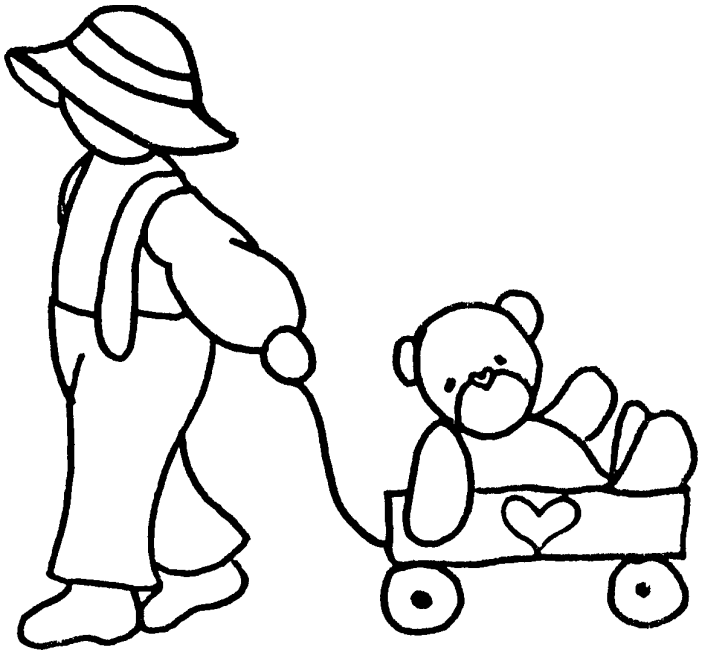
Applied Science

Our Technological World

KINDERGARTEN

SCIENCE AND MATH



3 WEEKS
LESSON PLANS AND
ACTIVITIES

APPLIED SCIENCE
OVERVIEW OF KINDERGARTEN

SCIENCE AND MATH

WEEK 1.
PRE: *Describing and comparing nests, birds, and eggs.*
LAB: *Describing different shapes.*
POST: *Exploring shapes in nature.*
WEEK 2.
PRE: *Distinguishing different senses.*
LAB: *Discovering how to use the senses to find new things.*
POST: *Describing how senses feel.*
WEEK 3.
PRE: *Discovering components of the microworld.*
LAB: *Comparing a microscope to a hand lens.*
POST: *Identifying tools that help us observe.*

PHYSICS

WEEK 4.
PRE: *Deriving information from an observation.*
LAB: *Discovering changes in the night sky.*
POST: *Describing interactions of the physical world.*
WEEK 5.
PRE: *Exploring magnetism.*
LAB: *Discovering which objects repel or attract each other.*
POST: *Discovering how electricity is made.*

TECHNOLOGY

WEEK 6.
PRE: *Discovering technology.*
LAB: *Exploring different simple machines.*
POST: *Exploring how machines help people work.*
WEEK 7.
PRE: *Exploring inventions.*
LAB: *Discovering how to invent.*
POST: *Exploring how inventions may not be useful.*

BUILT ENVIRONMENT

WEEK 8.
PRE: *Recognizing the difference between artificial and natural.*
LAB: *Classifying objects in the classroom.*
POST: *Exploring living requirements of an environment.*

APPLIED SCIENCE - SCIENCE AND MATH (KA)

PRE LAB

Students look at different eggs.

OBJECTIVES:

1. Observing nature.
2. Describing and comparing nests, birds, and eggs.

VOCABULARY:

nest
observation

MATERIALS:

crayons
worksheet
collection of bird's nests
different size eggs
different oval shapes (optional)

BACKGROUND:

Science in kindergarten is all about observing the world by using a child's senses. In later grades children will use some of the experiences they experienced in the lower grades. A child's experience is not only talking and observing different objects, but also touching and playing with equipment. Play is an integral part in a child's discovery of science and math.

Observation is a very important concept in science and is usually overlooked when teaching basic skills. Observing your surroundings and mentally recording this information is very important because it is from observation that many decisions are made. The better the observational skills of a child, the more they can learn on their own. Children, however, must have a baseline to start developing their skills. Observation is not an inborn skill, it is a learned behavior. This exercise helps teach students to think critically while they are observing objects in nature.

PROCEDURE:

1. Prior to this activity, ask your students if they have old nests they have found. Remember, make sure they do not take nests that are occupied.

2. You can make a display that will become a colorful addition to your classroom and a future home for all the nests you find throughout the year. It just takes a large

branch (about 2 meter tall) with smaller branches able to support nests. Ask a neighbor or parent to save a large branch when they trim a tree.

Make sure you "cure" the branch first, leaving it outside so the sap and "bugs" leave the branch before you bring it into the classroom. Get a base (redwood tub is ideal) and wedge the branch into the base of the tub. Put large rocks in the tub to make sure the branch will not move.

