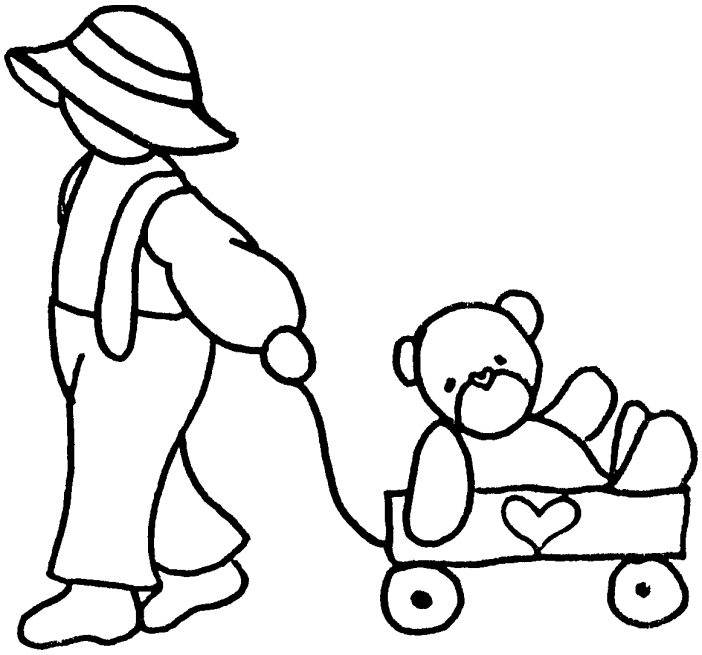
Applied Science

Our Technological World

SECOND GRADE

TECHNOLOGY



3 WEEKS
LESSON PLANS AND
ACTIVITIES

APPLIED SCIENCE
OVERVIEW OF SECOND GRADE

SCIENCE AND MATH

WEEK 1.
PRE: *Exploring perception.*
LAB: *Experimenting and predicting volume, weight, and length.*
POST: *Estimating and gathering data.*
WEEK 2.
PRE: *Comparing and contrasting two and three dimensional objects.*
LAB: *Recognizing and comparing shapes.*
POST: *Exploring unit cells to create patterns.*
WEEK 3.
PRE: *Investigating symmetry.*
LAB: *Comparing symmetry in nature.*
POST: *Discovering tessellations.*

PHYSICS

WEEK 4.
PRE: *Describing the physical world.*
LAB: *Exploring the physics behind toys.*
POST: *Investigating how things work.*
WEEK 5.
PRE: *Comparing different forms of energy.*
LAB: *Investigating different forms of energy.*
POST: *Exploring nuclear, heat, and chemical energy.*

TECHNOLOGY

WEEK 6.
PRE: *Investigating everyday simple machines.*
LAB: *Investigating machines that produce work.*
POST: *Comparing machines that produce energy.*
WEEK 7.
PRE: *Exploring technology.*
LAB: *Investigating computer technology.*
POST: *Comparing technologies used in the entertainment industry.*

BUILT ENVIRONMENT

WEEK 8.
PRE: *Comparing different energy machines.*
LAB: *Investigating how solar energy produces power.*
POST: *Contrasting different forms of energy.*

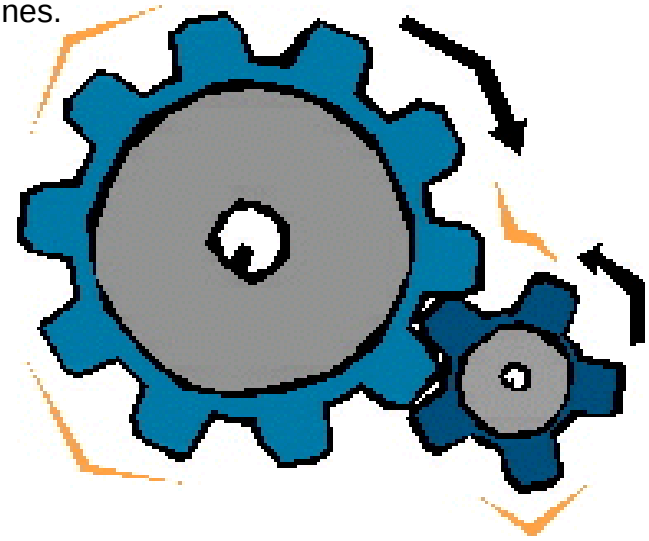
APPLIED SCIENCE - TECHNOLOGY (2A)

PRE LAB

Students use worksheets to explore simple machines.

