



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
2006 Volume VI: Anatomy and Art: How We See and Understand

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## The Human Skeletal System: Inside and Out

Curriculum Unit 06.06.03  
by Barbara Natale

### Introduction

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I hope my unit; **The Human Skeletal System: Inside and Out** will be used by elementary teachers interested in a hands on artistic approach to the teaching of science, especially human biology. It is targeted for grades four and five but can be adapted or modified for younger or older students.

I am presently a Special Education teacher working in both the fourth and fifth grades at Davis Street Interdistrict Magnet School. Our curriculum is thematic unit based. We integrated social studies and science into literacy, math and writing. This unit will allow teachers the opportunity to integrate these lessons or to teach them in the core subject. In my unit, I hope to integrate all aspects: literacy, math, science, and some social studies for both the fourth and fifth grade students to enjoy.

Being a Special Education teacher co teaching with a General Education teacher has shown me that differentiated instruction is vital not only to the special education students but all students. This unit will incorporate all modalities, visual, auditory and tactile. Children learn by seeing, hearing and doing. The students participating in this unit will read about the skeletal system, hear about the function of the human body and the support of bones, through multimedia. They will make a poster, a three dimensional bone, an abstract skeleton, and two supplemental projects. One of the projects will be a creative writing lesson using x-rays or MRI. The last project will incorporate Davis Street Interdistrict Magnet theme of Multiculturalism, by discussing "Day of the Dead" celebrated in Mexico.

Davis Street Interdistrict Magnet School is also "A School of the 21st Century, Celebrating Literacy through the Arts, Technology, and Multiculturalism." This unit will address all three areas. The hands on art projects will be linked to both research and will also tie into a multicultural lesson. Teachers may want to utilize only certain parts of this unit. My unit will address all avenues to accommodate the Davis Street Interdistrict Magnet theme and curriculum.

Elementary students have a difficult time with the unknown, and special education students have even more difficulties. This unit will allow all students with hands on experience that will enhance their learning and hopefully encourage a love of the scientific inquiry for the unknown. Many students see themselves as a whole unit and are not cognizant of the complex systems that make up the human body. This unit will allow students

to really "see" inside themselves.

This unit will have several components. One, an introduction of basic knowledge teacher and students will need on the skeletal system to complete the art projects. Two, teachers and students will utilize internet and resources to gain knowledge of the skeletal system. Third, this unit will include hands on art activities for teachers and students to create. I will also include a short unit to incorporate multiculturalism, and writing. Teachers may include field trips to the Human Anatomy Laboratory at Yale, or any Art Museum to enhance learning and a list of these will be provided.

In each unit the teacher will have the opportunity to display vocabulary words on a word wall or for the 5th graders a vocabulary notebook. This technique also the students to utilize the correct vocabulary words when writing in "Poster Child" labels and "An Unfortunate Accident."

When doing some preliminary research, I discovered that in Mexico "The Day of the Dead" is celebrated during the first week of November. Therefore, this unit can be taught during the last few weeks of October, into the first weeks of November. The unit will take several weeks, if teaching all the components. As stated before all or part of this unit can be utilized and the students will certainly benefit from any part. I will teach this unit during this time period. Davis Street Interdistrict Magnet school also celebrates Halloween with an Awesome Author's celebration in lieu of the typical scary costumes. This is where I will introduce the multicultural aspect of my unit.

Teacher and students who are not artistic should not defer from this unit. Artistic talent and or lack of, is not part of the assessment. A rubric scoring system will be used only to monitor the students understanding of the skeletal system. Art after all "is in the eye of the beholder." Students will be encouraged to use their talents, creativeness and individual perceptive when completing their projects.

#### Unit Activities:

Part 1: GREEK GEEK: Introduction to the skeletal system will include facts from resource materials for both teacher and students. Factual statements and discussion

questions will stimulate the student's natural scientific inquiry. One factual statement the teacher might write on the board would be, "The Greek meaning of the word skeleton is *dried up* ." Or the teacher could start the lesson with a question such as, "What would we look like if we had **NO** bones?" These introductory strategies will begin the student's excitement to learn about the skeletal system.

Part 2: TECH-KNOW: Internet resources, interactive CD's and video suggestions will allow the visual learner an opportunity to explore the skeletal system by seeing it in action. Since Davis Street Interdistrict Magnet School is a technology school, I will use the laptop and classroom computers to allow students exploration time. A variety of websites and CD-Rom discs will be available for students to continue their enthusiasm for fascinating information about the skeletal system. These will assist them with their hands on projects.

Part 3: LET'S MAKE A BONE: This will be the first of the hands on projects. The factual statement to facilitate inquiry about bones might be, "Where in your body is the smallest bone?" (stirrup in your ear) or "The largest bone in your body is the femur. Where is it located?" After some discussion, the students will make their own model of a bone using newspaper, paper towel roll, strips of white paper and a water glue solution. The research and factual information along with pictures from the previous two lessons will allow students to visualize the skeletal structure. Human anatomy coloring books would also benefit the visual learning child.

Part 4: IT'S HIP TO BE SQUARE: Students will use geometric shapes to assemble a skeletal system. A stimulating sentence to activate learning might be, "Bones are grouped together. One group is called long bones like your femur. Another group is called short bones like in your wrist. One group is flat like your ribs and the last group is called irregular like the bone in your vertebrate." Also for young children the song, "Your knee bone is connected to your shin bone" would also be a way to introduce the project. For this project students will receive pre cut geometrical shapes such as squares, rectangle, and hexagons etc. in black construction paper. The students will explore their mathematic skills and their visual spacing to create a skeleton. After the shapes are assembled, the students will embellish the skeleton they created with gold and silver markers. This abstract art activity will allow students to experiment with geometric shapes in a fun way.