We suggest that you put the "tree" together in the classroom because the rocks will make it too heavy to easily move. Use artificial grass or turf at the base of the "tree" and artificial leaves and flowers on the branch to make your "tree" look realistic.

3. Introduce information on birds and how they build nests. Try to use information provided by children to gain information for the rest of the class. Ask questions like, “Where do you find nests?” “Who has found nests before and where were they found?” “Do most birds build nests?” “What do birds use to make their home?”

4. Show any real or models of nests you might have to students. Discuss what type of egg might fit into the nest. Small nests can only hold small eggs and large nests can only hold large eggs. Small eggs come from small birds, and large eggs come from large birds. Just by looking at the nest, you can tell how large the bird is!

5. The worksheet focuses on a child discovering a nest. Have the students become the child in the picture and is describing their discovery to someone else. How large is the egg, how large would the mother bird be, and what is the nest made of? Make sure the children color each egg the same color. Although there are many different colors of eggs, the eggs from one bird are the same color. This is an excellent time to warn students not to disturb the birds. Birds are organisms like us and deserve respect.

APPLIED SCIENCE - SCIENCE AND MATH (KA) PRE

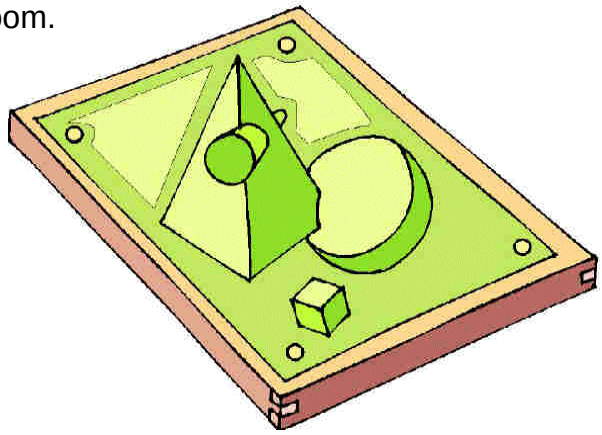
APPLIED SCIENCE - SCIENCE AND MATH (KA)

LAB

Students describe different shapes.

OBJECTIVES:

1. Describing different shapes.
2. Discovering shapes around the room.



VOCABULARY:

circle
rectangle
square
triangle

MATERIALS:

pattern blocks
tangrams
geometric wooden or plastic shapes
worksheet

BACKGROUND:

Basic shapes like circles, diamonds, squares, and triangles can make interesting and complex shapes. Learning how to make a pattern from these basic shapes helps a child develop skills in logic, color, shape perception, size and quantity relationships, laws of prediction, and manual dexterity.

PROCEDURES:

