematic symbols from a standardized a list of twenty items.

Don't get hung up on the educational jargon. Just remember, what will the student be able to do if the material is successfully transferred?

Teacher Preparation: What materials will the teacher need to present this topic? Be sure to include tools, materials, training aids or equipment.

Student Preparation: Will the student require any advanced knowledge to be able to fully participate? For example, the students may have been asked to review the material from the last class and to read Chapters X and Y for this lesson.

Lecture/Demonstration: This is the meat and potatoes of the lesson. List the major points of the presentation to be covered.

Student Activity: Provide opportunities for the student to reinforce the knowledge acquired through interaction. For example, solder a wire or draw a simple circuit.

Review: Summarize the material, with a final check for understanding.

Homework: What the student will need to do to prepare for the next lesson.

Proper lesson planning will reduce stress. They will also ensure that you cover certain points and assist in your pacing of the material. Feel free to jot down notes next to each topic, such as: a question to ask the class or a personal experience that relates to the topic, as part of your introduction. Consider printing out your lesson plans in larger type so you may refer to it more easily.

Effective Use of Instructional Technology

Instructional Technology embraces any hardware that may be used to assist the student in the acquisition of information. Traditionally items such as slide, overhead and movie projectors, tape recorders and videotape recorders, would come to mind.

In today's world, many of these items have been replaced by digital projection units, computers and wireless devices.

The availability of hardware support may vary from nothing to a flip chart or chalk board to a complete state of the art demonstration electronic classroom. The instructor's task is to identify appropriate devices and to utilize them effectively.

Courses that meet in schools, churches, or business may have audio visual equipment available, if you make arrangements prior to class. Always think back up, in case the equipment does not materialize.

Using technology just because it is fun is not a justification for its inclusion in a lesson. Technology is used to expand a student's level of understanding. Technology should not be considered a novelty, nor is it a replacement for good teaching.

Instructional technology offers the student an opportunity to view, or hear, material that normally would not be available. For example, bringing a class of students to the E-911 Dispatch Center would be nice, but not necessarily practical. Using a camcorder you could take a tour and share it your class. This technique could also be used to demonstrate specialized radio modes, such as Packet, SSTV or satellites. Using a TV camera, it is possible for students to visualize a process that would be too small to see at a distance.

Training Aides

Training aides fall into a variety of categories. Items such as charts, transparencies, slides, films, videotapes, equipment and software are a few examples.

When using a training aid, keep in mind its effectiveness. Educators sometimes refer to this as levels of authenticity. Level one would be the actual object, the best way if possible. Other levels have a reduced relationship, such as a 3-dimensional model, a 2-dimentional display, a videotape, a picture, on down the line. The closer you get to reality, the more effective the training aid.

When using any training aide, be sure to preview material before showing to a class. You would not want to get in an uncomfortable situation caused by a mislabeled tape or illustrative content that may not be appropriate for general viewing.

Due to time restrictions, you may wish to consider only playing the portion of a media presentation that relates directly to the topic, instead of viewing the entire production. Just cue up the section you need. If using a VHS unit you may wish to note where on the tape a segment is located, making a list of segments. You could also prepare a secondary tape, or CD/DVD disc, with just those segments you will be needing.

When designing training aides, consider type font style, size and color. Charts have to be read at a distance. A pretty chart that contains too much information will compromise its effectiveness.

Consider this scenario, once during a military lecture on training devices, an instructor pulled out a centerfold and briefly showed it to a male audience. Then he asked the class a question, "What month was it?" Obviously the lettering could not to seen at a distance and the focus of attention was not the text. Make sure your illustrations are appropriate and focus directly upon the concept.

Utilizing the resources of the Internet, and the ARRL library, many audio visual aides are available. ARRL course instruction manuals contain many supplementary resources. Reinventing the wheel is not a productive endeavor.

Conducting a Demonstration

The demonstration is a primary method of sharing information. This technique is especially effective for a student, as it helps to solidify the retention process. The more senses you employed the deeper the knowledge will be. If students can see it, hear it, feel it, smell it and taste it, they will have a richer experience to recall.

Presenting a proper demonstration lesson has a number of predetermined steps for success.

- Clearly identify the goal.
- Physically obtain and set up the materials to be used ahead of time.
- Always stress the safety aspects of the process.
- Make sure that all students have clear line of sight and can hear you.

    Consider where you are standing. You may wish to be seated and have the students standing over your shoulder, to get a personal point of view. You may consider standing behind the equipment, performing the demonstration from behind so the students' view is unobstructed. Mirrors may be effective in certain instances.