OBJECTIVES:

1. Discovering simple machines.
2. Investigating everyday machines.



VOCABULARY:

inclined plane
lever
pulley
screw
simple machine
wedge
wheel and axle

MATERIALS:

worksheets
crayons

BACKGROUND:

A machine captures motion and is capable of transforming motion into useable energy. Modern machines are very complex; but are essentially a combination of one or more of three basic elements: the wheel and axle, the lever, and the inclined plane. All simple machines are combinations. A screw and wedge is a modified incline plane. A pulley is a wheel and axle and lever. A gear is a wheel and axle and lever.

The general function of machines is to generate power and to transmit that power through work. Machines, whether simple or complex, make life easier for humans. Make sure students know that machines are made almost exclusively by humans. Some monkeys and gorillas fashion primitive tools.

PROCEDURE:

1. The enclosed sheets will help you to review simple machines. Make sure to explain that simple machines help make work easier; and that most machines we see today are complex machines, made up of a series of simple machines that work in harmony.

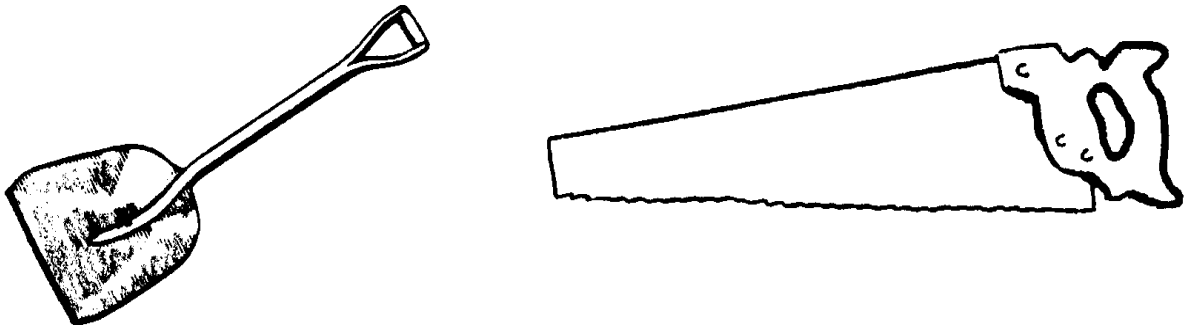
2. Inclined plane uses the principle that if you extend the distance to perform a task it will become easier. The saw and a shovel are designed to slowly use force (usually from a human) to make work easier.

3. The level uses a similar principle except it concentrates power in a certain area, which makes the task easer to perform.

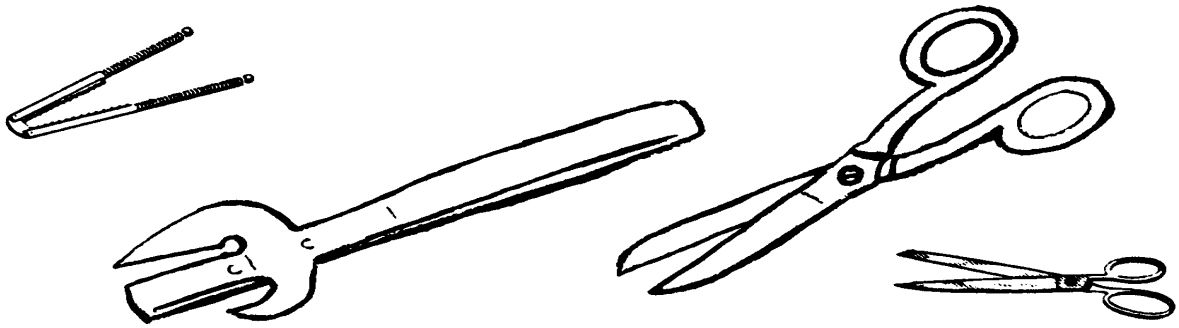
4. A wheel and axles transforms energy efficiently and quickly.

