unit

1 *The Human Body*

Prior Knowledge

The student has

1. constructed sets of objects lesser than or equal to 100
2. added and subtracted with single-digit addends
3. found linear measurements in inches and centimeters
4. estimated linear measurements
5. drawn circles, squares, ellipses and rectangles

Mathematics, Science and Language Objectives

Mathematics

The student will

1. count tallys and convert to numbers
2. collect data by counting, adding and subtracting
3. make appropriate number comparisons
4. measure height in inches and centimeters to nearest 1/2 unit
5. write and solve original addition and subtraction problems that appropriately describe and compare lengths and volume
6. estimate linear measurements
7. make and read a graph summarizing collected data
8. identify and draw geometric shapes.

Science

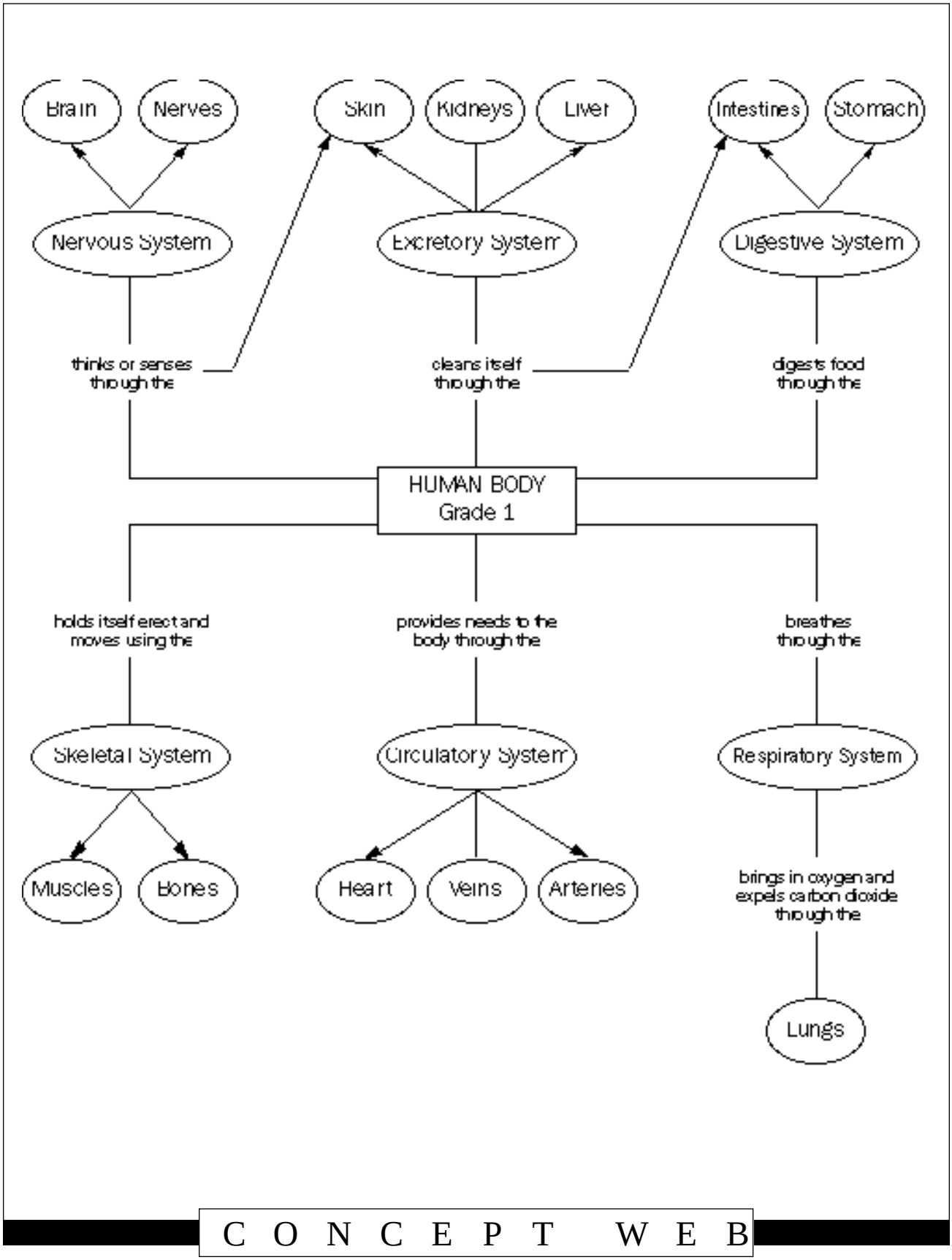
The student will

1. describe several ways people change as they grow
2. identify and describe characteristics of the human body
3. using a body diagram:
   a. explain how the heart pumps blood throughout the body
   b. describe the functions of the liver, kidneys and skin
   c. locate and give function of muscles and bones
   d. describe the body parts that help digestion
   e. discuss the function of the brain
   f. describe the reproductive function of the body.

Language

The student will

1. read or refer to a favorite story or book on the human body
2. ask related questions on the human body
3. report verbally on a function of any of the human body parts
4. sequence the events of a body function
5. work with a peer to write an illustrated story about a body function.


Brain
Nerves
Skin
Kidneys
Liver
Intestines
Stomach
Nervous System
Excretory System
Digestive System
thinks or senses through the
cleans itself through the
digests food through the
HUMAN BODY
Grade 1
holds itself erect and moves using the
provides needs to the body through the
breathes through the
Skeletal System
Circulatory System
Respiratory System
Muscles
Bones
Heart
Veins
Arteries
brings in oxygen and expels carbon dioxide through the
Lungs

C O N C E P T W E B

V O C A B U L A R Y

graph gráfica	growth desarrollo	head cabeza	neck cuello	hands manos
legs piernas	feet pies	physical físico	arms brazos	knees rodillas
windmill molino	breathing rate índice de respiración	heartbeat latido cardiaco	bones huesos	muscles músculos
lungs pulmones	capacity capacidad	volume volumen	skull cráneo	brain cerebro
liver hígado	kidneys riñón	intestines intestinos	stomach estómago	nerves nervios
cells célula	gall bladder vesícula biliar	waste excremento	bladder vejiga	spleen bazo
pancreas páncreas	spinal cord médula espinal	reproductive organs órganos reproductivos		

● ● ● Teacher Background Information

The study of the human body can be a very enlightening and, thereby, a very rewarding experience for a young child. Although all of us believe we are familiar with our individual bodies, we may also feel that they are mysterious. As we look at ourselves in the mirror we see some of our body parts, but we know that there are other parts or organs that we cannot see, even as they function. We learn to manage many of the body's functions at a conscious level — such as through movement and thought. However, there are other functions that our bodies perform unconsciously. These unconscious actions such as the beating of our hearts, respiration and digestion are generally not observable. Young children have a natural curiosity about their bodies. This curiosity can motivate them to learn about the human body.

Students will find it interesting to measure body temperature with a thermometer, especially if they develop some notion for the basis of its use. The basic principle in its operation is that matter usually expands as it absorbs heat. Thermometers contain a substance that readily expands when heated. Mercury, in its liquid state, and alcohol are substances that expand as they absorb heat. Since mercury is more expensive than alcohol, most inexpensive thermometers contain colored alcohol to give the temperature reading.

A thermometer scale for the ambient temperature is marked in units called degrees (˚), shown in multiples of 10. The reference points of a thermometer are

usually the freezing and boiling points of water. To measure body temperature, however, oral thermometers show scales between 92˚ and 105˚ F. Each unit on the scale is divided into five subunits. An observant student may ask about the differences in these two types of thermometers.

An oral thermometer has been calibrated so that each large mark shows one degree and each small mark measures 2/10 of a degree. When reading the thermometer, the students learn to rotate it in their fingers until they can see the level of the colored liquid against the scale. They will need to practice this for a while until they can do it consistently.

It is the purpose of this unit to give basic information about the biological systems with which the body performs its amazing functions. As children learn how muscles and bones help them move, how teeth and tongue help them digest their food or how the blood helps keep the body warm and protected from invading harmful organisms, they develop an appreciation of the body and of the scientific methods needed to learn about the body's seen as well as unseen but necessary activities.

LESSON FOCUS

■ LESSON 1 *Humans Grow and Change*

BIG IDEAS Humans grow and change. Difference in measurement shows growth.

■ LESSON 2 *Our Cells — Tiny Units of Growth and Change*

BIG IDEAS Every part of the human body consists of many tiny living things called "cells". Cells are the building blocks of the body; the body makes over a billion new cells every minute.

■ LESSON 3 *The Body — A Complex Form*

BIG IDEAS Bodies have parts that help us move, think and feel. Measurements help us describe our bodies.

■ LESSON 4 *The Heart — The Nonstop Pump*

BIG IDEAS The heart pumps blood to all parts of the body. We describe the heart's rate in beats per minute.

■ LESSON 5 *The Lungs — A Gas Swap Meet*

BIG IDEAS The lungs take in air and take the oxygen out of the air to send it through the blood to all parts of the body. The lungs have capacity (volume) that we can measure.

■ LESSON 6 *The Muscles and Bones — A Magnificent Machine*

BIG IDEAS Muscles and bones work together to help the body move; bones also protect important body organs. Over 200 bones are in the human body.

■ LESSON 7 *The Stomach and Intestines — The Food Processors*

BIG IDEAS The stomach, intestines, teeth and saliva prepare the food we eat so the body can use it for energy.

■ LESSON 8 *Liver, Kidneys, Skin — The Great Eliminators*

BIG IDEAS Because the body is a living organism, it produces waste that it must eliminate as it uses up energy.

■ LESSON 9 *The Brain — The Master Computer*

BIG IDEAS The brain is like a computer that controls all the body functions; the nerves are the electrical system that helps it work.

■ LESSON 10 *Reproduction — A New Human Begins*

BIG IDEAS Humans reproduce when an egg cell from the mother and a sperm cell from the father unite. The united cells begin to separate many times to form a new human being.

OBJECTIVE GRID

Lessons	1	2	3	4	5	6	7	8	9	10
Mathematics Objectives										
1. count tallies and convert to numbers			•							
2. collect data by counting, adding and subtracting	•			•	•	•		•		
3. make appropriate number comparisons	•			•	•		•	•	•	
4. measure height in inches and centimeters to nearest 1/2 unit			•		•					
5. write and solve original addition and subtraction problems that appropriately describe and compare lengths and volume	•		•	•	•					
6. estimate linear measurements	•		•	•	•	•				
7. make and read a graph summarizing collected data	•		•	•		•				
8. identify and draw geometric shapes.										
Science Objectives										
1. describe several ways people change as they grow	•									
2. identify and describe characteristics of the human body	•	•	•	•	•	•	•	•	•	•
3. using a body diagram:										
a. explain how the heart pumps blood throughout the body				•						
b. describe the functions of the liver, kidneys and skin								•		
c. locate and give function of muscles and bones						•				
d. describe the body parts that help digestion							•			
e. discuss the function of the brain									•	
f. describe the reproductive function of the body.										•
Language Objectives										
1. read or refer to a favorite story or book on the human body	•	•		•	•	•	•	•		

Lessons	1	2	3	4	5	6	7	8	9	10
2. ask related questions on the human body						•	•			
3. report verbally on a function of any of the human body parts			•		•	•	•			
4. sequence the events of a body function			•		•	•	•			
5. work with a peer to write an illustrated story about a body function.										

LESSON 1

Humans Grow and Change

BIG IDEAS Humans grow and change. Difference in measurement shows growth.

Whole Group Work

Materials

Book: **Love You Forever** by R. Munsch, later added to the **Library Center**
Collection of teacher's and students' baby pictures
Name tags for student names
Graph paper or chart to make a graph
Sentence strips
Reference books on the human body
Word tags: change, growth, height, weight, organism

Encountering the Idea

Showing the book cover and telling children who the author is, ask children to predict what the story **Love You Forever** is about. Read the book aloud. At the conclusion of the story discuss human growth and change. What changed and what stayed the same in the story? Focus on:

- height
- voice (sound, talking)
- movement
- growth is slow, and we cannot see it on a daily basis; we can measure the growth of hair and nails

During the discussion, write students' observations on a chart tablet or on sentence strips for use later at the **Writing Center.**

Exploring the Idea

In order to see human change and growth, students compare current and baby pictures to note the differences. Display current pictures of the teacher and the students on a bulletin board. Students bring baby pictures, labeled on the back, and place them on the board. The students match current pictures with the baby pictures. Teacher helps students make correct identification. After matching the pictures, the students discuss: Who has changed the most, the least?

At the **Science Center, the students find their heights.** On butcher paper fastened to a wall or door frame and marked in nonstandard units labeled with letters, each student marks his/her height. Transfer the information to a graph indicating heights by using letters instead of names. For example, if three students measure to the letter C, enter three tally marks on the graph at the place labeled C. The students convert the tally marks to numbers.

At the **Mathematics Center,** the students

1. utilize the completed graph begun in the **Science Center** to solve problems and to illustrate their own problems on story boards. Students take turns giving the answers.
   Student A is ____ m (or inches, feet).
   Student B is ____ m.
   The tallest student is _____.
   The shortest student is _____.
   How much taller is student A than student B?
   Which letter has the most tally marks? The least? In the middle (between the most and the least)?
2. complete **Activity** — Differences Show Growth
3. complete **Activity** — Mathematics of the Body.

Getting the Idea

Tell the student that as human organisms, humans grow and change. Change is sometimes very slow and we can't see it, but we can use mathematics to record it. Humans grow in many different ways. Our bodies become bigger, and we also learn many new things. We learn not to cry if we don't get our way and not to get angry when we have to do something we don't like. We learn to get along with our friends and share what we have. All of this requires change.

1. Ask the students to focus on their current and baby pictures and to describe the ways in which they have changed.
2. What mathematics operation do we use to find a difference? What differences did we find? Yes, in height, in weight. What other things? Have you learned to talk, to walk, to run? What other things have changed?
3. At every opportunity, the teacher uses the new terms "change" and "growth" to help the students use them appropriately during the remainder of the unit.

Organizing the Idea

1. At the **Writing Center,** students write about how they have changed and grown by describing their pictures and by focusing on the concepts developed in the introduction to the activity above.
2. Students write a poem:
   I was then .....
   I am now .....
3. The student describes and/or draws ways in which he/she has changed the most. The student discusses this with a partner, and the partners take turns editing each other's work. The teacher asks students to summarize the stages of a person's life and writes the responses on a large chart for use by students. The stages are: infant/baby, child, adolescent/teenager, adult, senior citizen.

Applying the Idea

1. What experiment that we started in this lesson shows that humans grow?
2. Are human beings different? Are they alike? Name some ways we can show that people are different.

Closure and Assessment

1. Students draw in their journals pictures of a person from birth to old age in sequence.
2. Students talk about human change: How do we know we are changing? What happens if we stop changing?
3. Students summarize stages of a person's life (infant, child, adolescent, adult, senior citizen).

List of Activities for this Lesson

▲ Mathematics of the Body: Part 1

▲ Differences Show Growth

▲ Using Tenths

ACTIVITY

Mathematics of the Body: Part 1

Objective

Students use addition and/or subtraction appropriately to answer questions about information obtained in class.

Materials

8½ x 11 pieces of laminated construction paper
Erasable marker
Cuisenaire rods or other models that demonstrate place value

Procedure

Students use erasable markers to write on individual story boards made of 8½ x 11 pieces of laminated construction paper. Students write and solve addition and subtraction problems, using classmates' data on height and weight.

