Communication Through the Ages (Discovery Education)

Have you ever imagined what life would be like without cell phone technology? Think for a moment about what it would be like if we had no instant communication. How would people send messages to friends and loved ones? How would you let someone know if you were running late? What would people do in the case of an emergency? The scenario you are imagining was reality for people of the mid- to late 1800s. Once you picture a life without instant communication, you can begin to imagine how revolutionary technologies like the telegraph and telephone really were. In fact, in many ways these inventions were similar to social media today because they changed the way people interacted with one another.

Life Before Instant Communication

Humans have always had ways to send messages. Long before recorded history, early people sent messages with the use of fire, drums, and smoke, and by blowing through animal horns. Of course, these messages could not be very complex— you could not send a photo or email with smoke—but they could send a simple warning message.

As human societies advanced, so too did forms of communication. Early Americans sent messages within towns, to different towns, and even cross the ocean. The main difference from communication today was the time it took for messages to reach their recipients. Handwritten letters traveled on stagecoaches, trains, or steamships until they reached their destination, a process that would take many days. Imagine a young man leaving home to visit Europe and sending a letter to his parents to let them know he had arrived safely. His parents likely waited several weeks before they received the letter. As the young nation grew, two important inventions, the telegraph and the telephone, changed the way people communicated with one another.

The Pony Express operated from April 1860 to October 1861. This mail delivery system used riders on horseback, as shown in the drawing above, to deliver mail to the Western United States. It took about 10 days for a letter to travel 2000

Rise of the Telegraph

The telegraph was an important invention of the 1800s. This relatively simple device used electrical currents to transmit a message through wires. Although there were a few early versions of the telegraph, the invention is credited to Samuel Morse in 1832. He invented a system of simple signals—dots and dashes—that represented different letters. These signals were transmitted as electrical

impulses through wires, and they could be received seconds later in a different city. Samuel Morse, working with fellow inventor Alfred Vail, made a series of successful demonstrations of the telegraph, enough to convince the United States Congress to invest in the technology to use it across the nation. Morse and Vail built a simple telegraph line between Washington, DC, and Baltimore, Maryland. While members of Congress watched, Morse sent a now famous message to Vail, “What hath God wrought!”

Members of Congress were so impressed that they agreed to fund the construction of the telegraph network. In order for this new technology to work, wires had to be strung from town to town. Soon, telegraph wires were spreading across the nation, and the telegraph became a common method to transmit news and important messages. People marveled that they could instantly communicate with people in different towns and different states, without waiting for a stagecoach to carry a letter.

As telegraph lines spread across the country, so did telegraph offices. Western Union, a company that sent and received telegraphs, became the first giant corporation in the United States.

Of course, the telegraph had drawbacks. It required an extensive network of transmission wires. Telegraph wires did not run to private homes, but rather to telegraph offices, which were usually along train lines. The telegraph lines themselves also followed train tracks, and it was common to see a series of poles with overhead lines next to train tracks. If there was no train to your town, there was likely no telegraph either, which meant people in small towns needed to travel to the nearest town with a telegraph office to send or receive a message. Sending a telegraph also cost money, so people usually kept their messages short. Telegraphs were mainly used for coordinating train schedules, but they were also important for sending urgent, time-sensitive messages. Most people still wrote letters for in-depth communication. Also, because telegraphs were sent in Morse code, they required operators fluent in Morse code to both send and receive the messages. Despite these drawbacks, the telegraph soon spread westward. In 1861, the first transcontinental telegraph line was completed, linking the East Coast of the United States to the vast western frontier.

The Telephone Changes Communication

The telegraph was vitally important for connecting all corners of the large United States, but it did not allow for direct conversations between two people in different areas. That changed with the invention of the telephone in the late 1800s by Alexander Graham Bell. Bell’s invention advanced the idea of the telegraph by using electricity to transmit sounds. Although he started by transmitting the sounds of musical instruments, Bell soon developed a device that sent and received the sounds of the human voice.

Bell received a patent for his invention in 1876. Not long after, telephone offices began to appear all over the United States. While the telegraph was invented to link people in different towns, the telephone was invented to allow people in the same town to talk to each other. Telephone switching offices linked lines from private houses together, so a person would pick up the phone and ask the operator to connect the line to another house. The operator then plugged the caller's wire into the receiver's line, allowing the two people to talk.