APPLIED SCIENCE - TECHNOLOGY (2A) PRE

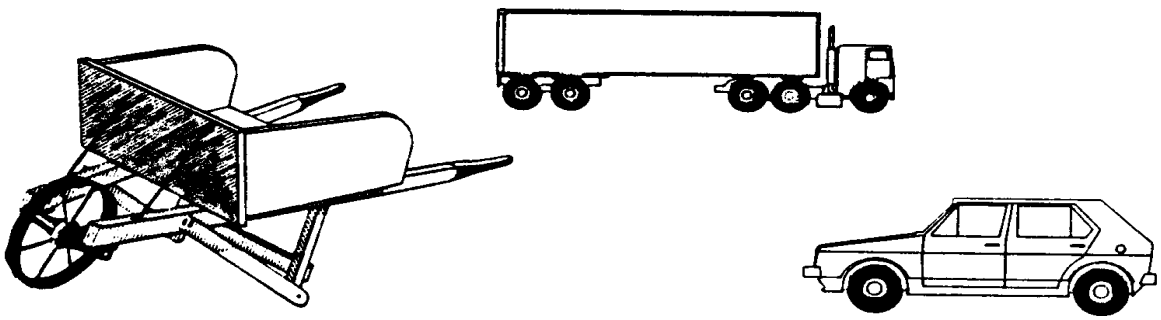
EXAMPLES OF MACHINES



INCLINED PLANE

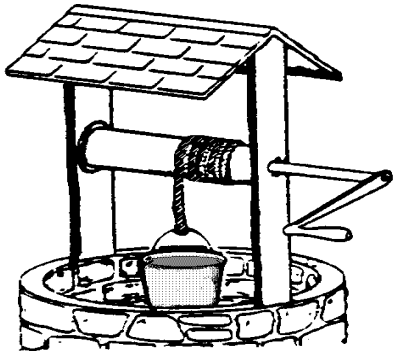


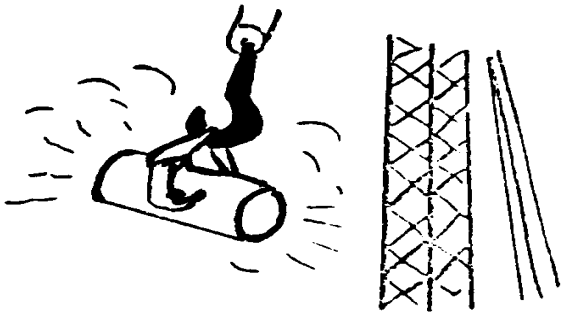
LEVER



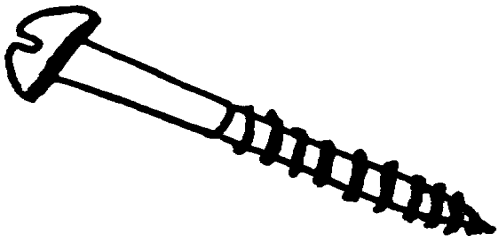
WHEEL & AXLE

EXAMPLES OF MACHINES

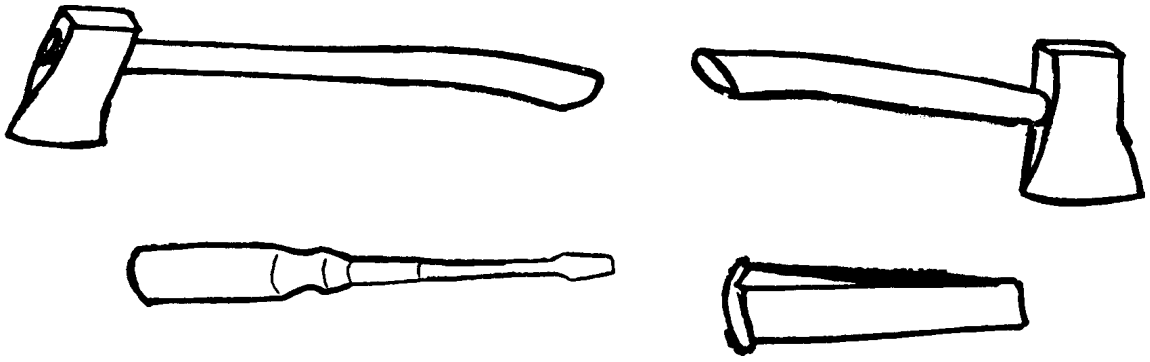




PULLEY



SCREW



WEDGE

APPLIED SCIENCE - TECHNOLOGY (2A)

LAB

Students describe common simple machines.

OBJECTIVES:

1. Comparing how machines make less work.
2. Investigating machines that produce energy.

VOCABULARY:

force
machine
work

MATERIALS:

Applied Science - Technology (2A)
or everyday simple machines

BACKGROUND:

You can lift people, buildings, cars, heavy rocks, and lots more. You can cut through metal, and move faster than anyone can run. How can you do all these things? By using machines. Machines can make you stronger and let you move very fast. Machines help make our work much easier.

But what is work? It's whenever you move something from one place to another. Work that is hard requires a lot of force; work that is easy requires less force. What can make work easier?

1 book = little force
box of books = little more force
huge box of books = can't lift it!

How do you move it? By using a machine (a machine is anything that can help you do work).

PROCEDURE:

1. Use the simple machines in the module and make stations around the room. At each station students should try to identify the machine. They should also try to describe the simple machine by using the terms: lever, inclined plane, pulley, wedge, wheel and axle and gears.

2. Have them predict what type of work the machine is making easy.

3. Answers: (please note, your module may be slightly different)

- potato peeler - lever; easy to peel potatoes
- pizza cutter - wheel and axle, wedge; easy to cut pizza
- egg cutter - lever, wedge; cut eggs in thin slices easily
- can opener - gear; open can easily
- spaghetti grabber - lever; collect spaghetti by extending human arm
- toy car - wheel and axle; makes car move