The following are sample problems only. Use actual student names and data. Ask:

1. Julia is 39 inches tall. Thomas is 34 inches tall. How many inches taller is Julia than Thomas? Draw a picture of Julia and Thomas that shows the difference. Julia (or other student) shows three 10s and nine ones with the manipulatives. Thomas (or other student) shows three 10s and four ones. They decide that by comparing or subtracting, Julia is five inches taller.
2. Yvette is 31 inches tall. Mario is 29 inches tall and Juan is 35 inches tall. If Mario, Juan and Yvette put their outlines head to toe, how long will their three outlines be? Use the manipulatives to help you add. Draw a picture to show the outlines.
3. Of Julia, Thomas and Mario, who is the tallest? Who is the shortest? Who is in the middle? Use the manipulatives to show the students in order by height. Draw a picture that shows how to find the answer.
4. Jenny was 45 inches tall in May. In September, she was 48 inches tall. How much did she grow? How can you see change? What is the difference in the two heights? Use your counters.
5. Martha is 40 inches tall. Jerry is 40 inches tall. What number tells the difference in their heights? Use your counters and show a picture.

ACTIVITY

Differences Show Growth

Objective

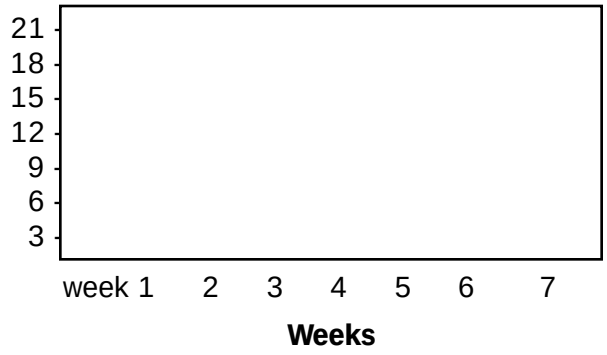
The student says that one way to notice that the human body grows and changes is to measure the growth of fingernails and toenails.

Materials

Colored nail polish; ruler marked in millimeters; chart paper

Procedures

1. Each student puts a spot of nail polish next to the cuticle of one fingernail and one toenail.
2. Every week (on the same weekday) check the spot of polish and measure its distance from the cuticle. Record the measurement. Continue to measure the spot until it grows out and has to be cut off when clipping the nail.
3. If the spot of polish begins to wear out, put on some more, exactly on top of the first spot.



4. Record the data for a fingernail and a toenail on the same chart in two different colors.
5. When both nails grow out, use the chart to answer the following questions:
   - What is the weekly growth of the fingernail and of the toenail?
   - Did one nail grow faster than the other? If so, how much faster?
   - Can you tell this by looking at the chart only?

This activity begins during the first lesson and continues for the duration of the unit, and longer as appropriate.

ACTIVITY
Using Tenths

Note: In order to give the students sufficient time to develop the notion of fractions, the class may take several days to complete this activity.

Objective

The student constructs a set (or an area) illustrating a given fraction in tenths, and writes a corresponding fraction for a given part of a line unit.

Materials

Each pair of students has:

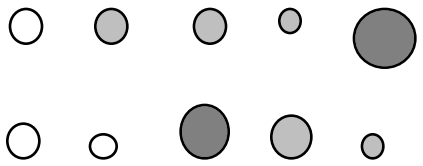
10 objects that are different in color and size (see family picture, below) or actual picture cutouts of a family with 10 members

Paper plate for each student

Pennies and dimes for each student group

Problem

Today we are going to meet a new family — it is the Tenths family. Let me show you what the Tenths family looks like. On your paper plate, make a set showing the Tenths family. How many are there in the family? Yes, there are 10 of them. Each member of the Tenths family is a Tenth. Three tenths of the family are girls. Can you find them? Five tenths of the family are boys. Can you find them? Two tenths of the family are the parents. Can you find them? How many babies do you see in the family? What would you call the three babies? Yes, they are three tenths. How many teenagers do you see? Yes, five of the tenths are teenagers. How many children do you see? Eight. Eight of the Tenths are children, so we say that eight tenths of the family are children.



Exploring the Idea

1. The students working in pairs make some new families. Assign different pairs of students different families such as the Thirds, Fourths, Sixths, Sevenths, Eighths and the Ninths.
2. For example, one pair of students makes a family called the Fifths family. The students show the Fifths family on a paper plate.
3. The students tell what part of the family the parents are; they describe the part of the children, the boys, the girls and anything else they want to tell about their family.
4. All groups assigned to the same family collaborate to share the information about their family; they check each other to make certain they describe the family correctly.
5. All the groups report to the class about their families.

Getting the Idea

After the students complete their reports about the families, tell them that they have been using some new numbers that tell about a **part of something.** In our story, we talked about the **Tenths** family. Why do you think it is called the Tenths family? Yes, because there are 10 of them. Each member of the family is one tenth. If there are five of the family members, then they would be called what? Five tenths.

Tell the students that these new numbers they are using to show a part of something are called **fractions.** The word **"fraction"** actually means a "piece" of something or a part. The new number called a fraction is made up of two numbers: for example, one and five, which means one fifth; three and 10, which means three tenths, and so on.

Did you discover a pattern in working with these number families? Yes, each new number has two names. For example, if three fifths of the family were children, then the new number three fifths is made up of two numbers — three and five. The first numbers tells us who, or how many, we are talking about, and the second number tells us about the family, like a last name; this is what the two numbers have in common.

Exploring the Idea Again

1. Give each student group 10 pennies. The students take turns giving each other a number of pennies; one partner says what fraction of the pennies he/she gave to the other, and the second partner says what fraction the first partner has left. For example, Jesus gives Mia three pennies and says: I gave you three tenths. Mia says: You now have seven tenths of the pennies.
2. When the students can say the correct fraction names after they receive some pennies, they do the opposite: one student says a fraction name, say two tenths, and the partner gives the student two pennies.
3. Each student group now is to work with eight pennies only. They repeat Step 1 above, being careful to use the term "eighths" rather than tenths. They explain to each other why the term is now eighths instead of tenths.

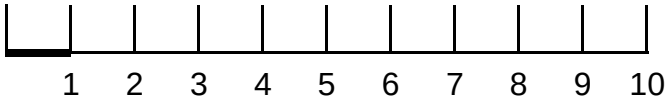
Getting the Idea

Tell the students that the two numbers necessary to make up a fraction are called the **numerator,** which is always the **first number.** The **second number** is called the **denominator.** Each family has a total number in the group of its members, and that number is the denominator number.

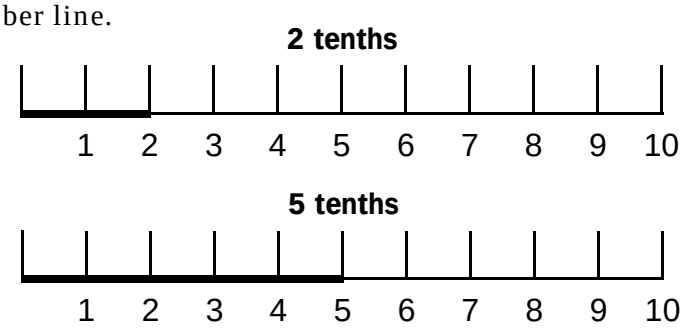
When there are only two members in a family, this family is called the Halves, not what you might think — the Twos. They like being called the Halves better.

Exploring Again

1. Each student gets a copy of a number line marked in tenths. In this activity they will show the Tenths family in a different way. They will show it as 10 line segments, each segment of the same length. In this first picture we show one tenth.



2. The students take turns showing two tenths, five tenths, and other fractions on the number line.

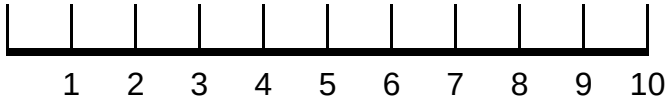


3. The students share the results with members of the group and with the class.

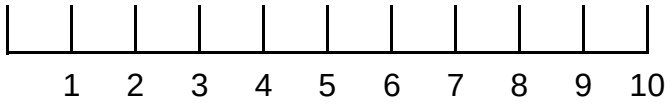
Assessment

Problem Solving

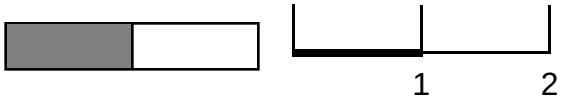
1. What name would you give to the part of the Tenths family that went on a picnic if all 10 of them went on a picnic, as the picture below shows? (10 tenths, all, the whole.) Do you think we could say that **one whole** family went on a picnic? Discuss this with your partner.



2. What name would you give to the part of the Tenths family that went on a picnic if no one went on the picnic? (Zero tenths, none, zero.) Discuss this with your partner.



3. Using objects, students construct a set and parts of the set (or a line segment separated into equivalent parts) and show various fractions. They assign fractions to the different parts of the set (or to the line segment) and name the fractions for a friend or the teacher. For example:



4. A friend or the teacher gives a student a fraction. The student constructs a set or a line segment to show that fraction.

LESSON 2

Our Cells — Tiny Units of Growth and Change

BIG IDEAS Every part of the human body consists of many tiny living things called "cells". Cells are the building blocks of the body; the body makes over a billion new cells every minute.

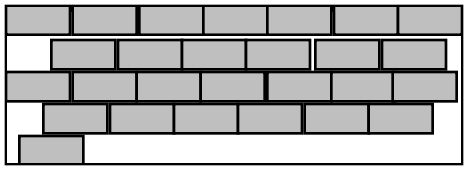
Whole Group Work

Materials

Picture of the night sky showing many stars
Reference books having pictures of different body cells
Diagrams of red and white blood cells, muscle cells and other types
Modeling clay of different colors, sufficient for several student groups
Microscope and slides of different kinds of cells
Bag of sand
Word tags: cell, tissue, nucleus, membrane, cytoplasm, organ, billion

Encountering the Idea

Show students a picture of a brick house. The students, working in small groups, model the clay into small rectangular "bricks" and place them together to form a "wall". Students discuss how they formed the wall and the placement of the bricks. Students discuss the patterns they formed in placing the bricks to make the wall not fall over or separate. What do we know about a wall? What does it do? (Protect the inside; keeps people and animals out; keeps things like children and pets inside.)



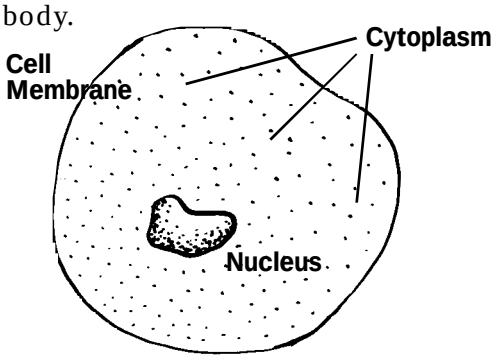
A "Cell" Wall

Exploring the Idea

Using a microscope with the highest magnifying power possible, examine slides of a variety of cell samples. Students look through the microscope and describe what they see. Are the cells close together? What are their shapes? Are they of different colors? Can you see them move? (No, because these cells have died; if they were alive, we could see them moving.) Do they have a "wall"? Can you see it? What is inside the wall? What does it look like? The cell wall is very thin. The nucleus is the heart, the center of the cell, and the cytoplasm is the substance that gives the cell its shape.

At the **Mathematics Center,** students explore the concept of a "billion". Place

the picture of the night sky in the center. Show the bag of grains of sand. Tell the children to look at the picture and to imagine a number **so large** that it could tell you how many stars are in the sky or how many grains of sand are on the beach. The number "one billion" is a very large number that we need to count the number of tiny cells in the body.



Getting the Idea

All living things are composed of cells. The smallest living organisms — the bacteria — are composed of a single cell. The largest cells are chicken egg yolks. Show the diagram. The cells walls are called "membrane".

Cells are the smallest units in the human body and cannot be seen without a microscope. Cells that perform the same job gather themselves into shapes that make "tissue" like the skin, muscles, bones and organs such as the liver, lungs and kidneys.

Tissues are groups of like cells that perform the same function, for example, muscle tissue or bone tissue.

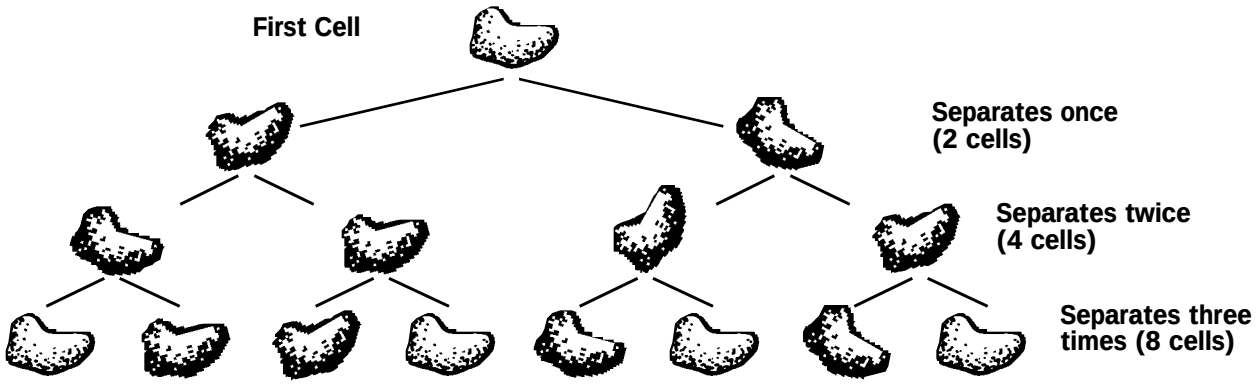
Organs are tissues that group to perform a specific function, like the heart or the liver.

The teacher tells students that the human body consists of many cells.

1. Cells are of different shapes and sizes.
2. The body makes over a billion new cells every minute.
3. Some cells are muscle cells, some are bone cells, and others blood cells, skin cells or nerve cells.
4. Each cell can make new cells by separating itself into two new cells; we say that cells **divide.**
5. Cells help humans grow.
6. Cells help humans heal injured body parts by making new cells.
7. Blood cells take food and oxygen to all the other body cells to help the cells develop and reproduce or help make new cells.
8. There are special cells the body needs to reproduce itself.
9. Inside the cell membrane is a substance called "cytoplasm".
10. Inside the cell, along with the cytoplasm, is the nucleus, which is the central part that controls the actions of the cell. The nucleus grows and then separates into two parts to form two new cells.

Organizing the Idea

At the **Art Center,** students draw and color a variety of different cells. They can draw the cells they saw through the microscope and/or cells they have seen in the reference books.



Applying the Idea

1. A single cell grows and changes until it has to "divide" itself. It divides or separates itself into two cells. How many new cells will there be after it "separates" for the second time? The third time? (Hint: Draw a picture of the cells as they separate; then count them.)
2. How many times would a single cell have to separate for 32 new cells to exist?
3. What do cells need in order to reproduce or "divide". (Food and oxygen that is supplied by the blood, which is also composed of blood cells.)

Closure and Assessment

The student completes this sentence: The two most important things about cells are _____ and _____ .

LESSON 3

The Body— A Complex Form

BIG IDEAS Our bodies have parts that help us move, think and feel. Measurements help us describe our bodies.

Whole Group Work

Materials

Chart
Colored nail polish
Collection of students' pictures
Black markers, graph paper, poster boards, butcher paper
Model or pictures of the human body
Measuring tape in inches, feet, centimeters
Unifix cubes to use to measure length
Word tags: internal, external, organ, lungs, liver, torso, legs, arms, head, neck, hands, arms, toes, knees, legs and others as student name them

Encountering the Idea

We've learned that the body grows and changes; we've learned that it is made up of tiny cells that grow and separate for the body to grow, that repair when the body has become injured or ill and that perform all its required functions. Let's continue to learn more about our bodies. Let's describe our bodies. Students draw a body on a poster board (or trace their own body on butcher paper) and label the body parts as they discuss them. They will use this diagram later to write in their journals. What can we see? Students count, describe and list what they see in a mirror. Then they speculate about what they cannot see — blood, stomach, etc.