Part 5: POSTER CHILD: The introduction sentence for this activity might be: "There are 206 bones in your body and each one has its own name!" I enjoy utilizing posters in the classroom to illustrate a certain concept. During this activity students will create their own poster of the skeletal system. Using the material from the internet or materials

supplied by the teacher, students will assemble a poster to hang in the classroom. The poster will include factual information, pictures, names of bones, and types of joints. A rubric/scoring assessment will be used for grading purposes. Various store bought posters may be utilized for students to score, assessing if the poster depicts a good visual representation of the topic.

Part 6: THE UNFORTUNATE ACCIDENT: This supplemental activity will be used to show the creative writing that many students enjoy. The piece will be narrative writing but could be adapted to expository. The students will be given x-rays that a teacher would obtain from a doctor's office, or even a veterinarian. The student will write a story to explain how, where, when the accident occurred adding and exciting beginning to draw suspense and end with a "zinger". A rubric will be used to assess the story elements.

Part 7: DAY OF THE DEAD: Davis Street Interdistrict Magnet School celebrates the concluding activity for International Day each year in May even though the curriculum is on going from September. In Mexico, The Day of the Dead is celebrated in November. Students will research and celebrate this Mexican Holiday but making skeleton puppets.

## Part 1 Greek Geek

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### Introduction

Until 1895, we could only imagine what our bones looked like, either by feeling under our skin, or looking at bones of dead people who were dead for a long time. With the invention of the x-ray all that changed. We didn't have to wait until a corpse was discovered to examine the bones!

What happens underneath our skin is no longer a mystery. Scientists, Doctors, and teachers have given us the opportunity to "see" inside ourselves with the aid of x-rays, MRI (magnetic resonance imaging, CT scans (computer tomography) and ultrasounds. We no longer have to guess how long our femur is or where the fracture might have occurred. We can see clearly all 206 bones.

The 206 bones we have make up the wonderful skeletal system you will learn about in this unit. The skeletal system has five important functions. In this unit you will learn that

the bones support you and give you your shape, allow you to move, protect important organs, store materials, and produce blood cells.

### **Support/Shape and Movement**

What would you do if you were just a pile of skin? Would you be able to walk? No! Would you be able to even stand up? No! Your bones allow you to stay upright, walk and even dance. Bones are very strong because they need to hold up our body. Our leg bones allow us to stay upright. Even our toes keep us balanced! Our spinal column also keeps our bodies straight and balanced. The top sections of the vertebrae in the neck area support our head. We would droop and swivel around if we did not have the proper support. The curves in the vertebrae make it easier to keep your balance. Each vertebrae by itself will allow you to twist and bend just a slight amount, but together you are able to move more.

Together with the muscular system we have a tremendous amount of support to keep us upright, moving and balanced. When one muscle contracts and the other muscle relaxes, our bones move. This occurs with the help of ligaments, cartilage, tendons and muscles. Ligaments are strong tissue holding two bones together at a joint. Between two bones is a layer of cartilage. This soft material between bones like in your vertebrae prevents the bones from rubbing and therefore disintegrating. We have over 600 muscles attached to our bones that allow us to move. At the end of our muscles, connecting to the bones, are tendons.

To help your skeletal system move, your bones are connected at joints. This allows you to move freely. The joints are; ball and socket/shoulder, hinge/elbow, pivot/neck, saddle/base of your thumb, gliding/wrist, ellipsoid/ base of finger, sutures/skull. Joints are where bones are connected and held together by ligaments and tendons. We have over 230 moveable joints in our body.

There are two sections of the skeletal system. The center section called the axial; include the skull, ribs, breastbone, and vertebrae. This runs down the center of your body. The appendicular includes your arms, legs, hands, feet, hips, and shoulders. The word appendix means "to hang", so these parts hang off the axial sections of your skeletal system.

### **Protection**

What would you do if you fell and hit your head but did not have a hard protection like a skull? Well, probably you would have a severe brain injury. The skeleton system protects vital organs. The skull protects your brain. It is like you are wearing a special helmet! The skull is made of 29 bones, even though it does not feel like separate bones. They are fused together. When you were born the bones were all separate and grew together as you age. There are bones that form the cranium which is the top part of your skull. The face part of the skull has 14 bones that give you face its beautiful shape! Part of the face bones includes the mandible which is your jaw. This allows your mouth to open and close.

Our ribs protect many organs. Our heart and our lungs are protected because without them we could not live. Because our lungs expand and contract when we breathe, our ribs can not look like our skull. Instead our rib cage is perfect for protection, yet is flexible. We have 12 pairs of ribs or 24 all together. The space between them is important for breathing. The top ribs are connected to a special cartilage which is connected to the sternum. Small children may know the sternum as their breastbone. The cartilage acts as a shock absorber, so

we you fall or are hit in the chest, the ribs give slightly and absorb the pressure so not to injure the heart or lungs.

The pelvis or hips have two important functions; protection and a place there your legs are attached. The pelvis protects organs such as your bladder and large intestines. When forensic scientists or paleontologists discover the remains of a human they can distinguish between a male and a female by the size of the pelvic. A woman's pelvic is wider and has a larger opening for childbirth.

The spine is also multitasked! We learned that the spine gives you balance, yet it also protects your spinal column or spinal cord. Your vertebrae are on top of one another with the spinal cord running through. There are 31 pairs of nerves that extend off the spinal cord to the rest of your body. Your brain communicates and sends messages to all parts of your body and if it is damaged, the message will not go to the part of the body the brain wants it to. Therefore your vertebrae column has a very important job.

