

Bones! Bones! Bones! Exploring the Skeletal System

Grade Level: Third

Presented by: Amy Jacobs, Hawthorne Elementary, San Antonio, TX

Length of Unit: Seven lessons

I. Abstract

During this ten to twelve day science unit students will be introduced to systems of the human body and will examine in more detail the skeletal system. They will learn the number of bones in the human skeleton, the location of those bones, and will become familiar with ligaments, tendons, cartilage, joints, and fractures. They will also explore orthopedics as a future profession. The unit accommodates a variety of learners-- visual, auditory, and kinesthetic-- and has both literature and math connections. The specificity of the topic paired with a variety of culminating activities allows the unit to mesh well with the *Core Knowledge Sequence*.

II. Overview

A. Concept objectives:

1. to discover how the different body systems are interrelated
2. to learn what the skeletal system is comprised of
3. to comprehend that the skeletal system is vital to the function of the human body
4. to understand the importance of taking care of the skeletal system and the whole body
5. to encourage a future in medical professions

B. Content from *Core Knowledge Sequence*:

1. Second Grade
 - a. taking care of your body
 - (1) vitamins and minerals
2. Third Grade
 - a. the skeletal system
 - (1) skeleton, bones, marrow
 - (2) musculo-skeletal connections
 - (a) ligaments
 - (b) tendons, Achilles tendon
 - (c) cartilage
 - (3) skull, cranium
 - (4) ribs, rib cage, sternum
 - (5) scapula, pelvis, tibia, fibula
 - (6) broken bones, X-rays

C. Skills Taught:

1. group work
2. information
3. summarization
4. research
5. graphing
6. interpreting data
7. forming hypothesis
8. categorizing
9. "How to. . ." writing

III. Background Knowledge

- A. For teachers:
 - 1. *Core Knowledge Sequence*. Charlottesville: Core Knowledge Foundation 1995.
 - 2. Cumbaa, Stephen. *The Bones and Skeleton Book*. New York: Workman Publishing, 1991.
 - 3. Dillner, L. and Abrahams, J., consultants. *The Human Body*. Wilton, CT: Victoria Points Pub., 1993.
 - 4. Hirsch, E.D. (ed.) *What Your Third Grader Needs to Know*. New York: Doubleday Publishing, 1991.
 - 5. *The Human Body. Whole Language Theme Unit Workbook, Grades 4-6*. Instructional Fair Inc., Grand Rapids, MI.
- B. For students:
 - 1. Kindergarten: The Human Body
 - a. Taking care of your body-- exercise, cleanliness, healthy food
 - 2. First Grade: The Human Body
 - a. Body Systems-- an introduction
 - 3. Second Grade: The Human Body
 - a. Taking care of your body-- vitamins and minerals
 - 4. Third Grade: The Human Body
 - a. The muscular system unit

IV. RESOURCES

- A. Books:
 - 1. *The Human Body. Whole Language Theme Unit Workbook, Grades 4-6*. Instructional Fair Inc., Grand Rapids, MI.
 - 2. Moore, Jo Ellen. *My Skeleton and Muscles*. Monterey: Evan-Moor Corp., 1987.
 - 3. *Core Knowledge Sequence*. Charlottesville: Core Knowledge Foundation, 1995.
 - 4. Hirsch, E.D. (ed.) *What Your Third Grader Needs to Know*. New York: Doubleday Publishing, 1991.
- B. Videos
 - 1. *The Magic School Bus: Inside Ralphie*. 30 minutes, color, NR, 1995.
- C. Other
 - 1. Various X-rays (found at doctor's offices or hospitals)
 - 2. "Parts of Bone" overhead
 - 3. Various posters of the different body systems

V. LESSONS

Lesson One: Let's Learn Systems!

- A. Objectives:
 - 1. Lesson content: systems of the body
 - 2. Concept objective: Students will understand what a system is and different parts of the body work together as one system.
 - 3. Skill objective: Students will discriminate between some of the body's systems by researching and presenting new information to a group. They will practice the skill of formulating hypotheses. They will correlate systems and functions.
- B. Materials:
 - 1. poster that displays the body's systems
 - 2. cards for matching game