- Demonstrate the process, step by step.

    Verbally and physically

- Repeat the process, with the teacher performing the task, as students identify the steps.
- Repeat the process with the student performing the task, while the instructor observes, offering guidance and reinforcement, as needed.

    The previous two steps may be modified depending on the difficulty of the task being presented.

- Review the process, relating the results to the subject presented.

The First Meeting

The first meeting is full of anticipation, by the students and the teacher. A teacher wants his or her first meeting to set the stage for the rest of the course.

Have your name written on the board, on a folded piece of stiff paper or a sticky name label. This way, students may address you properly from the start.

In the relatively informal environment of amateur radio instruction, address each student by their first name. If you want to use a last name always, be sure to put a Miss, Mister or Mrs. in front of it. Calling on a student by their last name only is cold and impersonal.

If you do not previously have student information, take a moment to collect basic information from the students on a 3x5 card. You don't need their life history, basically just contact information. In today's world, be sure to have an e-mail address too. Be sure to include any special medical issue, such as a diabetic or seizures, so that you will be aware if a problem arises.

Explain the procedure that will be followed in the event of a class cancellation, such as a snow storm or hurricane. If meeting as part of an Adult Education program, an announcement will usually be made in the local media.

While going over that procedure, add in the rules of the facility, such as no smoking in class, the consumption of food in class or where to go in the event of a fire alarm.

Once you collect the cards, go around the room asking the students to identify themselves. This will start the bonding process. The process of getting to know each other may be modified to accommodate the size of the class. You may also wish to have the students wear a name tag or have a folded paper on their desk, containing their name.

The first class usually includes a fear of the unknown factor for everyone. Share with the students the goals for the course. The goal is a successful completion of the final examination. You should convey to the students that you are there to work with them all the way to the end. Students must feel secure in that knowledge. Students should understand that you have a plan to get them there. During this process you will provide any assistance that may required so they WILL be successful. Students have to know you are on their side and that the end result will be a teamwork approach to learning.

Have a course overview for distribution, a syllabus containing the dates of meetings and the chapters/topics to be presented. Arrange ahead of time with a local VE Team to be available on a set date. This way you have a goal. Have a back-up date, should some unforeseen circumstances happen.

Answer any questions, take a break. Prepare for your first lesson.

Motivation: Positive Reinforcement

Motivation is one of the most important attributes a teacher may possess. This skill, if properly used, will allow the student to grow academically and personally.

At work, if your supervisor calls you in for chat and commends you for a task well done, guaranteed you will walk out of their office with a sense of accomplishment. You'll be able to look at yourself in a mirror and honestly say "I'm a successful person." You will continue to work hard, desirous of repeating this event.

Students respond well to positive reinforcement. This technique gives the student a sense of a pride, having mastered a particular skill or curriculum knowledge. They then say to themselves, "I'm ready for the next step, so I can do this again. I'm smart, my brain electrons are flowing." Motivational words must be honestly given. A student will see a gratuitous comment as you putting them on, mocking them. If you use the wrong tone of voice or a curt word, not only will the student feel embarrassed, but they could mentally shut down. This often leads other students in the class to feel badly for him, creating a potentially tense atmosphere.
Motivation can be verbal, "good job" or physical, a thumbs up sign, when a proper response is given. Either way the student receives the message.

If an improper response is given, you still have the opportunity to turn this into a positive one, rehabilitating the student's status. When acknowledging an improper response, give the student a redirect. Examples include:

> Why do you think the answer is ___?
>
> Are you sure of that answer?
>
> Rephrase the question to lead the student to the correct answer. Note that this approach also reinforces the material for all students in the class. Other student will then self evaluate mentally the response they would have given.

Positive reinforcement will provide a better learning environment for your students. As a by-product you will find a lower dropout rate and a higher pass rate.

Remember, ALWAYS positive reinforcement

Humor in the Classroom

Humor is a very important part of life. Without humor, the world would be a much sadder place. The most important aspect of using humor in the classroom is to remember that there is a proper time and place for everything.

Humor may be used to help introduce a lesson. A funny story, a joke, or illustration directly relatable to the topic, may be an attention getter to hook the students. Keep in mind that the purpose of the course is to transfer information to the student, not to audition at the local comedy club.

Some people are just naturally funny. If you have this character trait use it. Some people have a dry humor and yet others are humorless. Forcing humor doesn't work and will be a distraction. This would be equivalent to have a joke bomb during the opening monologue during a late night talk show. A joke that falls flat kills the mood.