- nail - wedge; cuts easily into materials by concentrating energy
- screw - inclined plane, wedge; easily anchors one material into another
- clothes pins - wedge, inclined plane, axle; holds up clothes easily

APPLIED SCIENCE - TECHNOLOGY (2A)

PROBLEM: Can you predict what a machine was designed to do?
PREDICTION:_____
PROCEDURE: Use the following words to describe the simple machines: inclined plane, lever, pulley, wheel and axle, gears, wedge

ITEM	DESCRIBE MACHINE	HOW DOES IT MAKE LIFE EASIER
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

CONCLUSIONS: Can you determine the use of machines?

_____

APPLIED SCIENCE - TECHNOLOGY (2A)

POST LAB

Students use a worksheet to compare gears and pulleys.

OBJECTIVES:

1. Comparing machines that produce energy.
2. Comparing how machines make work easier.

VOCABULARY:

gear
pulley
simple machine

MATERIALS:

pulley
gear
worksheet

BACKGROUND:

A pulley and a gear help transfer energy to create different types of work. If would be very difficult to drive a car without gears or go up to the 10th floor in a building without pulleys. This unit investigates the use of pulleys and gears. On the worksheet, students determine if the picture is of a pulley or gear.

A pulley uses a belt. Used together, this is a mechanical arrangement for transmitting energy to another pulley. The energy originates at a wheel or drum called the drive pulley that applies energy to a continuous, flexible belt. The belt passes around and delivers energy to a second wheel or drum called the driven pulley. The belts can be made of leather, cotton, plastics, rubber or any other substance that can withstand the tension. Ask students if they ever hear their mother or father say that the belt in the car is broken. The belt is part of a pulley system and transfers energy. Without a belt, the car will get overheated and will not be able to be driven. Pulleys help move objects straight up and down. An example is painters using a pulley system to hoist themselves up large buildings to the spot they wish to paint.

