Bone Bank Lab: Teacher Guide

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Driving question. Many people get shorter as they get older. Where does the height go, and can a teenager do anything about it now?

District connection

An **addition** beyond the district section list: the BPS A&P unit document has no skeletal aging row. It builds from the Chapter 7 wrap-up items, Data Analysis: Exercise and Bone Health and Extend the Phenomenon: When Bones Break Down (bone diseases), and from Hole's Essentials life-span changes for the skeleton.

NYSSLS alignment

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS-LS1-1.** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells (touched lightly, through osteoblasts and osteoclasts).

SEP 2 Developing and Using Models: Tab 2, Questions 9 and 10. **SEP 4** Analyzing and Interpreting Data: Questions 1 to 5, 7, 12. **SEP 5** Using Mathematics: Questions 4 and 13. **SEP 6** Constructing Explanations: Question 15. **CCC 1** Patterns: Tab 1. **CCC 6** Structure and Function: Tab 2. **CCC 7** Stability and Change: Tab 3.

Opening: pick a phenomenon

Option	What it is	Notes
Video	Why do astronauts exercise at least two hours a day in space? (Smithsonian National Air and Space Museum, first minute). Backup: Bone Density in Microgravity, Try This At Home.	Checked to embed. Not watched end to end: preview both.
Activity	Squeeze two sponges: one whole, one with holes cut in it. Which one gives? 3 minutes.	Two kitchen sponges, scissors.
Photos	Healthy and osteoporotic vertebra slices; an older woman stooped forward.	No face shown.

Part by part

Part 1, Tab 1. Questions 1 to 3 are explore. The Learn It opens after all 10 age groups for women and for men. Questions 4 to 6 are apply. The misconception to watch: adult bone is finished. It is rebuilt all through life.

Part 2, Tab 2. Questions 7 and 8 are explore. The Learn It opens after all four ages are load-tested for women. Questions 9 to 11 are apply. Key idea: strength falls faster than density.

Part 3, Tab 3. Questions 12 and 13 are explore. The Learn It opens after all three peaks are recorded; then the lifting study appears. Questions 14 and 15 are apply. Second misconception: only women get osteoporosis. About 1 in 23 men over 50 has it.

The model and its limits

Tab 1 numbers are real averages for groups, not one person followed over time. Tab 2 is a model: strength is taken as density squared, a rule of thumb from lab tests on bone (Carter and Hayes, 1977). Tab 3 moves the whole curve up or down by the peak percent; real bone loss rates differ from person to person.

Sources

Looker and others, Bone mineral density and body composition, NHANES 2005-2008, Vital and Health Statistics Series 11, No. 251 (NCHS, 2012), Table 17. Sarafrazi, Wambogo and Shepherd, Osteoporosis or low bone mass in older adults, NCHS Data Brief 405 (2021). Watson and others, J Bone Miner Res 33(2), 2018 (LIFTMOR). Carter and Hayes, J Bone Joint Surg 59(7), 1977. Hernandez, Beaupre and Carter, Osteoporos Int 14, 2003. NASA Human Research Program, bone loss in spaceflight. Pictures are credited on the lab page.