Exploring the Idea

When students have listed a number of the body parts and described what they can, ask them to describe their hearts, brains, livers and so on. We can't describe some of these organs because we can't see them. In the centers we will discover more about the body and describe the parts that we cannot see. Using either a model of the human body or pictures brought by students of themselves, the students describe a human body including important internal organs that they cannot readily see.

At the **Science Center,** the students

1. complete the following **Activity** — Let's Describe our Bodies.

   The teacher draws the outline of a head on the board, for example. At the **Science Center,** the students complete the activity. They copy the outline of the head into their journals and provide other details such as eyes, nose, ears, etc. They complete the rest of the body — neck, torso, arms, etc. — on subsequent days. Label and describe the parts according to the students' comments. The descriptions should include number and shape descriptions.

2. complete **Activity** —Body Diagram. After making their body diagrams, the students place them in a secure spot to make in subsequent lessons a **composite** body diagram that will show body organs.

At the **Mathematics Center,** the students complete Part 2 of **Activity** — Mathematics of the Body.

Getting the Idea

External organs are those that are on the outside and can be easily seen and described. **Internal organs** are those that are inside the body and cannot be seen. We have to use instruments and equipment like X-rays to see the internal organs inside the body.

Let's talk about the measurements you've taken to describe your bodies. Look at Juan's outline. Juan, on the side of your body diagram, you wrote that you measure 43 inches in height. You also wrote that you measure 109 centimeters and that you measure 3½ feet in height. Why do you get these different numbers? Why is it 43 inches? 109 centimeters? And 3½ feet? What is a standard unit? Are all standard units the same?

Organizing the Idea

1. After completing their work on the body outlines and diagrams, the students work in pairs to review the new terms by asking their partners to point to and name various parts of the body they have studied. If they do not know the terms, they ask other students or the teacher.
2. The students draw pictures of the body and complete the frame sentences and write them in their journals. Place the chart with the frame sentences where students can see it:

   On top of my body is my _____. The head rests on the _____. The _____ are used to hold onto things. The hands are at the end of the _____. I laugh if you tickle my feet and my piggies, which are really my _____. When I play marbles, I rest on my _____. For running, I use my strong _____.

After the students complete the activities in the **Science Center** and finish measuring each other, each group confers and gives an explanation of why the numbers they got when they measured each other's length, for example, in inches and in centimeters are different. As soon as one group can explain, the Reporter/Recorder of the group signals. Students discuss using different size units. (The smaller the unit (cm.), the more of them you need.)

During the discussion, encourage the students to use specific new words they have learned to refer to their bodies. They may also use the outlines and diagrams they have made to give explanations of their observations.

Applying the Idea

1. What is the most interesting thing you learned about your body today?
2. Tommy measured the length of his foot. He said it was 8½ inches. His mother measured it and said it was 21 centimeters. Who was right? How do you know?

Closure and Assessment

1. After reconvening, the students can sing “Them Bones.”
2. The students summarize what they have learned about the human body and what they have learned about themselves.
3. The students make a list of questions about other things they would like to know about the human body.
4. The students discuss the following:
   - Do you feel different about your body today as compared to yesterday?
   - Have you changed in how you feel about yourself? How have you changed?
   - What made you change how you feel about yourself?

List of Activities for this Lesson

▲ Body Diagram

▲ Mathematics of the Body: Part 2

.....

Objective

The student places body organ cutouts in their appropriate places in a body diagram.

Materials

Butcher paper; markers; measuring tapes (inches and centimeters); scales (pounds and kilograms)

Procedures

Students work in teams of three. Each student obtains enough butcher paper to trace the outline of his/her body. Students lie on the butcher paper to outline their shapes. After they trace each other, they label the parts.

1. Students continue working in groups as they measure the length of their own outlines. This is done in inches, feet and/or centimeters. On the side of their body outline, they write: "I am (*inches, centimeters, feet*) tall."
2. Students use a tape measure to measure the circumference of each other's heads, in inches and centimeters. They ask each other about the different measurements they get. Ask them to give their reasons during the closing activities of the lesson.
3. The students measure the length and width of their hands. They measure the length and width of their feet. They measure the circumference of their waists and wrists, and discuss the more effective unit — the centimeter or inch — to measure their wrists. They measure the circumference of their thumbs.
4. Students weigh each other in pounds and kilograms. On the side of the body outline they write: "I weigh _____ pounds or _____ kilograms."
5. Each group confers and gives an explanation of why the measurements are different. (The smaller the unit (cm.), the more of them you need.) As soon as one group can explain the Reporter/Recorder signals. Students discuss reasons why different people might want to use different standard units such as the inch and centimeter.

ACTIVITY

Mathematics of the Body: Part 2

Objective

Students use addition and/or subtraction appropriately to answer questions about information obtained in class.

Materials

8½ x 11 pieces of laminated construction paper
Erasable marker
Cuisenaire rods or other models that demonstrate place value

Procedure

Students use erasable markers to write on individual story boards made of 8½ x 11 pieces of laminated construction paper. Students write and solve addition and subtraction problems, using classmates' data on height and weight.

After they have collected information on students' weights, the students write original problems involving weight comparisons, in the same manner as the problems in **Activity**—Mathematics of the Body: Part 1.

LESSON 4 *The Heart— The Nonstop Pump*

BIG IDEAS The heart pumps blood to all parts of the body. We describe the heart's rate in beats per minute.

Whole Group Work

Materials

Book: **Harry and the Terrible Whatzit** by D. Gackenback, added to **Library Center**
Diagram of a heart or a model showing veins and arteries
Prepared tape for the **Heart Center**
Books about the heart
For **Heart Center** see **Activity** — My Heart
Oral Thermometer; stethoscope; clock/watch
Sheet of paper; gauze or cotton balls; alcohol to clean thermometer
Word tags: arteries, veins, temperature, degree, heart, pump, oxygen, carbon dioxide

Encountering the Idea

Begin by introducing **Harry and the Terrible Whatzit.** First, have the students predict what the story is about. Read the book aloud. Afterward, the class discusses how Harry must have felt when he was afraid of the Whatzit. Do you think his heart was beating the same as it always does? Was it beating faster? What do you think makes our hearts beat faster? We will explore these ideas at the learning centers.

Tell students that they will explore more about blood when they do **Activity** — Body Temperature.

Exploring the Idea

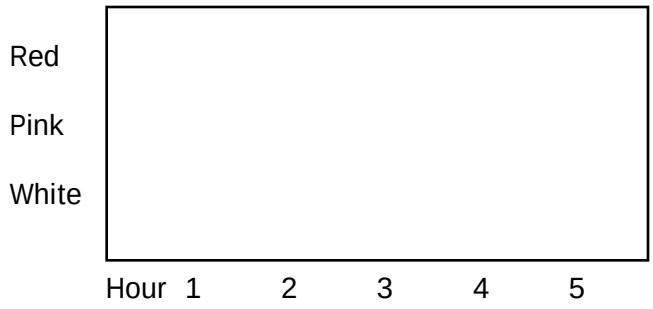
At the **Science Center,** the students

1. complete **Activity** — My Heart
2. complete **Activity** — Body Temperature
3. complete **Activity** — Veins and Arteries, as below.

PRIOR PREPARATION: Early in the day cut several pieces of celery stalks on a diagonal and place in a solution of red food coloring and water. Record the water level every hour for the entire school day.

Procedures

1. When placing the celery stalks in the water, the students observe the color of the stalks and the leaves, noting that they are green, light green and/or white, later becoming pink and then red.
2. At various intervals, the students make observations and record them. They observe that the color is traveling along a system of veins in the stalks and leaves.



Students discuss how the water and color travel from the glass into the stalks and leaves. They compare this system of veins with the body's system of veins and arteries that carries the blood to all parts of the body.

They draw the celery stalks in their journals and color the veins.

Getting the Idea

What did you learn when you completed your first activity — when you took your heart rate when you were resting and when you were exercising? What did that suggest to you? Did that activity have anything to do with the activity with the celery stalks that showed that the colored water could flow upwards into the leaves? What do those two activities have to do with the activity about your body temperature? (Pause for student responses. As they suggest ideas, write them down for further discussion.) Yes, your heart pumps your blood throughout your body. That, of course, is an extremely important function because the blood that gets to your cells does many things.

Show diagram of the heart. Discuss that the heart is one of the most important organs of the body. It pumps blood throughout the body, sending it through **arteries** and **veins. Arteries** are channels like flexible pipes that take the blood with oxygen from the lungs to the cells of the body. **Veins** are channels that take the blood filled with carbon dioxide back to the heart and lungs. Veins send blood through the lungs to get oxygen and leave the carbon dioxide, then through the liver and kidneys to leave other wastes. Besides taking oxygen to the body's cells, the blood also helps to take food in the form of sugar and proteins to the cells. As the blood flows throughout the body, it helps keep it warm.

Let's talk about your experiment with your body temperature.

1. Students compare temperatures and compare results with other groups.
2. State a hypothesis about the human body's temperature. Why does the body stay at 98.6˚ F?
3. Hypothesize about what it means if the thermometer reads 102˚. What does it mean if it reads 92˚? (This could mean that there is an illness such as flu, a cold, an infection.)
4. What do you think would happen to your body if you went outside on a cold day to play and your body did not stay at a temperature of about 98˚ F?

At the **Art Center,** the students cut out the heart diagram in **Activity** — The Heart, color it and locate it in its appropriate place on the body diagram. Explain to the students that the arteries are colored red because they carry the blood that is full of oxygen to the body cells, and that veins are colored blue because they are returning the body wastes to be removed. Using the two-color code, you can trace where the blood goes and what it does.

After students have had an opportunity to participate in all of the activities, they discuss: The **arteries** are channels, like flexible tubes, that take the blood with oxygen from the lungs to the cells of the body. **Veins** are channels, flexible tubes, that take the blood filled with carbon dioxide back to the heart and lungs.

At the **Mathematics Center,** the students

1. continue to work on **Activity** — Mathematics of the Body: Parts 1 and 2
2. complete **Activity** — Rates.

Organizing the Idea

At the **Music Center,** students engage in a **Sing and Dance** Activity. Students point to the parts of the body as they sing **"Dry Bones"** found in **We Sing** tapes and records. Students sing and dance **The Hokey Pokey**. They relate words to the body parts.

Students complete these frame sentences in their journals after completing **Activity** — Rates.

Students compare each other's heartbeats.

(*students*)'s heart beats (*faster/slower*) when (*running, sitting*) than when _____.

_____'s heart beats _____ more beats when _____ than when _____. _____'s heart beats _____ more beats in one minute than _____'s.

They show the subtraction sentences under the word sentence.

Applying the Idea

Problem solving

How many times does a heart beat in **one hour?** At the slow rate? At the fast rate?

The student constructs or builds a pump that can draw in a liquid as well as pump it out.

For one example, see **Activity** — A Rubber Pump.

Closure and Assessment

How fast does the heart beat when you are being quiet? After exercising?
What is the difference between the two?
What happens when we begin to rest after we exercise?
How does the graph show this?
What do you think the rate is at six minutes? At seven minutes?

List of Activities for this Lesson

- ▲ The Heart
- ▲ Body Temperature
- ▲ A Rubber Pump
- ▲ Rates

ACTIVITY
The Heart

Objective

The students say that a person's heart rate changes with a change in the person's activity.

Materials

Rubbing alcohol in a small jar with lid; stethoscope; cotton balls; pencil; tape recorder; cassette tape

Electric clock with a minute hand, or a tape recording counting 30 seconds or 60 seconds

Book: **Hear Your Heart** by P. Showers

Part 1

Procedures

Students work in pairs, with one student acting as a timer for the other student.

1. The teacher prepares a cassette tape of the book (reads the book so that students can follow along in the center).
   a. The students clean the stethoscope's earplugs with cotton and alcohol.
   b. The students put on the stethoscope and listen to own heart and teammate's heart.
   c. The students look at the minute hand on the clock. Begin to count heartbeats when the minute hand is on 12. Stop when the hand reaches 12 again. The teacher may cue the 60-second timing rates on the cassette tape by using "Ready, listen, go ..... stop."
   d. The students write down the number of beats for the resting rate.
2. Count and record heart rate after walking and running. The student follows the tape-recorded directions to measure his or her heartbeats. The student records his/her heartbeats on a chart.

Crystal's Heart

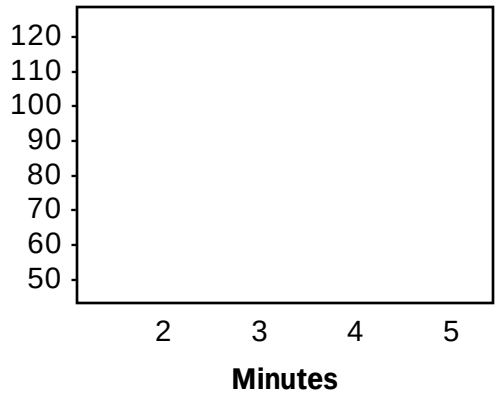
_____	_____	Resting beats in one minute
_____	_____	Walking beats in one minute
_____	_____	Running beats in one minute

Part 2

Students take and record the heart rates of five classmates before and immediately after running, two minutes after vigorous exercise, and then every minute thereafter up to five minutes. Students prepare a graph and describe and discuss the results.

1. How fast does the heart beat when you are being quiet? After exercising?
2. What is the difference between the two?

3. What happens when we begin to rest after we exercise?
4. How does the graph show this?
5. What do you think the rate is at six minutes? At seven minutes?



Part 3

1. Make a tape recording of a person counting one to 60 seconds to use in the following activity.
2. Using a stethoscope the students count the number of heartbeats heard in one minute. Students record this number.
3. The students run in place for one minute, counting the number of heartbeats heard in one minute.
4. The students use the two heartbeat counts to write a number sentence on a human outline. Which is less?
5. Working in pairs, students write number sentences comparing fast and slow rates.

[1]A student's heart rate can be taken by locating and lightly placing a person's (teacher) middle finger on the student's forearm close to the hand (on the pulse) and counting beats for 15 seconds.
[2]As an alternative, the children may count for 30 seconds on the tape and double the number of heartbeats to get the rate per minute.

ACTIVITY
Body Temperature

Objective

The student says that a normal body temperature is about 98˚ F and takes her/his temperature with an oral thermometer.

Materials

Oral thermometer with Fahrenheit and Celsius scales (one with each scale shown on a side of the thermometer) for each student

Piece of paper; gauze and alcohol; a clock with a seconds timer

Procedures

Students work in small groups of three or four.

1. Each student group examines and describes a thermometer noting: the liquid in the cylinder; how the scale is marked; the number of subdivisions; and any other noticeable features. They find the largest number, the least number and any other special marking. They make these observations using the Fahrenheit scale and the Celsius scale.
2. The students read the thermometer the way they would read a number line, noting that the scale is in units of one degree, and the subdivisions are 2/10, 4/10, 6/10 or 8/10. They record the temperature as shown on the thermometer. If the students have not worked with fractions, they may estimate to the nearest one-half of one degree.
3. Each student cleans the thermometer with a piece of gauze wet with alcohol before taking her/his temperature. The student has the teacher shake the thermometer down to at least 94˚ F.
4. The student inserts the thermometer under his/her tongue, being careful to not bite on it, and closes the mouth and keeps it closed for at least 20 seconds by a clock.
5. Students read each other's temperatures to the nearest 1/2 degree, or fraction of a degree, and record them.
6. The students report on their body temperature.

