Darn Those Ham Radio Operators!

Purpose: The objective of this activity is for the students to experience how interference adversely impacts the quality of the information transmitted by wireless technology and the need to keep interference to a minimum.

Overview: When parents yell at the children the "turn that radio/TV down!" what is actually occurring? Probably the volume is so loud that the sound is interfering with something that the parents want to accomplish. So parents set rule and guidelines to follow so that each member of the family can enjoy the activities that are important to them while not necessarily infringing on the enjoyment of others. What if there were no rules? Well frankly children would relish the chance to live in a world where there are no rules, but quickly they will come to realize rules are important and in fact look for, seek out, and if not forth coming, develop rules to bring order to apparent chaos.

In this activity, a TV set has the incoming signal deliberately degraded so that the slightest interference with the signal will have large affects on the quality of reception.

Time: One class period to discuss the need for rules to manage the airwaves in an attempt to prevent interference with legitimate wireless activity. One class period for students to report to the rest of the class their observations during the activity.

Skills Required:

- Listening
- Observation
- Critical Thinking
- Writing and expression

Materials and Tools:

Standard television set with antenna connection.

Preparation:

Discuss with the class the different types of interference including deliberate and unintentional interference.

Discuss with the class how interference degrades the quality and accuracy of the communications event. In class demonstrations with students role-playing rude interruptions of a private conversation can illustrate the point.

Emphasize the point that not all interference is intentional and that careful observation of the interference can be useful in diagnosing and fixing the problem.

Background:

Now You're Talking pages 6.1417.

Handbook pages 28.1 – 28.14

The following is a news release of just one of many examples where people are dealing with wireless communication interference:

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ON THE AIR:  PERTH HAMS JAMMED OFF 2.4 GHZ

A cloud of radio frequency interference has settled in on the 2 point 4
Gigahertz in the city of Perth Australia.  For many hams it is
making  satellite operations impossible.  Felix Scerri, VK4FUQ, reports
from the city of Ingham  down under:
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You may not hear many VK6 hams on AO40 for a while. Many are suffering from
interference from some form of wide band data transmission centred on
2.4GHz.  The signal covers much of the Perth metro area and is very strong.
So strong in fact that it does not matter where you beam you can still hear
it - mainly from reflections.
The signal, which runs continuously, sounds like a 100Hz buzzing  sound and
has a bandwidth of about MHz.  Looking at the signal on a  spectrum
analyzer it has a flat top and very steep sides.  The signal  started about
6 weeks ago and one suggestion is that it might be an  image response of S
band down converters to the 2.1GHz  G3 mobile  phone service that have just
started tests.
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At airtime, the interference is still there and hams in Perth are wondering
what to do to make the problem, go away.  (Q-News)
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What to do and how to do it:

1. Tasked the students to tune into TV stations in their local area that can be received direct from an antenna or 'rabbit ears'. The students should create a log listing the channel number and the picture quality.

2. Next, the students disconnect the antenna from the television and observe the picture quality change on each station and log the results.

3. Finally, the student should experiment with different electrical appliances in the home to see if, and what type of interference they cause in the TV. Log any observations about the type and severity of the interference and how it affects the interpretation of the information being received. Household devices that typically cause interference are electric drills, kitchen mixers, florescent lights, light switches, outside security lights, electric fences.

The students share their observations with the rest of the class.

Data Analysis:

Create a class-generated table that summarizes the individual student's results. Not the frequency that a particular category of home appliance that causes interference. In

addition, noting the particular brand of appliance that causes interference might give the students some consumer insight into which brands to buy and which to avoid.

Activity questions:

1. How do you feel about watching a TV program that has ' snow' like interference in the picture? Has your family done anything to improve the quality of your TV reception? If so what? What were the trade-offs for the improvements?

2. If your family did make improvements, why do you do it?

3. Did interfering appliances affect all channels the same way? Were they any appliances that did not cause interference? Was there anything in common among those appliances that did cause interference?

4. Why would this activity work with TV stations that are received directly off of the antenna while those received from cable or satellite TV providers would not work?

5. If you have an amateur radio operator or citizens band operator living next door and they appear to be interfering with your TV set, who is responsible for clearing up the interference?

6. Do you think that radio and TV manufactures as well as appliance manufactures have any responsibility to design their appliances so that they do not cause interference? If so, who pays for the additional costs?

7. Most of our consumer electronic devices are made in Japan, China, and Korea. How can the United States encourage manufactures in those countries to make interference resistant products? Is there anything that you personally do to encourage manufactures to make interference resistant products?

Adaptations for special needs: No accommodation should be necessary for this activity. Blind students can duplicate the activity by using a standard AM/FM consol radio.