There are some ground rules. Humor is *never* to be used negatively or sarcastically. Stay away from race, religion and politics. These subjects are no winners, which will often alienate students

The expression, "we're laughing *with* you not *at* you" is to be remembered. Never embarrass a student, as the class will immediately react negatively toward you, feeling empathy for a classmate. If this innocently happens, apologize immediately. Take whatever corrective active is needed, to get the students refocused on the topic.

Often times the funniest events transpire without any set-up, they just happen. Being able to think on your feet can transform a spontaneous event into a learning reinforcement tool or stress reducer.

A teacher must set the proper environment so that humor is welcomed. Students may also contribute. Avoid creating a situation where a "class clown" mentality is encouraged. This will waste time by bantering back and forth, often ending with a "can you top this?" scenario.

Every class has a personality. Be aware of a class' composition. Humor that works with one group may not be effective with another. Comedians often say, "you have to know your audience." The classroom is your stage, use it wisely.

Questions, Questions

Contrary to the adage, "there is no such thing as a bad question," there can be.

Questioning techniques are an essential to good teaching. Asking a question is an ideal way to interact with students, reinforcing elements of a lesson. This process also allows you the opportunity to gather immediate feedback by verbally testing for understanding, on the fly.

The responses you receive may then be built upon to introduce the next aspect of a lesson. If the responses are off the mark, recycle your instruction using a different technique to share the information again.

A well formed question is clear and requires other than a "yes" or "no" response from a student. The question is directly related to objective being presented.

In your lesson plans, have a few questions pre-written to be used to reinforce a talking point or in case you draw a blank.

When a question is asked, allow *wait time*. Do not be too quick to give the answer. This will give the student more time to formulate an answer. Students don't like silence putting pressure on themselves to come up with an answer. Sometimes a simple rephrasing of the question will elicit a response. If nothing else, you know the information or the question was not understood. Share the bullet point again with emphasis, presenting the question in a different manner.

When a proper answer is given, be sure to use positive reinforcement. Nice job! You're making this look easy! Be sure that your praise is honest, not mechanical. If sincere, your response will be appreciated. If not, the students will see right through you. People don't liked being played with in such a manner.

In a larger class, you may want to involve more people in an answer. When a proper response is given, select another student and ask, "Is this answer correct?" "Do you agree with that answer?" When a "yes" or "no" is given, follow up with "why?" Another technique is to ask a question with multiple correct answers, for example, "amateur radio has four basic principles. Can you name one?" Then select different students around the room, until all four answers are obtained. This way you have involved more people in the learning process. It also keeps the attention of other students and reinforces the correct response.

Be sure to constantly scan the room, so you won't be looking for responses in the same area of the room, or from certain students. Surprising to some, classroom observations find that teachers have a tendency to select students on one side of the room over the other, depending on whether they are right handed or left handed. This is an unconscious behavior based on physiological reasons. Be sure to share questions proportionally by gender. In either case, don't get yourself hung up on this, just be aware of the possibility, so that no student is overlooked.

Awareness of non-verbal communication is important. While raising a hand for attention is the traditional manner, watch a student's eyes and demeanor. Does a student look tentative? Is a

student trying to hide in their seat or gazing away to avoid eye contact? These clues and other body movements provide feedback to you. This may also signal a good time to take a break.

When a student asks a question there are a variety of possible reasons, among them:

> The student has an honest request to clarify an issue.
>
> The student likes to hear his or her voice.
>
> The student desires to prove to others how brilliant he/she is or wants to play stump the teacher.

One fear everyone has is being asked a question to which they don't have a ready response. This is very true for teachers. A teacher projects that students believe they are a fountain of wisdom, someone who knows all the answers. If that were true, you would be in a bottle at Yale being studied. This situation may make you feel uncomfortable.

If you are unable to come up with a quick, accurate and complete response, have no fear. Compliment the student on his or her insightful question. Offer to obtain the information and respond after the break. If this happens at the end of class, you may wish to fall back on the old "hold that question. We will start with that at our next session."

If the question is off topic, you may redirect it or ask the student to remain after class for a response. Should the question be related to a topic to be covered in a subsequent class, ask the student to hold the question. You may use this inquiry when the topic comes up in a future class or as a topic starter in your next class.

Students respect any teacher who is willing to go the extra distance for them.

