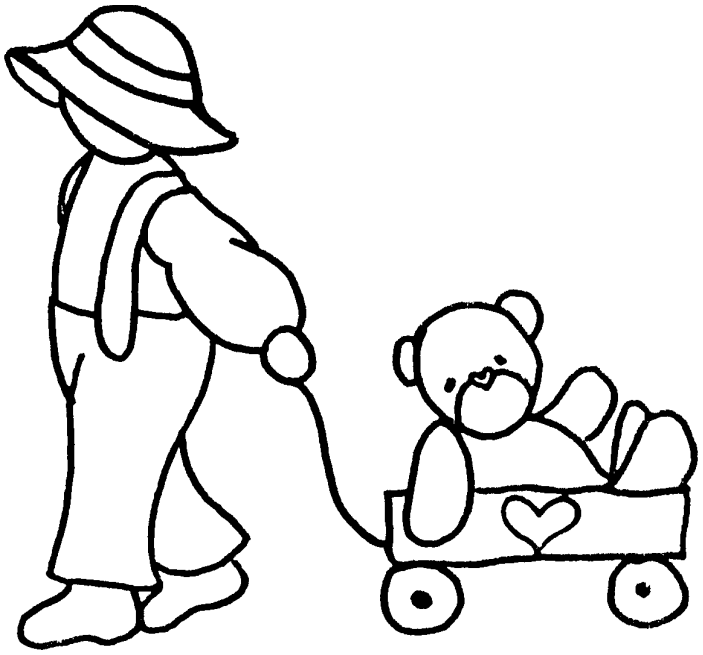
Applied Science

Our Technological World

FIFTH GRADE

BUILT ENVIRONMENT



3 WEEKS
LESSON PLANS AND
ACTIVITIES

APPLIED SCIENCE
OVERVIEW OF FIFTH GRADE

SCIENCE AND MATH

WEEK 1.
PRE: *Interpreting data from a graph.*
LAB: *Estimating data and comparing results on a graph.*
POST: *Exploring different types of graphs.*
WEEK 2.
PRE: *Measuring objects.*
LAB: *Obtaining and interpreting medical data.*
POST: *Researching a problem.*
WEEK 3.
PRE: *Researching background information for an experiment.*
LAB: *Experimenting, recording, and interpreting data.*
POST: *Analyzing data on sound.*

PHYSICS

WEEK 4.
PRE: *Distinguishing between electromagnetic and physical waves.*
LAB: *Comparing diffraction, refraction, and reflection.*
POST: *Interpreting the electromagnetic wave spectrum.*
WEEK 5.
PRE: *Discovering the components of light.*
LAB: *Exploring properties of light.*
POST: *Comparing reflection and refraction.*

TECHNOLOGY

WEEK 6.
PRE: *Distinguishing between incoherent and coherent light.*
LAB: *Analyzing laser beams.*
POST: *Exploring the uses of lasers.*
WEEK 7.
PRE: *Comparing and contrasting the different parts of the microscope.*
LAB: *Analyzing the focal distances in microscopes.*
POST: *Comparing the optics of the microscope with that of an eye.*

BUILT ENVIRONMENT

WEEK 8.
PRE: *Exploring how physical and electromagnetic waves are used.*
LAB: *Comparing different light bulbs.*
POST: *Investigating how knowledge of light and sound changes society.*

APPLIED SCIENCE - BUILT ENVIRONMENT (5)

PRE LAB

Students use a worksheet on understanding sound levels.

OBJECTIVES:

1. Exploring how physical and electromagnetic waves are used in society.
2. Investigating how high sounds can cause damage.

VOCABULARY:

decibel
sound

MATERIAL:

worksheet

BACKGROUND:

Most information comes to us in some form of waves. It is through wave motion that light comes to our eyes and sound comes to our ears. In our built environment, humans capture and use the power of sound and light to infiltrate every aspect of our lives. The richness of sounds and sights are all around, and they would be difficult for many of us to live without. Ask students to imagine being a blind or deaf person. These next units act as a vehicle to discuss how we use sound (physical waves) and light (electromagnetic waves) in our society.