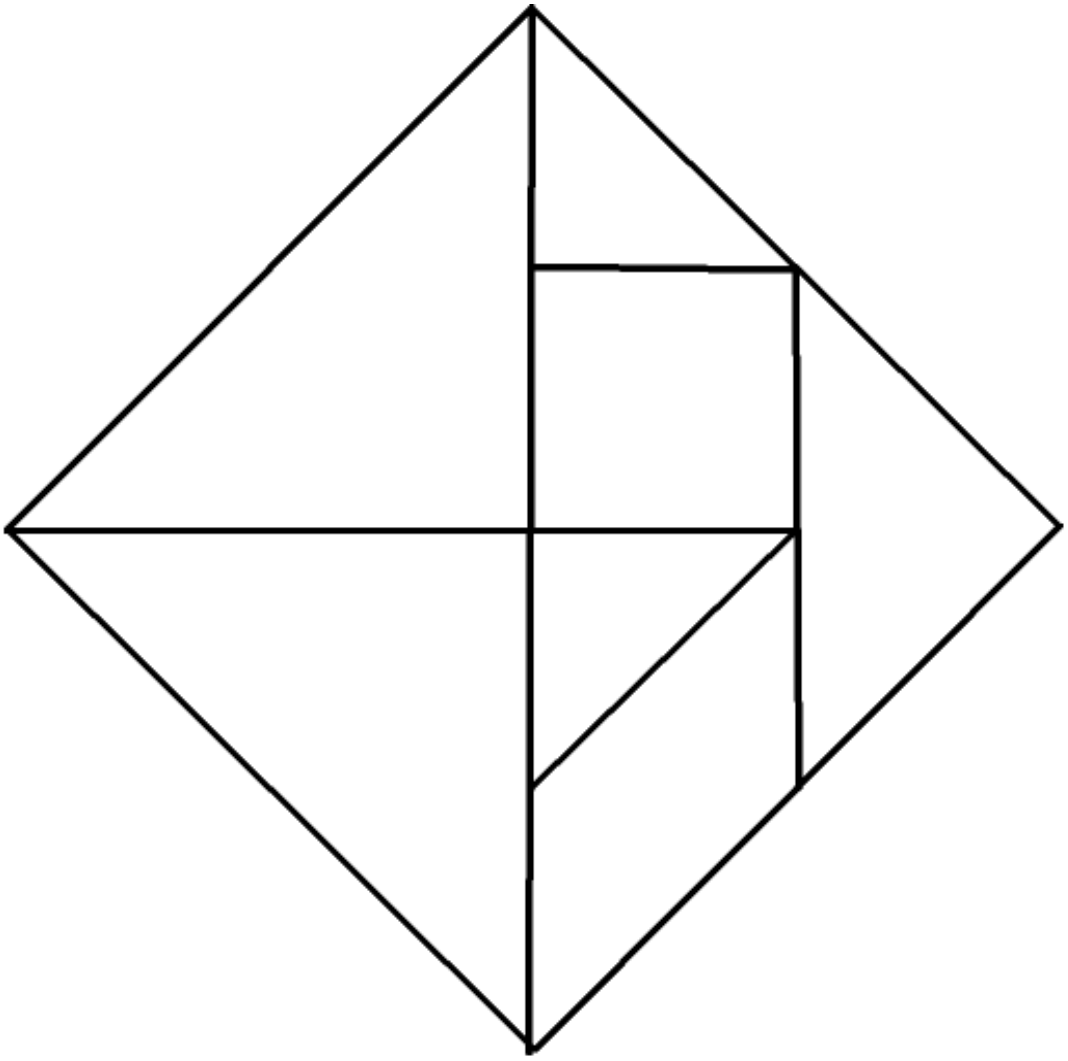
1. Students should cut out the pattern on the worksheet along the black lines(or have them precut). Ask students to create different patterns with the pieces. Show them the different animals that they can create below including a swan, bird, bear, fish, rabbit, and an eagle.

2. You can purchase other tangram sets. These puzzles challenge the child to experiment or logically determining what shapes are required to create new patterns using two dimensional blocks.

3. Next show students three-dimensional blocks. A cube is a three dimensional square. A column or pillar is a three-dimensional rectangle. A pyramid is a three-dimensional triangle. A sphere is a three-dimensional circle. If you have other shapes, discuss them with students.

4. After your students have learned the different shapes, explain that these shapes are mathematical representations of the real world. Go around the room and see if students can identify different shapes. The important lesson is to recognize that shapes in real life are not as perfect as shapes that are made or drawn.

COLOR, CUT, AND CREATE



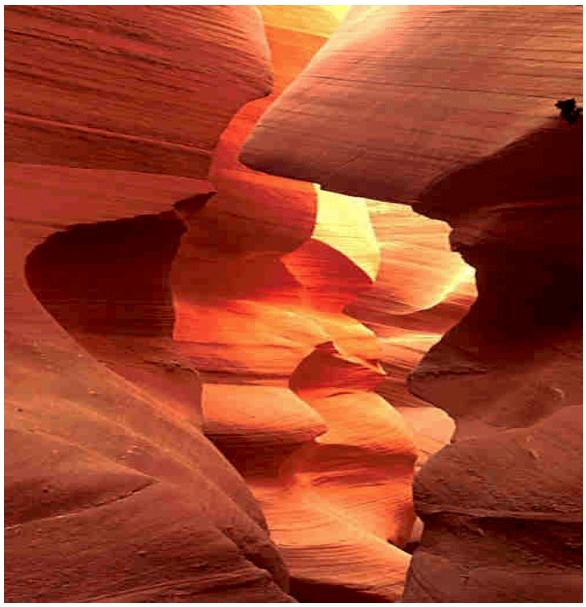
APPLIED SCIENCE - SCIENCE AND MATH (KA)

POST

Students use a worksheet to describe their favorite shape.

OBJECTIVES:

1. Exploring shapes in nature.
2. Describing shapes around us.



VOCABULARY:

circle
shape
square

MATERIALS:

worksheet
different geometric shapes

BACKGROUND:

A child's world before school is usually three-dimensional. Most things they see and touch has height, depth, width, and weight. When they arrive at school, a curious thing happens. Students are asked to draw or write on a flat, 2 dimensional piece of paper. It is difficult for students to draw depth of objects, so they usually draw a circle for a sphere, a square for a box, or a triangle for a cone.

Descriptions in science rely on three dimensions. Objects are spheres, not circles. It is important for teachers to provide vocabulary for the three-dimensional world. Students can then describe accurately what they are seeing.