3. butcher or chart paper and marker
- C. Key Vocabulary:
1. circulatory system
 2. respiratory system
 3. digestive/urinary system
 4. muscular system
 5. skeletal system
 6. nervous system
 7. immune system
- D. Procedures:
1. Introduce “Amazing Fact” #1: There are over ten systems in the human body that all work together so we can function successfully.
 2. One “Amazing Fact” will be introduced each day of the unit.
 3. Discuss definition of “system.”
 4. Group students into threes. Assign each a system.
 5. Have each group brainstorm and use poster to hypothesize what they think the function of their system is and the parts of the body that comprise the system.
 6. Introduce some of the systems of the body and their functions to the large group by having each small group present their hypothesis and brainstorm results.
 7. Write each system and function on chart paper as a classroom reference.
 8. As a class, discuss how the systems work together.
 9. Introduce the skeletal system as the next class topic.
 10. View *The Magic School Bus, Inside Ralphie*.
- E. Evaluation/Assessment:
1. Systems/Functions Game
 - a. divide students into groups of three
 - b. pass out set of cards to each group
 - c. students practice coordinating system and function
- F. Standardized Test/State Test Connection:
1. Reading
 - a. students will perceive relationships
 - b. students will determine the meaning of words
 - c. students will formulate hypotheses, make predictions

Lesson Two: What is a Bone?

- A. Objectives:
1. Lesson content: parts of a bone
 2. Concept objective: Students will understand that bones have a unique structure and function. Bones are living things and need nourishment.
 3. Skill objective: Students will form hypotheses and conduct a science experiment.
- B. Materials:
1. “Let’s Look at Chicken Bones” experiment sheet (see Appendix A)
 2. chicken bones from meat department of grocery store
 3. vinegar
 4. water
 5. “Parts of Bone” overhead
 6. “Parts of Bone” worksheet (see Appendix B)
- C. Key Vocabulary:
1. periosteum

2. spongy bone
 3. compact bone
 4. marrow
 5. calcium
- D. Procedures:
1. Introduce Amazing Fact #2: The human thighbone is stronger than reinforced concrete.
 2. Introduce parts and functions of bone using overhead.
 3. Demonstrate parts of bones using “Chicken Bones” experiment sheet.
 4. Place bones in jar of three-fourths vinegar and one-fourth water.
 5. Discuss what will happen to these bones after a week or so-- vinegar will absorb calcium making them bendable.
 6. Discuss calcium and its importance to bones.
- E. Evaluation/Assessment:
1. “Parts of Bone” labeling worksheet
- F. Standardized Test/State Test Connection:
1. Reading
 - a. students will read information from graphs / visuals
 2. Math
 - a. students will use graphic sources of information

Lesson Three: Count Your Bones: The Skeleton

- A. Objectives:
1. Lesson content: number of bones in the human body
 2. Concept objective: Students will understand how bones fit together and how many bones there are in the human body.
 3. Skill objective: Students will count and estimate the number and location of their bones.
- B. Materials:
1. “Count Your Bones” worksheet (see Appendix C)
 2. “The Dancing Skeleton” cutouts from *My Skeleton and Muscles* (Moore and Evans), pages 4-6.
 3. actual human skeleton, if available
 4. brad fasteners
- C. Key Vocabulary: N/A
- D. Procedures:
1. Introduce Amazing Fact #3: In your lifetime you will “lose” over 600 bones (through growing and fusing).
 2. Introduce “skeleton” and the number of bones found in the human body.
 3. Have students pair up and complete worksheet, “Count Your Bones” by feeling their bones and estimating.
 4. Go over questions together as a large group.
- E. Evaluation/Assessment:
1. Students will cut out skeletal parts from “Dancing Skeleton” worksheet and use brads to put together correctly.
 2. Hang these from ceiling.
- F. Standardized Test/State Test Connection:
1. Math
 - a. students will predict outcomes

- b. students will form hypotheses
- c. students will estimate

Lesson Four: Let's Name Our Bones!

A. Objectives:

- 1. Lesson content: names of the bones in the human body
- 2. Concept objective: Students will understand the names of bones and their connectedness.
- 3. Skill objective: Students will verbalize and illustrate bones, locations and connectedness.

B. Materials:

- 1. "Mr. Bones!" reference sheet (see Appendix D)
- 2. "Mr. Bones!" worksheet (see Appendix E)
- 3. actual human skeleton, if available
- 4. butcher paper
- 5. markers
- 6. kid-size skeletal systems, cut out

C. Key Vocabulary:

- | | |
|--------------------|------------------|
| 1. skull / cranium | 12. tibia |
| 2. jaw bone | 13. fibula |
| 3. vertebrae | 14. ankle bones |
| 4. scapula | 15. foot bones |
| 5. clavicle | 16. toe bones |
| 6. sternum | 17. humerus |
| 7. ribs / rib cage | 18. radius |
| 8. floating ribs | 19. ulna |
| 9. pelvis | 20. wrist bone |
| 10. femur | 21. hand bones |
| 11. knee cap | 22. finger bones |