A gear transmits motion and force from one rotating shaft to another. The grooves on a gear are called teeth. In a pair of gears, the smaller gear is called the pinion and the larger is the gear. When the pinion is on the driving shaft, the pair acts as a speed reducer; when the gear drives the pair, it is a speed increaser. Gears are more frequently used as a speed reducer. Students may be familiar with large trucks which have many gears to slow the truck down. The mass of a truck is very difficult to stop. Brakes on normal sized cars will do the trick, but for large trucks, gears are necessary to slow it down.

Truck drivers have special licenses that certify they can drive a truck. It is not an easy task!

Gears can have more shapes than most students are familiar with. On the worksheet are several types of gears. There are helical gears, worm gears, epicyclic and crossed-axis helical gears.

PROCEDURE:

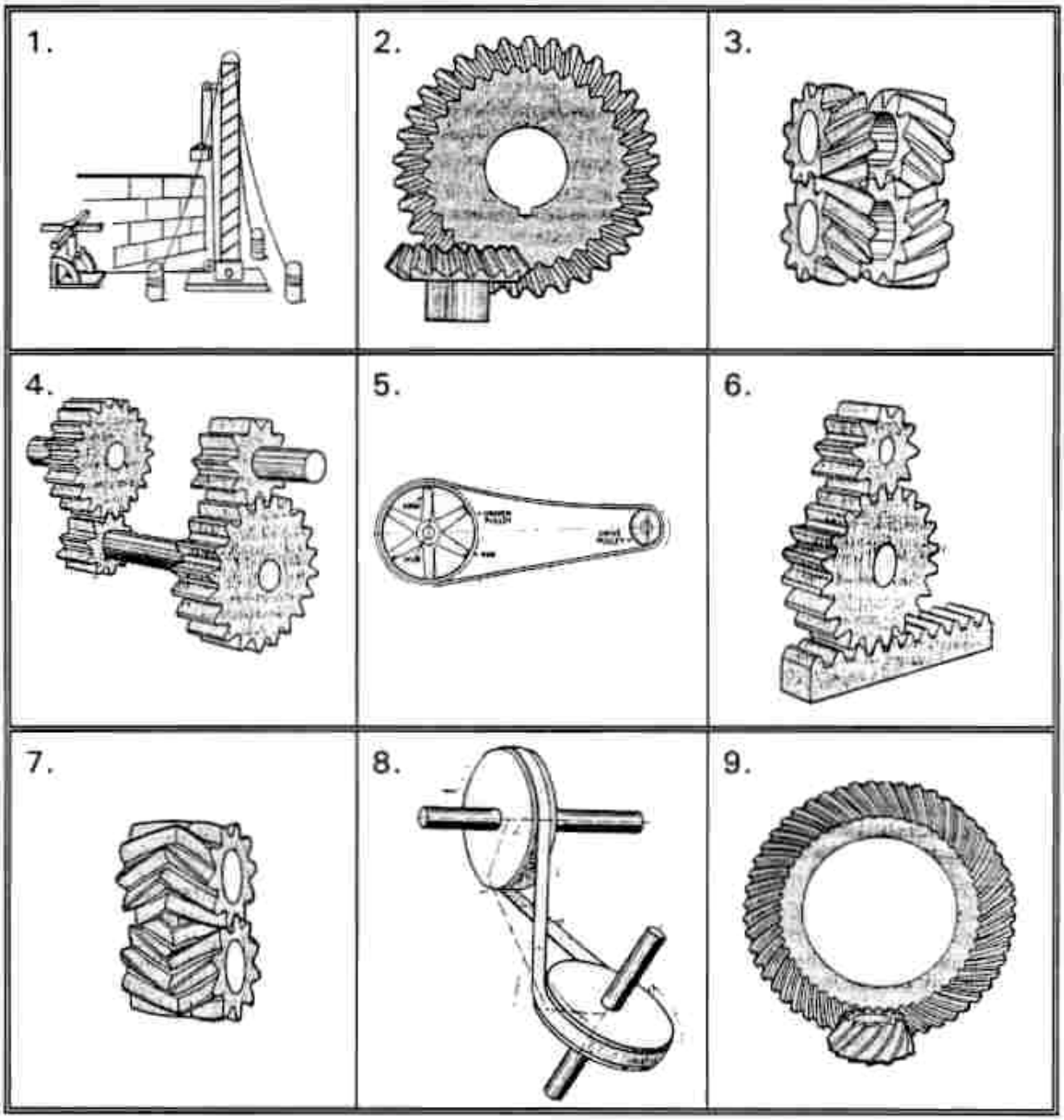
1. The main point is for students to realize that gears are used to control motion and pulleys are used to move otherwise heavy objects. You can demonstrate this if you have good pulleys and gears.