At first, telephone lines only connected locations near a central switching office, but soon, the lines spread so that they connected locations throughout a town or city. When the telephone lines of one city connected to the telephone lines of the neighboring city, the networks could be joined and messages could travel across several switching offices, creating a "long distance" connection. As technology advanced, the lines switched to copper, which allowed them to handle more and more telephone signals, until virtually every home had a telephone in it.

For the first time, people in different places could hear and send voice messages and connect and communicate across distances, without needing a telegraph officer to translate. Not only could people quickly send information, but also they could hear emotion. They could laugh with distant relatives, comfort each other during sad times, and delight in the ability of the telephone to shrink great distances.

Soon, technology advanced so that each home had a unique phone number, and operators were replaced by electronic switching systems. When a caller dialed a number, electrical pulses were generated that signaled which lines should be connected.

Communication Today and into Tomorrow

Over time, inventors have improved technology to make communication faster, easier, and more powerful. By the late 1890s, inventors like Gugliemo Marconi were using radio waves to send telegraph messages without wires. Before long, radio waves were used to carry voices, and even music. People could listen to radio broadcasts in their homes or communicate with one and other using two way radios. In the 1960s, a jazz musician named Teri Pall invented one of the first cordless phones. Her phone used radio waves, instead of a chord, to send a signal to a receiver up to two miles away. The receiver was plugged into a traditional phone line, but Teri could make a call from anywhere nearby.

In the 1970s and 1980s, companies continued to test new ways to use radio waves to replace wires so that consumers could bring phones with them in their cars and, eventually, their pockets. With today's cell phones, it is no longer necessary to have a network of overhead telephone lines. Instead, cellular phone calls are transmitted by radio waves to towers that pick up and send signals in that area, called a "cell". The tower then relays the signal to other towers on the network using wires or radio waves, until it reaches its destination. If you move to a new area, cell phones are automatically connected to the closest tower. This allows people to move about with ease, always able to stay in touch.

Today's phones also do far more than make calls. Many are also small computers that allow people to send instant messages, photos, and videos across radio signals throughout the cellular network.

Engineers at phone companies continually improve the technology in phones and towers to allow radio signals to carry more information and provide faster service. Each “generation” of improvements allows cellular technology to carry more information at faster speeds.

Wires still play a large role in communication, too. New technologies like fiber optic cable, cables made out of thin strands of glass or plastic can carry far more information than the copper wires used in earlier telephones. These improved cables can provide fast television and internet services to homes and businesses for many users. Homes, businesses, and even entire cities can turn these powerful connections into radio signals, creating “hot spots” that allow anyone with a computer or phone to access fast internet service. In your lifetime, you will no doubt experience changes in the ways people communicate. Not much more than 100 years ago, it was considered revolutionary to hear a voice speaking across a wire, and today cell towers and satellites make it easy to have video conversations with people across the globe.

1. What is one way early human sent messages?
    a. smoke
    b. letters
    c. telegraph
    d. telephone
2. Which of the following was a drawback of the telegraph?
    a. Telegraph wires never extended all the way across the country.
    b. The messages were typically long and required much time to send.
    c. Telegraphs used electricity, which was not available in most places.
    d. Telegraphs required operators to both send and receive the messages.
3. Which of the following explains why telephones were considered a more advanced form of communication than telegraphs?
    a. Telephones did not require wires, and telegraphs did.
    b. Telephones allowed people to hear voices and emotions.
    c. Telephones allowed people to send short visual messages.
    d. Telephones were the first form of instant communication.
4. Today we live in a world of social media and instant communication. In what ways were the methods of communication in the mid- and late 1800s similar to and different from communication methods today? Use evidence from the reading passage to support your answer.

