Bones and Muscles!

Unit Study

Science – 3rd and 4th Grade

Created by Karen Carlton

Karen_Carlton@hotmail.com

The purpose of this unit study on bones and muscles is to help students learn and understand the function and purpose of the bones and muscles in the body. Students will do various activities to help them discover the purpose of the bones and muscles in the skeletal and muscular systems and the importance of health.

This unit is designed to take approximately two weeks, but could easily be adapted or expanded to take longer with additional time for activities and practice. It is designed to complement the material in your science textbook. I used this unit with an older science book and used it to supplement the materials in the chapters on bones and muscles. I also made sure to cover the information in the book and then used the chapter/unit tests as my final assessments.

Purpose: To understand the function of the bones and muscles in the body.

Day	Objectives: Students will know/be able to…	Aligned Standards NAD Science 2014- / NSTA/Next Generation Science (USA)
1	Identify the purpose of the bones in our bodies.	**Science Standards Linked to this Unit** S.3-5.HS.1 Make observations to construct an evidence-based link between healthy behaviors and personal health. S.3-5.HS.7 Construct a model that illustrates the various influences that impact personal health. S.3-5.L.S.2 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. S.3-5.L.S.3 Use a model to describe systems of information transfer that animals use to receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
2	Demonstrate understanding of the skeletal system by designing a reproduction of the bone structure.	
3	Identify safety measures to protect the bones and to apply the knowledge in first aid skills.	
4	Visualize bone marrow and evaluate and interpret the probability of a bone marrow match.	
5	Demonstrate understanding and apply this knowledge to name the bones.	
6	Differentiate between the three types of muscles.	
7	Explain how muscles work and illustrate the way they work.	
8	Compare and contrast the way muscles work with gravity and without gravity.	
9	Apply the knowledge of the past two weeks and be evaluated that information on the test.	

Day	Supplies Checklist (and page numbers in unit)
1	Tent without poles or stakes Book: *Dem Bones* by Bob Barner Bone chart, skeleton or online skeleton picture to use for naming the bones
2	Skeleton Quiz (p. 6, answers p.7) overhead bone chart poster board bone chart for each student brads or glue
3	Bandages and sticks or cardboard for making splints Guest speaker – orthopedic doctor Additional/optional *Who Am I* Game (pp. 9 & 10)
4	Probability Match activity (p.12) and chart (p.13) two dice for each team PVC pipe willed with Jell-O
5	Play dough or clay, toothpicks, skeleton chart, chapter test
6	3-column chart for Muscle Notes (p. 16)
7	2 column chart materials for balloon activity (supply list on p. 18)
8	Internet access for web research
9	Final test for chapter (You will need to prepare this based on the information you want to assess.)

Additional Resources – Bones and Muscles

Compiled by Karen Carlton

http://hes.ucfsd.org/gclaypo/skelweb/skel04.html

http://www.discoveryeducation.com/teachers/free-lesson-plans/muscles-in-motion.cfm

http://bogglesworldesl.com/skeletalsystem.htm

Day 1

Objectives: To identify the purpose of bones in our bodies.

Give the students a small tent without the poles or stakes and ask them to figure out a way to set it up. Give students 5-10 minutes to work together as a team. At the end of the time, ask the following questions. These can be answered in a group discussion and collected on the board, or the students can answer the questions in their individual science journals.

- Would directions have helped you be able to set up the tent?
- What missing pieces did you need to set up the tent?
- How would the tent be sort of like our bodies? What are the poles in our bodies?
- What happens if one of our bones breaks or bends? Does that affect our whole body?

Today, we are going to start learning about the bones in our bodies and what they do and how to take good care of them.

Read the book *Dem Bones* by Bob Barner.

Play Simon Says by pointing at the different bones on an overhead chart or wall poster. Students take turns answering with the names of the bones.

Students will then work on filling in their own bone chart with the correct names of the bones.

You can find a nice chart and blank worksheet here: http://www.lessontutor.com/jm_skeleton.html

Day 2

Objectives: To demonstrate understanding of the skeletal system by designing a reproduction of the bone structure.

Supplies: Quiz, overhead bone chart, poster board, bone charts for each student from yesterday, brads or glue.

Give the students the fun quiz – next page. This is just an information gathering exercise to see what they know already.

The questions on the quiz will be the questions for the comprehension, knowledge, application and analysis part of this lesson plan. The quiz can be used in tomorrow's lesson to assess the learning from today.

Today, we are going to continue learning about the bones in our bodies and what they do and how to take good care of them.

We are going to make a skeleton that is the shape and size of each of you.

