

These Youngsters Are Radio-Active!

By Mike Zane, N6ZW (retired from Lodi, CA Police Dept.)

The Lodi School District is a "year round" school, due to severe over-crowding. That means that there are two tracks of students and teachers going to school and one track off. The tracks are on for approximately 4 months and off 2 months. Example: A & B tracks are on and C is off. A goes off and B & C are on, etc. My school ham clubs meet one day a week for one hour. One school meets on Tuesdays and the other on Thursdays. As I mentioned before, one of the schools is kind of in limbo because of re-construction of classrooms. They are still trying to find space for us. We used to meet and have a station in my wife's classroom, but new cabinets and shelves took the space we used, so now I don't know what's going to happen. Anyway, I recruit new members by going into the 5th and 6th grade classes and giving demos about ham radio and electricity. I use an HT and make contacts through local repeaters and then show the kids where the repeaters are located on a map. I also bring in a general coverage receiver and throw a wire out the door and can generally pick up some foreign broadcast from somewhere, especially Central and South America. There are a lot of Hispanic children at one of the schools, so they can generally pick up on some of what is heard in Spanish and that is kind of a moral booster for them.

For electricity demos, I use an "energy ball." This is a small plastic ball about the size of a ping-pong ball. In it is a circuit that has a buzzer and red flasher that goes off when the two small metal tabs are touched to complete the circuit. I have all the kids join hands and the last two complete the circuit and the "ball" goes off. That shows them that some "electricity" is "good" and won't hurt them. Then I use a fused AC power strip and "spark" 110V AC and tell them about regular house electricity. I also use Gordon West's "pickle" demo. That's putting electrodes from 110V AC into the ends of a big pickle and boy does that thing spark, glow and smoke. I reference this pickle to the human skin and that gets the point across. I show them one of the crystal radios that a previous student made, which shows them that kids their own age can make radios.

I also show them colorful QSL cards from my station and from the school station. I don't go into much detail about the licensing structure except the Novice/Tech licenses, and not too much on rules and regulations. Our local adult club has donated two sets of the Walker Tompkins and Cindy Wall books to the school(s) library and I point out what adventures they tell.

I generally get three or four kids from each track to join the school ham club. Sometimes all stay through both 5th and 6th grades, but I lose some after a few months. There will be a few who think the ham club will be fun, but quit when they realize they have to study a little outside school.

The kids start off building a crystal radio. I use just the basic circuit of tapped coil, "fixed" capacitor (at first), crystal diode and a wood base for mounting parts. Here is what I use for the parts:

For the coil: I get heavy cardboard tubes from the local "copy" business. These are rolls left from fax paper. The business just throws them away, so I have them saved for me. They were glad to when I explained what I used them for. The tubes are 1-3/4 diameter X 12-1/2 long. I can get three coil forms from the tube by careful cutting.

For the coil wire: I use #26 or 24 enamel wire. I use Radio Shack # 2781345, and use the spool of #26. I also get spools of magnet wire from Antique Electronic Supply in Tempe, AZ, and if I need a couple lengths quickly, a local motor winding shop gives me about 100 feet free.

For the crystal diode, I use Radio Shack 1N34s. They are 99 cents for 10.

For the fixed capacitor, I use anything I have on hand from 100 pF to 330 pF disc ceramic type. Later the kids take the fixed cap out and replace it with a 250 pF variable that I get from Mouser Electronics. That part number is 24TR222 and is called a poly-film RF tuner capacitor. I generally buy 10 at a time at \$1.18 each. Mouser also has magnet wire for coil winding. The kids use the coil and variable cap again when they build the AM radio. Some elect to wind a new coil, so they don't have to tear up the crystal radio.

Other miscellaneous parts used are: Fahnstock clips (when I can find them) and/or wood screws for fastening down the coil and 1N34. I also make 2 jumper wires using a 6-inch piece of #22 covered wire with small alligator clips (again from RS) to connect the 1N34 and antenna to various coil taps for tuning. I have two sets of high impedance headsets for the kids to test the crystal radios. Later they will build an audio amp. with a small speaker so they don't have to spend \$15.00 to listen to a \$1.00 radio. More on the audio amp later. The wood block used for the base is the standard 1 X 4 inch white pine that comes in 6 foot lengths (the cheap stuff) at almost any lumber yard, or home supply store. The length of the block used for the radio is about 6 inches long. I can get a bunch of bases from the standard length of 6 feet that is sold, and it's inexpensive.

The next project the kids build is a Morse code key. They use the same wood base for the key. We use a plastic key arm, made from what "TAP Plastics" call poly-plastic. A key arm of this stuff is about 4-1/2 inches long and 1 inch wide & has enough spring that a regular spring is not needed. As this key is not going to be used extensively, they last quite long. The stand-offs used to mount the key above the block are toothpaste caps or caps from small pill bottles such as Excedrin, etc. Long wood screws are used to mount the arm on the stand-offs. Some of the kids also use a pill cap for a key "button." I loan the kids a RS buzzer that is connected in series with a nine-volt battery and the key arm. Makes a lot of noise and the kids can practice a little code if they want. I have shareware computer programs to give out if the kids want to learn Morse, but its not pushed on them. The kids will make a 2-transistor CPO later to use with the keys.

