

## Invention Timeline

**Class:** Science

*Quest for Knowledge*

*Science & Technology*

### BACKGROUND

Printing is the process of making multiple copies of an image. The image may be a picture, letters or numbers, or any combination of pictures and text. Anything that can be drawn can be printed. The invention of printing really began with the invention of paper, in China, in the year 105 AD. Once the Chinese had paper, they began to duplicate images on paper by carving the reverse of the image into a block of wood, applying ink and then pressing the paper onto the block. By the 10th century the Chinese were printing paper money for use by Chinese citizens. In 1041, individual Chinese characters were being carved in clay and assembled on wood blocks as a way of printing whole scrolls of Chinese text. These movable characters did not make a big impression on Chinese communication though ó the Chinese language uses an average of 5000 characters, a lot to keep track of and move around!

For centuries, Europe traded with China along the Silk Road, an ancient route that allowed exchanges of horses, spices, silk and eventually paper between China and Europe. When Marco Polo returned to his home in Venice, Italy in 1295, having spent 24 years exploring China, he brought with him knowledge of woodblock printing. Italians began to produce books using the hand-carved block technique of cutting away the background of the wooden block, leaving raised letters. The raised letters were then inked and paper placed overtop. When removed, the result was a printed page of words and images. Sometimes a page of a book would require a number of carved woodblocks joined together. The process was time consuming and not permanent. Since wood weathers and cracks if it's dry and warps if it is wet, giving the blocks used to print pages had a limited lifespan.

In 1436, a German man named Johann Gutenberg altered an olive press to create a printing press machine. Instead of using the heavy screw to press the olives for oil, he used it to force a printing block onto a sheet of paper below it. Gutenberg developed metal type for each of the 26 characters in the Roman alphabet (easier to manage than the Chinese 5000), and designed a way to move the characters around on a printing plate. This system became known as the movable type printing press and made it possible to print multiple copies. With its invention, it was possible to print more copies in a few weeks than could have been produced in years using the hand-carved block method. The printed word spread like very quickly throughout Europe.



Illustration of Gutenberg's Press

Before the printing press was created, only the church and royalty were wealthy enough to have books printed.

Once printed material became widely available, a greater number of people learned to read and the flow of textual information reached all corners of Europe. Access to information helped to feed Europe's brainpower, closing out the Middle Ages for good and helping to open the door for the Renaissance.

## INVENTION TIMELINE (continued)

### CLASSROOM TIME

Four or five 40 minute periods

### OBJECTIVES

Students will:

- Understand the impact of the printing press on the Renaissance.
- Understand how the invention of the printing press continues to influence our lives today.
- Practice research skills.
- Trace the development of other communication technologies from the Renaissance until today.
- Identify technologies and industries that supported and resulted in the creation of new communication mediums.

### PENNSYLVANIA ACADEMIC STANDARDS

#### Arts and Humanities

9.1.8 C. Identify and use comprehensive vocabulary within each of the arts forms.

9.2.8 C.. Relate works in the arts to varying styles and genres and to periods in which they were created (Renaissance).

#### Science

3.2.7 A.. Explain and apply scientific and technological knowledge.

- Answer "what if" questions based on observation, inference, or prior knowledge or experience.

3.2.7 B. Apply process knowledge to make and interpret observations.

- Describe relationships by making inferences and predictions.
- Communicate, use space/time relationships, define operationally, raise questions, formulate hypotheses, test, and experiment.

### MATERIALS

- Small printed reproductions (one of each) *Diogenes* (Uga da Carpi), *The Rich Kitchen* and *The Poor Kitchen* (After Peter Brueghel the Elder), *Portrait of Durer* (Erhard Schon), *Allegori of the Discovery of Metal* (Domineco Beccafumi), *Baccio Bandinelli's Studio* (Enea Vico), *Captain of the Infantry, Marching Left* (Hendrik Goltzius)
- One printed and assembled Printing Press Timeline
- Timeline Research Worksheets, one per student
- Access to library materials for research, for example, encyclopedias and books on inventors and/or inventions
- Pencils, pens and paper for worksheets

### OPTIONAL RESOURCES

- The "Background" section of this lesson, reproduced as a student handout.
- Computer stations to access the Internet for Computer stations with word processors and printers for writing
- Art materials for each student to decorate their contribution to the timeline.