You will need to use the skeleton chart from yesterday so that students can see the shape of each of the bones. Students will draw each of the bones listed on the bone chart on a piece of poster board. They will measure the bone in themselves (length of arm, etc.) and make sure the bone piece is the right size for themselves. Cut out the bones and assemble them with brads or glue. Or, they can trace their outline (working in pairs) on buchart paper and then draw and label the bones on the full sized "body" shape.

Students will finish putting their skeletons together and then hang them on the bulletin board/wall. This may take more than one session to complete these projects.

Grading Percentages

Accuracy of labels (correct name in the correct place)	50%
Neatness of work	25%
Accuracy of spelling	25%

Review the names of the bones and where they are located. Talk about the answers to the questions from the quiz.

Practice memorizing the bones. They can work in teams of two or by themselves.

SKELETON QUIZ ~~~ Name_____ Date_____

1. How many bones do you have as a baby?_____

2. How many bones do you have as an adult?_____

3. Name a hinged joint._____

4. Name a fixed joint._____

5. What is the longest bone in your body?_____

6. Where will you find the smallest bone in your body?_____

7. What is the correct name for the head bone?_____

8. What is the correct name for the jaw?_____

9. Name a ball and socket joint.____ _____

10 How many bones are in each hand?_____

Teacher Answer Sheet for Skeleton Quiz

1. over 300

2. 206

3. elbow, knee , ankle

4. skull or cranium

5. femur

6. ear

7. cranium

8. mandible

9. shoulder, hip

10. 26

Day 3

Objectives: To identify safety measures to protect the bones and to apply the knowledge in first aid skills.

Supplies: bandages and sticks or cardboard for making splints.

Guest speaker today – ask an orthopedic doctor to give a presentation to the class. Ask them to bring some joint samples, cast materials, and other props for the children to look at.

Ask the following questions of the class to help introduce the guest speaker. Give the guest speaker the questions as well, so that they can be prepared to answer them in their presentation.

- How many of you have had a broken bone before?
- What happened to make the bone heal?
- What are some ways to help keep your bones safe?
- Is it dangerous to break a bone?

Today we are going to continue learning about the bones in our bodies and what they do and how to take good care of them.

We have a guest speaker today. Dr. _____ is an orthopedic surgeon. That means that he/she works on broken bones a lot. He/she will talk to us about how to keep our bones strong.

Guest speaker will talk about broken bones, hip replacement and other types of fixes, importance of nutrition on bone health, etc.

Students will practice basic first aid techniques for splinting a broken bone.

Review the information that the Dr. shared with the students. Ask students to answer the following questions in their journals.

1. What can you do to protect your bones from getting hurt? (Eat healthy foods, exercise wear a seat belt, bike helmet, etc.)
2. If a bone gets broken, how does it heal?
3. Draw a picture of something that you learned today from Dr. _____ about our bones. Be sure to label your picture and write a sentence or two describing your picture.

Practice memorizing the bones. If you have student computers in your classroom, or a projector that is hooked up to a computer, students can use the following website to work on placing the correct label on the correct bone. www.abcya.com/skeletal_system.htm

This is an additional resource that can be used to review the information that has been covered or to assess student knowledge to this point. Some of this information has not been covered yet, so it would identify what students know and don't know up to this point. It could be used as a pair game. Cut the questions apart and have students work together to match the word bank words (also cut apart) to the correct question. Teacher can assess the answers as the students are matching the words to the questions and evaluate student knowledge and understanding.

GAME: "WHO AM I?" Answer Key

Q: My frame supports the body. Who am I?
A: The skeleton

Q: I protect the brain. Who am I?
A: The skull

Q: I protect the internal organs in your body. Who am I?
A: The ribs

Q: I make your body move. Who am I?
A: Muscles

Q: I weigh more than fat. Who am I?
A: Muscles

Q: There are 206 of these in your body. Who am I?
A: Bones

Q: There are 600 of these in your body. Who am I?
A: Muscles

Q: I hold together the skeleton. Who am I?
A: Cartilage

Q: The smallest bone is found here. Where am I?
A: The ear

Q: The largest bone is found here. Where am I?
A: The thigh

Q: I am a large, hollow muscle about the size of your fist. Who am I?
A: The heart

Q: I am a muscle that always works – even when you are sleeping. Who am I?
A: Involuntary muscle

Who Am I Quiz

Name_____

Answer Bank

The heart
Bones
The skull
Muscles
Muscles
The thigh
The ear
The skeleton
The ribs
Muscles
Cartilage
Involuntary muscle

My frame supports the body.
Who am I?

