TITLE OF LESSON PLAN:
Invention: Computer Technology

LENGTH OF LESSON:
One class periods

GRADE LEVEL:
6-8

SUBJECT AREA:
Technology

CREDIT:
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OBJECTIVES:
Students will understand the following:

1.
Inventions can change the way we live.

2.
Many inventions start out with design flaws and are refined later by subsequent inventors and designers.

3.
The computer, invented in 1834 by Charles Babbage and still being refined, is an example of such an invention.

MATERIALS:
For this lesson, you will need:

If possible, an encyclopedia dated 1980 or earlier, with an entry for *computer*

A computer with Internet access

PROCEDURE:

1.
Ask students if they know who invented the computer. If they don't know, inform them that, in 1884, Charles Babbage, an English mathematician, tried to build a complicated machine called the "analytical engine." It was mechanical, rather than electronic, and Babbage never completed it, but computers today are based on many of the principles he used in his design. Your students may be interested to know that, as recently as forty years ago, computers were so large that they filled whole rooms. They were so complicated that only specially trained people were able to use them.

2.
If you can find an encyclopedia dated 1980 or earlier, have students read the entry for *computer*and hold a brief discussion of computers then and now.

3.
Ask students if they can think of any other inventions that changed the way we work and live. Can they trace changes and refinements in those inventions? An example might be the sewing machine, which, originally, was mechanical, rather than electric, and had to be operated by a foot pedal. Another might be the phonograph, which evolved into the CD player.

4.
Tell the class that the activity in which they will participate will illustrate how inventions have evolved and are still evolving. Start by having students find partners.

5.
Give each pair of partners the following assignment: Select a common, non-electric household item that you believe is important. Together, write down answers to the following questions about your item:

- What need does this item fill?
- What do you think the first one looked like?
- How did it change?

- How could it still be improved?

- What might this item look like in the future? (Draw a sketch.)

6.
After students have selected their items and answered their questions, have each pair of partners give an oral presentation on their findings.

7.
Lead a class discussion about how the activity applies to computers and how they evolved and continue to evolve.

ADAPTATIONS:

Adaptations for Older Students:
Have students research computer history. Have each student choose an earlier stage of the computer and compare and contrast it with computers we use today.

DISCUSSION QUESTIONS:

1. Babbage designed his mechanical computer in 1834. Why did it take electronics to make a practical computing machine?

2. The computer came from research by the U.S. Army to better fight wars. Should the U.S. spend money researching how to fight and kill better?

3. The Internet is blurring the lines between computing and communications. Is this a good thing? What are the positive and negative aspects of this technology?

EVALUATION:

You can evaluate your students on their assignments using the following three-point rubric:

- Three points: all questions answered, sketch imaginative and carefully executed, oral

presentation well-organized and presented in a clear and lively manner

- Two points: most questions answered, sketch adequately executed, oral presentation clear and organized

- One point: few questions answered, sketch missing or poorly executed, oral presentation lacking clarity and organization

You can ask your students to contribute to the assessment rubric by determining criteria for a well-organized and lively presentation.

EXTENSION:

Dive into a Think Tank
The U.S. Government pays millions of dollars a year to "think tanks." These are organizations that research the state of things now and where they think things are going. In your class, establish think-tank teams of people with varied interests. Their assignment is to develop an image of a possible American culture fifty years from now. They should consider these questions:

- What can the Internet do?

- How do people communicate?

- What new uses have been found for integrated circuits?

- What advances in health care occurred because of the computer and/or integrated circuit?

- What are the problems in society as a result of growth and development?

- What new job possibilities are there that don't exist today?

The culmination of the activity is an oral presentation by each team, painting the picture of the world they envision and giving reasons for their predictions.

"They can put a human being on the Moon, but..."
Ask your students if they can think of any things we use in everyday life that are not very well designed. Do they think there are needs that no one has yet filled with the appropriate invention? Have students choose one of the following assignments:
A. Find an item used at home, school, or another place you frequent, that is not designed well, and redesign it to make it easier for people to use. (Designs may be presented as drawings or physical mock-ups. Mock-ups may be made from any materials available. They do not necessarily have to work, just so they represent what the real item would look like, either full size or to scale.)