### SCIENCE LESSON

#### 1. Setting the Stage

(Note: The background section of this lesson might serve as a handout to help students in this activity.)

## INVENTION TIMELINE: SCIENCE LESSON (continued)

When Johann Gutenberg invented the printing press around 1450, it had amazing results for European culture. The printing press brought printed information to everyone. More people learned to read and acquire knowledge. This spread of information helped create a new environment and led to the Renaissance which was a period of great learning and growth in science, literature and the arts in Europe.

Did the printing press create the Renaissance? Not exactly, but it certainly contributed to it. Can students think of other communication technologies that have been invented since the Renaissance? See if they can find out what kind of impact other communication technologies have had by placing them on a timeline.

### 2. The Renaissance Connection

Explain to students that a timeline represents events along a line in chronological order. Show students the *Renaissance Connection* timeline, either on-line or printed and assembled. Review the definitions of woodblock printing. Show students the reproductions of prints from the *Renaissance Connection* and have students place them on the timeline. Discuss the events that followed the invention of the printing press.

Explain to the students that they are going to investigate the inventions of other communication technologies and the events associated with them and place them on class timeline. You may want to spend a few minutes as a group brainstorming communication inventions and technologies to get ideas flowing. Students may work individually, in pairs, or small groups. Handout the Timeline Research Worksheets and decide how students will work together to complete research and gather the information to create the class timeline.

Caution students that there is rarely one inventor or one event that leads to an innovation. Remind them that the invention of the printing press depended on knowledge of olive oil production and printing techniques developed in China. Encourage students to find all the information they can to populate the timeline rather than just one name and date. Explain how a timeline full of information helps us see how new ideas and innovations develop from ideas and innovations in the past. Again, use the *Renaissance Connection* timeline to illustrate this point.

Students will need to decide on the design of the timeline and how to display their research on it. Encourage students to write or type the information they will display and include pictures, drawings or diagrams. Collect the information that students gather and place it on the timeline. Have students or groups of students present the information from their research to the rest of the class.

### 3. Summary

Discuss with students:

Does the invention of photography, radio, television, film, the computer and the Internet make information more or less available? In the Renaissance, the invention of the printing press helped to create a society where everyone was interested in learning about the world around them. Do these other forms of media contribute to our interest in learning? Why or why not? Do we continue to use printed material today? Does it still have the same impact that it did during the Renaissance? Why or why not?

### 4. Assessment

The completed timeline has the correct dates and sequence of events, and each student contributed to the creation of the timeline. See also teacher's version of completed Timeline Research Worksheet.

## VOCABULARY

**chronological:** events arranged in the order in which they occurred.

## INVENTION TIMELINE: VOCABULARY (continued)

**Johann Gutenberg:** inventor of the printing press.

**Marco Polo:** In 1271 Marco Polo traveled with his father and uncle to China, and returned to Venice, Italy in 1295. Marco Polo wrote a book about his travels, which served as the only source of information about many parts of Asia for Europeans for until the late 1800s.

**printing press:** a machine that presses inked plates containing images or text onto paper or textiles that are fed through the machine.

**Silk Road:** a trade route stretching from Xian, China to the Mediterranean Sea, active from about 100 BC until the discovery of a sea route from Europe to Asia in the late 15th century dealt a damaging blow to trade along the Silk Road.

**woodblock printing:** Prints made from blocks of wood carved with pictures or text. The blocks are covered with ink and then pressed on to paper where the image or text is transferred.

## PRINTING PRESS TIMELINE

1041 Movable clay type invented in China.

1436 Gutenberg began work on a printing press.

1440 Gutenberg completed his wooden press, which used movable metal type.

1461 The first illustrated book is printed, *Edelstein*, featuring a number of woodcuts.

1477 England prints its first book.

1499 Printing is established in more than 250 cities around Europe.

1550 Metal screw threads replace wooden ones to aid the power action of printing presses.

1584 Cambridge University begins printing. Still active today.

1593 Shakespeare's *Venus & Adonis* is printed

1609 Johan Carolus of Strasbourg prints the world's first newspaper.

1637 A decree limits the number of printers and foundries in England.

1639 Stephen Day sets up the first printing press in the United States.

1644 The Licensing Act is passed and anything printed is subject to censorship in England.

1689 The Declaration of Rights is issued, leading to the end of the Licensing Act in England.

1690 America begins to print paper money.

1694 The Licensing Act expires and is not renewed.

1699 By this year, 150 paper mills in England employ over 2,500 workers.

1720 France begins to print paper money.

**INVENTION TIMELINE (continued)**

**TIMELINE RESEARCH WORKSHEET**

**Photography** was invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of photography use?

What industries grew as a result of the invention of photography?