I protect the brain. Who am I?

I protect the internal organs in your body.
Who am I?

I make your body move. Who am I?

I weigh more than fat. Who am I?

There are 206 of these in your body. Who am I?

There are 600 of these in your body. Who am I?

I hold together the skeleton. Who am I?

The smallest bone is found here. Where am I?

The largest bone is found here. Where am I?

I am a large, hollow muscle about the size of your fist. Who am I?

I am a muscle that always works – even when you are sleeping.
Who am I?

Day 4

Objectives: To visualize bone marrow and evaluate and interpret the probability of a bone marrow match.

Supplies: Probability charts, two dice for each team, PVC pipe filled with Jell-O.

Bring a PVC pipe that is filled with Jell-O. Show the pipe and see if the students know what it represents. After the students make guesses, ask the following questions.

- How is the pipe like our bones?
- Are our bones hollow?
- What is bone marrow made out of?
- What is bone marrow used for in our bodies?

Today we are going to continue learning about the bones in our bodies and what they do and how to take good care of them.

We are learning about the inside stuff of our bones called bone marrow. This is where red blood cells are made. There are some times when a person gets sick with cancer or leukemia that the bone marrow becomes affected by the medicine for the disease. Talk about the use of bone marrow transplants.

Students will work individually by rolling two dice to determine the likelihood of a perfect match for a bone marrow transplant. Activity and direction attached.

This activity is designed to help students understand how unique we each are and how God created us each in a special way. We may each have the same bones and muscles, but so many other parts of us are very unique and special.

God has made each one of us with an amazing set of bones to hold our bodies up and together. He has also made us each unique in many ways.

Practice memorizing bones. They can work in teams of two or by themselves. Today, they will work on spelling practice for the names of the bones.

Bone Marrow Probability Match Activity

Students will be working to find the probability of getting a match on two dice at the same time. Ask students to write down how many rolls they think it will take to get a match (i.e. 6 on each die).

A dice has 6 possibilities. You can roll any number from 1 to 6. So with one die, your probability of rolling a particular number is: 1 (favorable outcomes) / 6 (possible outcomes) or 1/6 or 20%.

Students will have to figure out how the probability will change when two dice are used. (There are 36 possible pairs.)

Students will fill out the chart with all the possibilities and then actually roll the dice to see if it takes them 36 tries to get a match.

Probability of a Genetic Match with a Pair of Dice

Die #1	Die #2		Die #1	Die #2
1	1			
1	2			

How many possible sets are there when you roll two dice?_____

Now, roll the two dice and make a tally chart below to record how many times it takes for you to roll both dice with 5's.

Day 5

Objectives: To demonstrate understanding and apply this knowledge to name the bones.

Materials: Play dough/clay, toothpicks, skeleton chart, chapter test.

Today we are going to take a test over the bones (the skeleton chart from the first day). We will also cover some of the other information we have learned about this week.

Students will take turns being the tour guide of the skeleton. They will tell about the bone and their use. This will review their comprehension of the material, and knowledge.

Mid-unit test to analyze the student's learning of the material. (I wrote this lesson plan using an older Science text book and used the chapter test from that book and the skeleton worksheet where the students have to write the bone names in.)

Students will need to fill in the names of the specific bones.

Grade tests together and discuss the answers to the questions.

You have all learned a lot this week about bones and how they help us. We've also learned about ways to make our bones healthy and keep them safe.

Students will use play dough or clay and toothpicks to build their own little skeletons to reinforce the learning that has occurred. The skeletons will be placed on a piece of paper and then students will label the paper beside each section with the correct name of the bones.

Grading Percentages

Accuracy of the "body" shape	33%
Accuracy of the labels	33%
Spelling on the bone names	34%

Day 6

Objectives: To differentiate between the three types of muscles.

We are going to play a game of mirror muscles. We'll take turns being the leader. The leader will make a move using different muscles and the rest of the class will mirror the leader's movement. Then the next person has to do the first movement and add a second of their own. Class copies each movement.

After each student has had a chance to do the activity, ask the following questions.

- What are muscles?
- How do muscles help you run and jump?
- You can break a bone, can you break a muscle?
- Do your muscles grow?

We are going to begin learning about the muscles and why they are so important in our bodies.

Provide the 3-column chart (attached) for the students to glean defining points about each of the three types of muscles. I used an older textbook and it had a page with a section for each type of muscle and listed the attributes.

Using an overhead of the muscles from the textbook, talk about the three types of muscles the students have just studied about.