Wherever we are, we are surrounded by sound. It might be the pleasant sounds of a breeze or the intense sounds of a jet engine. The loudest sounds we can tolerate have intensities a million times greater than the faintest sounds we hear. The relative loudness of a sound is measured in decibels, abbreviated db. The decibel (db) was named in honor of Alexander Graham Bell. Some common sounds and their noise levels are:

jet airplane, 100 feet away	140 db
air raid siren, nearby	125 db
rock music, amplified	120 db
riveter	95 db
busy street traffic	70 db
conversation in home	65 db
quiet radio in home	40 db
whisper	20 db
rustle of leaves	10 db
threshold of hearing	0 db

PROCEDURE:

1. Scientists have learned that noise can be harmful to humans. Noise changes our moods, prevents us from concentrating, and may even reduce our ability to learn. Very loud noise can damage our bodies.

2. The worksheet has students look at different sounds during a day. Using the chart, they must determine the approximate decibels of the sound. For example: A student worked by a construction job. It was noisy. The noise level was somewhere between a riveter (95 db) and a busy street (70 db). The student would write 85 db. If a person is exposed to noise over the 95 decibel range for a long period of time, their hearing may be impaired. The ear drum which picks up the sound, can actually be damaged.

APPLIED SCIENCE - BUILT ENVIRONMENT (5)

In the first 2 columns on this chart, write down the types of sounds you hear in 24 hours and the sources of those sounds. For each sound on your list, decide the decibels of that noise. Then decide how necessary each noise is (somewhat, or not at all). Finally, make suggestions for reducing the noises on your list in the proper columns.

jet airplane, 100 feet away	140 db
air raid siren, nearby	125 db
rock music, amplified	120 db
riveter	95 db
busy street traffic	70 db
conversation in home	65 db
quiet radio in home	40 db
whisper	20 db
rustle of leaves	10 db
threshold of hearing	0 db

SOUND	SOURCE	DECIBEL	HOW NECESSARY	HOW REDUCED

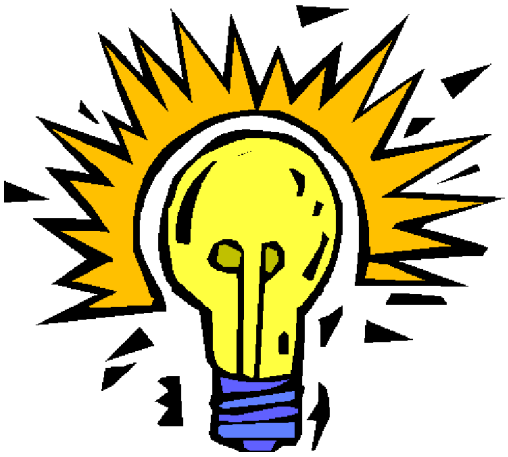
APPLIED SCIENCE - BUILT ENVIRONMENT 5

LAB

Students look at filaments of different light bulbs under the microscope.

OBJECTIVES:

1. Exploring how the light bulb changed our society.
2. Comparing different light bulbs.



VOCABULARY:

filament
incandescent

MATERIALS:

Bulbs (4 different types of bulbs) or
Applied Science - Built Environment 5
Swift GH microscope

BACKGROUND:

Thomas Edison and many other inventors and scientists in the late 1800's, created and improved ways of capturing electricity to produce light. Ask students to imagine a world without the light bulb. It is almost unthinkable! Most students take the light produced by light bulbs for granted. Many do not even think about how marvelous this invention is.

