GLOSSARY:

Bandwidth: The amount of data that can be passed along a communications channel in a given period of time. For analog devices, such as land line telephones, bandwith is the range of frequencies that can be transmitted and is expressed in hertz (cycles per second). For digital devices, bandwidth is measured in bits per second. The wider the bandwidth, the faster data can be sent.

Electromagnetic radiation: Radiation consisting of electromagnetic waves, including radio waves, infrared, visible light, ultraviolet, x-rays and gamma rays.

Fiber optic cable: Glass cable, thin as a human hair, capable of carrying light around the world.

Morse Code: A code developed by Samuel Morse for transmitting messages in which the alphabet and numbers are represented by sequences of written dots and dashes, or short and long signals such as electric tones or voltages. Morse code was used extensively in telegraphy. In a format that has been standardized for international use, it is still sometimes used for long distance radio communication.

Routing device: A device in a network that handles message transfers between computers, receiving and forwarding information based on what the router determines to be the most efficient route at the time of transfer.

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***Advanced* Teachers Guide**

SYNOPSIS:

Communications technology is everywhere. We send and receive information through televisions, internet, email, radio, text message and social media. This issue goes into depth about how electronic communication has evolved over time.

Whether using an old rotary phone or some new technology, there are basic principles behind each that many of us are unfamiliar with. Land line telephones send sound waves that are converted into electrical impulses that work with a series of switches and routing devices that open an electrical pathway to whomever you're calling. More commonly, cell phones operate by means of a modulated electromagnetic wave – basically a radio. These signals connect to an electronic communications network. Metropolitan areas are divided into small networks where antennas send and receive signals depending on the user's location.

CURRICULUM UNITS:

- Chemistry
- Computer engineering
- Computer science
- Physical science
- Physics

CAREER OPPORTUNITIES:

- Chemist
- Computer programmer
- Hardware engineer
- Information technology specialist (it)
- Network engineer
- Software engineer

PROGRAM OVERVIEW:

Communications technology is a fast changing industry. Until the 1960s, all the electrical information carried on phone networks travelled along wires. With businesses and the public increasing their use of the phone networks in the later part of the 20th century, scientists set out to increase bandwidth, which is the range of frequencies used to transmit a signal. They moved on to fiber optic cable.

Fiber optic cables start as tubes of highly refined glass. By sending gases through the tube while turning and heating it, a second layer of glass with a different refractive index is built up on the inside. The newly formed rod is subjected to high heat. As it changes to a liquid, the glass falls under its own weight, forming a thin strand. This strand cools as it sinks, creating a cable with one type of glass on the outside and another in its core. It's this property that enables it to reflect inside the cable so that the light continues traveling through the core even when the fiber is curved or bent.

Multiple frequency photonics revolutionized the telecommunications industry. Data rates increased dramatically with ISDN and ADSL. ISDN is integrated services digital network, which enables wide-bandwidth transmissions over telephone networks. ADSL is asymmetric digital subscriber line, a method of transferring data over copper telephone lines. With these technologies, the possibility to share high quality audio and video advanced very quickly. And of course, new technology resulted in more compact equipment.

ISSUES & CRITICAL THINKING:

1. Discuss with students how communications have evolved over the decades. Ask them to predict future technologies by sketching or writing a description of communication technologies that will be common twenty years from now.

2. Investigate health risks associated with cell phones and electric and magnetic fields.

3. Create a graphically interesting timeline that marks the invention of communications technologies. How have the inventions affected human society?

4. Have students research and then discuss whether or not any appreciable atmospheric heating can be accounted for by radio waves to and from satellites and cell-phone towers.