Edison vs. Tesla Article

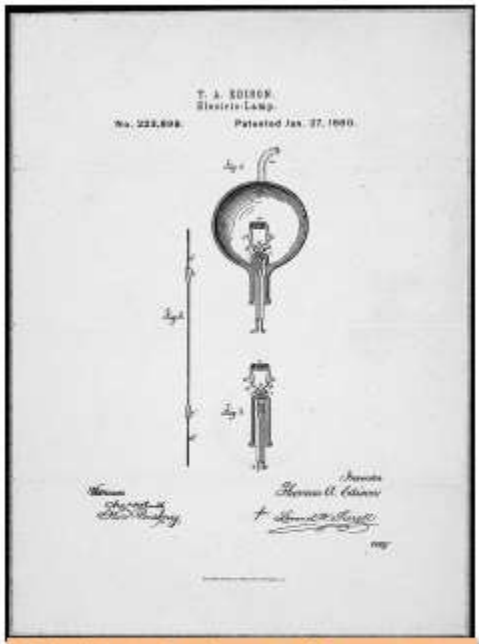
Around the end of the 1800s, a flurry of new technologies drastically changed life in the United States. Many of these changes were due to the work of two men: Thomas Edison and Nikola Tesla. The inventions from their laboratories are now found in living rooms around the world. However, even

though they shared many of the same interests, the two inventors did not always get along. In fact, Edison and Tesla's rocky relationship may be considered one of science's greatest rivalries.

Early Electric Lighting

Like many scientists in the 1800s, Thomas Edison wanted to develop a system of electric lighting that people could use in their homes and businesses. In fact, he imagined a network of lights that would illuminate whole cities! At that time, people were still using candles and gas lamps for light. Lightbulbs were not yet available to the public. Scientists had tested some very primitive lightbulbs, but the bulbs only lasted for a few minutes.

In 1878, Edison started the Edison Electric Light Company with money from investors. Here, he and his colleagues worked on electric light projects for over a year. They developed useful tools such as light switches and fuses. However, they struggled to develop a lightbulb that would last for several hours. The challenge was to find the perfect material for the bulb's filament. The filament is the thread inside a lightbulb that emits light.



This illustration is part of the patent that Thomas Edison earned in 1880 for the incandescent lightbulb.

Source: The National Archives

Finally, they got it! In 1879, they carbonized some sewing thread, by baking it under high heat. Then the scientists sealed the thread inside the bulb and turned on the electricity. The lightbulb glowed for 13 hours. This was the first long lasting incandescent lightbulb. In this type of lightbulb, an electric current flows through the filament in the bulb. This heats the filament, causing it to glow.

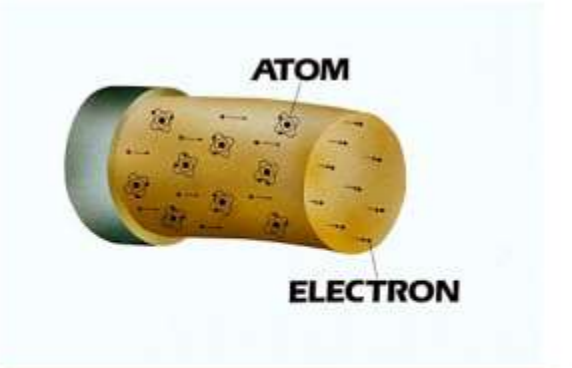
In 1882, electric lights were installed on Pearl Street in New York City. Around this time, Edison formed several new electric companies to make, sell, and operate all of his products. He soon had hundreds of customers. Edison even traveled to Europe to demonstrate his new invention at several international events.

The Rivalry Begins

Edison's success was soon challenged by a fellow inventor named Nikola Tesla. Like Edison, Tesla had visions of changing the world through technology. An engineer, Tesla came to the United States from

Austria-Hungary in 1884. Because he and Edison shared an interest in electricity, he began to work at Edison's lab. Their professional relationship did not last long, however. One source of tension was an argument over a bonus. Tesla claimed that Edison promised him $50,000 for some of his inventions. However, Edison claimed that this "promise" was only a joke, and he refused to give Tesla the money. Furious, Tesla left Edison's laboratory and went to work for George Westinghouse, who was Edison's biggest competitor.

The rivalry between Tesla and Edison was not only financial. Tesla and Edison also disagreed over their scientific approach to electricity. In particular, they conflicted on whether to use direct current (DC) or alternating current (AC) in their electric systems. Current refers to the flow of electric charges.



In wires, like the one shown here, small particles called electrons carry an electric charge. The electrons move from one atom to another.

Like water in a river, the currents or charges in an electrical system flow through wires. This is true in small circuits, such as a battery-operated flashlight, or in large circuits, such as the electrical grid of a large city. In direct current circuits, the charges flow constantly in one direction. This direction does not change. However, in alternating current circuits, the charges flow back and forth. After flowing one way for a short time, the charges then switch and flow in the opposite direction. The amount of time between switching directions is called the frequency of the AC. Alternating currents have the advantage of being able to send large amounts of power, and varying voltages, across long distances. Direct currents, on the other hand, have the advantage of being more efficient. Because the current does not change direction, less energy is lost during transmission. Direct currents work best for small, simple systems, whereas alternating currents are preferred for large, complex electrical systems.