PROCEDURE:

1. Review two dimensional and three dimensional shapes by using the worksheet. Have the students color each of the shapes. Discuss the differences between two and three dimensional objects.

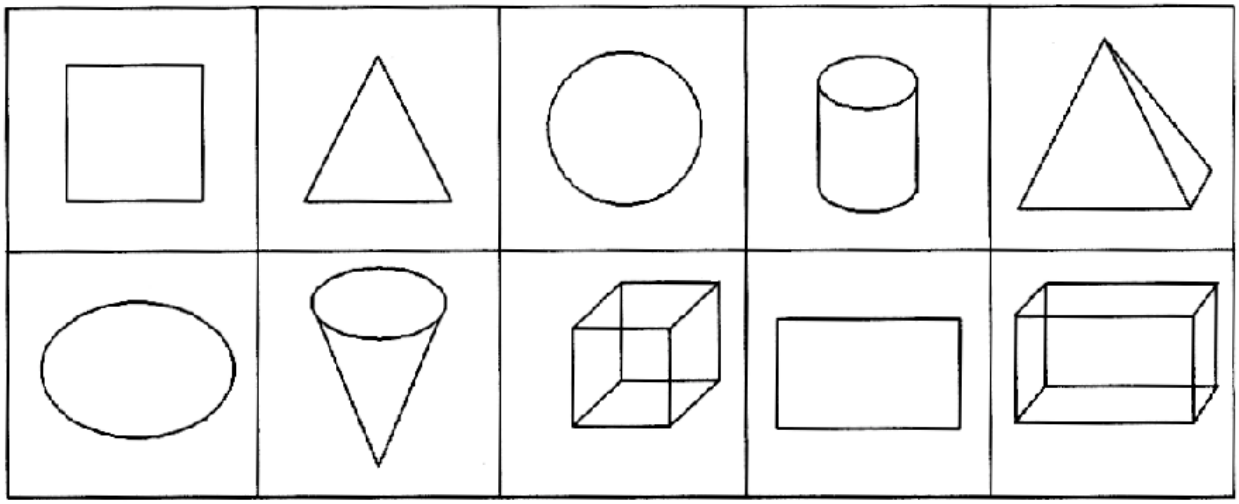
2. With the worksheet as a guide, identify different shapes in the classroom. Then go outside and continue to identify shapes. Students may notice that there are more geometric shapes when objects are human-made. Nature tends to be more obscure in their geometry.

3. Inside the classroom, circles can be represented by wheels on toys. Spheres

can be represented by balls or globes. Notice that many objects are not perfectly geometric. A desk is a rhombohedral shape (a 3 dimensional rectangular).

4. Outside the classroom, finding objects is more difficult. A blade of grass is rectangular, but it has depth to it! If you look at the top of a slab of cement, it appears two-dimensional yet it also has depth to it. Trees can be columns or pillars. Wheels on cars are circular. Many objects are not strictly geometric structures, but a series of curves. Describing curved objects is difficult and actually is the mathematical basis of many fields of calculus.

5. Encourage students to draw their favorite shape on the worksheet.



MY FAVORITE SHAPE

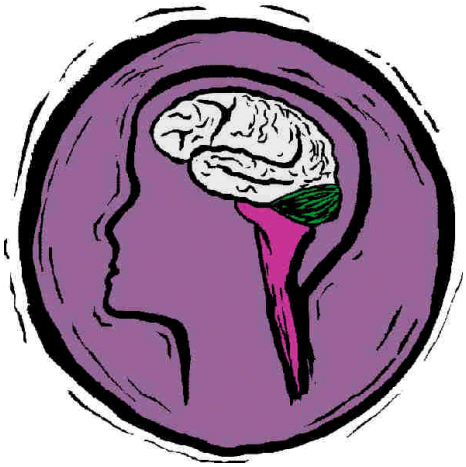
APPLIED SCIENCE - SCIENCE AND MATH (KB)

PRE LAB

Students are read a book on senses.

OBJECTIVES:

1. Exploring the human senses.
2. Distinguishing different senses.



VOCABULARY:

senses
sight
smell
sound
taste
touch

MATERIALS:

My Five Senses by Aliki or any other books on the senses

BACKGROUND:

The senses are part of the nervous system. Touch, smell, sound, sight, and taste are all controlled by the brain. If the information cannot get to the brain through the nervous system, there is something wrong with the network of nerves.

Senses are very important to science. They help a person investigate. Chemicals are sometimes invisible and we need to use our smell to detect them. Sight helps us many times, but children don't realize that the other senses are also very important. An object can look "cold" but when you touch it, the object is really "hot."