During the lab, students will compare different parts of four different light bulbs. Students should especially look at the filament that generates "incandescence." Incandescence is the state of glowing at a high temperature. This is caused by electrons in vibrating atoms and molecules, which are moving in and out of their stable energy levels, and which emit radiation in the process. Radiation of many frequencies is emitted. (The electrons heat the filament causing it to “glow.”) Students do not necessarily have to understand incandescent light or how filaments work. The key objective is for students to observe the filaments, which are key to how a bulb emits light.

A light bulb no longer emits light when the filament is finally “burned up!” This can be heard when you shake a burned out bulb. The sound you hear is the burned filament that has fallen to the base of the bulb.

Students may ask about fluorescent bulbs. Fluorescence works on a different principle than incandescence. A fluorescent lamp produces light by the passage of electricity through a vapor from a metal in a tube or bulb, which creates a glowing plasma. Fluorescent lamps do not have filaments.

The following is a list of filaments used during the development of the light bulb. The tungsten filament is the most commonly used today because it lasts longer than most other filaments. Research is still being conducted to created a better light bulb.

1. 1879 carbonized paper filament
2. 1880 bamboo filaments
3. 1881 nickel or platinum screw
4. 1881 platinum
5. 1907 tungsten

PROCEDURE:

1. During lab, students will look at the design of filaments. Put each bulb under the Swift GH and focus on the filament. Students should draw the different types of filaments on their lab sheet. The filament design helps the bulb last longer and utilizes the voltage more effectively. A simple bulb has a great deal of detail which may interest the students. Remember, the filament is in a vacuum. The vacuum is important because it allows the filament to burn slowly, increasing the life of the bulb. The filament is made first (by machine) and then put inside the bulb using vacuum technology. It is now automated, but imagine what it was like to make a light bulb by hand!

2. Have the students look at a light bulb that is on (not through the microscope), so they can observe that it is really the filament emitting light.

APPLIED SCIENCE - BUILT ENVIRONMENT (5)

PROBLEM: Are all light bulbs the same inside? Why or why not?
PREDICTION:_____

MATERIALS: 4 different light bulbs, microscope
PROCEDURE: Look at light bulbs at your station and draw the inside of the bulb. You may use a microscope. Make sure that the filament is 5.5 cm away from the objective. Remember the bulbs are glass. HANDLE WITH CARE. Label the following: glass, filament. Trace the flow of the electrons through the light bulb in each of the pictures.

Your teacher has a light bulb that is producing light. Look and see if you can determine what produces the light. Use the following space to make notes.

_____

_____

CONCLUSIONS: Why do light bulbs have different filaments?

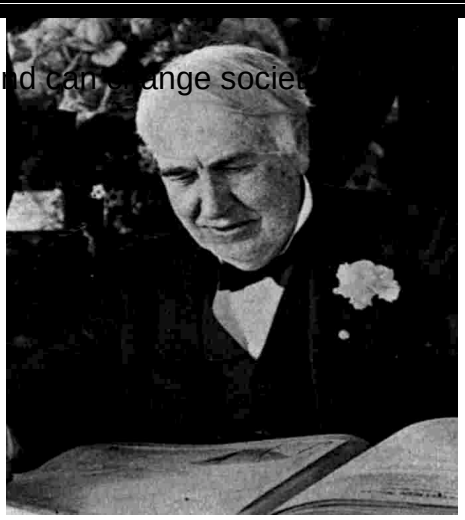
_____

_____

APPLIED SCIENCE - BUILT ENVIRONMENT (5)

POST LAB

Students research on Thomas Edison.