In the 1800s, many inventors disagreed about which type of electric current was better. Thomas Edison was a strong supporter of DC. All of his new electrical systems in New York City used DC. The DC approach seemed to work well with Edison's lighting system. Because his system was in an urban area, the lights were relatively close together, and the power did not have to travel very far. In addition, Edison viewed AC as inefficient and dangerous, noting that AC was used to electrocute and kill things. On the other hand, Tesla was in favor of AC. He and other AC supporters realized that AC was much

better for sending power over long distances. This meant that a region would need far fewer power plants to bring electricity to streets and buildings.

The War of Currents

Edison and Tesla's disagreement over AC and DC was part of what historians now call the War of Currents. Both Edison and Tesla knew that only one system of electricity could survive in the American market. Tesla's employer, Westinghouse Electric Company, began to install AC systems in rural areas that Edison's DC systems could not access. In response, Edison tried to convince people that AC was too dangerous for household use.

However, in 1893, the tide turned in favor of the AC approach. Westinghouse won a contract to light the World's Columbian Exposition in Chicago. When the event was a success, people began to gain confidence in the AC approach. Not long after that, Westinghouse earned permission to make the first hydroelectric power plant at Niagara Falls. Although Edison continued to argue in favor of DC, he could not change popular opinion. Eventually, Edison's company, now called General Electric, went on to adopt AC.

Edison and Tesla's Later Years

The War of Currents did not mark the end of Edison's and Tesla's careers. In fact, both men went on to invent other great things. Edison resumed work on the phonograph in 1887, a project he had begun earlier in life. By the 1890s, he was selling phonographs for people to use in homes and businesses. He also got involved in the early motion picture industry but left after the business became too competitive. Edison then went to work on batteries for electric vehicles. Although electric cars declined in popularity, Edison's storage batteries were used to light train cars and mining lamps. They also helped inspire the alkaline battery that is still used today.

New technologies grew quickly in the 1880s. Telephone and electric wires, like the ones on this New York City street in 1884, brought new services to consumers.

Like Edison, Tesla worked on a variety of projects after the War of Currents. He left Westinghouse in 1885 and established his own lab. A series of experiments with electricity led to the invention of the

Tesla Coil. This device is still found in many electronics, such as television sets. Tesla also experimented with radio waves, and he created the first remote-controlled device.

The Inventors' Legacy

Both Edison and Tesla helped to make electric power more widely available to consumers. This affected more than just lighting. With electric power available in their homes, people began to buy more appliances, such as sewing machines and vacuum cleaners. In turn, these appliances made many household chores easier for consumers. Most of the appliances we use today would be useless without the ability to plug in to an electric power source.

Even though Tesla's side may have won the War of Currents, people can still find examples of both DC and AC in their everyday lives. Today, the power plants that supply electricity to our homes use AC. However, the batteries that power devices such as laptops and cameras use DC. AC/DC adapters allow DC devices to connect to AC power supplies, so that both systems can exist simultaneously.

1. What is the role of a filament in an incandescent lightbulb?
    a. It controls the amount of light given off.
    b. It emits light when a current flows through it.
    c. It prevents the glass from exploding when heated.
    d. It connects the bulb with a power source, like a battery.
2. Which of these newspaper headlines best captures Edison's argument during the War of Currents?
    a. AC Puts Electricity Consumers at Risk
    b. Sewing Thread Revolutionizes Lightbulb
    c. Electric Lights Have No Place in New York
    d. DC Fails to Meet Demand of Rural Customers
3. How did the World's Columbian Exposition in Chicago shape the future of electric power in the United States?
    a. It revealed that DC was unable to function in large urban areas.
    b. It exposed the corruption and instability of Edison's many companies.
    c. It showed that Tesla's claim that Edison cheated him out of $50,000 was true.
    d. It demonstrated that AC was effective, causing more people to support Westinghouse's approach to electricity.
4. Edison and Tesla helped electric power become widespread. How did access to electric power change Americans' lives? Provide details and evidence from the passage to support your answer.