Students will do a series of exercises to build stronger muscles. Each student will do sit-ups, pull-ups, push-ups, etc.

3-Column Chart for Muscle Notes

Cardiac Muscles

Smooth Muscles

Skeletal Muscles

Day 7

Objectives: To explain how muscles work and illustrate the way they work.

Today, we are going to have a stare down to see how long each student can go without blinking. After the stare down, ask the students to work in pairs and answer the following questions. They should record their thoughts, and then share with the whole class.

- Do we have to think to make all of our muscles work?
- How can our muscles work without us thinking about it?
- What is one muscle that works without us thinking about it?
- Do involuntary muscles ever get tired?

We are going to begin learning about the muscles and why they are so important in our bodies.

Today we are going to learn the difference between voluntary and involuntary muscles.

Make a two column chart on the board. "Voluntary/Involuntary"

Students will read the chapter (I was using an older science textbook and there was a specific section on this) and then offer suggestions for the two columns. The suggestions could be collected for what makes a muscle voluntary or involuntary or could include specific muscles in each category. Teacher will write the answers on the board.

We will talk about the different ways that muscles work together and how they can be involuntary and voluntary at the same time. Also, talk about why things like breathing and our heart beating are so important to keep working even when we don't think about them.

Students will do the balloon activity to see "muscles" in action.

"I am fearfully and wonderfully made!" Review the different types of muscles and the amazing way God has put us together so that we keep on working even when we are asleep.

Ask students to take 5 minutes to write in their journals about something new they learned today. Why was it interesting to them?

Balloon Activity

Students will make models of their arm muscles. Each group or pair of students will receive 2 cardboard strips that are 2"x 6", 2 paper clips, tape, a hole punch, a red and a blue balloon.

Punch a hole 1 ½" from both ends of the cardboard.

Tape the ends of the cardboard together so that the holes are about 3" apart. The strips will bend like an elbow on the taped end. One strip is now the upper arm and the other is the lower arm.

Use a paper clip to attach the two balloons to opposite sides of the upper arm cardboard piece. Put the red balloon on top of the taped side. Attach the other ends of the balloons to the other end of the lower arm cardboard piece.

Now, you can bend and flex your cardboard arm and see then when you bend it one way, the red balloon stretches and the other way the blue balloon stretches.

The red balloon is like the bicep muscles and the blue balloon is like the triceps. One relaxes while the other contracts.

More details here: http://www.discoveryeducation.com/teachers/free-lesson-plans/muscles-in-motion.cfm

Day 8

Objectives: To compare and contrast the way muscles work with gravity and without gravity.

Ask the following questions – students will work in pairs or small groups and answer the questions in their group and then share with the class.

- Do astronauts use their muscles in space?
- How does gravity affect our muscles?
- If we went to space, would we still need muscles?
- How do astronauts prepare their muscles for being in space?

Today we are going to learn about how gravity affects our muscles and bones.

Students will do some research online to find out info about astronauts and how the lack of gravity affects their bones and muscles. They will research this website: http://www.esa.int/esaKIDSen/SEMG2JWJD1E_LifeinSpace_0.html to find information about the following:

1. Does an astronaut have to exercise?
2. Is it harder or easier to exercise in space than on earth? Why or why not?
3. How does weightlessness complicate life?
4. How do muscles react to no gravity?
5. How do bones react to no gravity?
6. What are some things that would be more fun if there was no gravity?
7. How does an astronaut sleep?

Students will write the answers to each of the above questions as they find the information on the website. They will present the information orally to the class.

Talk about why God created people on the Earth with an atmosphere and not on the moon or someplace where there is no gravity. Could God have made us to work perfectly on the moon without gravity too?

Study for final bones and muscles test. Students can continue using the online game at www.abcya.com/skeletal_system.htm or the blank chart that was used at the beginning of the unit.

Day 9

Objectives: To apply the knowledge of the past two weeks and evaluate that information on the test.

Today we will have a test over the whole unit on bones and muscles.

Students will work in groups of two and take different sections of the chapter and write questions and create a separate answer key. They will also write a summary about their section. Once each student has written their questions, they will trade and have their partner answer the questions on their partner's test.

We are going to study together today to review for the test at the end of the class period.

Today, you are going to write some test questions and present the highlights from each section in our textbook that we've been covering.

Students will share the info that they summarized and ask their test questions to the class.

Review the points that might have been missed by the student presentations.

Unit test on Bones and Muscles. I used the test from the older science book I was using.

You can use the bone chart from the beginning of the unit again as well as the quiz/notes worksheet for the specific facts covered in this unit or create your own test or use the one from your textbook.