Around the outer layer end section of our bones we have a protective rubbery material called cartilage. This protects the bones from rubbing together and wearing thin. This protection allows you to move more freely without causing damage to your bones.

Between your bones in the joint, is a sac filled with fluid. This is the synovial fluid. This fluid also protects the area between your bones by keeping it moist making movement easy. Older people have less synovial fluid between the bones causing movement more difficult. If you crack your knuckles, you can hear the air bubbles popping in the fluid.

### **Stores Material**

Bones are not dried out as once was thought many years ago. They are living tissue storing important cells and minerals. The inside of bones stores both yellow and red marrow. Yellow marrow stores fat and releases it to needed parts of the body, and red marrow makes red and white blood cells along with platelets. The red blood cells carry oxygen through out the body, the white blood cells fight infection, and platelets help the blood to clot. Our bones also store minerals. The minerals are stored until a certain part of the body needs it and then it is released into your blood. Calcium is stored in your bones. Calcium is used to keep our bones strong and also to help blood clot. Calcium is also utilized by the nervous system. Without it our muscles would not function properly. Phosphorus is also stored in our bones. Phosphorus is a chemical that is a building block of DNA.

### **Taking Care of Your Bones**

Since bones are so important, we need to keep them healthy. Sometimes fractures do occur, but some could have been avoided. A fracture is the breaking of a bone. Sometimes sprains occur. This is when there is over stretching of the muscle or tendon. To keep your muscles from injury, stretch before and after exercise or when you are involved in a strenuous activity. Wearing important equipment during sporting events is very crucial. Strengthening your bone through proper exercise and diet will enable you to live longer and stay healthier. Sleep and proper rest is very important. When you sleep, your muscles relax and therefore allow them to get rid of the waste material they have stored throughout the day.

### **Conclusion**

Today we are able to view the anatomy of our body thanks to modern technology. Children and adults are still

curious about how we function, move, live and breathe. Science, especially the anatomy of the human body can be grotesque to some, but this unit will enlighten them. "Art and Anatomy: The Human Body Inside and Out" takes a hands on approach, making the lessons fun and engaging.

## Part 2 Tech-Know

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### Information

This section is devoted to internet sources, materials, books, interactive CD's and any other resource that will enhance the student's information to succeed on their projects. Some of the resources will have a critique and/or feedback.

### Internet Resources

[www.kidshealth.org/kid/body](http://www.kidshealth.org/kid/body)

Excellent section called "The Big Story on Bones".

[www.thehumanbody.escd.net/student\\_gallery.htm](http://www.thehumanbody.escd.net/student_gallery.htm)

Pictures of body parts

[www.eskeletons.org/panel.cfm](http://www.eskeletons.org/panel.cfm)

Interactive learning page

[www.enchantedlearning.com](http://www.enchantedlearning.com)

\$20.00 per year, some sample activities for free, worth the money.

[www.teachervision.com](http://www.teachervision.com)

Fun Brain Quiz Lab "Know the Bones", 25 multiple choice questions about the skeletal system.

[www.inside-mexico.com/decorate.htm](http://www.inside-mexico.com/decorate.htm)

Used in section 8 Multicultural section, easy directions and fun even to use for Halloween.

[www.mnsu.edu](http://www.mnsu.edu)

Excellent, easy to read, very informative with great definitions and examples.

[www.mediniche.com](http://www.mediniche.com)

Excellent for section 3, discussion of fractures, healing, and minimizing risks of fractures.

<http://yucky.kids.discovery.com>

Question and answer format, easy to read, fun and games, "gross" section students will like.

<http://classroomclipart.com>

Illustrations and pictures of any body part. Great to use for Poster project section 5.

[www.ask.com](http://www.ask.com) or [www.google.com](http://www.google.com)

Source for images to use in poster project.

<http://home.earthlink.net/~dayvdanls/bonecell.html>

Pictures of bone cell for use in section 3.

[www.human-anatomy.com/human-anatomy/sh214.htm](http://www.human-anatomy.com/human-anatomy/sh214.htm)

Pictures and order form for purchase of life like body parts. Skull \$729.95!!

<http://upload.wikimedia.org/wikipedia/en/e/e4/Roetgen-x-ray-von-kollikers-hand.jpg>

X-ray picture of German physicist Wilhelm Roentgen's wife's hand. Roentgen invented the x-ray in 1895

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<http://www.microsoft.com/education/BoningUp.msp>

Projects for grades3-5, lesson plans on all systems, power point rubric.

[http://vilenski.org/science/humanbody/hb\\_html/skeleton.html](http://vilenski.org/science/humanbody/hb_html/skeleton.html)

Has a nice skeletal system self quiz.

[www.scienceforkids.org/articles](http://www.scienceforkids.org/articles)

"If Only Bones Could Speak" is an article about fossils and old bones.

[www.innerbody.com/images/skelfov.html](http://www.innerbody.com/images/skelfov.html)

Uses the mouse to move over parts of each system, naming the area. Great for self quiz.

[www.imcpl.org/kids/guides/health/skeletalsystem.html](http://www.imcpl.org/kids/guides/health/skeletalsystem.html)

Lists fact files about all the systems. Lists other resources for students to research.

[www.bio.psu.edu/people/faculty/strauss/anatomy/skel/skeletal.html](http://www.bio.psu.edu/people/faculty/strauss/anatomy/skel/skeletal.html)

Best site, real photographs, excellent quiz, uses scientific vocabulary.