2. ANSWERS

1. pulley; 2. gear; 3. gear; 4. gear; 5. pulley; 6. gear; 7. gear; 8. pulley; 9. gear

APPLIED SCIENCE - TECHNOLOGY (2A) POST

State whether the pictures below are a pulley or a gear.



APPLIED SCIENCE - TECHNOLOGY (2B)

PRE LAB

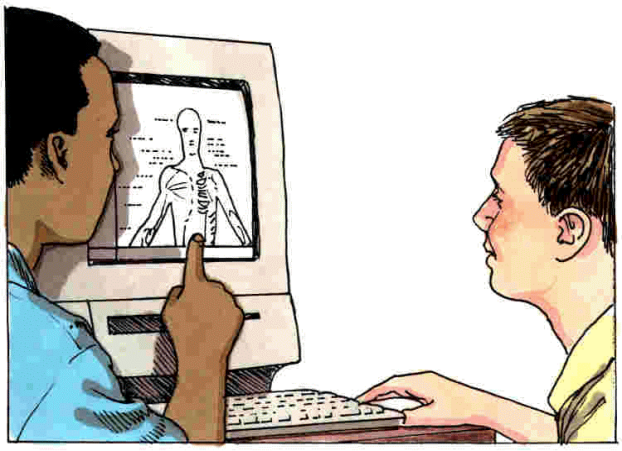
Students use a worksheet to explore today's technology.

OBJECTIVES:

1. Exploring technology.
2. Comparing different technologies at home.

VOCABULARY:

machines
technology
work



MATERIALS:

Flying Machines by A. Nahum
Inventions by L. Bender
worksheet

BACKGROUND:

Who would ever think that running shoes would feel the impact of advanced technology. This high-tech shoe is equipped with computers that record distances, points of impact that may cause injuries, and the runner's force. Even jogging can't avoid this technological takeover! But is this revolution in technology really new, or is it just a popular label to an old idea. Historians have labeled "technological revolutions" in the past: Stone Age, Neolithic Age, and the Bronze Ages. In the 1800's it was called the Industrial Revolution, then in the 1960's, the Space Age, now the Technological Age. All these labels point to one fundamental concept - new developments in science, math, and engineering change the way humans live and think.

It is difficult for students in America to imagine a life without the conveniences of modern technology. Many students, unfortunately, take our lifestyle for granted.

PROCEDURE:

1. The recommended books get students into the spirit of thinking about technology. The Eyewitness Books, *Flying Machines* and *Inventions* focus on machines that have been invented. Use pictures in these books to show students "technology."

2. Although students use technology every day, they rarely think about it. In this exercise, students will think about the technology they use at home and write a sentence about 5 different technologies.

3. First, discuss the meaning of technology. Technology is a method and a means of solving practical problems by using principles of science. Have students imagine a world without simple machines, cars, light, washing machines, bubble gum machines, videos, or movies. What would their world be like?

4. Emphasize that it takes a lot of thought to invent the technology which makes human's work easy. After you discuss technology, and you are sure that students know what it is, give them the following assignment.

5. "Go home and find 5 technologies that you use every day to make your life easier. You may include items that your mother or father uses. Write a sentence about each technology by stating how it makes work easy for you."

Use the following example:

! My dad drives me to school sometimes, or else I would have to walk. The use of cars in society has changed the world.