Teachable Moments

In the learning process there are moments that happen when students are super receptive to information. This may be part of a class', or a student's, internal rhythm, or spontaneous, based upon something that has recently happened. Regardless of the reason, be aware of this event and adjust your teaching accordingly.

Think back to your school experiences. How did the class react the first period of the day, verses, mid-day or the end of the day? What was the mood of the class after a tragic world event? How do you feel attending class after a long, tiring day at work or if there has been a family issue?

Recent tragic weather related events may present an opportunity to discuss amateur radio in an emergency or as a public service. Current weather may represent a chance to discuss radio wave propagation or static electricity.

Teachable moments will often occur when a student asks a question. In general, when a student asks a question, they have an interest, creating a need to be addressed. If students didn't care they wouldn't ask. Sometimes the question will be out of left field, other times relatable from a different perspective.

When answering any question, be aware of the big picture of information to be presented. You may wish to introduce information a little out of sequence, because the timing is right for student reception. Often this requires quick thinking and flexibility. Be willing to go with the flow, directing its movement.

Extra Help

Teachers enjoy sharing; it is part of their being. The amateur radio term of "Elmering" is the act of assisting newcomers into amateur radio. Think of this as one-to-one, or small group tutoring.

Situations may develop when assisting those with special circumstances, such as limited mobility or medical problems. When assisting outside of class time, there are some considerations to address.

Society has changed a lot over the years. Some behaviors may become misinterpreted, so it is best to follow some guidelines for everyone's protection. The basic rule is you want to avoid any appearance of impropriety or incidental physical contact.

- Never meet alone in a classroom with a student. Should there be no alternative, make sure that the classroom door is open and you are in full view of the doorway.

- Always try to have another adult is in the room. This is especially true when working with minors.

- Meeting with a group of students collectively is fine. When you have completed your business, all students should leave the room together.

- Do not offer to drive a student home. There are times when car pooling is practiced and is the norm in a community. If you participate in such a routine, make sure that you are never alone with a minor.

- If you meet a student outside of class for tutoring, always meet in a public place, such as a library.

Working with adults is usually not a problem. When working with minor children extra precautions must be taken. One way to get younger students participating is to get their parents involved. If a parent is present many issues are automatically reduced. While a minor is in your care you must maintain a higher standard of diligence. For example, if a child is waiting for a ride home, a student should not be left alone or in any area not supervised.

When running a class, the more assistance you can get the better. You may wish to maintain an Elmer contact list with phone numbers or e-mail addresses. This way if a student has a question in between classes, they can try to have it answered. Depending on the class composition, you may wish to match up certain individuals with specific Elmers, based upon compatibility, learning styles or geographic areas.

E-mail can be an effective way to handle questions. This technique is often seen in schools and is business today, so it is familiar to most individuals. Depending on the size of the class and the degree of technical expertise available, you may wish to set up a chat room on the Internet,

making yourself available at a set time. Other Internet approaches include: creating a mail reflector to share questions and answers, or for class administrative activity.

Often new hams need assistance putting up an antenna or setting up their stations for the first time. Antenna parties are very common in the hobby. If working with a minor, ALWAYS be sure to have the permission of a parent and request that at least one parent is present if you will be at a student's home.

Special Learning Issues

There may be a time when you have a student with special needs. They may be physical, mental or emotional in nature. Amateur radio has had a long history of good operators with special challenges. The beauty of the process is when on the airwaves, there is an equalizing factor established. When you are operating you don't know if the other person is visually challenged, deaf or missing an appendage. You only know if they are a good operator and fun to QSO with. For a person with challenges this is a huge ego boost, as they CAN compete in the real world on an equal footing. Be positive, concentrate on what can be accomplished, and don't focus on the negative.

Any student with special needs should make that fact known immediately to the instructor or person registering the class. Accommodations should be made in accordance with the American Disabilities Act. Sometimes a fix is a matter of seating a student in a proper area for easier sight, or closer to the instructor, if they have a hearing impairment. Other issues may have to be addressed with hardware, known as adaptive technology. Hams are a creative lot. While you are not expected to incur any expense, you can seek out resources for the student.

Handi-Hams is an excellent organization with a long history of success.

The mission of The Courage Handi-Ham System is to provide tools for people with disabilities to learn Amateur Radio and technology skills, and to earn their Amateur Radio licenses.

The HANDI-HAM program teaches technology to people with physical disabilities and sensory impairments. Ham radio, computing and more can be learned at home through the use of cassette tape books, or at one of their residential camps. Perhaps you are teaching a class in amateur radio to blind students. They have books on tape!