## **Teacher Resources**

Human Body, Quick & Easy Internet Activities for the One-Computer Classroom, Scholastic, Laura Allen, 555Broadway, New

York, NY. 10012, 2001, ISBN: 0-439-27857-0, \$9.95

Visit the website, use the book to gather facts, and then complete interactive projects.

"Beastly Bone" compares human to animal skeletons. The students use information to invent a new animal with a skeletal system they create.

The Human Body; Thematic Unit, Teacher Created Materials, Inc. P.O. Box 1040, Huntington Beach, CA.92647, 1993, ISBN 1-55734-235-0, \$10.50

Includes The Magic School Bus Inside the Human Body, by Joanna Cole.

Video available "The Magic School Bus: Inside Ralphie", Scholastic, Kid Vision, ISBN 1-56832-430-8, 1995.

"Human Body", CD-Rom, Snap Everyday Solutions, Topic Entertainment, Renton, WA., 2001, ISBN 1-931102-82-1

Uses MS Windows 95, 98 to show 3D graphics.

Science: The Human Body Systems and Functions, Rainbow Horizons Publishing

Projects on all the systems

Skeletal system provides information that is easy for students to understand and includes fact files on each page. The projects are engaging and fun. Some include puzzles and games. Check out the website: [www.relyontherainbow.com](http://www.relyontherainbow.com)

ISBN: 1-55319-065-3 \$16.00

Easy Make & Learn Projects: Human Body, Donald M.Silver and Patricia J. Wynne, Scholastic Inc., 555 Broadway, New York, NY. 10012, 1999.

Easy to make models, projects, mini-books and posters

Great step by step directions for grades 2-4

"Where are my bones" is an activity where students make a human skeleton with windows that when opened expose a section at a time.

"Grow a bone" is an activity where students make a model to show how bones grow. Great for supplemental activity to go with part 3 in the unit (Let's Make a Bone)

ISBN: 0-439-04087-6

## **Books/Reading Material for teacher and student**

(These are the books I feel are the best resources for teachers.)

The Skeletal System, Dr. Alvin Silverstein, Virginia Silverstein, Robert Silverstein, Twenty-First Century Books, Brookfield, Ct. 1994

Great teacher reference, describes each section and function of the skeletal system.



ISBN: 0-8050-2837-4

Eyewitness Books: Skeleton, Steve Parker, DK Publishing, Inc., Great Britain, Dorling Kindersley Limited, 2004

Compares human skeleton to animals. Great pictures, real. Interesting facts about the system.

Great for teachers and students

ISBN: 0-7566-0727-2

Kids Discover: BONES, Volume 11, Issue3, March 2001

Subscription, but worth the money. May order individual magazines.

Great for grades 4 and 5

Many visuals

Compares human and animal bones

A New True Book: Your Skeleton and Skin, Ray Broekel, Children's Press, Chicago Regensteiner Publishing Enterprises, Inc. 1984

Great for grades 1-3 or lower level readers

The Big Book of Bones: An Introduction to Skeletons, Claire Llewellyn, Peter Bedrick Books, N.Y., NTC Contemporary Publishing Group, Inc., 1999.

ISBN: 0-87226-546-3

How Your Body Works; How Do We Move?, Carol Ballard, RSVP, Raintree Steck Vaught Publishers, Austin, Texas. 1998

ISBN: 0-8172-4741-6

## Part 3 Let's Make a Bone

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### Information

How do broken bones heal?

What is the largest/smallest bone in your body?

Can your students imagine themselves in a large pile on the floor not begin able to move? Well that is what would happen if they had no bones. Ask them if they have seen a baby or if they have a little brother or sister? Begin a discussion about their bones and ask them if theirs are the same size as yours or the same size as their dads, or even the same size as Shaquille O'Neal? Once the material is introduced, this activity will show students how their bones grow and how they heal!

You begin your life with over 300 bones and as you get older you have only 206. Most of your body is soft and

rubbery. This rubbery cartilage stays that way so it is easier for you to be born. After you are a few months old, your bones grow. You grow very fast and your bones will begin to get hard so that you can start to walk and run. The once rubbery cartilages join with other pieces of cartilage and then turn into bones. Your bones grow and change because they are made of living cells. As you get older your bones may join together. The Greek meaning of the word skeleton is "dried up". We know this is not true. Bone is made of living tissue and minerals. So how do you grow if your bones are hard and do not stretch?

Ask the students if their mother tells them to eat their vegetables and drink their milk so you can grow big and strong? Well she is right! Bones are made up of a substance called minerals. These minerals contain calcium and phosphorus. This makes our bones hard. We need calcium and phosphorus everyday to keep our bones strong. Your bones are composed of layers. This layering makes your bones strong. Each layer has a specific function.

Bones are also made of a protein fiber called collagen. The protein holds the bone together so we can run and jump without breaking anything. Bones would crumble if the collagen was removed. Have you ever broken a bone? You know that it will eventually heal. The outer cover of your bone is covered with periosteum. This is a tough skin like cover that contains blood vessels and nerves. These blood vessels provide food and oxygen to your bones. This tough skin like cover helps your bones grow and repair from a break.