! I get cold milk out of the refrigerator. Without a refrigerator most food would spoil.

! I use an elevator to get to the 12th floor, otherwise I would have to use the stairs.

APPLIED SCIENCE - TECHNOLOGY (2B)

5 TECHNOLOGIES THAT MAKE MY LIFE EASY.

1.
2.
3.
4.
5.

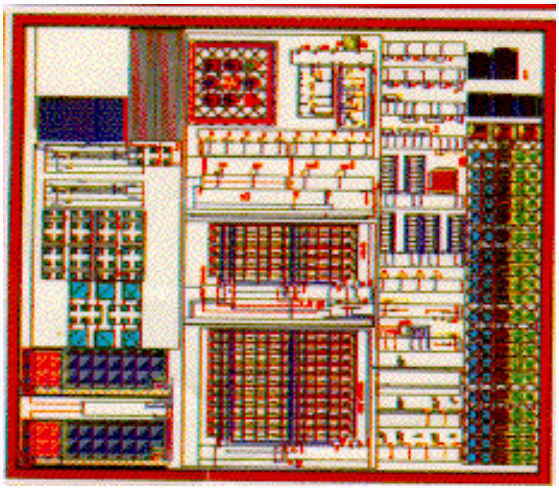
DRAW A PICTURE OF ONE OF THE TECHNOLOGIES LISTED ABOVE.

APPLIED SCIENCE - TECHNOLOGY (2B)

OBJECTIVES:

1. Investigating computer technology.
2. Observing computer chips.

Students look at a microchip under the microscope.



VOCABULARY:

chip
computers
silicon
technology

MATERIALS:

Microchip and Silicon
Swift GH microscope

BACKGROUND:

Children are very familiar with the computer, but many do not know how computers operate. In this lab, we want the students to look at one of the basic components of a computer, the computer chip.

The manufacture of silicon that is used to make chips is a threefold process. The first phase uses crushed quartzite (SiO_2) and coke. It is heated until a commercial grade of silicon is made. The second phase is when commercial grade silicon is mixed with methyl chloride to create different types of silicones. The third phase takes the silicones and hydrogen which then produces 99.9% pure silicon. It is this silicon that is used in the chip making industry.

When hot, silicon becomes liquidized, it can be poured into molds. Usually long cylinders are made of pure silicon, then cut into thin wafers. The wafer is then "fitted" with a plastic template and submerged into a vat of acid. This etches the exposed part of the template, which then acts as tiny electrical circuits.

PROCEDURE:

1. Ask students to list people or things that use a computer:
    a. secretaries - word processing
    b. scientists - data
    c. airplane pilots - navigate
    d. check-out stand - read price of food
    e. bankers - read money reports

f. teachers - education

2. Hopefully there is a computer that you can show your students. Point out the parts of the computer. Ask students what kind of energy is needed to make a computer work? "Electricity." Can computers work without electricity? "No!"

3. Show them a piece of silicon which is a human-made element derived from quartz. Microchips are made mainly from purified silicon.

4. Have the students take the chip out of its container. Put it carefully under the Swift GH microscope and have them observe the microchip. On the chip, students are looking at the etchings. The lines are really a miniature circuit board. Students should sketch what they see on the lab sheet.

5. Show students a circuit board that you may have gotten from a broken computer or appliance. The circuit board has many chips that are laid in what is called "caterpillars." The caterpillars are the black rectangular objects that have "legs" that are hooked to the circuit board. The chips are in between the black layers.

Hopefully now, students will know how "Silicon Valley" in California gets its name!

LOOKING AT A COMPUTER CHIP

PROBLEM: What is on a computer chip?

PREDICTION:_____

PROCEDURE: Look at the piece of silicon.

ITEM	DESCRIBE
SILICON	

Look at the computer chip under the microscope. Keep the lid on the box, you can use the microscope to look through the box. Draw what you see.

CONCLUSION: How is silicon related to a computer chip?

_____

APPLIED SCIENCE - TECHNOLOGY (2B)

POST LAB

Students discuss technology behind the movie industry.