PROCEDURE:

1. There are many books on senses. You probably have a favorite one or your library may have one that explains senses in a clear and enjoyable manner. Go over the vocabulary words. Have the students repeat the words several times. Make sure they know what part of the body is responsible for the senses. The recommended book clearly summarizes all of the senses.

2. There are some senses that are organs or specific body part. For example, ears hear sound, eyes can see, a nose smells, and a tongue can taste. Touch, however, is a very large organ called the skin. Explain to your students that there are sensitive parts of the skin. Your fingertips, for example, are more sensitive than skin on your leg. Ask your

students how they sense things.

The brain however, is the main organ that regulates and allows our body to interpret all these senses. If the brain is damaged, it can affect parts of the body that are far from the brain.

3. As you discuss each part of the body, have your students observe each part. Let the students look into each other's eyes. Ask them to describe what they see. They will come up with a list of "discoveries" because although we all have eyes, we rarely try to describe them. Ask the same questions for the other parts of the senses including skin, tongue, nose, and ears. Emphasize that these senses help us discover and describe the world around us.

APPLIED SCIENCE - SCIENCE AND MATH (KB)

LAB

Students use their senses to identify different objects.

OBJECTIVES:

1. Experiencing the different senses.
2. Discovering how to use the senses to find new things.

VOCABULARY

feel
hear
senses
sight
smell
touch

MATERIALS:

objects for “feely” boxes

BACKGROUND:

The human body has five major senses which operate to gather information from the world around us, sight, hearing, smell, taste, and touch. Any stimulus to one of the sense areas is detected by sensory nerves and is sent to the brain for interpretation.

The eye (an organ) acts like a camera. Human vision is stereoscopic, which means seeing in three dimensions. When we look at objects, two slightly different images are transmitted to the brain, and are merged so the brain can interpret the image that we see. This allows us to see objects which stand away from the background, not flat like you see in a photograph.

The ear (an organ) is specially made to receive sound waves that are sent out by vibrating objects and converts them into sensations we call sound.

The nose contains the nostrils and organs of smell. The stimulus that excites smell is chemical, for example onion and garlic give off different chemical sensations.

The tongue is the organ that controls taste. Taste is also a chemical stimulus. Things to be tasted must touch the tongue, sometimes, taste become combined with smell because of the connection between the mouth and the back of the nose.

Touch is created by stimulating the skin (the largest organ of the body) through the sensations of touch, pressure, pain, heats and cold. Discussing senses and actually having the children experience the different senses requires selecting items that will "accent" the sensation of that sense. For instance, the sense of touch is much more exciting if the item being touched cannot be seen and feels "gooey." If you eliminate some

of the other senses and have the children rely just on one sense, the sensation is much more acute.

PROCEDURE:

Now that the students have learned about senses, let them use their newfound knowledge to explore items. You can do this in several ways, depending on the availability of materials and the help you get from parents.

1. One way is to make "feely" boxes. Put items in a box that the students cannot see what the item is. Try to get objects that have an unusual feel. Use a box with a hole cut in the side or use an empty tissue box and have the students figure out what they are touching. Have the students describe the texture. It is more important to have the students use their senses than identify the object. (When you finish with the materials, put them back into their appropriate box. Students will want to play with the items if you leave them out.)Students are using the sense of touch and eliminating the sense of sight. On some of the items you might have the students shake the box to use the sense of sound.

2. You can blind fold your students and give them samples of fruit to see if they can determine what the fruit is (sense of taste). While they are blind folded, bottles of perfume or flavoring can test the sense of smell.

3. If you have enough help, you can divide the students into small groups and discuss the following activities. For instance, one station might have different smells, for example vanilla, perfume, oil, or any other smells you would like to introduce. Ask students to pick the smell that reminds them of cookies (vanilla) or the one that reminds them of flowers (rose perfume). At another station, cut up pieces of oranges, apples, bananas, lemons, or any other fruit. Have students close their eyes and ask them which one tastes sour (lemon).

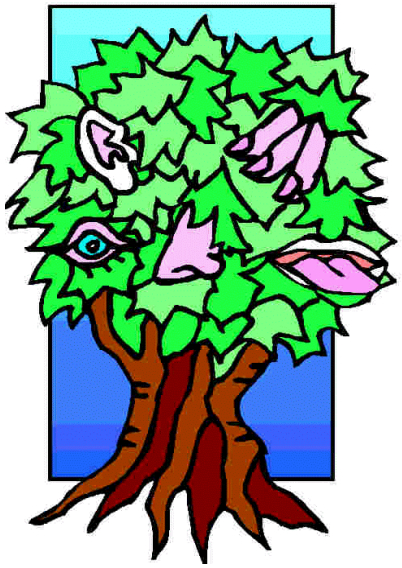
APPLIED SCIENCE - SCIENCE AND MATH (KB)

POST LAB

Students relate stories on feelings.