The first layer gives your bone strength and is so hard that a doctor would use a saw like instrument to cut through it. This layer is called compact bone. There are small holes in this area to allow blood vessels and nerves to pass. This compact bone area is dense. The next layer is area called the cancellous bone. The cancellous is sponge like in shape, but very hard. This sponge looking structure gives your bones extra support. In some bones, the inner cancellous region or center of the bone is the site of blood cell formation. This active blood forming region is called bone marrow. This spongy bone marrow is important because blood cells are made there. Red blood cells which carry oxygen throughout the body are produced in this area, along with white blood cells that fight disease and infection. Platelets are also produced in this area. These platelets clot the blood if you are injured. Yellow marrow is also stored in this area. Yellow marrow contains fat and releases it to different places in the body.

Over six million Americans break a bone each year. There are several types of fractures. An oblique fracture occurs across the bone in a diagonal way. A spiral fracture is when the fracture travels in a spiral shape around the bone. A transverse fracture is straight across the bone. Some of you may have heard of a compound fracture. This is when the broken bone pierces through the skin! A simple fracture is when the bone does not pierce the skin.

If you should break a bone, a doctor or orthopedic surgeon will x-ray the area to find where the fracture occurred, what kind of fracture and then cast it to keep it from moving. Once your broken bone is in a cast, your bone will begin to heal. This usually takes six to eight weeks. How does this happen? You learned that the bone is covered with a protective layer called periosteum. You also learned that blood cell and vessels are located in this area. Well your blood clots rush to this area, between the broken bones. After a few days, your bone cells from the periosteum join in and close up the area. Callus, which is new bone tissue, develops and after a while the broken bones begin to join. The callus then hardens and you are healed!

Many diseases also occur. One very dangerous disease is rickets. Rickets occurs when a person does not have enough calcium to keep their bones strong. The bones become soft and bend. Small children in countries where food is limited can be seen with very pronounced bends in the legs.

Now it is time to begin the activity with the students. Ask them to find their femur! Do they feel how long this bone is? It is the longest bone in your body. In the activity the students will make a bone. Have the students to [www.ask.com](http://www.ask.com) and view pictures of a femur. This will give them a good idea on the shape of the bone.

Project: Let's Make a Bone

Objective: To show students bone size, structure and shape.

Materials: 1 paper towel tube, 1 cup flour, 5 cups water (1cup and 4cups separated), 1 large plastic bowl, newspaper cut into strips, masking tape, white, tan tempera paint, paint brush.

Procedure: Note- Teacher should prepare glue mixture at home or where there is access to a stove. Mix 1 cup flour into 1 cup water and set aside. Simmer to a slight boil the other 4 cups of water. Remove from stove and slowly stir in flour mixture. Let cool for 5 minutes or longer. Pour mixture into container to bring to classroom. Students will tear newspaper into strips about 1 inch wide. Once the strips are completed, the student will use larger pieces of newspaper and crumble into ball shape. Using tape, the student will attach the newspaper to the ends of the tube to form the shape of a femur using visual pictures supplied by the teacher or ones they printed from the computer. Once the proper shape has been formed, students will dip the 1 inch newspaper strips into the flour/glue mixture and wrap around the bone shape.

After a day or two the bone model will be dry. Students will use the paint and brush to complete the bone.

This model could be used not only as a visual representation of a bone but also for science experiments to see how much force or pressure can be placed on the bone before it breaks.

### **Let's Make a Bone Score Sheet**

1. \_\_\_\_\_pts Follows project directions
2. \_\_\_\_\_pts Bone has shape similar to a bone in the human body
3. \_\_\_\_\_pts Bone has support (doesn't fall apart)
4. \_\_\_\_\_pts Student can orally state five facts about bone structure.

25 points per section

Grade:

100-90pts= A E/E-

89-80pts= B S+

79-70pts= C S-

69-60pts=D N

59-0pts=F N-

## Vocabulary Words for Word Wall

Femur | stirrup | periosteum | compact bone

Marrow | calcium | phosphorus | transverse fracture

Callus | red blood cell | white blood cell | cancellous bone

Oblique fracture | Blood platelets | Spiral fracture

## Part 4 It's Hip to be Square

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### Information

Bones are grouped together in categories. Long bones (femur), short bones (wrist), flat (ribs) and irregular (vertebra). Each group has a special function.

The skeletal system has many functions. Most often we think of support; to keep us upright and protection of the vital organs. It also has an important role in allowing us to move, produces blood cells, red and white and stores calcium and phosphorus.

If we did not have a skeleton system we would be a pile of skin and fat, unable to move, run or bend. Each bone connected to another bone at a joint with muscles and tendons allows us to move, bend and play.

Many bones have the job of protection, just like the armor on a knight. The skull protects our brain, ribs protect our heart and lungs and the vertebrae protect the spinal canal and also support us. Some bones do have more than one job.

Bones are also grouped into categories by their shapes. Long bones such as the femur and humerus describe exactly that- a long bone. Our femur is the largest bone in our body. It is almost five times as strong as steel. This means it can support a lot of weight and it also helps us move along with the two shin bones.

Next we have short bones-usually found in our wrist and ankle. They are as long as they are wide. Carpal bones in your wrist connect to your fingers, and tarsal bones in your ankle connect to your toes.

Your ribs are in the flat bone category. All twelve pairs of ribs are anchored to your backbone. The ribs protect many organs such as, the heart, lungs, stomach, liver and other organs in the upper abdomen area. The first upper seven pairs of ribs are connected to the backbone and the sternum (breastbone) in the front. The next three pairs are connected to the backbone and cartilage in the front. The last two pairs are called floating ribs because they are only connected to the backbone.

The last group is called irregular bones because they have an irregular shape, such as vertebra. Adults have 26 vertebrae and small children have as many as 33. The bones in our spine help us move, stand, sit and bend. Not only are the bones themselves an unusual shape, but the vertebrae are not straight. They have an S curve which helps us keep our balance.