Getting the Idea

1. Where do you think the heat that keeps your body warm at 98˚ F comes from?
2. We have learned that heat is one type of energy; where does this heat energy come from? (The cells burn the food with the oxygen that the blood brings to them to create heat energy and other kinds of energy that the body needs.)

ACTIVITY
A Rubber Pump

Objective

The student explores ways to show how the heart functions.

Materials

One transparent rubber glove
Two plastic drinking straws
Three small rubber bands to seal off the top of the glove and two fingers of the glove
Two transparent plastic tumblers; one with colored water, the other with clear water

Procedures

Students can work in pairs.

1. Snip the end of the thumb and one of the fingers of a rubber glove. The cut should be small, only large enough to insert one end of a plastic drinking straw.
2. Insert one of the plastic drinking straws into the cut on the thumb and seal it back up with one of the small rubber bands. Make sure no air can leak through the seal.
3. Do the same thing with the other finger of the glove.
4. Put enough water into the rubber glove to make it bulge. With a small rubber band, seal the top of the rubber glove so that no air or water can escape.
5. As the water begins to flow out of the fingers of the glove, one person puts a finger on each exposed end of the drinking straws to keep the water from flowing out.
6. Insert the thumb with the drinking straw attached to it into the tumbler with the clear water. Squeeze the rubber glove gently and release the end of the finger with the straw attached to it into the tumbler with the clear water. What happens? Clear water flows into the tumbler.
7. Now, remove the finger from the colored water, and the other person pulls on the rubber glove to expand it. What happens? Colored water flows into the rubber glove.
8. Repeat the process back and forth. What happens? The clear water in the glove begins to turn red and the clear water in the thumb tumbler also begins to turn red.

Discussion

The student explains to the teacher how the pump works and why the water begins to turn red in the glove and in the other tumbler.

ACTIVITY
Rates

Objective

Student compares two rates and says which is faster or slower.

Materials

Stopwatch or watch with second hand or digital watch that shows seconds

Procedures

Students work in pairs.

1. Using a stopwatch, student times 10 seconds and notices how long that time "feels".
2. Now the student snaps his fingers or taps on a table with a pencil every second to get the sense of the rate of one second. Writes: One tap in one second.
3. Now the student taps her/his fingers **evenly** twice for every second. Practice tapping until it is even. Writes: two taps in one second.
4. The student taps **evenly** four times in two seconds. Writes: four taps in two seconds.
5. The student taps three times in one second. Writes: ___ taps in ____ second.
6. The students take turns tapping and guessing the number of taps in one second or two seconds.
7. The students say which rate is faster and which is slower.

Discussion

1. Which rate was the fastest? The slowest?
2. How can you tell? Can you hear it? Can you see it? (One response: We wrote it down and compared the number.)

LESSON 5 *The Lungs: A Gas Swap Meet*

BIG IDEAS The lungs take in air and take the oxygen out of the air to send it through the blood to all parts of the body. The lungs have capacity (volume) that we can be measure.

Whole Group Work

Materials

Book: **When Will I Whistle** by M.M. Green or **The Toy Trumpet** by A. Grifalconi
Lung model from **Activity** — How the Lungs Work
Pictures and diagrams of the lungs
Word tags: lungs, torso, carbon dioxide, oxygen, volume, capacity
Word strips
Stopwatch or digital clock

Encountering the Idea

The teacher reads the story of **When Will I Whistle,** or any other story that involves the use of the lungs such as **The Toy Trumpet.** The teacher asks students to name the parts of the body used to whistle or to play a horn. Write students' responses on word strips for future use in writing activities. The only way a person can play a trumpet is to be able to blow air through it. Where and how do we get air to play a trumpet? We'll be able to see by completing some of these activities at the learning centers.

Exploring the Idea

At the **Science Center,** the students:

1. complete **Activity** — How the Lungs Work
2. complete **Activity** — Lung Capacity.

Getting the Idea

1. Use the model constructed for **Activity** — How The Lungs Work to discuss the structure and function of the lungs. Use the diagram from **Activity** — The Lungs. Explain how the lungs work by showing students other pictures and diagrams as well as the model, focusing on:
   1) The **lungs** are two organs on each side of the **torso** that exchange oxygen and carbon dioxide for the body.
   2) Air comes into the lungs through the nose and the mouth. This air contains **oxygen.**
   3) Inside the lungs are some small sacs, called bronchioles. The oxygen is **exchanged or swapped for the carbon dioxide** brought in by the blood cells in the small sacs.
   4) Blood cells that are full of oxygen pass through the heart and go through the arteries to the body cells. The blood cells deliver the oxygen and pick up the carbon dioxide.

5) Blood cells filled with carbon dioxide go back to the lungs through the veins and start the cycle again.
6) There is a large, strong muscle called the **diaphragm** under the lungs. The diaphragm helps push air out of the lungs when they are full. It opens them up when they need fresh air.
7) The lungs have a capacity to fill with air when we **inhale.** Then when we let out air, we **exhale.** How much air can the lungs hold? We can discover this in one of our experiments.

2. Students now discuss the idea of lung capacity. What is another word for capacity? (Volume, size or amount.) At the learning centers, the students take turns describing how the lungs work. They compare the lung capacities of the members of their group. If a class member, including the teacher or a teacher from another class, plays a musical instrument — flute, horn, reed — he/she can demonstrate the way to play it to the class. The musician can discuss how she/he keeps the lungs strong in order to play well.
3. Discuss: Why do you breathe faster when you run?
4. The students place cutouts of the lungs in their appropriate places on the body diagrams begun during the first lesson. **Note: Leave the lungs unglued.** The students should be able to lift the lungs and see the organs that go underneath. Glue the trachea only.

At the **Mathematics Center,** students complete **Activity** — Don't Hold your Breath!

Organizing the Idea

At the **Writing Center,** the students
1. write a story that tells about how the lungs work
2. write a patterned paragraph: The two most important things about the lungs are _____ and _____. (The student writes two or three sentences to elaborate and then concludes by paraphrasing the two reasons.)
3. draw a diagram of the lungs in their journals and show the carbon dioxide being replaced by the oxygen.

Applying the Idea

Problem Solving

1. Explain what you do when you need to take a big breath, for example if you want to swim underwater or you want to hold your breath. (Stand up straight, open the mouth to let the lungs expand completely.)
2. What happens when someone punches you in the stomach by accident? Yes, you lose all your air because the diaphragm squeezed hard, and it pushed the air out of your lungs.
3. How important are the lungs in playing basketball, soccer and in swimming?
4. Do you think a trumpet player's lungs have more capacity (can hold more air) than the lungs of people who do not play the trumpet? Why would that be true or not true?

Closure and Assessment

1. In the experiment on lung capacity, what does the amount of water you put with the measuring cup into the bottle show? (This is the amount of air you blew into the bottle.)
2. After each student repeats the activity, the students compare their lung capacities: Who had the largest capacity? Who had the smallest capacity? What is another word for capacity? (Volume.)
3. In what ways do our lungs help us? (Breathe, play an instrument, whistle, play sports and **talk.**)
4. In the story we read, how were the lungs used?

List of Activities for this Lesson

▲ Don't Hold Your Breath!

▲ How The Lungs Work

▲ Lung Capacity

▲ The Lungs

ACTIVITY

Don't Hold Your Breath!

Objective

Students discover their breathing rate when at rest and when exercising vigorously.

Materials

Stopwatch or digital clock

Procedures

Students work in pairs.

1. One student counts and records the number of times his/her partner breathes normally in one minute.
2. One students runs in place at an even pace for one minute.
3. At the end of the minute, the student continues running in place while his/her partner counts and records the number of breaths taken during the second minute of running.
4. Summarize the information on a chart for comparison.

Breaths in One Minute

Student	*Number breaths resting*	*Number breaths running*	*Difference*
J			
K			

5. Compare the breaths taken resting and running and then compare breath rates of the two students.
6. Are the breathing rates the same? What is the difference between the two students?
7. Pantomine: You are asleep. You hear a burglar come in. You go to investigate. What happens to your heart? What happens to your breathing?
8. Who had the largest difference between resting and running breathing rates in the class?
9. Who had the least difference?
10. Compare breathing rates and heartbeat rates (from **Lesson Four**) during resting and exercising.

Discuss

Is there a connection between the heart beating faster and the person breathing faster when exercising?

ACTIVITY

How the Lungs Work

Objective

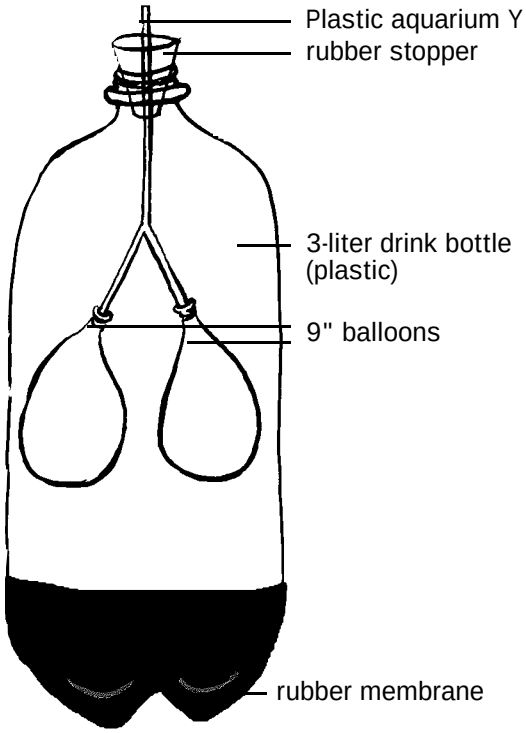
The student constructs a lung model.

Materials

For whole group:
Empty quart bottle of soda pop with the base cut off
Y tube for an aquarium
Piece of rubber sheet or large balloon cut with a diameter larger than the base of the bottle
Rubber stopper that fits the opening of the bottle and has a single hole that fits the Y tube
Two balloons attached to the dual ends of the Y tube

Procedures

1. Cut off the base of the plastic bottle.
2. Connect the Y tube to the rubber stopper and attach the balloons with tape to make the attachment airtight.
3. Secure the rubber tube to the top of the bottle.
4. Cover the base of the plastic bottle with the rubber sheet and secure on the sides with tape to make it airtight.
5. Pull the rubber sheet away from the base to show the two small balloons inflating; when the rubber sheet is released the balloons empty.



Lung Model

TEACHER DEMONSTRATION

Lung Capacity

Teacher Demonstration

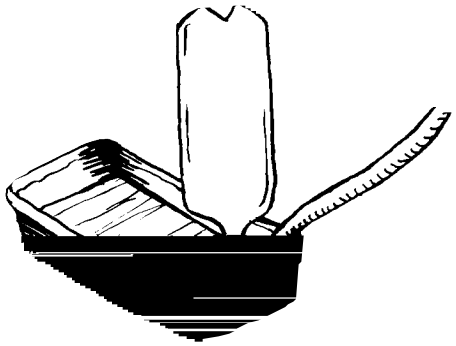
Materials

Three-liter soda pop bottle or one gallon vinegar bottle
Large pan
Two feet of tubing
Measuring cup marked in ounces and milliliters
Masking tape
Paper towels

Procedures

Students work in pairs or groups of three.

1. Fill the large pan with water to a two-inch depth.
2. Fill the three-liter bottle with water.
3. Cover the opening of the bottle and, holding it upside down, lower the bottle into the pan. Let the bottle stand upside down inside the water.
4. Tip the bottle to the side and insert one end of the tubing into the bottle.
5. As one student holds the bottle to keep it from tipping over, another student blows air into the bottle.
6. Each student takes a turn taking a deep breath and blowing it out through the tube into the bottle until the lungs are empty. Students should do this only once.
7. Mark the water level with a piece of tape.
8. Empty the water, and turn the bottle right side up.
9. Using a measuring cup, refill the bottle with water to the level marked with the tape. Record the number of milliliters it took to fill the bottle to the mark.



Discussion

1. What does the amount of water you put into the bottle with the measuring cup show? (This is the amount of air you blow into the bottle.)
2. After each student repeats the activity, compare the lung capacities:
   Who had the largest capacity?
   Who had the smallest capacity?
   What is another word for capacity? (Volume.)

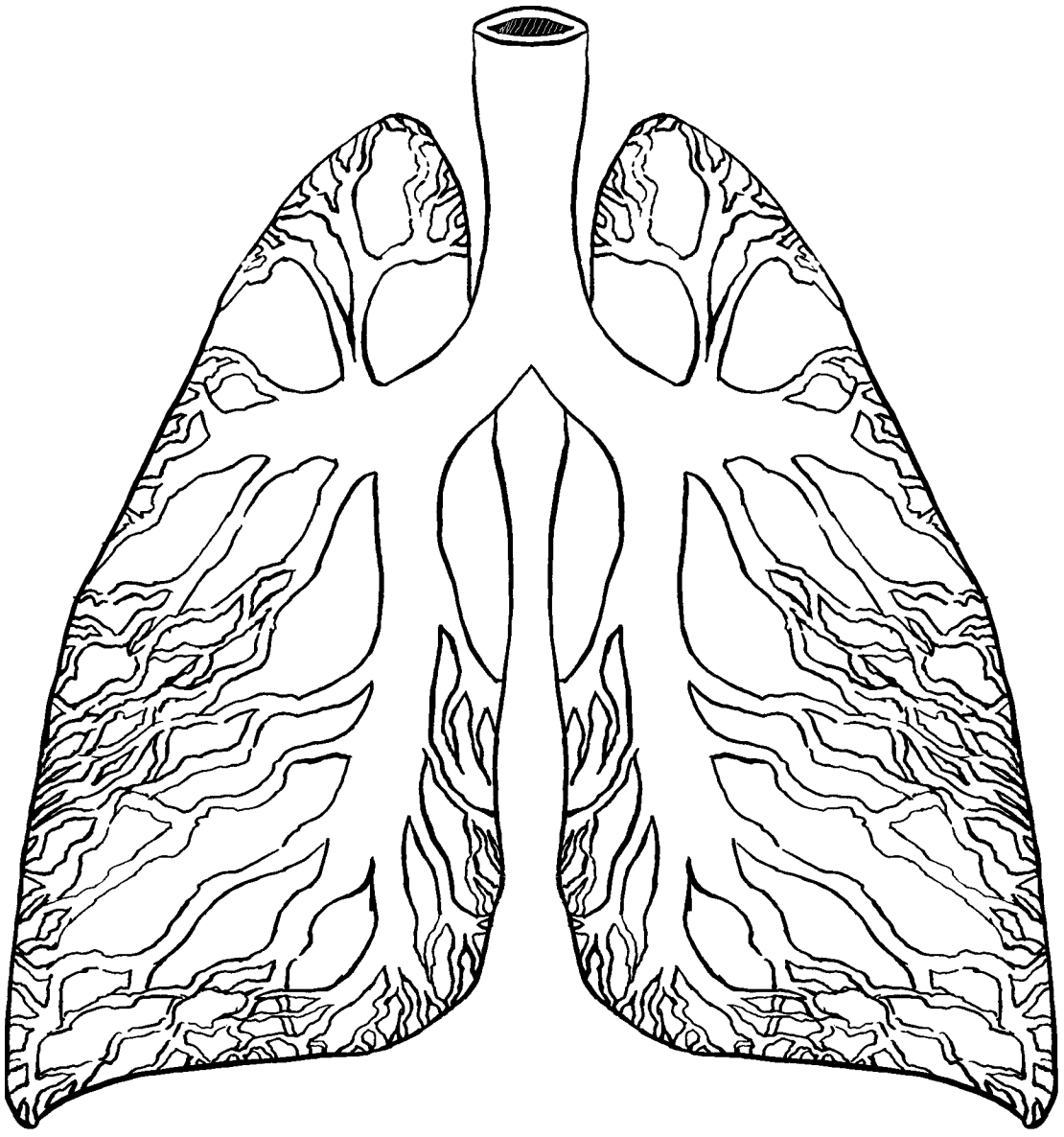
ACTIVITY

The Lungs

Note: Leave lungs unpasted. Students should be able to lift up the diagram to see the organs underneath.