Next the kids will practice soldering parts on old PC boards. I have 8 small soldering irons they use. I made "board holders" from a piece of 2 X 4 and a wooden clothes pin. When all of the kids are ready, they go on to the audio amplifier. This is a standard LM386 circuit that can be found almost anywhere. We use two methods: if I get donations from our adult group of PC boards from RS, (mini-pre-drilled RS-276-148) we use them; or I get single-sided PC boards from All Electronics (Los Angeles) and they use the "ugly" technique of soldering parts to copper squares.

I etch out blocks on the boards. I can get two boards from cutting one of the All Electronics boards in two. I've found that neither technique is better than the other for the kids.

The next project is the two transistor CPO. I have them do this right after the audio amp because the soldering techniques are still fresh in their minds. I found the circuit in an old Radio Shack book long out of print. I can't even remember what it was nor what transistors they used. I experimented with various transistors and found two that work good. I etch small boards and the kids solder the two transistors, two resistors and one capacitor on the boards. I also supply 1-inch or 2-inch diameter speakers. The speakers are also used with the audio amps and are "clip-leaded" to either the crystal radio or the CPO. A 9V battery is also used to power the CPO. The tone is loud enough that no volume control is needed. If it bothers parents, they can put a small piece of cardboard with a few holes over the speaker to cut down on the noise. The transistors used are: (RS) MPS2907 and MPS222A. The other three parts are: (1) 100 ohm and (1) 15K resistor and (1) .1 cap.

In between all of these projects, the kids are studying a "ham manual" that has lessons starting from what ham radio is about, the license structure, FCC, call signs, operating techniques, basic electricity, how radio waves are generated and how a radio picks them up. I use John Abbott's book, Ride the airwaves with Alpha & Zulu, and ARRL's Now You're Talking. We also spend time on the school radio station making contacts. We have a map that the kids track and mark the contact locations.

I have 3 small VOMs that the kids use when we do electricity experiments. The kids have fun measuring battery voltage through several simple circuits they build using various resistors and pilot lights. They also grind up pencil lead and make their own resistors by glueing the lead to paper. Sometimes it works, sometimes it doesn't.

Each child in the club(s) progress at their own rate. Some have trouble winding the coils, soldering parts and following directions. But as my wife tells me, that is normal for 5th-6th graders. (She is a 6th grade teacher.)

I retired in 1989 from the Lodi Police Dept. And not being the type of person to just sit around, I thought about starting a school club. I went to the high schools and found absolutely no interest at all. Then I went to the middle schools (jr. High, 7th, and 8th) and got some interest from the administration, but none from the teachers. I contacted the principal at the school where my wife was teaching. That fellow thought ham radio was a good idea. So I went into the 4th, 5th and 6th grade classrooms for my recruitment demo. I soon found out that 4th grade was a little too young for the club. Their attention span is not quite long enough and it became apparent most of my time was going to be spent telling them to sit down and be quiet. So, I've limited the club to 5th and 6th grade students. That first year at Nichols Elementary, my wife switched schools and went to Reese Elementary where I started another club later on. At Nichols we have a Kenwood TS-830S, 40 and 20 meter dipole for HF. For VHF we have a Alinco DR-130 for FM voice and packet. And for ATV we use PC Electronics gear. All of the equipment is stored in a big cabinet on rollers up on the stage in the auditorium/cafeteria. Our adult radio club also meets at this school and can use the radio equipment or antennas for demos during club meetings. Since starting the club at Nichols, the principal retired and the vice principal took over. He is just as

supportive as the first principal was. The 5th and 6th grade teachers are also supportive. They have agreed to let the radio club students out of class early to attend radio club. This has several benefits. One is an incentive to finish class work so they can come to the club meeting, (they do have to finish school work first). The kids don't have to stay as long after school -- normal school lets out at 2:45 PM -- we meet from 2:25 to 3:25.

Over the last two years, I've found a couple of old shortwave receivers to loan to some of the kids. I have the kids (and their parents) agree to return the receiver after one month of use. I make sure that they can put up some type of outside wire for an antenna. I've been using an old Hallicrafters S-38D and a National SW-54. They have been working pretty good after new tubes and a little realignment. I've just picked up a Knight Star Roamer and a Hallicrafters S-120. Both need a little work to perk them up. I have the kids keep a SW log of what they hear and when. So far, no one has been able to copy any station information. But it seems to keep their interest up.

The club at Reese Elementary is suspended right now. The school just went through classroom reconstruction and I lost the space for the radio station to shelves and cabinets. We are still trying to figure out where to put a radio, at least a small transceiver. We could put a small 2M rig in with a Ground Plane antenna on the roof, but the kids lose interest after a few sessions on the local repeater. I thought packet would be nice, but after trying to send a few messages back and forth to another school, both lost interest. One of the advantages I have at Nichols Elementary is that most of the kids are from low income families that don't have home computers. Those that do, usually don't have Internet capability so I don't have to compete with that. The other school, Reese, is in a very affluent area. Most of the kids are on the Internet and the PTA is trying to get computers with Internet capability in the classrooms. That is one thing I disagree with. I haven't come across one kid in 5th or 6th grade that can use a keyboard as intended. Most are good mouse-game users, but I don't think that is what the PTA has in mind.

Just checked my email and found 2 requests for school skeds. One from a new school club(N2WG) at Myrtle Grove Middle School, Wilmington,NC and one from a 4th grader (Brian Hohner-KCOEFV) who just got his novice license in Sept. Will have to try for some school contacts.