There are several ways to contact Handi-Hams.

Mail:
Courage Handiham System
3915 Golden Valley Road
Golden Valley, MN 55422

E-Mail: hamradio@courage.org

Toll-Free telephone: 1-866-HANDIHAM (1-866-426-3442)

FAX: (763) 520-0577 Be sure to put "Handi-hams" in the FAX address!

The Final Task: *Evaluation*

High quality instruction requires constant assessment. The depth of this feedback varies depending on its purpose. What is it you want to know?

During a class, the instructor gets immediate feedback interacting with their students. Are the students attentive? Are they asking quality questions? When asked a question do students give responses indicating the comprehension of information presented? This feedback allows instructors to make immediate changes in their delivery.

Course/Instructor assessment is needed to provide information for future classes. The goal is to constantly strive for improvement. This can only be achieved through proper evaluation and planning.

The methods used to gather this data vary. The tool you develop should reflect the academic level and number of the students participating. Do you have a large group, a small group or multiple sections? Was the course traditional or high intensity?

The same content, delivered in a different process, could yield different results.

Regardless of the method employed, there are certain areas of interest when evaluating.
1. Student learning
2. Communication and Clarity of materials
3. Class organization

Examples in each area are given below as a starting point for developing your evaluation tool.

Student Learning:

- The classroom environment encouraged questions.
- The course provided me the information needed.
- I learned to appreciate communications concepts
- The course motivated me to learn more amateur radio.

Communications/Clarity

- The instructor used clear examples
- Handout materials were focused and easily understood
- The instructor effectively used demonstrations and media to present material.
- The instructor clearly understood and responded to students' questions.

Class Organization

- Was the instructor well prepared for class?
- Was the course content presented in a logical manner?
- Was the instructor accessible during non-classroom sessions?
- Did the instructor use class time effectively?

An effective evaluation tool is quick and meaningful. Class time is valuable. There usually isn't enough time at the end of the course for tying up many loose ends. You don't want a student to plod or rush through many detailed items and options. This could lead to less than thoughtful responses or question misinterpretations.

Methods

- ***True/False*** A true/false questionnaire must be clearly written. The data collected could be fuzzy, depending on how the student read the question. Trigger words like sometimes, always or usually often raise a question on the part of the student. Is this a trick question?

- ***Scale***. Questionnaires that offer a range of responses are very effective. Consider: 1- Strongly agree; agree; disagree, 10 - strongly disagree. Using a 1-10 scale the student must make a decision favoring one extreme or the other. A scale of 1-5 is sometimes used. 1- Strongly agree 5 – strongly disagree. This gives the student a possible 3- Neutral response. Students could use this to take the easy way out of responding.

- ***Open ended questions*.** Open ended questions offer an opportunity to really respond in depth to specific items. The quality of responses can vary depending on the class' composition.

- ***Combination*:** When constructing an evaluation tool a combination of methods may be employed. Often scale-type questions are used, with an option for open ended responses at the end.

- ***Small group discussion*:** Sometimes in a small class, a roundtable type of discussion may be conducted for an informal evaluation. This technique can be intimidating to some, altering potential responses.

Teacher Preparation

Once the teacher has decided upon the scope of the evaluation, an easy to understand form should be put together. How large the class is will determine the amount of effort needed, on the teacher's part, to get accurate feedback.

Always try to keep the form under one side of one page. In some cases, if many items are involved, place the scale questions on one side of the paper, with directions to complete open ended questions on the reverse side.

You could give the students large index cards. Write the questions on a white board, asking the students to number their card's lines for responses. For an open ended question use the reverse side of the card.

Data spread sheet programs can be effective. This would also allow you to tabulate the data, placing it in a visual form, for interpretation.

The evaluation form is the final classroom activity. After they have completed the form, the student should hand it in, to a neutral spot l leave. In this way other students won't be distracted.

In some classes, depending on the composition of the class, some instructors prefer to give out the forms and leave the room. Depending on requirements, you may have another adult monitor the process.

One new approach is to construct a student feedback page on a club's website. Using a web form, students may input their responses after the class sessions are over. This would also save class time during your course wrap up class.

Student Preparation

When preparing students to complete an end of course evaluation, proper preparation is mandatory for meaningful results. The students should clearly understand that you are interested in their feedback to make improvements for students in the future. You do NOT want them to sign their names. Students should understand that you take their input seriously and appreciate their assistance.

Evaluation is an important tool, for both the teacher and the student.