## **Project: It's Hip to be Square**

Objective: Students will use various geometrical shapes to make a skeleton. Note- Teacher may have these precut or have the students cut during a math lesson.

Materials: Black construction paper, white construction paper (2), glue, gold or silver pen, scissors or die cut shapes.

Procedure: Take the various black construction paper shapes and arrange to make a skeleton shape. Shapes include: circle, hexagon, rectangle, square, triangle, trapezoid, rhombus, oval, parallelogram and pentagon. Make various sizes of each.

Once the skeleton has its shape, glue on white construction paper.

Getting started- Teacher may show students that a circle and a smaller hexagon make a skull.

Use the silver or gold pen to add cracks in the skull, holes for eyes, nose and mouth.

It's Hip to be Square Score Sheet:

1. \_\_\_\_\_pts Shape of the skeleton
2. \_\_\_\_\_pts Uses at least five different shapes
3. \_\_\_\_\_pts Embellishment
4. \_\_\_\_\_pts Five facts about functions and categories of bones

25 points per section

Grade:

100-90pts= A E/E-

89-80pts= B S+

79-70pts= C S-

69-60pts= D N

59-0pts= F N-

### ***Vocabulary Words for Word Wall***

Irregular | Support | Protection | Vertebrae

Humerus | Carpal | Tarsal | Sternum

Cartilage

## Part 5 Poster Child

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### Information

There are 206 bones in your body and each one has its own name!

We are not born with 206 bones, but many more. A baby has 150 more bones at birth, and over time certain bones grow together. This soft bone like material is cartilage. A good example of this joining is in your skull. At birth a baby has "soft spots." These gaps remain open as a baby's brain grows. When a child is about two years old, the bones fuse together and form the 29 bones in our skull. Other bones fuse together and get hard. That is why we start off at birth with over 300 bones and end up with 206.

The skeletal system in adults weighs about twenty pounds. Each individual bone does not weigh that much considering you have 206 of them. The largest bone, the femur, is your thigh bone. It makes up one quarter of your height. If you are 60 inches (5 feet) then your femur is fifteen inches long. If paleontologists, scientists who study the remains of people and animals, were to find remains of a person, they would measure the femur to

see how tall that person was while they were alive. If they find a femur measuring sixteen inches they would know that person was 64 inches or five feet four inches.

The pelvis is your hip bones. There are several bones joined together to form the hips. The older we get bones in this area fuse together. Women have larger pelvises than men to help in childbirth. Paleontologists can measure the pelvis to determine if a person was male or female.

Our hands and feet have the most number of bones. Each hand has 27 bones; there are 19 bones in our toes, six in each ankle or 25 in each foot all together. That is a combination of 126 bones in our arms/hands and legs/feet. That leaves 80 bones for the rest of our body. There are many bones that work together to help us move. Each finger has three bones called phalanges; however our thumb has only two. The palms of our hands have five long bones called metacarpals. Our metatarsals help us walk, keep us balanced and bear our weight. We use our hands much more than we use our feet.

Carpal Tunnel Syndrome is caused by a repetitive use of our wrist. The tendons running through our wrist becomes inflamed and presses on the nerves. This inflammation causes severe pain, numbness and weakness in the hand.

Bones are joined together and where they connect is called joints. This helps with movement. The joints are: ball and socket like your shoulder and hip; the hinge joint like your elbow and knee; the gliding joint like your spine which allows for small movement; the pivot joint, allows you to tilt your head side to side; and the saddle joint found in your thumb. This joint allows us to pick up small objects. We also have ellipsoid joints in our wrist. It is similar to a ball and socket joint.

### Project: Poster Child

Objective: The student will produce a poster depicting the skeletal system and its functions.

Materials: Mosby's Anatomy Coloring Book or Human Anatomy Coloring Book by Margaret Matt, Crayons,

colored pencils, magic markers, glue, scissors, Poster paper/poster board 20" x 26" or larger.

### **Bones to include :**

Cranium femur mandible patella

Tibia vertebral column ribs fibula

Clavicle sternum pelvis tarsal

Humerus metatarsal radius phalanges

Ulna carpal metacarpal

### **Types of bones**

1. Flat
2. Long
3. Short
4. Irregular

### **Inside a bone**

1. Periosteum
2. Blood vessels
3. Compact bone
4. Spongy bone (red marrow)
5. Growth plate
6. nerves

### **Movement (joints)**

1. Ball and socket
2. Hinge
3. Gliding
4. Pivot

### **Function**

1. Movement

2. Support

3. Protection

4. Produce blood cells and store calcium

Procedure: Teacher and/or students will photocopy coloring pages, download pictures of various parts needed as described above to utilize in this project. This is an excellent time to reference **Tech-Know** section. Students who have access to a computer may research the web-sites for pictures and diagrams.

Students arrange the pictures into the five sections, glue on poster paper and color. Students will use magic markers to write facts next to each section.

### **Poster Child Score Sheet**

1. \_\_\_\_\_pts Follows project directions

2. \_\_\_\_\_pts Completes enter poster

3. \_\_\_\_\_pts Examples of all five sections

4. \_\_\_\_\_pts Verbally explain poster to class

25 points per section

Grade:

100-90 A E/E-

89-80 B S+

79-70 C S-

69-60 D N

59-0 F N-

### **Vocabulary Words for Word Wall**

Pelvis | fuse | phalanges | metatarsals

Metacarpals | tendon | inflammation | ball and socket

Hinge joint | gliding joint | pivot joint | saddle joint

Ellipsoid joint | Carpal Tunnel Syndrome



## Part 6 The Unfortunate Accident

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### Introduction

Accidents can happen everyday. Six million people break a bone each year!

