

No Bones about It—Part 1

Overview

This series of activities is designed to investigate the form and function of bones and joints. Students are given a set of cut out bones and asked to assemble a skeleton. They then speculate about how the form of bones allows movement and the function of different joints.

Background

The bones that make up the human skeleton are living tissue. They grow and change throughout our lifetime. Bones are composed of collagen, a flexible (structural) protein, and the brittle and hard mineral mixture of calcium and phosphorus. Living cells are interspersed in this mixture. Bones serve many purposes in the body. They provide support for and protection of vital organs, allow movement, produce blood cells, store fat and minerals, and are essential in the transduction of sound. Bones have a hard outer layer of “compact bone,” which is the dense smooth white surface we see when looking at a skeleton. This dense bone accounts for about 80% of the skeleton’s mass. Inside this layer of compact bone is spongy bone tissue, which is more porous. The open space in the spongy bone tissue is filled with blood vessels and marrow.

A human infant has 270 bones, while the average adult has 206. The reduction is the result of the fusion of bones during growth. The skeleton makes up 13% of body weight and half of that weight is water. Infants have cartilage plates in the bones that allow for growth. These plates eventually harden, at which time the bones will no longer grow. Bones repair themselves when broken in four basic steps. The broken blood vessels at the break cause a blood filled swelling or hematoma at the fracture site. This blood clot is replaced by a cartilage callus that helps to hold the bones together. Over time the cartilage is filled in by spongy bone tissue. Increased stress on the bone promotes development of compact bone tissue over the fracture site. This process usually takes 6 to 8 weeks.

Materials

Materials for pairs of students

- 1 set of bones cut-out sheets per pair of students (2 sheets)
- 1 skeleton diagram key
- 1 *Here Are the Answers—Musculoskeletal System*
- Removable tape
- Scissors for every student

Materials for individual students

- Science notebook

Preparation

- The teacher should prepare his or her own skeleton and tape it together. **This is only to be displayed at the conclusion of this activity.**

Procedure

- Start with the *Here Are the Answers—Musculoskeletal System* activity.
- Debrief the activity with discussions of why students chose their particular answers. You might choose not to give the correct answers at this time but leave some of the answers hanging and ask students to research them further.
- Ask the students for other questions they have about bones and muscles.
- Tell the students that they are about to play the role of a CSI (crime scene investigator) or an anthropologist by constructing a skeleton from bones. They should cut out the bones as carefully as possible and assemble the skeleton using removable tape at the joints. This activity can take some time and produce some frustration. Give the students time and coach them through frustrations by asking questions like “What do you think the bones in your hand look like?” or “Which bone is bigger, your upper arm or your thigh?” The dashed lines in the diagrams indicate places where one bone picture slides behind another. The removable tape will allow students to modify the articulation of their skeleton as they refine their work.
- Once students have worked to get their skeleton as “right” as they can make it, have the discussion suggested below.
- After the class has puzzled out as much as it can with the cut out diagram pieces, give them the skeleton diagram key and have them fix their skeletons. Further discussion could address common mistakes made by the teams and the names of the bones.

Reflection/Discussion

Ask the students to look at their skeletons and generate questions for other students that can be answered by looking at their models. Ask students for some general observations about the skeleton or surprises they had while working on the activity. Ask them what was difficult about the task and why it was difficult.

Students can look in a reference book or the Skeleton Diagram Key and find and name the bones.

Assessment

These two activities are designed as introductory activities. As such it is only appropriate to use participation or the production of an articulated skeleton for assessment purposes. Do not grade for correct answers at this time.