The **radio** was invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of radio use?

What industries grew as a result of the invention of radio?

The **telephone** was invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of the telephone use?

What industries grew as a result of the invention of the telephone?

**Moving pictures** were invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of moving pictures use?

What industries grew as a result of the invention of moving pictures?

**Television** was invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of television use?

What industries grew as a result of the invention of television?

**Computers** were invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of the computer use?

What industries grew as a result of the invention of the computer?

The **Internet** invented in     (year?)     by     (whom?)    .

What existing technologies did the invention of the Internet use?

What industries grew as a result of the invention of the Internet?

**INVENTION TIMELINE (continued)**

**TIMELINE RESEARCH WORKSHEET**

(teacher's version)

**Photography** was invented: *Joseph Nicephore Niepce made the first permanent image with a camera obscura in 1826, Louis Daguerre created the daguerreotype in the 1830s.*

- What existing technologies did the invention of photography use?  
*A combination of the camera obscura, invented in 1500, and the discovery that silver salts turn dark when exposed to light.*
- What industries grew as a result of the invention of photography?  
*Camera manufacture industry, film making and developing, print products (magazines, newspapers) using photography.*

The **radio** was invented: *Nikola Tesla invented the Tesla coil, a type of high-frequency transformer in 1891, Guglielmo Marconi sent the first radio communication signals through the air in 1895.*

- What existing technologies did the invention of radio use?  
*James Clerk Maxwell's theory (1864) of the existence of electromagnetic waves that travel at the speed of light.*
- What industries grew as a result of the invention of radio?  
*Radio manufacture industry, radio broadcasting stations, broadcasting networks, radio programming and advertising.*

The **telephone** was invented: *Alexander Graham Bell in 1876.*

- What existing technologies did the invention of the telephone use?  
*Electrical current.*
- What industries grew as a result of the invention of the telephone?  
*Telephone manufacture industry, phone companies, telephone poles, telephone networks, telephone directories.*

**Moving pictures** were invented: *Louis Jean and Auguste Lumiere held the first public screening of projected motion pictures in 1895.*

- What existing technologies did the invention of moving pictures use?  
*Photography, the first photographs of motion were made in 1877 and 1878 by Eadweard Muybridge, film, electricity.*
- What industries grew as a result of the invention of moving pictures?  
*Hollywood, movie projector and sound manufacture industry, movie theaters.*

**Television** was invented: *experimental telecasts took place in 1920s and 1930s, the Radio Corporation of America (later RCA Corporation), installed television receivers in 150 homes in the New York City area in 1936.*

- What existing technologies did the invention of television use?  
*Knowledge of light and sound waves, photography, transmitters of electromagnetic waves.*
- What industries grew as a result of the invention of television?  
*Television manufacture industry, commercial and public television stations and broadcast networks, television programming and advertising.*

**INVENTION TIMELINE: TIMELINE RESEARCH WORKSHEET (continued)**

**Computers** were invented: *Herman Hollerith devised a punched card system and equipment for tabulating the results of the United States census in 1888. John V. Atanasoff created the first special-purpose electronic digital computer in 1939. The first personal computer, the Altair, was introduced in 1975.*

- What existing technologies did the invention of the computer use?  
*Early punch card devices, early automatic calculators, binary systems and Boolean logic.*
- What industries grew as a result of the invention of the computer?  
*Computer manufacture industry, computer software industry, and virtually all other industries as people discovered more and more applications for computer-based technology.*

**The Internet** invented: *The United States Department of Defense developed ARPANet, a network of university and military computers in the late 1960s.*

- What existing technologies did the invention of the Internet use?  
*Computers, telephone/digital networks.*
- What industries grew as a result of the invention of the Internet?  
*The World Wide Web, developed by Tim Berners-Lee, a British computer scientist at the European Organization for Nuclear Research (CERN) in 1991, allowed images to be distributed over the Internet. Email, and e-commerce, software applications for users and service providers of email and e-commerce, World Wide Web design firms, Internet hosting and service providers.*