OBJECTIVES:

1. Describing how senses feel.
2. Exploring students' senses.



VOCABULARY:

feel
hear
senses
sight
smell
touch

MATERIALS:

worksheet

BACKGROUND:

Words help to express how we sense different things. Young children are trying to determine which words can best explain the situation. For instance, is boiling water, warm or hot. If you call something “hot,” does that mean it will hurt you.

Helping a student describe through words helps that student to express the sense in more detail. Languages throughout the word use different "sounds" for the same event. English-speaking people hear "OINK, OINK" from pigs while other languages do not.

PROCEDURE:

1, If you have students with different native languages, you might want to ask them how they describe animal sounds.

2. Have the students use descriptive terms to describe taste, feel, and sight. For instance, the taste of sour and sweet or a warm winds verses a cool wind.

3. Prior to this lesson, ask your students to think about how their senses have helped them discover things about the world. Let the students give an oral report to the rest of the class on their "sense" experiences. Give them some examples of a sense experience that turned out to be something else.

1. Mary heard a noise that sounded like a baby. She looked outside to try and find the lost baby. After a few minutes, Mary found Fuzzy, her cat. He was hungry and was making a noise that sounded like a baby.
She used the sense of sound.

2. Bill has a brother who likes to play jokes on everyone. Bill was watching television when a weird object touched him. Although Bill wanted to move away, he knew it was his brother teasing him. Sure enough, his brother used some wet spaghetti to scare Bill.
He used the sense of touch.

3. Charlene felt a warm wind against her back. She heard a moan. She thought it was a ghost. She turned around and it was the door being opened by a strong wind.
She used the sense of sound, touch and sight.

APPLIED SCIENCE - SCIENCE AND MATH (KC)

Students use a worksheet to discuss magnification.

PRE LAB

OBJECTIVE:

1. Exploring magnification.
2. Discovering components of the microworld.

VOCABULARY:

magnification
microscope

MATERIALS:

Greg's Microscope by Millicent E Selson (Harper)
coloring exercise
crayons

BACKGROUND:

The microworld is different than the world we live in. A grain of sand can become a boulder to a protozoa that wants to get around it. A small obstacle for humans can be a challenge to the microworld.

Very small organisms look different because they have different requirements than we do. Their bodies look different than ours because they have adapted to a very small world. There are microworlds in our refrigerator, in our bathroom, in our carpets, and in our hair! Germs, which include many different types of organisms, are also part of the microworld.

The book, *Greg's Microscope,* will get students excited about looking through a microscope. Greg and his family have so much fun, students will anticipate the coming lab.

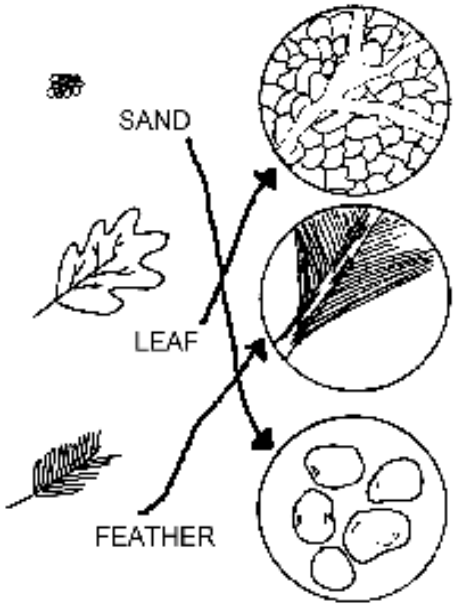
PROCEDURE:

1. Read the book, *Greg's Microscope* to students. This reading exercise explains that microscopes make small things seem large. Explain that the microscope is a tool to see items in more detail. Our eyes are limited in the amount of detail it can see. If we didn't have these tools we could not see the microworld.

2. Discuss that the prefix " micro-" means small. Anytime you see this in a word you should think "small." The opposite of "micro-," is "macro-," which means large. The terms microbe (small organisms), microbiologist (a scientist that studies small things),

micropaleontology (the study of small fossils), and even microscope (a scope that looks at small things) are examples.

3. The coloring exercise is to prepare the students for what they might see under the microscope. Discuss what sand, a leaf, and a feather will look like under the microscope. If you have the appropriate objects have the students look at them. Have them draw a line from the word and picture to the appropriate magnification.