OBJECTIVES:

1. Investigating how knowledge of light and sound can change society.
2. Exploring the life of Thomas Edison.

VOCABULARY:

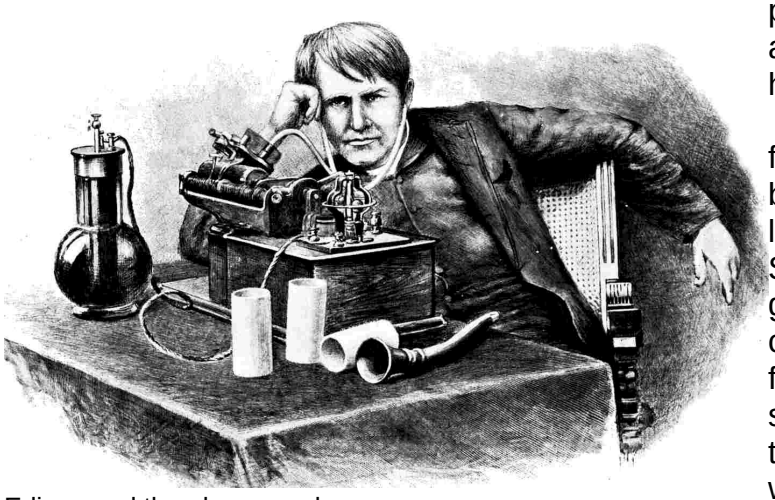
inventor

MATERIALS:

books on Edison
video by Thomas Edison Foundation
Internet

BACKGROUND:

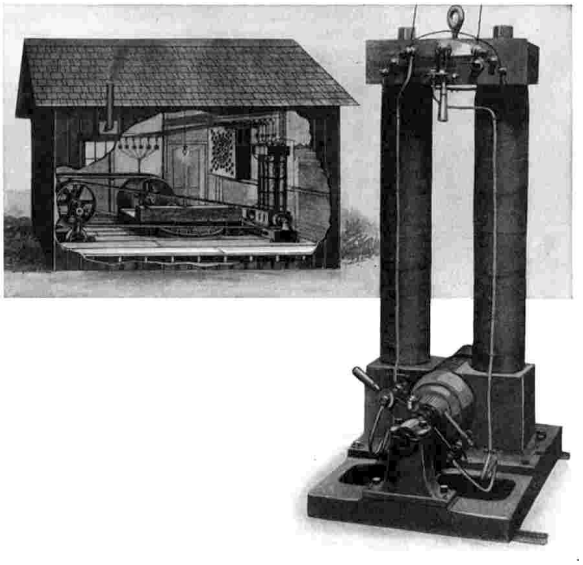
Thomas Edison left school when he was twelve to sell candy on a railroad train. In between sales, he did experiments in the baggage car. He learned how to be a telegraph operator and began to invent better ways to do things. By the end of his amazing career he had developed the light bulb, motion pictures, the phonograph, directed installation of New York City's electrical system, and had made improvements in the telephone and in almost every other means of communication. He brought about a revolution in living: people now could work and read after the sun went down, and could hear each other over vast distances.



Edison and the phonograph.

Edison is one of the most famous inventors of our time because he was not only curious, but loved to find a problem and solve it. Stress that Edison was not a college graduate, but a man of immense commitment who always searched for solutions. If anything, Edison serves as a model of a human whose talents allowed him to explore new worlds. Edison used his ability to solve problems and his wealth to continue exploring. A profile of his life can help students realize that creativity is inside anyone, not necessarily the rich and educated.

PROCEDURE:



Power station and dynamo.

1. Emphasize that Thomas Edison not only worked with electromagnetic waves (light) but he also worked with physical waves (sound). Edison understood the properties that physical and electromagnetic waves shared, and could extent his inventions. Edison used his information across many diverse fields. An invention in one field was an inspiration for the next invention in another field. The video on Thomas Edison outlines the historical progression of his work. Although the film is a Hollywood version of his life, it does portray the essence of his creativity.

2. There are probably books on Edison in your library. If you need help, contact:

EDISON NATIONAL HISTORIC SITE
NATIONAL PARK SERVICE
WEST ORANGE, NEW JERSEY

3. There are many sites on Thomas Edison. Use an Internet search engine to find the most recent sites. These are two sites that have information on Edison.

http://www.tir.com/~quincy/ASITES.HTML
http://www.thomasedison.com/