D. Procedures:

- 1. Introduce Amazing Fact #4: Over half the bones in the human body are in the hands and feet.
- 2. Pass out "Mr. Bones!" reference sheet.
- 3. Choose one student to wear (tape onto clothes) the kid-size skeletal system.
- 4. Point out each bone of the skeletal system on sheet and on the student.
- 5. Songs/Activities: can be done throughout the unit to engage auditory and kinesthetic learners:
 - a. "Connected to . . ." song and actions
 - b. "If you're happy and you know it touch your skull (etc.) . . ."
 - c. "Simon Says" with bones of the body
- 6. Pair students up and have them trace each other's bodies on large sheets of butcher paper.
- 7. Give each a kid-size skeletal system to glue on their outlines.
- 8. Label the parts and hang on walls.

E. Evaluation/Assessment:

- 1. Quiz students with "Mr. Bones!" worksheet.

F. Standardized Test/State Test Connection:

- 1. Math
 - a. students will sort information

- b. students will draw conclusions
- c. students will assign labels

Lesson Five: Muscles and Bones

A. Objectives:

- 1. Lesson content: the muscular / skeletal system connections
- 2. Concept objective: Students will explore the definitions of skeletal system and muscular systems and how these systems work together.
- 3. Skill objective: Students will use resource materials, summarize information, synthesize information, and share with a large group.

B. Materials:

- 1. butcher paper and markers
- 2. "Research" worksheet (see Appendix F)
- 3. various resource books
- 4. Achilles tendon legend
- 5. chicken bone with meat (muscle), tendons, cartilage

C. Key Vocabulary:

- 1. tendon
- 2. Achilles tendon
- 3. ligament
- 4. cartilage

D. Procedures:

- 1. Introduce Amazing Fact #5: Without the Achilles tendon, a person could not run, would have difficulty walking and couldn't stand on his or her toes.
- 2. Tell (using a kid's version) or re-tell (with a teacher-made big book, for example) the mythological story of Achilles, the great Greek warrior and hero of Homer's *The Iliad*. [In order to protect him from danger, Achilles mother, Thetis, dipped him in the River Styx, which contained waters on invulnerability. However, the water did not touch the heel by which Thetis held him. He became a great warrior of the Trojan War but was shot by his brother, Paris. The god Apollo guided the arrow to Achilles' unprotected heel. Achilles died of the wound. The Achilles tendon (or heel) is named after this Greek legend].
- 3. Introduce and define tendon, ligament and cartilage as additional parts of the skeletal system.
- 4. Recall chicken bone experiment. Bring in other bones with meat (muscle) attached. Can you find the tendons? Cartilage?
- 5. Divide students into three groups, assign each one of the above.
- 6. Give each group resources or have them go to the library and complete "Research" worksheet.

E. Evaluation/Assessment

- 1. Students share their mini-report with the class and display summary statement in classroom

F. Extension

- 1. Students write their own legend explaining another part of the human body and how it got its name.

G. Standardized Test/State Test Connection:

- 1. Reading
 - a. students will identify information in a variety of written texts
 - b. students will summarize a variety of written texts
 - c. students will use resource materials
 - d. students will synthesize material

Lesson Six: Meeting Places!

- A.
1. Lesson content: joints of the human body
 2. Concept objective: Students will discover the different types of joints and where many of them are in the human body. They will understand what joints do and how important they are to the body's movement.
 3. Skill objective: Students will predict outcomes and recall facts and details.
- B. Materials:
1. "Meeting Places" worksheet from *The Human Body* (Instructional Fair), page 10.
 2. "Joints" worksheet (see Appendix G)
 3. "Mr. Bones!" Reference sheet (from lesson four)
 4. full size skeletal drawings (from lesson four)
 5. markers
- C. Key Vocabulary:
1. joint
 2. fixed joint
 3. moveable joint
 4. ball and socket joint
 5. pivot joint
 6. hinge joint
 7. saddle joint
 8. sliding joint
- D. Procedures:
1. Introduce Amazing Fact #6: The only jointless bone in your body is the hyoid bone in your throat.
 2. Introduce joints-- purpose, types, function.
 3. Pair students up.
 4. Students will use "Mr. Bones" Reference sheet and their bodies to find examples of each joint. Record on "Meeting Places" worksheet.
 5. In large group go over examples found.
 6. Have students stand up and "move" each joint as it is called.
 7. Have students label the various joints on their full-size skeletal drawings (done in lesson 4).
- E. Evaluation/Assessment:
1. Quiz students on joints of the body using "Joints" worksheet.
- F. Standardized Test/State Test Connection:
1. Reading
 - a. students will recall facts and details
 - b. students will predict outcomes
 2. Math
 - a. students will use and read charts and diagrams

Lesson 7: Bone Trauma and Treatment

- A. Objectives:
1. Lesson content: bone injury, treatment and professions
 2. Concept objective: Students will recognize a variety of bone injuries, learn the scope of treatment for those injuries and explore career options in orthopedics.
 3. Skill objective: Students will identify and recognize fractures from both visual and written scenarios and will read X-rays.