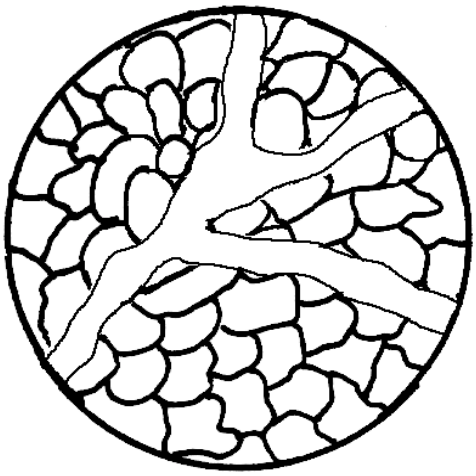


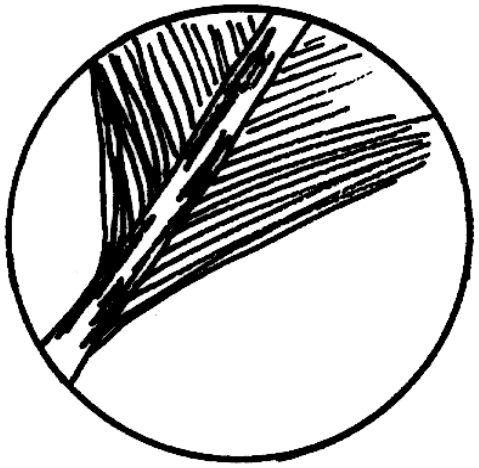
match and color

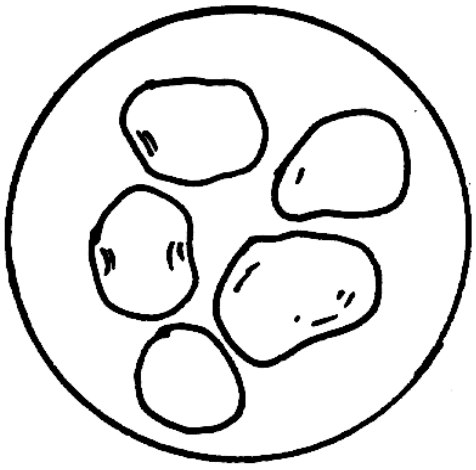
SAND

LEAF

FEATHER







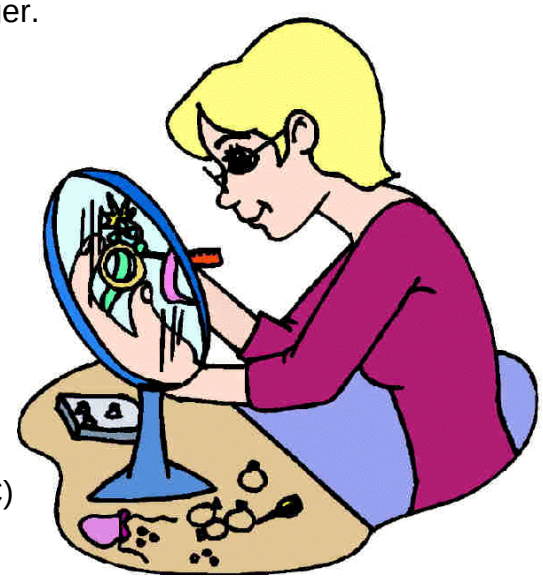
APPLIED SCIENCE - SCIENCE AND MATH (KC)

LAB

Students decide what instrument magnifies the most.

OBJECTIVE:

1. Comparing a microscope to a hand lens.
2. Exploring how objects can appear larger.



VOCABULARY:

hand lens
magnify
microscope

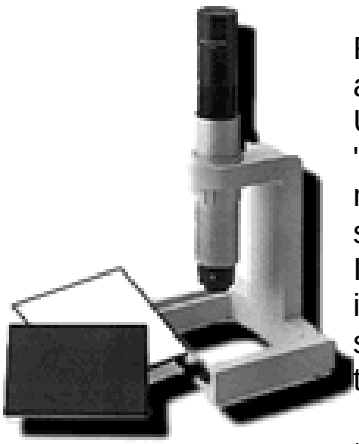
MATERIALS:

Swift GH Microscope
magnifiers
paper strips (see enclosed master)
Applied Science - Science and Math (KC)

BACKGROUND:

Many science concepts are built on the objects that children cannot see, including blood circulating through small pores in bones; microorganisms that are in and on your body; chloroplasts as the center of photosynthesis in plants; and minerals that make up rocks. The microworld is complex and all larger structures and organisms depend on it. This world can seem very strange and mystical, until you make an effort to look at it closely. The microworld includes the living within the kingdoms of plants, protozoa, animal, fungi, and bacteria and the non-living like viruses, minerals, micro-chips, and many other objects. Children will believe that this "micro-magic" exists of they can experience the joy of seeing this world. The microscope allows this to happen! It is important for children to see this world to understand the components of the earth and biological systems.