Each student receives a copy of the lung diagram to color and cut out.

Remember: Each person has a pair of lungs, one on each side of the ribs.



LESSON 6

The Muscles and Bones— A Magnificent Machine

BIG IDEAS Muscles and bones work together to help the body move; bones also protect important body organs. Over 200 bones are in the human body.

Whole Group Work

Materials

Model: How Bones and Muscles Work
Book: **Now One Foot, Now the Other** by T. de Paola
Films and pictures depicting how the bones and muscles work together
Rubber band and matches
Word tags: elastic, flexible

Encountering the Idea

Read aloud **Now One Foot, Now the Other** to the class. The teacher asks the class to predict what the story is about. After reading the story, the students answer questions: Why could the grandfather not walk? What does it take to be able to walk and move around? The teacher shows a rubber band as it expands and contracts. A rubber band is flexible and elastic. The teacher shows a match that is hard and not flexible. It can break. In this unit, however, we are going to learn that two things — one that is flexible and one that is not—can work together to do many wonderful things.

Exploring the Idea

At the **Science Center,** using pictures and film or filmstrips, tell students that muscles and bones work together to help the body stand up straight, walk, run and move in many different ways. Show students the rubber band model of how bones and muscles work.

1. Complete **Activity** — How Muscles and Bones Work Together.
   Using a diagram of the body, help students locate muscles in their arms, legs, hands, fingers, on the face, neck, etc. Help them feel the muscles as they flex and as they relax. Place models in the **Human Body Center** for more study.
   At the **Mathematics Center,** ask: How much weight can you lift? How many bones are in the hand?
2. Complete **Activity** — Bones Protect the Body, as shown below,

Materials

Football helmet; several pieces of colored pipe cleaners of various sizes

Procedures

1. After the class has had an opportunity to examine the helmet and feel it, a student wears the helmet.

2. Arrange the pipe cleaners to simulate ribs. Shape one piece into a circle to simulate the head. One long piece serves as the spinal column, and the ribs and head are "attached" to it.
3. The students discuss how the bone that is the skull protects not only the brain but also the eyes and ears.
4. The students construct a "rib cage" of their own using pipe cleaners.

Getting the Idea

Using the model of the muscles and bones the students have made, review the contraction and relaxation of the muscles, working in pairs to help an arm move. During Physical Education, the teacher can help the students move an arm or leg and feel the muscles to identify the one that relaxes while the other contracts to make the limb move. Then, move the limb in the opposite direction to see how the muscles feel.

Tell students that bones not only help the body move, they also protect it. The skull is a good example of how a bone protects the brain. The ribs are another good example of how bones protects the important organs of the body like the heart and lungs.

Ask a physician to visit the classroom to talk to the students about their bones and muscles.

Organizing the Idea

1. After completing the activity on counting bones, the students draw a skeleton using the number of bones they have found, reaching a consensus of the difference in the numbers each has obtained. Using a reference book, the students find out how many bones are in the human body and use the information to complete their illustration.
2. Students write and illustrate how bones protect the important organs of the body.
3. Students learn and sing the song "The Head Is Connected to the ... Bone."

Applying the Idea

1. Students design and construct their own model of bones and muscles working to make a body move. (Can use Legos, if they have any.) They can experiment in different ways. They report on what they have constructed to the members of the class.
2. Using sports equipment a student (or a group) demonstrates how protective gear protects the body in sports. Show a football helmet, knee pads and gloves and show the bones and organs this gear protects.

Closure and Assessment

1. How many bones were we able to count? Who counted the most? The least?
2. What is the function of bones? (Movement and protection.)
3. What is a function of the muscles? (Movement.)
4. Why can't we see and count all our bones? Muscles?
5. Each student writes and reads to the class one question he/she has written about bones and muscles. The other students answer the questions; correct

them if they are wrong. The student responsible for writing the question is also responsible for providing an answer to the question.

List of Activities for this Lesson

▲ How Muscles and Bones Work Together

▲ Counting Bones

ACTIVITY

How Muscles and Bones Work Together

Objective

The student constructs a model showing how muscles, in pairs, work to move a bone.

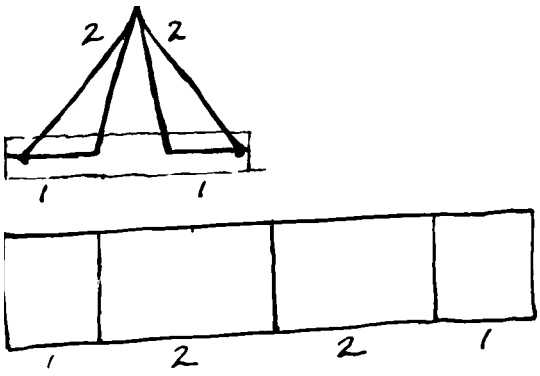
Materials

One one-inch wide piece of cardboard, six inches long
Two rubber bands
Glue or stapler
Large (4' × 5') cardboard to serve as a base

Procedures

1. Fold the cardboard at three places, evenly spaced.
2. Fold the cardboard at the center and one inch away from each end.
3. Open the cardboard and mark as shown in the figure below.
4. Leave the two-inch segments back-to-back and fold the one-inch segments perpendicular to the longer segments. Glue the one-inch segments to the cardboard base.
5. Attach the rubber bands about ¼-inch from the top of the two-inch segment — one on each side, and at the base about ¼-inch from the end.

How does this model help us understand how the muscles and bones work together? What happens when you pull the rubber band? (The bone (cardboard) moves.) In this model what do the rubber bands represent? (Muscles that contract and relax.) What represents the bones? (The two-inch cardboard segments.)



ACTIVITY
Counting Bones

Objective

The student locates various bones in the body and says there are over 200 bones in a human body.

Materials

Paper and pencil
Model of a human skeleton or encyclopedia or other appropriate reference books

Procedures

1. Feel the bones in the finger of one hand with the other hand. Count them.
2. How many bones did you count in your hand? Write that number down.
3. See how many bones you can count from your finger to your shoulder. Write that number down.
4. Now begin with your toes and work up counting all the bones you can find. As you count the bones in your foot, leg, back and so on, complete a chart.
5. Using this procedure, count as many bones in your body as you can. Write the number for each part.
6. Draw a picture of the human skeleton, including the bones you found.
7. Compare your notes and drawings with other groups. If your numbers are different for some part of the body, count again and try to determine where the difference occurred.
8. When you have counted and drawn all the bones in your body that you can find, go to the model of the skeleton (or encyclopedia) to see how many bones are in the human body.
9. How close was your count?

Discussion

Why can't we count all the bones? (Some are too small or well-hidden to be felt by hand.)

Counting Bones

Students' names	*2 hands*	*2 feet*	*2 legs*	*Torso*
Sara				
Betty				
Jorge				
Joe				

LESSON 7 *The Stomach and Intestines—The Food Processors*

BIG IDEAS The stomach, intestines, teeth and saliva prepare the food we eat so the body can use it for energy.

Whole Group Work

Materials

Book: **What Happens to a Hamburger** by P. Showers
Pineapple, banana and orange
Picture or drawing of a large dead tree
Plastic bag containing all the pieces of a small puzzle, mixed in with small pebbles and marbles
Food blender, preferably with glass sides
Various types of vegetables such as carrots, etc.
Water in a tumbler
Words tags: prepare, digest, separate, chemicals, saliva, intestines, kidneys, blender, food processor

Encountering the Idea

Tell students that you are going on a picnic. You want to make a fire to cook your picnic lunch, but you need firewood to cook your meal. Show students a picture or drawing of a large dead tree. There is a dead tree nearby that you can use for fuel. Can you use it to make your fire? What do you have to do to make it into firewood? Let the students describe cutting down the tree, making it into smaller pieces and then into very small pieces for kindling. Ask: Can you use the tree as it stands or do you have to do something with it? You have to **prepare** the wood for it to burn. You cannot use it as it is.

Next, show students a pineapple, a banana and an orange. Can we eat this pineapple, banana or orange as they are? You want to peel them first? Why?

Next, show the students a plastic bag containing all the pieces of a small puzzle, mixed in with small pebbles and marbles. Can you complete the puzzle? No, you have to sort out the pieces you want. Two or three students sort out the puzzle pieces, separating them from the other material. Other students help to construct the puzzle. Ask the students: What do all these demonstrations have in common? We'll try to find out as we complete some of these activities.

Exploring the Idea

In a whole group activity, the teacher uses a blender, preferably with glass sides, and various vegetables such as carrots, etc. to suggest to the students how the body digests food.

Ask the students: What is a blender? Is it a food processor? Then the teacher demonstrates how the blender cuts and mixes the various substances. Add water to show how much more easily then the blender mixes the food and how quickly it takes a liquid form.

Getting the Idea

Tell the students that the stomach performs an activity similar to that of the food processor and review the examples of the firewood, the puzzle and the fruit. The body cannot use the food we put in our mouths the way it is. The body needs to prepare the food; the body needs to process it. The processing begins at the mouth. The mouth begins the digestion by cutting the food into small pieces and mixing them with saliva. The process continues in the stomach.

The teacher distributes cookies or a snack to students and asks the children to guess what the ingredients could be. The teacher writes responses on a large chart tablet. The children eat the cookies or snack and hypothesize what will happen to the cookies as they eat them. Again write responses on a large chart tablet. Then, the teacher reads the story, **What Happens to a Hamburger.**

The teacher shows either a model of a human body that shows the stomach and intestines or a picture and/or diagram of the digestive system. Tell the students that another very important function of the body is that it is able to use food in order to get energy. The body cannot use the food for energy in its original form. It has to change it into a liquid so the blood can carry the food to the cells of the body for energy. Use the diagrams included in the activities on the stomach and intestines to point to the different parts of the body that digest the food.

As soon as the food enters the mouth, the saliva begins to mix with the food while we chew. That means we begin to digest the food. If the food is a liquid, like milk, we don't chew it, but it goes directly to the stomach where it is also digested. Digestion is the process in which chemicals in the mouth, stomach and intestines change food into a liquid form. The blood cells then pick up food from the lining of the intestines to take to the body cells. The process of digestion continues in the intestines, which are long tubes that contain the digested food from the stomach. The intestines then eliminate it, getting rid of what is left as "waste".

Water is not food. Therefore we do not digest it. We use water in the process of digestion. That is one important reason why we must drink the necessary amount of water every day for the body to work well.

Using a model/diagram of the stomach and intestines, the teacher discusses the functions of the stomach and intestines. Write sentence strips as the students discuss the process. Use these strips in the **Writing Center.**

The Stomach

1. The stomach is like a stretched plastic bag that holds food while it digests it. It takes about 10 minutes for the food that is swallowed to reach the stomach.
2. Food reaches the stomach through a tube called the **esophagus.**
3. Little glands in the stomach make acids that digest the food.
4. Once the food enters the stomach, the muscles begin to move the walls of the stomach.
5. The stomach muscles mash the food to mix it.
6. The acids and the mashing help to break the food into smaller pieces, to "digest" it.
7. The stomach has a valve like a door in it that closes to keep the food inside.
8. The stomach of an adult can stretch to hold almost two quarts of food.
9. When the stomach has digested the food as much as it can, the valve opens and the food travels into the small intestine.
10. When the stomach is empty, it shrinks like a balloon without air!

Next the teacher focuses on:

The Small and Large Intestines

1. The small intestine is a muscle about 20 feet long.
2. The muscle wall of the small intestine contracts, pushing the food into the large intestine.
3. The body digests food as it pushes it through the small intestine.
4. Digestive enzymes break food into very small parts.
5. Digestion takes from four to eight hours.
6. After we digest food, it passes into the blood to provide energy for the body.
7. Tiny, hairy, finger-like things called villi line the small intestine.
8. The villi absorb or suck in food and pass it into the blood.
9. The villi also help push the waste down into the large intestine.
10. The large intestine receives the waste products from the small intestine.
11. It takes the waste in the large intestine from 10 to 12 hours to complete its route.
12. The muscle wall pushes waste through five feet of large intestine.
13. Water is taken out of the waste to be recycled in the body.
14. The rectum pushes the solid waste out of the body.
15. It takes about 24 hours for food to travel from the mouth to the rectum.

The students use the cutouts of each of the organs — the stomach, the large and small intestines — and locate them in their appropriate place on the body diagram. The students color the organs using colors suggested by pictures they have seen in the reference books.

Organizing the Idea

At the **Writing Center,** the students working in groups of three, write down all they can remember about the stomach and intestines, explaining the digestive process in sequential order.

Closure and Assessment

The teacher can do much of the assessment for this lesson while the students work on the various activities of the lesson. The objective here is to have the students understand where the stomach and intestines are located and understand that the body prepares food for use in a long digestive process.