OBJECTIVES:

1. Comparing technologies used in the entertainment industry.
2. Discovering how simple tools evolved into useable technology.

VOCABULARY:

electricity
society
technology

MATERIALS:

Lights! Camera! Action! by Gail Gibbons
Inventions by L. Bender

BACKGROUND:

When did humans actually start to make an effort to use simple tools to better their lives as a society? You can argue that agriculture certainly made humans stay in one place, which would give humans time to control their environment. Remember humans do inflict adverse effects on their environment if they don't develop ways to control sanitation, food cultivation and storage, housing, and defense. Irrigation, flood control, tools, animal husbandry, cultivation, crop rotation, and fertilization were all principles that probably developed about 10,000 BC or what archaeologists call the Neolithic or New Stone Age.

The need to control the environment even more, started what is called the Bronze Age about 4000 BC in the Near East. This marks the beginning of larger structures caused by the invention of bronze, a mixture of copper and tin, an alloy that can easily be casted. Achievements during this age include the harnessing of animal power, wheeled vehicles, sailboats, the potter's wheel, and bricks.

During the 4th through 14th centuries, major technological advances were made, but most of them were refinements of earlier inventions. The idea that the Middle Ages or the Dark Ages were unproductive is only a myth. Politics, religion, and war are attributed to the "anti-knowledge" campaigns. Accomplishment like soap for cleansing, the making of barrels and tubs, the cultivation of rye, oats, and hops, the heavy plow, horseshoes, and the easily heated compact house are all inventions attributed to this time. The European "mini" Industrial Revolution started in the 15th century marked a rebirth of science and inventions. Of particular importance were the inventions and achievements of the Italian architect-engineers, the German metallurgists and printers, and the Dutch construction engineers.

The Industrial Revolution in the 18th and 19th centuries was concentrated mainly in England. Natural resources available in England and countries that they controlled, saw great technological advances using iron, coal and steam. They produced a society that would be forever dependant upon the machinery that they created. The Industrial Revolution came to America about the time of the war for Independence.

What was happening in other countries like Asia, Africa, South America, and Central America when all this inventing was going on? You must superimpose not only the politics and religion of these regions, but also geographic location and resources. A country that took part in the Industrial Revolution, must have natural resources in order to participate. What happens when a nation has no coal? They must import it into their country, which takes money from that nation into the hands of another nation. The United States is an excellent example of a country that has many natural resources. After all the acquisitions of territory, there were very little resources that this nation had to import. The United States was also fortunate not to have one religion dominate its politics, because religious fervor, no matter how well intended, causes a restriction of creativeness, if forced on a society.

But is it only resources and attitudes that make people invent? No, ideas generated by other scientists lead to other inventions. Science and math works best when there is communication between researchers. The beauty of science is that when one person has an idea, there may be many people who may know how to use it more effectively, especially if there is a possible monetary gain.

PROCEDURE:

1. Students watch movies and television and often do not think about the technology needed to produce them. In the Reading Rainbow book, *Lights! Camera! Action! How a movie is made*, students follow how a movie is made, from casting actors to hiring crew.

2. Discuss how without technology, we would not be able to produce a movie. Setting up props, costumes, and special effects take a very high level of understanding equipment.

3. As you read this book (or any similar book), go through the pages and discuss the technology being used. For example:

movie camera - uses light to make an image on photographic paper
special effects - uses light to form optical illusions; uses lasers, uses machines, uses computers
moving props - uses machines
costumes - uses sewing machines, zippers, fabric

4. Students do not realize that movies were not produced as a craft until 1890's when two French brothers, Auguste and Louis Lumiere created a combined camera and

projector which recorded continuous pictures on a strip. The book, *Inventions,* outlines the early history of movies and photography. Within the last 100 years, our society has changed a great deal. Videos were not as widespread 20 years ago as they are now. The future will probably produce more methods of entertainment.

5. Students may want to investigate this subject further. Suggest they watch an older movie or cartoon with a more recent one. See if they can notice any changes. Ask questions about movies or television to make viewing more educational. See if they know when color was first introduced into the movies, (the late 1940's).