We recommend the Swift GH Microscope for use with elementary students. Familiarize your students with the microscope by carefully going over some basic principles with them. Make sure students realize that one eye should be closed when they look through the optic tube. Have them cover one of their eyes and have them focus on an object. Four younger children you might want to have a set of "pirate patches" to make it fun. Have the students find out which eye is more comfortable. Also, children do not realize that there is a distance that the eye should be above the eyepiece. Their eye should be near the eyepiece, but not resting on the lens. Have them find the correct spot. They can look at a specimen with or without glasses, depending on whether they are comfortable or not.



Focusing can be a frustrating experience for students. For lower primary students they can use the arm to focus up and down, without playing with the focusing mechanisms. Upper primary students can learn how to recognize the correct "working distance" from an object. Usually, the lower the magnification the farther the object needs to be. Have the students measure the distance from the objective to the object. If you are using the 2.5x objective the distance from the object is 5.5 cm. Care and patience must be emphasized with students. Once they know approximately how far to rack the tube up and down, they will not get frustrated.

There are two techniques in using specimens for transmitted and reflected light. The specimen in a "medium", like water and place a coverglass to observe. The Swift-GH is not recommended for small items. Contrast in color of the specimen and background is needed. The specimen using reflected light must not be too large or else you will not be able to put the object into focus. Ambient light, light from the side of the base, or a flashlight will give you sufficient light to observe a specimen.

PROCEDURE:

1. The object of this lab is for students to decide whether the microscope or a hand lens makes an object more distinct. Students will "vote" at each station whether the hand lens or the microscope makes the object larger. Remember, you must have two identical objects if you did not purchase the kit. Use the same kind of magnifier at each station.

2. Review the use of the Swift GH microscope.

3. Students may have difficulty in looking through a microscope. One eye should be closed and the opened eye should look through the tube. You may want to use "pirate patches" over one eye or have the students put their hand over one eye. This helps students see more easily through the microscope. Do not have the students adjust the microscope. Focus the material for students. *Remember the 2.5 objective is about 5.5 cm away from the object.*

4. Give students 15 LARGE and 15 VERY LARGE strips of paper to be used for voting. Emphasize that you want your students to analyze how clear the image is.

5. Have students go to different stations that are prepared with two similar items (you can limit the stations but we suggest 15). Put one of the items under the microscope and examine the other item with the hand lens. On the microscope use the reflected light option. Children at this age have trouble looking at a thin section. If you have not purchased the kit, select items that the children are familiar with like feathers, sand, fabric, seeds, dirt, or any other available items.

6. After looking at both items, have students "vote" on the hand lense or microscope that makes the item look the largest (VERY LARGE) and the instrument that they think is not the largest, have them put (LARGE).

7. After the students have been to all the stations, go to each station and count the number of votes. Hopefully all the microscopes will win. Discuss how the microscope makes objects more distinct and shows more detail.

8. If you do not have the Swift-GH microscope, you may want to use another hand lens.

LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE
LARGE	VERY LARGE

APPLIED SCIENCE - SCIENCE AND MATH (KC)

POST

Students use a worksheet to explore tools of science.

OBJECTIVE:

1. Exploring tools of discovery.
2. Identifying tools that help us observe.

VOCABULARY:

binoculars
camera
discovery
eyeglasses
hand lens
microscope
telescope

MATERIALS:

worksheet

BACKGROUND:

Children "discover" by using all their senses. Students have been introduced to the five senses of hearing, touching, smelling, seeing and tasting. Scientists and inventors have invented “tools” that help us to experience each of the senses in more detail.

The sense of sight probably has the most tools to help us observe and discover new objects. Telescopes help us see the rest of the Universe, that we cannot feel, smell or taste. We have instruments that can detect sounds that might help us understand our Solar System or the inside of our Earth. Microscopes help us look at little things that we cannot see with the naked eye.

Sometimes people who have lost their sense of feeling have electrodes put into their head to feel again. Tools help us observe and feel our world.

PROCEDURE:

1. Ask students how they can see better. As students respond, draw or write the "tool" they mention. Display pictures of the items.

2. The following is a guide to help direct students comments. Make sure you draw a simple stick figure so students have a guide when they draw. Reinforce the concept that tools of discovery help scientists to see the world better. Have students draw a picture of

each of the instruments on the worksheet.

eyeglasses	help people see
hand lens	enlarges things
microscope	makes little things large
telescope	makes very far things seem near
binoculars	makes far things seem near
cameras	records what we see

APPLIED SCIENCE - SCIENCE AND MATH (KB) POST

EYEGLASSES	TELESCOPE
BINOCULARS	CAMERA
MICROSCOPE	HAND LENSE