Injuries occur to us everyday. We have learned about different fractures; oblique, spiral, transverse and compound just to name a few. We can also injure our joints. A dislocation is when the bone slips out of a joint. At that time we can injure the tendon or ligament. Painful injuries that involve a tear to the tendon or ligament may require surgery to reattach it to the bone or to a muscle. Some of us have encountered a slipped disc. This painful injury occurs when one of the discs between your vertebrae protrudes and presses on a nerve leaving the spinal cord. Sprains, pulls and overstretching a muscle are very painful also. A sprain is when we stretch or tear a ligament. A muscle pull involves tearing a muscle or tendon. All of these injuries can be minimized by stretching. We need to stretch before and after exercise or we will continue to hurt ourselves.

Diseases can also affect the musculoskeletal system. Rickets is a disease that affects the bones due to not enough of something such as calcium and nutritional foods. The bones become very soft and bend due to lack of calcium. Another disease that is caused by too much meat and fat products is gout. This is when the body does not get rid of the waste and the body gets very big or obese. There are other diseases and conditions that affect our bones. Arthritis is a very painful disease of the joints. There is wear and tear on the joints and this restricts movement.

There are many more that affect the development of bones and each one more painful than the other. The students may want to share some of their injuries, how they exercise, and the types of protection (helmet) they use to keep their system healthy and strong.

### Project: An Unfortunate Accident

Objective: Students will utilize x-rays depicting various injuries and/or diseases and write a fictional story about how the injury occurred.

Materials: Paper, pencil, x-ray

Procedure: Note- Due to the HIPPA laws, x-rays may not be available. An alternate activity is to go on [www.google.com](http://www.google.com) and search images for fractures. Once it is in print form, put pictures on transparency paper and place on an overhead projector. Some veterinarians provide animal injuries.

Display x-rays of various injuries for students to view. Allow students to choose the injury that they would like to write about. Discuss the narrative prompt or expository prompt with the class. Allow time for the students to share their ideas with a peer, draft an outline and provide them feedback.

Prompt: Imagine a fun day playing with friends. All of a sudden you are very hurt. Pick one of the x-rays and write about your injury, pain and how you are going to heal. Give all the details! Even if it is GROSS!

### An Unfortunate Accident Score/Rubric

**6** Student has an engaging beginning, complete sentences that are organized, include elaboration and

fluency. The story is clear and follows a well defined prompt with a beginning, middle and end.

**5** Student has included a somewhat engaging beginning, sentences are generally well constructed and organized. Elaboration and fluency are evident.

**4** Student has a beginning but descriptive inconsistencies throughout the story are evident in organization, elaboration and fluency.

**3** Student has a simple begging middle and end with minimal description. Very general elaborations. Some evidence of fluency.

**2** Student has not included one of the following: beginning, middle, and end. Unorganized and difficult to understand due to lack of fluency.

**1** No story is conveyed, very difficult to understand.

## Part 7 Day of the Dead

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### Information

In Mexico, they celebrate a unique holiday involving a skeleton!

Human beings and elephants are the only animals to show fear when they observe a skeleton of their own kind. Skeletons have always been related to evil and death. The Pirates symbol of death and destruction is the skull with two crossbones. The Tarot card with a picture of a skeleton means your future will be very short. Early artists painted skeletons to depict death. Even today young children view a skeleton figure such as "Skeletor" as the evil villain.

Because bones last a long time, some people view them as having great importance in their religion. The bones of Saints are preserved as an honor in some Christian churches. In Madagascar, the bones of loved ones are dug up, entertained and then buried again with gifts. (Kids Discover: Bones)

In the United States we celebrate Halloween by wearing spooky costumes, sometimes skeletons. This holiday, celebrated October 31st really began in the Christian community as a time when people remembered the dead. All Hallows Eve (hallow means holy) changed to Halloween.

In Mexico, on November 2nd, All Souls Day is celebrated and is known as The Day of the Dead. On this day, Mexicans visit the gravesites of their family and friends. They sing, dance and have a fiesta. Many days prior to this celebration, families prepare food, costumes and skeletons made out of sugar. The sugar model of a skeleton has been a tradition for over 100 years. These sugar skeletons are brought to the gravesite for the children to eat and enjoy.

## **Project: Day of the Dead/Sugar Skull**

Objective: To incorporate making a skull out of sugar and "International Day"/Multiculturalism.

Materials: Ready to roll white icing or fondant icing, wooden board, round-blade knife or modeling tool, cake decorations, food coloring, brush.

Procedure: Note-Teacher should instruct students not to make the skulls life size but a smaller version.

Knead icing until it forms into a soft texture. Pull off small pieces and roll into a small ball. Use the wooden board to roll sugar into a flat-bottomed egg shape. At the narrow end, squeeze the sides to form cheek bones. Use the modeling tool or rounded-blade knife to form the features: two holes for the eye sockets, two smaller holes for the nostrils, and make teeth shapes along the bottom part of the jaw. Let the icing harden over night. Paint the skull with food coloring and decorate with cake decorations. Share the finished product with classmates and enjoy!

Additional information can be found in World Crafts: Festivals, First American Edition, Danbury, CT., A Division of Grolier Publishing Co., 1997. Pgs. 22-23.

An alternative activity can be found on <http://www.inside-mexico.com/decorate.htm>. This activity involves decorating a paper calavera (puppet) after downloading it for the web. The students can click on the picture to enlarge the puppet, cut out the skeleton parts, use a hole punch to fasten the joints and join together with thread. This "Titere del Dia de Muertos" then can be decorated with sequins, buttons, thread and glitter and hang in the classroom for display.

