

The Bending of Bones

Grade Level: 12

Subject: Anatomy and Physiology

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Duration: _____

Materials Needed

PPT for Skeletal system	Worksheet for PPT (guided notes)	balance scale
Marieb text	Samples of bone, shank, pelvis, vertebrae	method for measuring volume
Lab notebooks	Lab directions	light microscopes/bone slides

Analyze Learners

Overview & Purpose (STEMcinnati theme)	Education Standards Addressed
<p>A: Students must understand how unhealthy behaviors can affect them, poor nutrition can eventually lead to osteoporosis. Understanding is the beginning for long term prevention.</p> <p>C/S: Many students are interested in careers in medicine or research. The ability to take a common problem and define a need and then solve that need is the basis of engineering solutions to the benefit of society.</p>	<p>Health Technology: Core Competency 3.9: Deliver formal and informal presentations that demonstrate organization and delivery skill.</p> <p>Competency 35.3: Record and report experimental results</p> <p>Mathematics: Use scientific notation to express large numbers and numbers less than one. (Number, Number Sense and Operations A, 8-10)</p> <p>Science Inquiry. 11th/12th grade: A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.</p> <p>Recognize that social issues and challenges can affect progress in science and technology. (e.g., Funding priorities for specific health problems serve as examples of ways that social issues influence science and technology.)</p> <p>Research how advances in scientific knowledge have impacted society on a local, national or global level.</p>

S elect Goals and Objectives	Teacher Guide	Student Guide	Assessment
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Goals and Objectives (Specify skills/information that will be learned.)	Goals: Students will understand the function of the skeletal system, stresses incurred by different bones in the human body and be able to describe Objectives: 1. Students will be able to identify the 4 different types of bones (long, short, flat and irregular) and describe common stresses normally sustained. 2. Students will be able to compare the functionality of normal and diseased bone		
Select Instructional Strategies – Information (Catch, give and/or demonstrate necessary information, misconceptions, etc...)	Day 1-2 Warm-up ? What holds us up? Describe how our support system works. (5 min) Open section with Bulldog Feud, to assess prior knowledge. Intro to the human skeleton ppt with coordinating worksheet HOMEWORK: lab writeup! Day 3; Warmup? What chemicals are an important part of bone, (5 min) - Begin Lab Assign research question: Day 4: Continue Lab Day 5: test stress/strain on samples Day 6: graph data in Excel, and finish conclusions	Complete warm-up Compete for a prize with teams Fill in worksheet while going over chapter data Record initial data (mass, volume calc density}on bone, Put bone in vinegar Use microscope to view slides of bone, draw diagram of what is seen at 4x and 10x Record data after vinegar, begin design of a method to test how much stress Dry samples in hood Record dry data, draw a diagram of test, test stress/strain	Pre-assessment: Game – Bulldog Feud (also to be used for review) with questions re: types of bones, names of bones, divisions of the skeleton, function of the bones, disorders, etc Function, microscopic anatomy of bone, types of bone HW: read lab writeup and copy into lab notebook
U tilize Technology	Design a tool to test stress and strain in 4pt bending on a sample Graph Data in Excel		Other Resources (e.g. Web, books, etc.) Excel _ _ _ _

Require Learner Participation Activity (Describe the independent activity to reinforce this lesson)	Discussion question in conclusion of Laboratory Report, Research Osteoporosis: describe the process that occurs in the development of osteoporosis. Compare the structure of normal bone to the structure of osteoporotic bone. Describe how normal bone functions. Predict how osteoporotic changes will affect the function of bone under stress.	Students work in teams of 4, each person answers one question and teaches the answer to their groupmates. The teammate will present the findings to the class, using the data collected in their experiment.	
Evaluate (Assessment) (Steps to check for student understanding) – See Objectives above		Rubric assessment of Research report/conclusion Label stresses forces in free body diagram of different bones in the body, Predict the location of fractures when different types of bones are put under stress, describe the difference in the location of fractures and the force necessary in diseased bone..	Additional Notes

Important Attachments:

1. Pre-Post Assessment
2. Worksheets
3. PowerPoint
4. Reflection after lesson