List of Activities for this Lesson

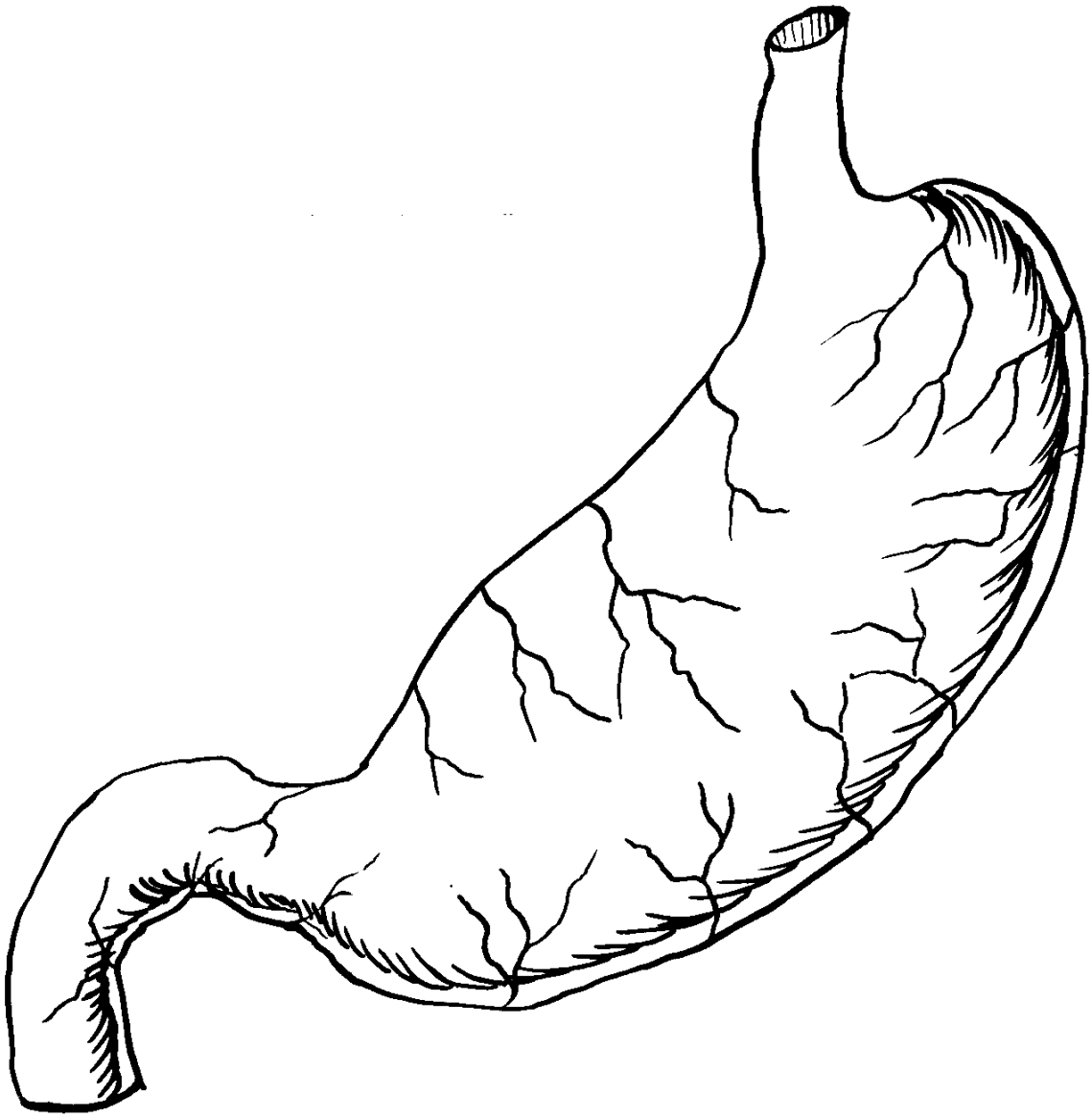
▲ The Stomach

▲ The Large Intestine

▲ The Small Intestine

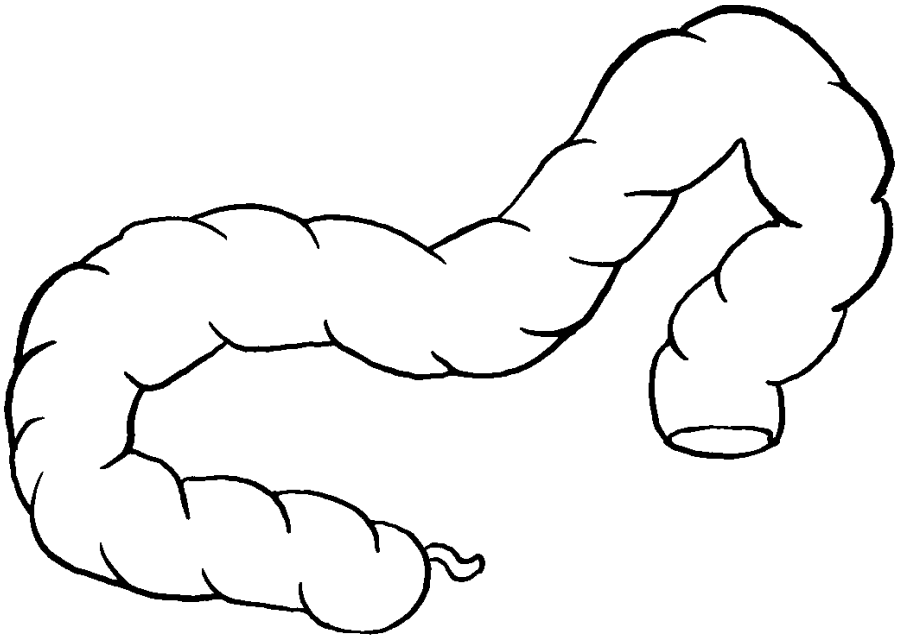
ACTIVITY

The Stomach



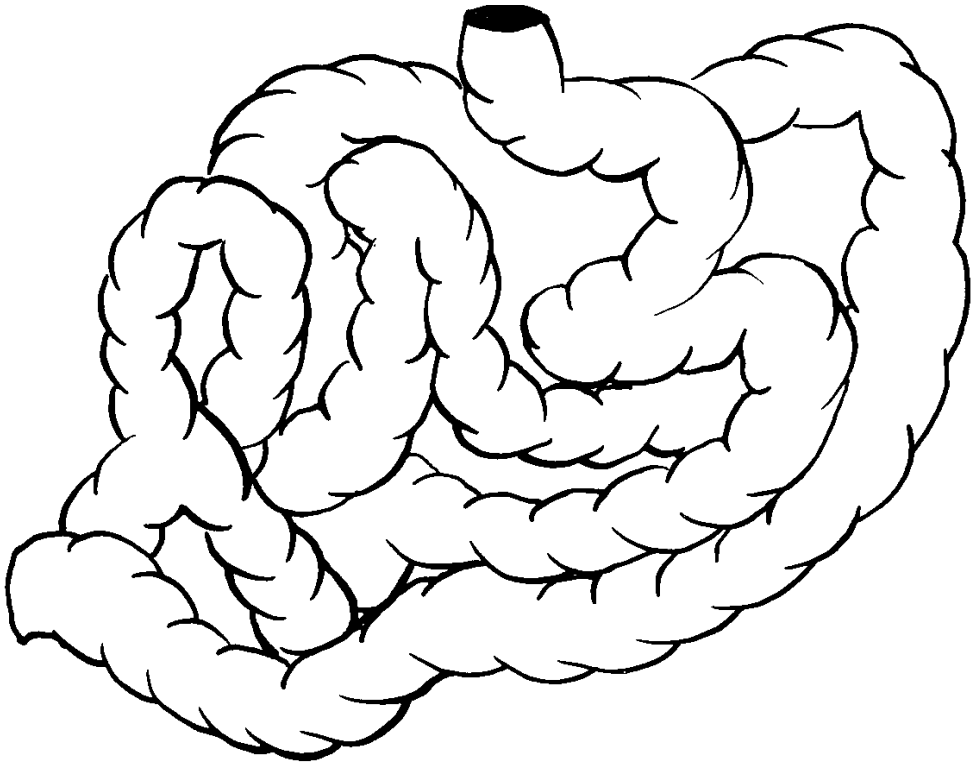
ACTIVITY

The Large Intestine



ACTIVITY

The Small Intestine



LESSON 8 *Liver, Kidneys, Skin— The Great Eliminators*

BIG IDEAS Because the body is a living organism, it produces waste that it must eliminate as it uses up energy.

Whole Group Work

Materials

Book: **The Magic School Bus: Inside the Human Body** by J. Cole
Microscope; glass/plastic slides; two-inch, square pieces of gauze
Human Body charts/models; reference books on the human body
Strainer with small gauge; mixture of black pepper in water
Empty jar for water; kidney beans
Word tags: liver, kidney, skin, eliminate, waste

Encountering the Idea

After a period of strenuous activity (probably after a physical activity during recess), the teacher has three or four students wipe perspiration from their faces, neck and forehead onto a glass or plastic slide. Place all slides except one or two at the **Science Center** to examine later for residue after the perspiration dries.

The teacher asks the children to hypothesize what they will see on the slides. The teacher demonstrates that we can separate wastes, using a mixture of black pepper in water and a strainer (a piece of gauze). Strain the mixture through the strainer while allowing the liquid to empty out into the jar. Students discuss what happened to the "waste". What did the process require?

Exploring the Idea

Using models/diagrams or the book **The Magic School Bus: Inside the Human Body,** the teacher shows the location of the liver, the kidneys and the layers of skin and discusses as follows.

The Liver

1. The liver is the largest organ in the body. It helps keep the blood clean.
2. The liver takes out sugar and vitamins the body cannot use immediately from the blood and stores them for use when they are needed.
3. The liver stores fats and starches for future use.
4. The liver manufactures a substance that makes blood clot in wounds inside and outside the body.
5. The liver manufactures bile needed to digest food.
6. The liver makes special cells called antibodies. Antibodies fight disease.

The Kidneys

1. The kidneys look like two large beans (kidney beans).
2. The kidneys produce urine, which is a liquid containing wastes, which goes into the bladder.

3. The kidneys clear the blood of waste through the urine.
4. A person may live life with one kidney and, at times, with one-half.

The Bladder

1. The bladder holds urine until it is full.
2. When the bladder is full, we feel uncomfortable and need to empty it. Then we go to the toilet to empty it.

The Skin

1. The skin covers our entire body and protects it.
2. The skin helps get rid of waste through perspiration.
3. The skin on the fingers has a unique pattern for each person.

The Pancreas

1. The pancreas is a gland that helps digest food and helps the body use the food's sugar.
2. The pancreas makes a liquid called pancreatic acid. This acid travels to the small intestine to digest food.
3. The pancreas makes another very important substance called insulin. Insulin helps the body burn extra sugars the body cannot use. If the extra sugar is not burned up it is stored, sometimes causing the body to gain weight.

The Spleen

1. The spleen helps destroy worn-out red blood cells, sending any leftover usable cell parts back for reuse in the making of new red blood cells.
2. The spleen stores red blood cells to use when necessary.
3. The spleen makes white blood cells that fight to help destroy infections in the body.

The Gall Bladder

1. The gall bladder is a storehouse for the body.
2. The gall bladder stores a greenish-yellow liquid called "bile" to help digest fats.
3. The gall bladder is under the liver and is shaped like a very small pear.

Getting the Idea

Since the skin covers the entire external parts of the body, we can easily see it and observe it. Because we cannot see them, the liver and kidneys are internal organs that are difficult for us to think about beyond having heard the words "liver" and "kidneys." It is important to show a variety of pictures and, if possible, models of the human torso showing the two organs. Point to the liver and have students use their fingers and palms of their hand to point in the general area of their own livers. The kidneys are in pairs, one on either side of the spinal column. The liver, kidneys and skin share a very important function — they take out body wastes.

The teacher tells the students that the body functions very much like a machine that needs energy to work. As it produces energy from the food it digests, the body makes byproducts called "waste". Then the body has to rid itself of this waste; it does, in part, through the liver, the kidneys and the skin.

The blood collects wastes from all the parts of the body and takes it to the liver, kidneys and skin. Then the wastes separate from the blood and expel in different ways. If the body cannot get rid of these wastes, it becomes ill.

Students discuss the concept of "waste", using examples such as vegetable peels, peanut husks and others.

Students complete **Activity** — Fingerprints.

Students locate and glue (in their appropriate place) the kidneys, bladder, liver, spleen, gall bladder and pancreas.

Organizing the Idea

List examples of waste; in their journals, the students draw the liver, kidneys and skin and show how they work.

Students complete **Activity** — Body-building Cookies.

Applying the Idea

At the **Mathematics Center**, each student collects fingerprints from five **different** students. Working in groups of four, the students examine the prints and describe them in terms of lines, ovals, whorls, ellipses and other geometric forms.

Closure and Assessment

1. Why are fingerprints or footprints used for identification in important documents such as birth and police records?
2. Why does the body create waste?
3. What organs help the body to get rid of waste?
4. What happens if the human body does not get rid of waste?

List of Activities for this Lesson

- ▲ Fingerprints
- ▲ Body-building Cookies
- ▲ Liver, Kidneys
- ▲ Pancreas, Spleen, Gall Bladder

ACTIVITY
Fingerprints

Objective
The student says that each individual has a unique set of fingerprints; our skin leaves small amounts of body oil on things we touch, and the oil remains as a pattern called a fingerprint.

Materials
Ink stamp-pad; small amount of talcum powder; clean sheet of white absorbent paper per student; several glass tumblers recently washed and thoroughly dried; small sponge

Procedures
Part 1
1. Ask several students to run their fingers over their forehead, nose and neck, and then to pick up a clean glass and hold it in their hands.
2. Lightly sprinkle talcum powder over the areas where the students touched the glass. Blow away the excess powder.
3. The students describe what they see. What are these called? Fingerprints.

Part 2
1. Using an ink stamp-pad, apply ink to a small sponge.
2. A student **lightly** rolls the right forefinger with a slight right-to-left rolling motion on the sponge. Make sure the student doesn't press the sponge.
3. Immediately after applying the ink to the finger, the student places that finger on a sheet of absorbent paper, using the same rolling motion.
4. The students study the fingerprints made by different individuals.
5. The students describe the fingerprints in terms of ovals, curves, lines that appear to be parallel, whorls and other geometric shapes.
6. The students look for patterns among an individual's fingerprints of his/her different fingers.
7. The students compare fingerprints of different students, using terms related to geometric figures.

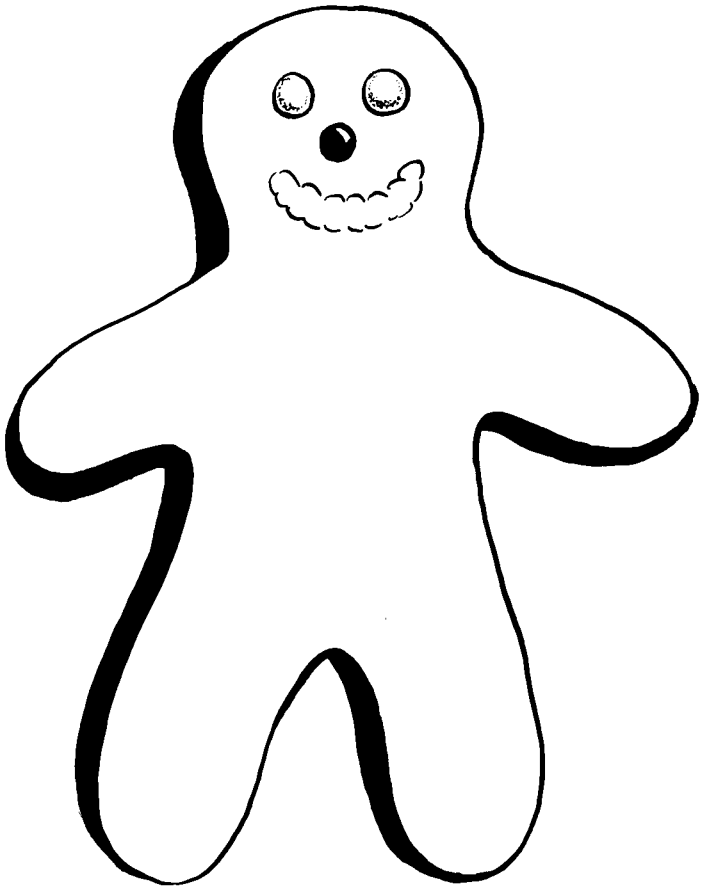
Discussion
1. In the first part of the activity, what was on your fingers that left the prints on the glasses? (Oil.)
2. How did the oil get on your fingers? (We touched our face, etc.)
3. Did you have to touch your face or other parts of your body to leave prints? (No, but we did this to make sure we could see the prints.)
4. What do we know about the skin and fingerprints? (Our skin helps our bodies eliminate waste in the form of oil or perspiration; when we touch things our fingers leave an oil pattern that is unique to each individual.)