- B. Materials:
1. "Fracture Scenarios" handout (see Appendix H)
 2. "Determine the Fracture" worksheet (see Appendix H)
 3. bar graph / math worksheet (see Appendix I)
 4. butcher paper
 5. markers
 6. sample x-rays from doctor's office or hospital
- C. Key Vocabulary:
- | | |
|----------------------|------------------------|
| 1. partial fracture | 5. impacted fracture |
| 2. compound fracture | 6. comminuted fracture |
| 3. simple fracture | 7. x-ray |
| 4. complete fracture | 8. orthopedic surgeon |
- D. Procedures:
1. Introduce Amazing Fact #7: Your bones grow as you grow. The average female grows until she is around 16 years old. The average male stops growing when he reaches age 18.
 2. Ask students to share some experiences with bone trauma-- broken bones, sprains, and fractures.
 3. Hand out "Fracture Scenarios," go over each situation. Discuss types of fractures. Record on chart.
 4. Talk about bone trauma treatment: X-rays, slings, casts.
 5. Show real X-rays. Hold up against light to read and try to determine the fracture.
 6. Introduce "orthopedics" and careers in the field.
- E. Evaluation/Assessment:
1. Students will match the "Fracture Scenarios" (already discussed in class) to the "Determine the Fracture" worksheet.
 2. Students will write about an experience with bone trauma or their future in the medical profession.
- F. Extension
1. Complete bar graph activity sheet on broken bones and types of fractures as a math connection.
- G. Standardized Test/State Test Connection:
1. Reading
 - a. students will compare and contrast
 - b. students will identify and eliminate
 - c. students will match
 2. Math
 - a. students will predict outcomes and interpret data from graphs
 - b. students will solve problems using bar graphs

VI. Culminating Activities

- A. Field Trip: Students will have the opportunity to visit a hospital and: meet with orthopedic specialists, see a real human skeleton, see a variety of X-rays and the screens used to view them, see other hospital equipment, observe a cast being set, discuss career options in orthopedics and other fields.
- B. Guest Speaker: If a field trip is not possible, have a doctor come to the school to discuss his/her occupation, education, daily routines, etc.

- C. Classroom casts: By dipping strips of newspaper in a simple mixture of school glue and water, the teacher can “cast” each child’s wrist. This is a good follow-up to lesson seven. An autograph party after the casts have dried would also be appropriate.
- D. Essay: Student should write an essay over one of many topic choices: what they thought of the field trip or guest speaker, their experience with skeletal system trauma, what they learned from the unit, why medical careers are so important, etc.
- E. Test: Students will complete the “Skeletal System Unit Test” (see Appendix J).
- F. Unit Evaluation: Students will complete “How’d You Like the Unit” sheet (see Appendix K) as a guide for teachers and future unit planning.

VII. Handout/Worksheets

- A. “The Dancing Skeleton” cutouts from *My Skeleton and Muscles* (Moore and Evans), pages 4-6.
- B. “Meeting Places” worksheet from *The Human Body* (Instructional Fair), page 10.
- C. see appendices

VIII. Bibliography

- A. *Core Knowledge Sequence*. Charlottesville: Core Knowledge Foundation, 1995
- B. Cumbaa, Stephen. *The Bones and Skeleton Book*. New York: Workman Publishing, 1991.
- C. Dillner, L. and Abrahams, J., consultants. *The Human Body*. Wilton, CT: Victoria Points Pub., 1993.
- D. Hirsch, E.D. (ed.) *What Your Third Grader Needs to Know*. New York: Doubleday Publishing, 1991.
- E. *The Human Body. Whole Language Theme Unit Workbook*, Grades 4-6. Instructional Fair Inc., Grand Rapids, MI. ISBN 0-88012-830-5
- F. *The Magic School Bus: Inside Ralphie*. 30 minutes, color, NR, 1995.
- G. Moore, Jo Ellen. *My Skeleton and Muscles*. Monterey: Evan-Moor Corp., 1987. ISBN 1-55799-101-4
- H. Strachan, Ian. *The Iliad*. New York: Kingfisher, 1997. ISBN 0-7534-5107-7.
- I. *The World Book Encyclopedia*. Volume “A.” Chicago: Childcraft International, 1990.