B. Think of a problem that hasn't been solved or a need that hasn't been met, and design an

invention to provide a solution or fill that need. Respond in writing to the following:

1. Define the problem.

2. Give causes for the problem.

3. Describe your solution.

4. Tell why your solution will improve the situation.

Have students give five-minute oral presentations when they have completed either assignment A or B.

SUGGESTED READINGS:

The History of Computers
Les Freed, Ziff-Davis Press, 1995
With fascinating photographs which cover the earliest mechanical calculators, this Ziff-Davis publication offers the clearest and most entertaining history of computer technology. The "must-read" title for this topic!

Computers for Beginners
Margaret Stephens and Rebecca Treays, Usborne Publishing, Ltd., 1995
Despite cartoon-style illustrations, this resource offers sophisticated, detailed explanations regarding computer programs, essential hardware and software, and such accessories as mouse, scanners, and compact discs.

WEB LINKS:

Hubble Space Telescope Public Pictures
This is the official public information site from the STSI. Great pictures!
http://oposite.stsci.edu/pubinfo/Pictures.html

The Computer Collection
One man's collection of old computers!
http://www.msn.fullfeed.com/~cube/collect.htm

Pierce Computer Collection
Great links and photographs of the technological development of computing and machines designed to carry out operations.
http://www.teleport.com/~prp/collect/index.html

Information Age: People, Information & Technology

An excellent starting point for previewing discussion of "Invention: Computer Technology."
http://photo2.si.edu/infoage.html

Star Logs Archive
Using information from this site, have students report on how problems on Hubble have been resolved with refined technological developments.
http://www.discovery.com/area/specials/hubble/hubble1.4.html

Chronology of Events in the History of Microcomputers

http://www.islandnet.com/~kpolsson/comphist.htm

VOCABULARY:

perseverance
Steadfastness.
Context:
We should celebrate their curiosity, their cleverness, their vision and their perseverance.

transistor
A solid-state electronic device that is used to control the flow of electricity in electronic equipment and consists of a small block of a semiconductor (like germanium) with at least three electrodes.
Context:
The difference is that we now can put millions of transistors into an area as big as my thumb.

liaison
Communication for establishing and maintaining mutual understanding and cooperation (e.g., between parts of an armed force).
Context:
He was the Army's liaison officer who convinced his military seniors to bankroll this project to invent the world's first electronic computer.

microchip
A tiny complex of electronic components and their connections that is produced in or on a small slice of material (like silicon).
Context:
The microchip is an extremely complicated microscopic electrical circuit.

semiconductor
Any of a class of solids (like germanium or silicon) whose electrical conductivity is between that of a conductor and that of an insulator in being nearly as great as that of a metal at high temperatures and nearly absent at low temperatures.
Context:
The answer was to make all of the components required in a single semiconductor.

galaxy
Any of the very large groups of stars and associated matter that are found throughout the universe.
Context:
The United States' giant space observatory, Hubble Space Telescope, is discovering a hundred new galaxies a week.

digitized
Converted (like data or an image) to digital form.
Context:
The CCD's digitized circuitry contained on this silicon wafer is a tribute to the marvels of electronic design.

ACADEMIC STANDARDS:

Grade Level:
9-12
Subject Area:
history

Standard:
Understands the historical perspective.

Benchmarks:
Understands how the past affects our private lives and society in general.

Grade Level:
6-8
Subject Area:
technology

Standard:
Understands the interactions of science, technology and society.

Benchmarks:
Knows that science and technology have advanced through the contributions of many different people, in different cultures, and at different times in history; science and technology have contributed to the economic growth and productivity of societies and this, in turn, results in social changes with different effects on societies and groups within societies.

Grade Level:
9-12
Subject Area:
science

Standard:

Understands the interactions of science, technology and society.

Benchmarks:
Knows that individuals and society must decide on proposals involving new research and technologies; decisions involve assessment of alternatives, risks, costs, and benefits, and consideration of who benefits, who suffers, who pays, who gains, what are the risks, and who bears them.

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