

BAG OF BONES

Bone up on your knowledge about the skeletal system. Find out how forensic pathologists use bones to determine age, gender and height, and conduct an experiment to learn about the effects of osteoporosis. Teachers are asked to supply plastic zipper-seal bags and cereal.

Kansas College and Career Ready Standards for Health

- Standard 1: The student will comprehend concepts related to health promotion and disease prevention as related to:
 - (b) prevention and control of disease
 - (d) personal health

Benchmark 1: The student will explain the relationship between positive health behaviors and wellness.

Materials needed:

- 3 snack size Ziploc bags for each group of 3 students
- Corn puff or Honeycombs-type cereal (amount needed depends on class size, enough to fill almost two snack size bags per group)
- A very heavy book (like a dictionary) for each group
- A broom and dustpan (for clean-up)
- “Skeleton Key” page

Students will:

Learn how forensic anthropologists use bones to pinpoint identifying characteristics
Discover the effects of osteoporosis on bones

The IDL lesson will include the following activities:

Activity: Skeleton Key

Materials needed for the activity:

- “Skeleton Key” page

Activity: Bag of Bones

Materials needed for the activity:

- 3 snack bags for each group of 3 students
- Corn puff or Honeycombs-type cereal
- A very heavy book (like a dictionary) for each group
- A broom and dustpan (for clean-up)
- “Bag of Bones” data sheet

Advanced preparation:

For each group:

1. Using a permanent marker, label the bags #1, #2, #3.

2. **Bag 1:** Fill the bag with enough cereal so that the bag is very full and there is very little air in it, but not so full that you cannot close it. Close the bag, and make sure it is closed tightly—otherwise you may wind up with a very big mess!

Bag 2: Fill the bag $\frac{3}{4}$ full.

Bag 3: Fill the bag $\frac{1}{2}$ full.

Program Connections Information

- 1. All classes will take place using Zoom desktop video. If your building is already set up to use a desktop video application with a computer, simply open a browser and enter <https://zoom.us/j/3662120241> in the URL space.**
- 2. You may need to download Zoom launcher software (free download) if you don't already have it. This needs to be done in advance of the lesson.**
- 3. While it is possible to utilize the internal webcam and microphone in a laptop for the audio and video for the lesson, they do not provide optimal results. An external microphone allows the Greenbush teacher to better hear your students and provides for a more interactive experience.**
- 4. If using a Polycom videoconferencing unit (or any legacy type videoconferencing unit) to connect to a ZOOM conference, make sure the unit is in "encrypted mode" then dial the following IP on the internet: 162.255.37.11 or 162.255.36.11 and once connected, they will ask for a MEETING ID: enter 3662120241 (for Sharon at Science Center).**
- 5. It's always a good idea to touch base with your district technology facilitator prior to your program to make sure all systems/equipment are in place and operational.**
- 6. Classes take place at the following times: 9:00-9:45, 10:00, 10:45, 12:15-1:00, 1:15-2:00, and 2:15-3:00. If you log in early to your class, you may connect during another class' lesson. If you do, please check your connection to make sure things are working properly and then leave the meeting until your scheduled time by selecting "End Meeting" in the lower right corner of your Zoom screen and click on "Leave Meeting". This prevents your site from interfering with the lesson currently in progress. After your lesson is finished, please leave the meeting.**
- 7. If you have questions, please call Sharon Bertolio at Greenbush (620-724-6281.)**

Prior to the IDL lesson, please pre-teach and practice these cooperative learning techniques with your students. These will be used in the IDL lessons this school year.

Round Robin

Each member of the team takes a turn sharing orally with the team.

Rally Robin

With a partner, students take turns sharing brief oral responses.

Timed Pair Share

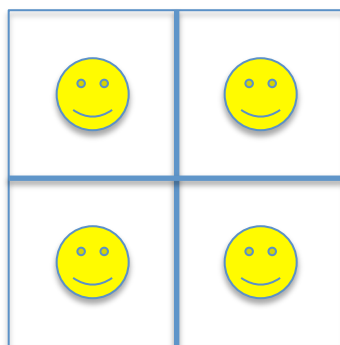
In pairs, students share with a partner for a predetermined time while the partner listens. Then partners switch roles.

Stand Up, Hand Up, Pair Up

Students move around with hands in the air and quickly find a partner with whom to share or discuss. Once students find a partner, they give each other a “high five” and stand together, ready for the next instructions.

More terms to know –

Shoulder Partner:
The person sitting on the student’s right or left.

