



Gross Science: Inner Workings of the Human Body

GRADE LEVELS:

Grades 4th – 6th

CONCEPTS:

- Circulatory System
- Respiratory System
- Digestive System

OBJECTIVES:

Students will gain a better understanding of blood, digestion and upset stomachs.

ACADEMIC CONTENT STANDARDS:

- Science: Life Science: 6.1
- Science: Scientific Inquiry: 4.1, 5.1, 6.2, 6.3
- Science: Scientific Ways of Knowing: 4.1, 5.2, 6.3, 6.4

VOCABULARY/KEY WORDS:

Cardiac Muscle - A specialized form of striated (striped) muscle occurring in the hearts of vertebrates.

Clotting - To form into a semisolid mass.

Digestion - The process by which food is broken up and converted into a substance suitable for use by the body.

Skeletal Muscle - A usually voluntary muscle having principally bony attachments.

EXTENSIONS AT COSI:

Life

- Visit Labs In Life to get a nutritional view of food and energy.

Gadgets Cafe

- Participate in hands-on activities that demonstrate the reaction of vinegar and different substances. Please note: you must sign up in advance on the day of your visit. A ratio of 1 adult to 5 children is required to participate.

ADDITIONAL RESOURCES:

<http://www.apples4theteacher.com/science.html#humanbody>

<http://www.homeworkspot.com/elementary/science/humanbody.htm>

<http://www.teachervision.fen.com/body-parts/teacher-resources/6632.html>
<http://teachers.net/lessons/posts/99.html>

SAMPLE TEST QUESTION:

Q. Use the information and table below to answer the following question:

Some students do an investigation on the reaction of baking soda with vinegar. They create a data table to record the mass (grams) and temperature (degrees Celsius) of the mixture every 5 seconds. Several pieces of data are missing from the table.

In your Answer Document (below), give one example of how the incomplete data makes it difficult for the students to draw conclusions about the changes that occur when baking soda reacts with vinegar. Explain how the incomplete data will affect the ability of other students to reproduce the experiment.

| Time (seconds) | Mass (grams) | Temperature (Celsius) |
|----------------|--------------|-----------------------|
| 0 | | 21 |
| 5 | | 20 |
| 10 | 57 | 18 |
| 20 | 55 | 17 |
| 25 | 54 | 17 |
| 30 | 54 | |
| 35 | 54 | |



Gross Science Pre Visit Activities

No It's Snot

Objective: Learn about the body's defenses against invasion from tiny particles.

Materials:

- Gelatin (one packet or scoop)
- Corn Syrup (1/2 cup)
- Hot water (1/2 cup)
- Large Bowl
- Spoon
- Small Whisk Broom
- Sand/dirt mixture
- Bussing Bin

Procedure:

1. Pour 1/2 dirt mixture over whisk broom to simulate nose hairs catching large particles.
2. Explain that many particles still get through.
3. Tell students that one ingredient of snot is protein. Place packet or scoop of gelatin in the bottom of the bowl. This is our protein.
4. Ask students what our bodies are mostly made of (water). What is the temperature of the water in our bodies (98.7 degrees Fahrenheit)? Add the water to the gelatin, stirring constantly until the gelatin is dissolved.
5. Why do your younger siblings sometimes eat their boogers? It's because they are sweet: snot has sugar in it. Add the corn syrup to the gelatin mixture to represent the sugar, and stir until a uniform consistency is achieved.
6. Dip the whisk brush in the snot and cover the bristles completely.
7. Pour the remaining dirt over the 'snot covered nose hairs.' Note how now practically no dirt manages to get through.

What is happening?

Dirt, dust, bacteria, and viruses are all floating in the air around us. Our bodies don't like these things, and have developed defenses against them. The main line of defense is our skin, but our skin has holes in it. Two of these holes are our nostrils. Our nose has a couple of defenses against unwanted invaders. Nose hairs (cilia) are

the first line of defense. They are designed to catch some of the larger particles. They don't work very well alone, though, so the second line of defense is snot. The components of snot are sugar (represented by corn syrup), protein (represented by gelatin), water and an enzyme called Lysozyme (represented by our imagination). Our body makes about four cups of snot a day, most of which ends up trickling down the back of our throats into our stomachs, where the germs are destroyed by stomach acid. Mucous helps protect our stomach from the effects of its own acids. Boogers are made up of snot that has hardened around trapped particles.



Bones

Description: Your body is a remarkably coordinated system made up of many, many parts (206 bones, 589 muscles, and over one billion nerves), each with a unique relationship to every other part. This activity explores a unique connection between them.