ACTIVITY

Body-building Cookies

Mix
1/2 C. margarine
1/3 C. sugar
one egg
1/2 tsp. vanilla
1/4 C. all-purpose flour
1/4 tsp. salt
favorite food coloring
sprinkles or other decorations

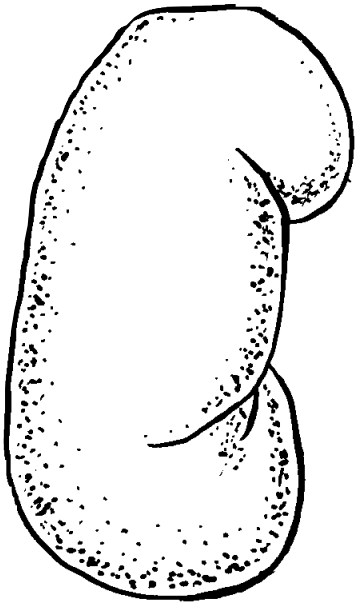
Shape and bake at 350˚ for eight to 10 minutes



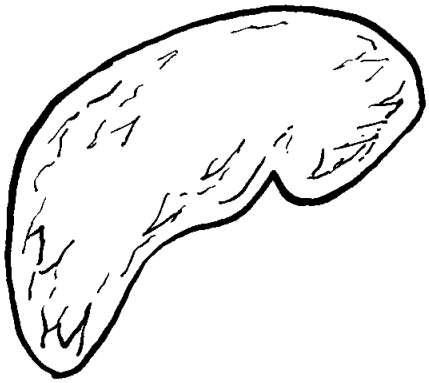
ACTIVITY

Liver, Kidneys

Kidney



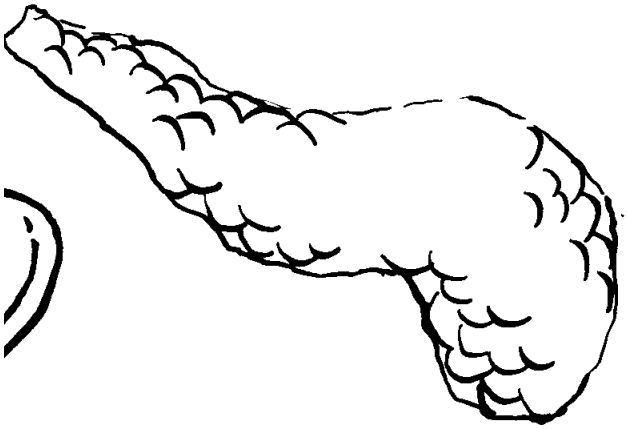
Liver



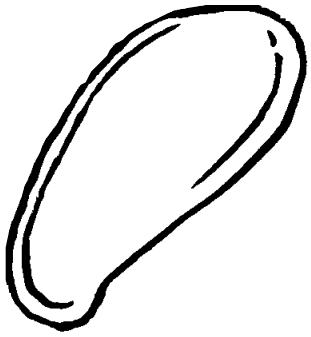
ACTIVITY

Pancreas, Spleen, Gall Bladder

Pancreas



Spleen



Gall Bladder

LESSON 9

The Brain— The Master Computer

BIG IDEAS The brain is like a computer that controls all the body functions; the nerves are the electrical system that helps it work.

Materials

Models/illustrations of the brain and the nervous system
Books: **Harry and the Terrible Whatzit** by D. Gackenback and/or **One Foot, Now the Other** by T. de Paola
Tray or transparency with about 10 items

Encountering the Idea

The teacher asks the students to recall the story of **Harry and the Terrible Whatzit.** Ask one of the students to review briefly the story for the class. What made Harry afraid? (His imagination.) What do we use for our imagination? (Our minds, our brains.) The teacher asks the students to recall the story **One Foot, Now the Other.** What happened to the grandfather? (He had a stroke, which means that some of the cells in his brain were damaged or hurt; he was not able to move and had to be taught how to walk again.) Today, we're going to discover many new things about the brain and all the wonders it can perform. Not even the most advanced computers in the world today can do some of the things our brains can do.

Exploring the Idea

At the **Science Center,** the students complete **Activity** — The Nerves Form a Circuit.

Voluntary Movement

Tell the students that they are now going to play **Simon Says.**

Simon says: Touch your nose.
Simon says: Jump up.
Simon says: Touch your toe.
Simon says: Say hello.

After several turns, the teacher says: You did very well. Only a few of you forgot to say "May I?" before following the instructions. That's very good. Now let's talk about what we did. After Simon says for you to do something, what makes your body obey Simon? After I said, "Yes, you may," what happened that made you do what Simon said? Your brain told you to do it? Why did some of you forget to ask: May I? Oh, that's right, your brain forgot to remind you! Let's play this game, now that many of you are familiar with.

Memory

Now, we're going to change the game. The teacher puts a variety of small objects on a tray or uses a transparency with several items drawn on it such as a pencil, marble, paper clip, etc. and lets students look at the items for 30 seconds. The teacher says: This game is sometimes called **Concentration.** Then without the stu-

dents looking, the teacher removes a few of the items from the tray. Then she asks students to look at the tray again to see what is missing. The students try to recall all the items on the tray. The teacher replaces the items, and they play the game again to see who can remember the most items. After the students have done this several times, add more items to increase the challenge to remember. (Then place the tray in the **Science Center** for students to improve their ability to recall the items.)

Now, let's talk about the game and what you had to do to play the game. Why is it called "Concentration"? What does concentration mean? Is it the same as thinking? What are some other words you can use to describe what you do to win in this game? Pay attention? See the items in your imagination? Did any one count the items and try to remember them in numerical order? Did some of you group them as writing materials or something else? What was helping you remember, concentrate, think and so on? Yes, your brain. We are now going to play a different game.

Feeling

Working in pairs, the students determine which parts of the body are more sensitive to touch than other parts. Asking a partner to close his or her eyes the student places **the tips** of a finger **lightly** on the partner's back, the shoulder, the forearm, the neck and the forehead. Sometimes they will use one, two, or three fingers, asking their partners to say how many fingers they feel. They will trade places and have their partners test their sense of touch the same way. The students record their sensations for comparison with the other groups.

The students compare and summarize the results of which body parts they judge to be more sensitive than others. They hypothesize about why some parts of the body are more sensitive than others.

Involuntary Motion

Ask the students to sit quietly and tell their hearts to stop beating. Can they do it? Can we make ourselves stop breathing? Tell the students to tell their stomachs and intestines not to digest their food. Can we do that? Let's tell our kidneys to stop cleansing our blood. Can we do that? No, we cannot **deliberately, on purpose,** tell our bodies to do certain things. Who knows what makes our body organs such as the heart, lungs, stomachs, intestines and kidneys continue working and doing the job at the time they need to do it? **That's right — the Brain.** The brain keeps track of all the things these body organs need to do and keeps them on schedule — just like a super computer. There are some motions that are **voluntary,** that we can do by thinking that we want to do them, just like we did when we played the games. But there are some **involuntary motions** the body does through the action of the brain. We don't have to take care of those actions by thinking about them. Now, we are going to discover how the message from the brain gets to our arms when we are playing "Simon Says."

Getting the Idea

The teacher tells students to put one hand on their forehead and the other on the back of their head, just above the neck. They are holding their skull which holds their **brain.** If they run their fingers down the back of their neck they can feel the neck bones that support the **spinal cord.** The brain connects with the spinal cord.

The brain controls all of our actions, both voluntary and involuntary, because it acts like a computer, but it works in a way that is like an electric circuit. (At this point, review the questions at the end of **Activity** — The Nerves Form a Circuit to make the analogy clearer to the students.)

The brain sends the messages through the spinal cord from your brain to the arms and legs. The **nerves** act like wires that carry the message.

Using diagrams and/or drawings, the students discuss the following ideas.

The Nervous System — the Brain, the Spinal Cord, and the Nerves

1. The brain looks gray, wrinkled and coiled, and it is about the size of your two fists together.
2. It will weigh between two and three pounds when it is an adult brain.
3. It is very fragile and soft.
4. The skull protects the brain.
5. The brain connects to the spinal cord.
6. The spinal cord has many nerves bundled together, and the bones of the spinal column protect the spinal cord.
7. Nerves are like little telephone wires that send messages from the brain to all over the body.
8. Some of the messages go to the different parts of the body through the spinal cord.
9. The spinal cord not only sends out and receives messages from the brain, but it also controls some involuntary actions (i.e. blinking the eyes when something is coming in).
10. The brain keeps the heart beating, the lungs breathing and it tells the muscles when to move. The brain thinks and remembers things.
11. The brain is where we see, hear, taste, smell and feel.

Organizing the Idea

Students make the cut-out diagrams of the brain, the spinal cord and nerves to include in the larger body diagram. They write about the brain, spinal cord and nerves in their journals.

Students write a patterned “Most Important Thing” paragraph about the brain, spinal cord and nerves.

Closure and Assessment

1. What is the part of our body we use to think? What other things does the brain helps us do?
2. What are some of the amazing things our brains can do?
3. How does the brain receive messages?
4. How does the brain send out orders?
5. What can we do to help our brain to think better?

List of Activities for this Lesson

▲ The Nerves Form a Circuit

▲ The Brain

ACTIVITY

The Nerves Form a Circuit

Objective

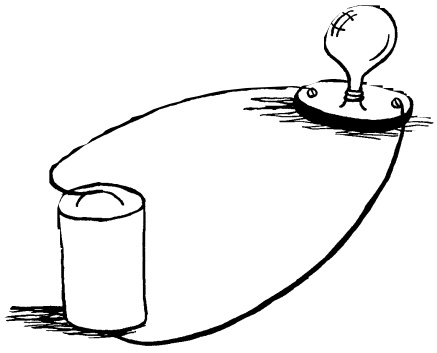
Students say an electric circuit can transfer energy from a source through wires and a socket to light a small bulb.

Materials

1½-volt flashlight battery (safe for classroom use)
Two 25-cm. (10 in.) lengths of single-strand insulated copper wire of 20 or 22 gauge, also referred to as bell wire
Small light socket with flashlight bulb; small screwdriver; wire cutter and stripper; duct tape

Procedures

1. Using the wire cutter and stripper, strip about 1/2-inch (about one cm.) off the ends of the two pieces of copper wire.
2. Connect the wires to the battery with duct tape, then to the socket with the bulb. Electricity will flow from the battery (power source) to the light bulb only if there is a closed path from one battery terminal (end) to the other.
3. Electric current will go through the copper wire but not through the plastic or rubber insulation (covering). Thus, students can work with the parts of the circuit without getting shocked only if they hold the wires on the insulated parts.
4. The bulb must make connection with the current, thus screw the bulb tightly in the socket. If the path to the battery is broken, the bulb won't light. The wires must be tightly connected with the screws on the socket.
5. Give the circuit kit (wires attached to the socket) to the students and let them discover how to make the circuit work by screwing the bulb in and touching the bare ends to the battery. They will discover that both bare ends of the wires must touch the battery terminals.

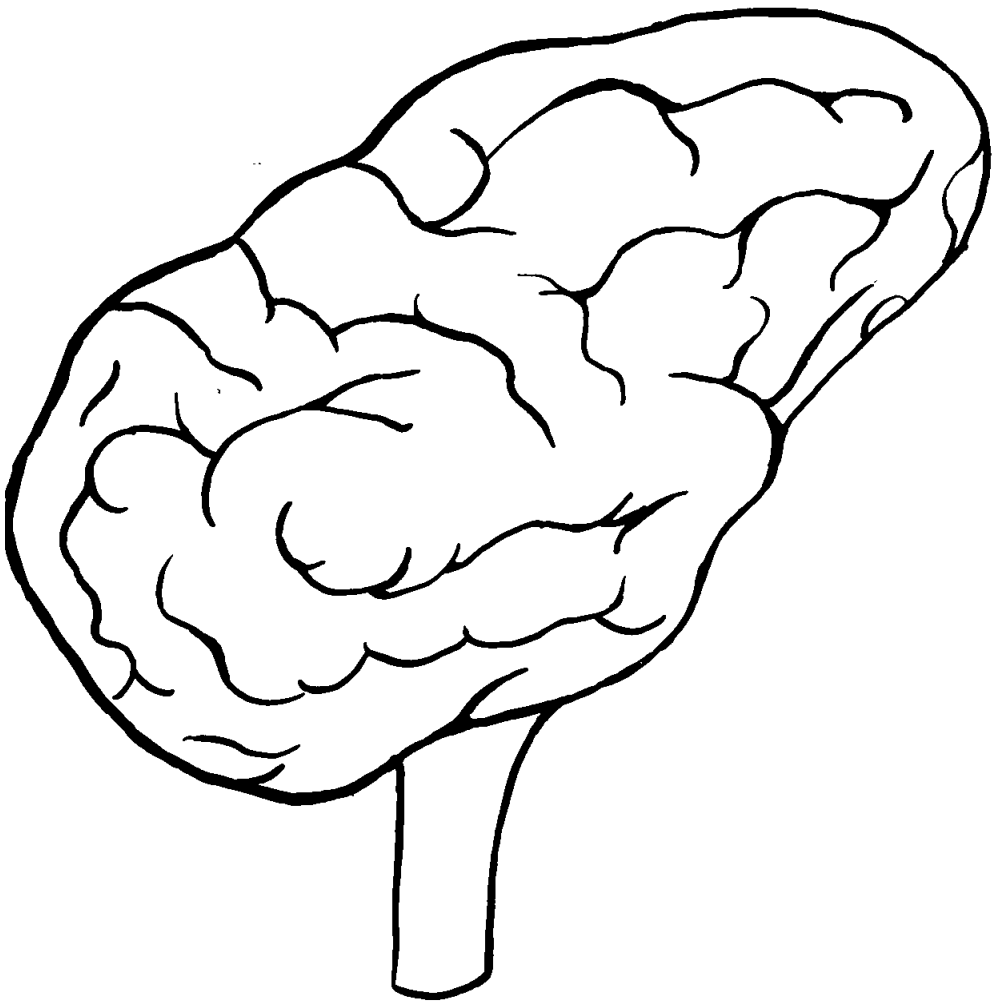


Getting the Idea

1. What type of energy is flowing from the battery to the light bulb? (Electricity, electrical.)
2. How does the electricity have to travel? (In a closed path.)
3. What does the word "circuit" sound like? (Circle; a circle is a closed path the electricity must have in order to get from the battery to the light bulb.)

ACTIVITY

The Brain



LESSON 10 *Reproduction— A New Human Begins*

BIG IDEAS Humans reproduce when an egg cell from the mother and a sperm cell from the father unite. The united cells begin to separate many times to form a new human being.

Materials

Book: **We Are Having a New Baby,** by V. Holland, **El Libro del Cuerpo** by C. Rayner
Slides of different types of cells, from a previous lesson; microscope
Word tags: egg cell, sperm cell, reproduction, mammal

Encountering the Idea

The teacher reads the story **We Are Having a New Baby** aloud for the whole group. After reading and discussing the book, ask the students how new humans begin. We know that all living things reproduce. Plants reproduce in their way and animals reproduce in a different way. For example: How do chickens reproduce — how does a new chicken begin? (The mother chicken lays an egg, the egg cracks open and a new chick hatches.)

Is this the same process for new puppies? (No, puppies are made inside the mother dog and are born from the mother as soon as they are able to live outside the mother.) Is this is the same for kittens? Yes, kittens are born the same way that dogs are born. What about horses? Name other animals that are born from inside the mother. The students give examples. These animals are called "mammals".

Do you know how a new baby begins life? Students offer their opinions. Yes, a human baby is also born from inside the mother after it develops enough so that it can live outside the mother's body. But this is not where life begins. In this lesson, we are going to discover how a new human being begins.

Exploring the Idea

All cells in living organisms come from two special cells: an egg cell and a sperm cell. In this next activity we are going to examine a cell — a very large one — a chicken egg.

The students complete the **Activity** — An Egg Cell.

Of course, we know that humans do not hatch from eggs, like chickens. Humans, do, however, develop from the union of two special cells — an egg and a sperm.

The teacher asks students to use the magnifying glasses to examine their skin. The teacher asks if someone has recently cut himself/herself. If a student has an injury that can be shown, ask the student to show how the injury has healed or is healing. Students examine the injury with the magnifying glasses, also. If no one has an injury to examine, ask the students to describe some injuries they have had and how they healed. Ask the students: What makes it possible for the body to heal an injury? (Cells die and new ones are made.) When you get a scrape on

your arm, what happens to the scrape? (It heals because new cells form.) The body makes new skin cells that take the place of the injured ones. Sometimes when the injury has not completely healed, you can see that the new skin is red and a little tender. But, in a few days, the scrape is gone, and you can no longer see where your skin broke. How does the body do this? The body creates new cells. This is what we will study to find out how a new human being begins.

Working in small groups, the students look at cell slides with a microscope. First we have to understand that the body is made of different types of cells. We have talked about cells in another lesson. We know that each human body is composed of millions and millions of cells. But every cell in our bodies has come from two very special cells. When these two special cells unite, a new human being begins. The new human begins when the two cells unite and begin to make new cells. The mother's body gets ready to have the baby grow, and the cells continue to multiply until the baby is born.