Instead of the sugar/icing, Crayola makes white Model Magic that can be utilized. The students however CAN NOT eat the modeling clay.

### **Day of the Dead Score Sheet**

1. \_\_\_\_\_pts Shape of a skull
2. \_\_\_\_\_pts Includes eye socket, nostrils, teeth
3. \_\_\_\_\_pts Embellishes skull
4. \_\_\_\_\_pts Verbally states five facts about the Mexican Holiday "Day of the Dead"

25 points per section

Grade:

100-90pts= A E/E-

89-80pts= B S+

79-70pts= C S-

69-60pts= D N

59-0pts= F N-

### **Vocabulary Words for Word Wall**

Arm/brazo | leg/pierna | foot/pie | eye/ojo | head/cabeza | face/cara

Trunk/tronco | hand/mano | feet/pies | Day of the Dead/Dia de Muertos

Puppet/Titere

## **Appendix 1**

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Science Standards for New Haven Public Schools:

1.0

Grade 4 and Grade 5

### **Scientific Inquiry:**

Develop powers of observation by observing similarities and differences.

Construct a simple classification system, and name the properties used for classification.

Arrange objects in order according to size, mass, volume, or quantity.

Select appropriate materials for an activity, and set up and conduct an experiment using control and experimental groups.

Recognize definitions based on observations.

Identify relevant data.

Learn to pose different kinds of questions appropriate for different kinds of investigations.

2.0

Grade 4 and grade 5

### **Life Science :**

Study animals with backbones.

Learn the identification and function of the systems of the human organism (movement and control).

5.0

Grade 5

## Science and Technology:

Explore how everyday problems can be solved or improved through scientific methodology or development of a new product or process.

## Power Standards

*Structure and Function-How are organisms structured to ensure efficiency and survival?*

5.2 Perceiving and responding to information about the environment is critical to the survival of organisms. The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.

## Appendix 2

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### Internet Resources:

[www.ask.com](http://www.ask.com)

[www.bio.psu.edu/people/faculty/strauss/anatomy/skel/skeletal.html](http://www.bio.psu.edu/people/faculty/strauss/anatomy/skel/skeletal.html)

<http://classroomclipart.com>

[www.enchantedlearning.com](http://www.enchantedlearning.com)

[www.eskeletons.org/panel.cfm](http://www.eskeletons.org/panel.cfm)

[www.google.com](http://www.google.com)

<http://home.earthlink.net/~dayvdanls/bonecell.html>

[www.human-anatomy.com/human-anatomy/sh214.htm](http://www.human-anatomy.com/human-anatomy/sh214.htm)

[www.imcpl.org/kids/guides/health/skeletalsystem.html](http://www.imcpl.org/kids/guides/health/skeletalsystem.html)

[www.innerbody.com/images/skelfov.html](http://www.innerbody.com/images/skelfov.html)

[www.inside-mexico.com/decorate.htm](http://www.inside-mexico.com/decorate.htm)

[www.kidshealth.org/kid/body](http://www.kidshealth.org/kid/body)

[www.mediniche.com](http://www.mediniche.com)

<http://www.microsoft.com/education/BoningUp.msp>

[www.mnsu.edu](http://www.mnsu.edu)

[www.scienceforkids.org/articles](http://www.scienceforkids.org/articles)

www.teachervision.com

<http://upload.wikimedia.org/wikipedia/en/e/e4/Roetgen-x-ray-von-kollikers-hand.jpg>

[http://vilenski.org/science/humanbody/hb\\_html/skeleton.html](http://vilenski.org/science/humanbody/hb_html/skeleton.html)

<http://yucky.kids.discovery.com>

## **Teacher Resources:**

Allen, Laura. *Human Body, Quick & Easy Internet Activities for the One-Computer Classroom*, Scholastic, 555 Broadway, New York, NY. 10012, (2001)

Cole, Joanna. *The Magic School Bus Inside the Human Body*, (1995).

"Human Body", CD-Rom, Snap Everyday Solutions, Topic Entertainment, Renton, WA., (2001).

Science: The Human Body Systems and Functions, Rainbow Horizons Publishing

Silver, Donald and Wynne, Patricia. *Easy Make & Learn Projects: Human Body*, Scholastic Inc., 555 Broadway, New York, NY. 10012, 1999.

*The Human Body; Thematic Unit*, Teacher Created Materials, Inc. P.O. Box 1040, Huntington Beach, CA. 92647, (1993).

## **Books/Reading Material for Teacher and Students**

Ballard, Carol. *How Your Body Works; How Do We Move?*, RSVP, Raintree Steck Vaught Publishers, Austin, Texas, (1998).

Broekel, Ray. *A New True Book: Your Skeleton and Skin*, Children's Press, Chicago Regensteiner Publishing Enterprises, Inc. (1984).

Llewellyn, Claire and Bedrick, Peter. *The Big Book of Bones: An Introduction to Skeletons*, N.Y., NTC Contemporary Publishing Group, Inc., (1999).

Parker, Steve. *Eyewitness Books: Skeleton*, DK Publishing, Inc., Great Britain, Dorling Kindersley Limited, (2004).

Silverstein, Dr. Alvin, and Silverstein, Virginia, and Silverstein, Robert. *The Skeletal System*, Twenty-First Century Books, Brookfield, Ct. (1994).

Kids Discover: BONES, Volume 11, Issue 3, March 2001.

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