Materials:

- A 7 foot piece of rope (depending on guest height), knotted on one end
- Hair clips or binder clips
- A meter/yard stick or fabric tape measure
- Vanity mirror

Procedure:

- Begin by removing your shoes. Put the knotted end of the rope at the edge of your heel and measure **the length of your foot from heel to toe**—use a clip to mark this length on the rope. This is your own personal “foot” measurement.
- Now with a friend’s help, use the same piece of rope and the “foot” you just marked to measure **the distance from your elbow to your wrist** (beginning again from the knotted end). It should be the same as the length as your “foot.” Follow this same procedure twice more to measure:
 - **The distance around your clenched fist.**
 - **The height of your head from your chin to the top of your skull.**(You should find that they’re all about the same length.)
- Now that you have a standard measurement, measure out 7 more “feet” on your rope and mark with a clip. (You can do this by measuring your “foot” on a yard stick and then multiply that length by 7, or you can simply accordion fold the rope so you have a total of 7 “foot” lengths.)

Note: Multiplying the length of the foot times 7 is usually a close approximation for adults and kids that don’t have a lot more growing to do. For younger kids, multiplying by 6 works better. (For really young children, it doesn’t work at all.)
- Now compare this new distance to:
 - **Your total height**, from the floor to the top of your skull.
 - **The entire width of your out-stretched arm span.**

(You should find that they're all about the same length.)

- This part is slightly less reliable, especially for children, but half of this larger measurement should be roughly equal to **the distance from the tip of the nose to the tip of the middle finger** (when arms are outstretched). On adults this measure should also be roughly equal to a yard.
- Using the rope again (this might be a little awkward, but it's part of a large sequence) measure:
 - **Twice around the base of your thumb**, then compare that to the **circumference of your wrist**.
 - **Twice around the wrist**, which should equal **the circumference of your neck**. You can skip this measurement depending on the age and behavior of the kids.
 - **Twice around the neck** (on an adult of "normal" weight) should equal **the circumference of your waist**.
 - The **distance from the outside corner of your eye to the corner of your nose on the same side** will equal both the **height of your ear**, and the **width of your mouth**.

What is going on?

This experiment is a glimpse into the field of science known as Forensic Osteology, or the study of bones. It is through the use of Osteology (how bones are formed, interact, age, and change over time) that Physical Anthropologists are able to analyze human remains. A person's individual proportions are so unique that this style of relating is the basis for forensic reconstruction, such as seen on CSI. Using a person's foot, the total height of the person in question can be estimated, and if the skull is present, the measurements you just took can be used to reconstruct the shape of all the cartilage and soft tissue which is likely to have decayed.



Gross Science: Post Visit Activities

Owl Pellets

Objective: To investigate the contents of owl “vomit.”

Materials:

- Owl Pellets
- Bone Identification chart
- Water
- Toothpicks
- Tweezers (optional)

Note: owl pellets with bone identification charts can be ordered through scientific supply houses.

Procedures:

1. Inspect the pellet. Note the size and any features that might help you figure out where it came from.
2. Soak the pellet in water.
3. Very gently, pull apart your pellet.
4. Use the toothpicks or tweezers to separate the bones from the fur and feathers.
5. Roll the last bits of fur between your fingers to find tiny bones or teeth that may have been overlooked.
6. Try to lay out or reconstruct the skeletons of the animals you found. How many animals were in each pellet? Can you identify the animals?

What Happened?

Owls eat small rodents, reptiles, and birds. They swallow their prey whole. An owl’s stomach acids aren’t strong enough to digest bones or hair, so the owl vomits up the indigestible parts about 24 hours after they eat. If you want to look for owl pellets, look under the tree where an owl roosts during the day.



Spit Test

Objective: Learn the beginning steps of digestion.

Materials:

- A spoonful of cornstarch
- Two crackers (preferably unsalted)
- Tincture of iodine (you can buy this at the drug store in the first aid section)
- Two glass bowls or small cups

Procedure:

1. Iodine turns dark bluish black when it touches starch. Prove this to yourself by adding a couple of drops to some cornstarch.
2. Break up one cracker into bits and put them into a bowl.
3. Chew up the other cracker. Don't swallow it: keep chewing until the cracker is all mushy.
4. Spit the cracker mush into the other bowl.
5. Put a few drops of iodine in each bowl. Is there a difference?

What is going on?

The enzymes in saliva break down long starch molecules and turn them into short sugar molecules. Chewing is the first step of digestion, and saliva is the second.