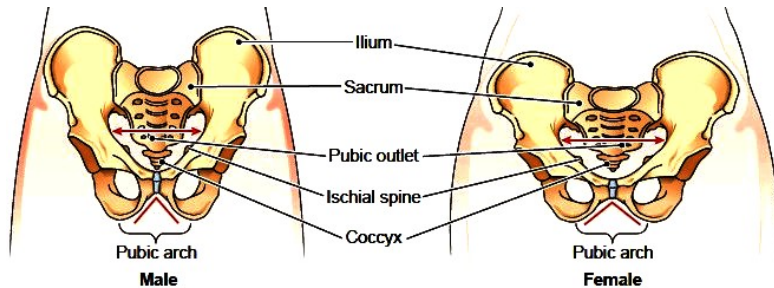


Face Partner:
The person sitting facing the student.

The Skeleton Key

Gender

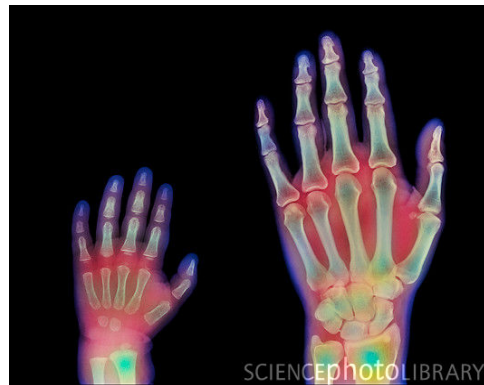
Women generally have proportionally wider pubic bones than. The use of the pelvic bone alone has proved extremely precise in establishing sex, with an accuracy of up to 95%.



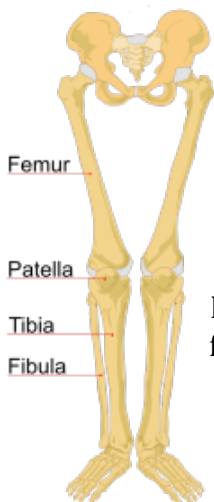
Age

As the bones fuse together, sutures are formed in between them, appearing as 'zigzag seams'. At birth, the human skull is composed of numerous smaller bone segments. As the individual ages the separate pieces fuse together.

Similarly, certain sections of cartilage around the body gradually turn into bone over time, again usually at a particular age. For example, at birth the wrists are composed of cartilage, eventually forming into bone at a later date. If the person is under the age of 13, a wrist x-ray can often pinpoint the child's age within a few months.

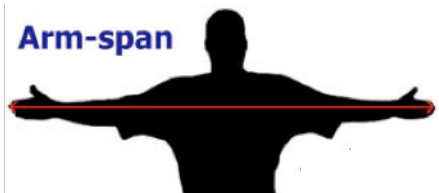


Height



There are numerous methods available to determine the height. If the skeleton is whole, direct measurement may be used to establish the rough height, with a few inches added to account for flesh. Otherwise, height is most commonly established using a formula based around the length of a long bone such as the humerus or femur. Human height is approximately four times the length of the femur, taking into consideration slight variations due to race and gender.

Height may also be estimated by a measurement from fingertip to fingertip of outstretched arms, the length of which roughly equals the body height. Ideally the complete bone is necessary, though less accurate formulae are available for incomplete bones.



Bag of Bones

Get Ready

3 snack size Ziploc bags for each group
Corn puff cereal
A very heavy book (like a dictionary) for each group
A broom and dustpan (for clean-up)
Permanent marker for each group

Think about it

Why is it important to have strong, healthy bones?
What will happen if your bones become weak?

Formulate your hypothesis

What do you think will happen to a bone (in this case, represented by your baggie and cereal) if force is suddenly applied to it? Will the results change if the bone is progressively weakened?

Get Set

1. Using a permanent marker, label the bags #1, #2, #3.
2. **Bag 1** will represent a healthy bone. To build a “bone” you will use pieces of cereal to represent individual bone cells. Fill the bag with enough cereal so that the bag is very full and there is very little air in it, but not so full that you cannot close it. Close the bag, and make sure it is closed tightly—otherwise you may wind up with a very big mess!
3. To represent a bone that has lost mass as a result of spaceflight or aging, you now need to fill each bag with less cereal, or bone mass, than is in Bag 1.

Bag 2: 75% of original bone remains; 25% original bone lost. **Fill the bag $\frac{3}{4}$ full.**

Bag 3: 50% of original bone remains; 50% original bone lost. **Fill the bag $\frac{1}{2}$ full.**

Go

Now you are ready to see what effects a sudden force may have on weakened bones. Place Bag 1 on a hard surface. Then, quickly and carefully, but forcefully, smash the heavy book onto the bag. Again using the same amount of force, smash the remaining bags.

What happened to your bones? How many cells in each of your bones were unaffected?