Getting the Idea

There are many events that have to take place before a human being is born.

1. A young girl and a young boy need to grow to become adults in order for them to have children. Becoming an adult means the different parts of the body grow and change; for example, the arms and legs become longer and stronger.
2. When children are almost adults, special organs in their bodies begin to develop. These organs are important for making babies.
3. A girl develops two egg sacs that contain many egg cells that can become babies. These two sacs attach to the **uterus.** The uterus is below the stomach deep inside the girl's body. The uterus is an organ that is like a pouch where the baby can grow. The girl's breasts begin to grow to make milk to feed the baby after it is born.
4. At the same time a girl begins to change into an adult, a boy that is almost an adult begins to change. Boys have sacs where the **sperm cells** begin to develop. These two sacs and the **penis** are located between the legs.
5. A girl cannot make a baby herself. A boy is needed to make a baby. When the boy and girl become adults and want to have a baby, the man uses his penis to deposit the sperm cells into the woman's body. The sperm cells travel to the uterus to join the egg cell in the mother's body.
6. A new human begins with the meeting of the two cells — the egg cell from a woman and the sperm cell from the man.
7. As soon as the two cells unite, they become one cell. This new cell divides to create many new cells. These cells divide very fast. In about nine months, the new baby that is growing inside the mother is ready to come out to live on its own. At this time, there is a **new human being.**

Organizing the Idea

At the **Art Center,** the students

1. draw and color the different cells they saw under the microscope
2. draw, label and color the different parts of the chicken egg cells they studied.
3. write a paragraph listing the steps in sequential order in the development of a new human being.
4. cut out the diagrams of the reproductive organs and place them in the appropriate place on the body diagrams.

Applying the Idea

How do new chickens and new human beings begin their lives in ways that are alike and ways that are different? The new chick begins **when an egg cell units with a sperm cell,** and a baby also starts when an egg cell from the mother unites with a sperm cell from the father. The chicken lays the egg, and **the chick develops outside the mother hen** until it hatches. In a human being, **the baby stays in the mother** until it can live by itself outside the mother.

List of Activities for this Lesson

▲ An Egg Cell

▲ The Reproductive Organs

ACTIVITY
An Egg Cell

Objective
The student says that a chicken egg is a cell that when united with a sperm cell develops into a baby chick.

Materials
Plastic cup and chicken egg for each student group; all the eggs should be fertilized, if possible

Measuring tape marked in inches and centimeters; a balance; metal washers to use to find the mass of the eggs

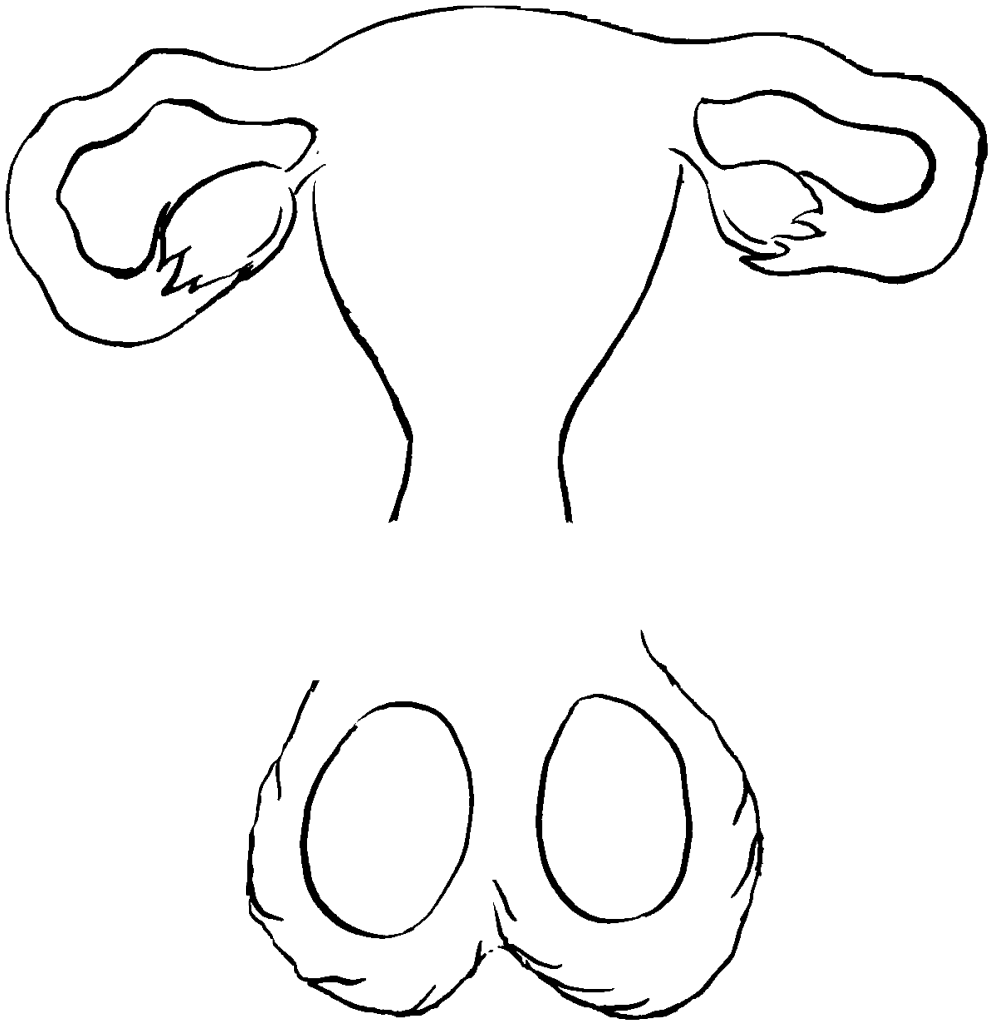
Procedures
1. Each student group is given a chicken egg and a plastic cup.
2. The students describe the egg. They record their observations: outside cover, shape, color, texture, mass it with the metal washers, measure it in length, measure its circumference with a tape.
3. The students carefully crack open the shell and place the egg white and yolk in the cup. They do not discard the shell.
4. The students describe the contents in the cup: color; shape, texture, odor.
5. The students look for a small crystalline object attached to the yolk. The teams that find the object show it to those teams that cannot find it.
6. The students describe the object. Is it small or large in comparison to the yolk? What is its shape?

Discussion
Tell the students that a chicken egg is a cell. The shell is the outside membrane that holds the contents of the egg. The egg white is the cytoplasm, and the egg yolk is the nucleus.

1. Let's describe the egg we had before we cracked the shell. (Students report their observations.)
2. After we cracked the shell, how many parts did we see? (The shell, the egg white, the yolk and, in some of the eggs, a small object attached to the yolk.)
3. The eggs that have a small clear object attached to the yolk have been **fertilized;** that means that another cell, a **sperm,** has attached itself to the nucleus of that egg cell; the two cells — the egg cell (the yellow part) and the sperm (the clear small object) have united.
4. If the fertilized eggs had been kept in a warm place, they would have developed into baby chicks. The eggs that were not fertilized would not have produced a baby chick.

ACTIVITY

The Reproductive Organs



U N I T A S S E S S M E N T

Oral Interview

1. How does our brain control our actions?
2. How do we grow?
3. How do we protect ourselves?
4. Do we need all of our body parts? Why?
5. Which book of the ones we used in this unit was your favorite? Who was the author?

Product / Performance

Using cutouts of the different organs such as the stomach, small intestine, large intestine, liver, pancreas, kidneys, spleen, have students place them on a large sheet, labeling each part.

Written / Oral

1. Fill in the blanks with one of these words.

heart	air	carbon dioxide
lungs	changes	food
liver	nerves	organs
kidneys	minute	sperm cell
skin	hour	egg cell
cells	day	
stomach	energy	
brain	bones	
muscles	blood	

My body is made up of many, many _____. My body grows and _____. My _____controls all my actions. My brain receives messages from the _____. My heart pumps _____ to all the parts of the body. The heart's beat is described in beats per _____. The lungs take in _____ and separate the oxygen from it. My lungs expel _____. When I walk, I use my _____ and my _____. My stomach and intestines prepare the _____ I eat so my body can use it for _____. My body is made up of many _____. A new human begins when a _____ from a boy unites with an _____ from a girl.

2. Choose one of these. Draw it and tell what it does.

Lungs	Stomach
Bones	Brain
Heart	

References

Ada, A. F. (1991). *Días y días de poesía: Developing literacy through poetry and folklore.* Carmel, CA: Hampton-Brown Books.

Chirinian, H. (1989). *First impressions: The human body.* Mahwah, NJ: Watermill Press.

Cohen, M. R., Cooney, T. M., Hawthorne, C. M., McCormack, A. J., Pasachoff, J. M., Rhiner, K. L., & Glesnick, I. L. (1991). *Descubre las ciencias.* Chicago: Scott Foresman.

Curran, L. *Cooperative learning lessons for little ones.* San Juan Capistrano, CA: Resources for Teachers.

Glemser, B. (1958). *All about the human body.* New York: Random House.
A good reference to be read to students in grade 1 — simple text — good illustrations.

Goin, K., Ripp, E., & Solomon, K. N. (1989). *Bugs to bunnies.* New York: Chatterbox Press.

HBJ Health, A Resource For Teachers (1-3). (1990). New York: Harcourt Brace Jovanovich.

Hillen, J., Wiebe, A., & Youngs, D. (Eds). (1988). *Patine al invierno con matemáticas y ciencias: K - 1,* Book 2. Fresno, CA: Aims Education Foundation.

Honig, B. (1984). *Science framework addendum,* Sacramento, CA: California State Department of Education.

Jones, A. G. (1990). *Concept science: Plants.* Cleveland: Modern Curriculum Press.

Karnes, M. B. (1977). *Learning mathematical concepts at home.* Reston, VA: Council for Exceptional Children.

Learning about your body. (1983). A Frank Schaffer Publication.

Meyer, C., & Pickens, K. (1989). *Sing and learn.* Carthage, IL: Good Apple.

Mullinson, G., Mallinson, J. B., Froschauer, L., Harris, J. A., Lewis, M. C., & Valentino, C. (1991). *Science horizons.* Morristown, NJ: Silver Burdett and Ginn.

Poppe, C. A., & Van Matre, N. A. (1985) *Science learning center for the primary grades.* New York: The Center for Applied Research in Education.

Stone, M. J. (1989). *Cooperative learning and language arts: A multistructural approach.* San Juan Capistrano, CA: Resources for Teachers.

Tolman, M. N., & Morton, J. O. *Life science activities for grades 2-8.* New York: Parker Publishing.

Wilson, M. (1959). *The human body: What it is and how it works.* New York: Golden Press.
A readable text for primary grade children.

Annotated Children's Books

Aliki. (1962). *My hands.* New York: Thomas Y. Crowell.
Structure and use of our hands are presented.

Andry, A. C., & Schepp, S. (1984). *How babies are made.* Boston: Little, Brown and Company.
This illustrated volume for grades K-3 explains intercourse, pregrancy, and birth — using flowers, animals, and humans.

Berger, M. (1983). *Why I cough, sneeze, shiver, hiccup, and yawn.* New York: Thomas Y. Crowell.
Presents a clear, interesting introduction and explanation of some basic body functions.

Bonsall, C. (1963). *The case of the hungry stranger.* New York: Harper and Row.
Friends try to find out who ate a blueberry pie.

Brown, M. W. (1949). *The important book.* New York: Harper Collins.
Everything and everyone has an importance. What is your importance?

Cleary, B. (1987). *The growing-up feet.* New York: William Morrow and Company.
The twin's feet haven't grown up enough for new shoes so they get red boots instead.

Cole, J. (1976). *A chick hatches.* New York: William Morrow and Company.
A simple account of how a chick hatches from egg to embryo.

Cole, J. (1984). *How you were born.* New York: William Morrow and Company.
A story of pregnancy from fertilization to birth. It contains explicit photographs.

Cole, J. (1989). *The magic school bus: Inside the human body.* New York: Scholastic
One of a series, this particular one takes Ms. Frizzle's class on a guided tour of the human body.

de Paola, T. (1980). *Now one foot, now the other.* New York: G. P. Putnam's Sons.
When his grandfather suffers a stroke, Bobby teaches him to walk just as his grandfather once had taught him.

Dragonwagon, C. (1976). *Wind rose.* New York: Harper and Row.
Contains an account of the birth of a child.

Gackenbach, D. (1977). *Harry and the terrible whatzit.* New York: Clarion Books.
Harry follows his mother into the cellar where he confronts the terrible two-headed whatzit. (Available in Spanish also.)

Gaskin, J. (1985). *The heart.* New York: Franklin Watts.
An easy introduction to the circulatory system.

Green, M. M. (1967). *When will I whistle?* New York: Franklin Watts.
This tells of the trials and tribulations of how a young boy learns to whistle.

Grufalconi, A. (----). The Toy Trumpet

Hamilton, E. (1970). *What made me.* New York: Hawthorne Books.
Explains the procreation.

Holland, V. (1972). *We are having a baby.* New York: Scribner.
A series of photographs that shows how four-year-old Dana and her family look foward to the birth of a baby and then how Dana adjusts to the newborn.

Iveson-Iveson, J. (1985). *Your teeth.* New York: Bookwright Press.
Explains baby teeth, the physical make-up of teeth, and how to care for them.

Kaufman, J. (1977). *Como nacemos, como crecemos, como aprendemos, y como funciona nuestro cuerpo.* México: Organización Editorial Novaro.
Also available in English, this comprehensive volume has good, colorful illustrations and is a good reference. It covers the reproduction system, also.

Kaufman, J. (1987, 1975). *The big book about the human body.* Racine, WI: Western Publishing Company.
A Golden Book, this volume provides a basic introduction to body structures, as well as their functions.

Le Master, L. J. (1984). *Your brain and nervous system.* Chicago: Children's Press.
Children are introduced to the human brain and nervous system.

Le Master, L. J. (1985). *Cells and tissues.* Chicago: Children's Book Press.
Diagrams and charts highlight this simple text introduction.

Mayle, P. (1973). *Where I come from.* Secaucus, NJ: Lyle Stuart.
Tells the facts of life like they are and in a way that children can understand and parents can enjoy.

Munsch, R. N. (1986). *Love you forever.* Willowdale, Ontario: Firefly Books.
A story of how a little boy goes through the stage of childhood and becomes a man.

Pluckrose, H. (1988). *Look at feet.* New York: Franklin Watts.
Examines feet through numerous photos.

Rayner, C. (1983). *El libro del cuerpo.* Mexico: Editorial Origen, S.A. Grupo, Editorial Diana.

Dr. Seuss. (1986). *You're only old once.* New York: Random House.
Humorous account of going to get a check up.

Showers, P. (1968). *Hear your heart.* New York: Harper Collins Publishing Co.
A simple introduction to the heart and how it works.

Showers, P. (1982). *You can't make a move without your muscles.* New York: Thomas Y. Crowell.
Introduces the muscular system.

Showers, P. (1985). *What happens to a hamburger.* New York: Thomas Y. Crowell.
The author explains how our bodies make use of the good things we eat.

Showers, P. (1991). *Your skin and mine.* New York: Harper Collins.
Explains the basic properties of skin, how it protects the body, and how it can vary in color.

Showers, P. (1991). *How many teeth?* New York: Harper Collins.
Describes how many teeth we have at various stages of life, why they fall out, and what they do.

Zims, H. S. (1959). *Your heart and how it works.* New York: William Morrow and Company.
Contains black-and-white illustrations, explaining the functions of the heart.