RAFT IDEAS

Topics: Biology, Digestive System, Measurements

Materials List

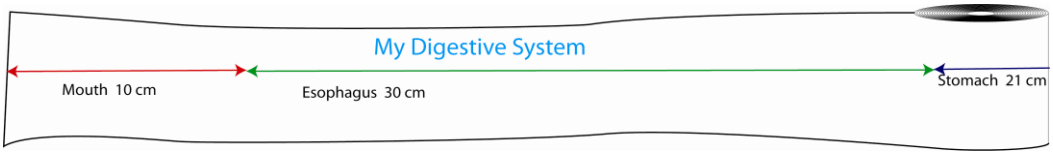
- ✓ Roll of adding machine tape
- ✓ Meter sticks
- ✓ Optional but could be helpful: metric ruler, metric measuring tape, and/or string
- ✓ Scissors

This activity can be used to teach:

- Body structures and systems (Next Generation Science Standards: Grade 4, Life Science 1-1; Middle School, Life Science 1-3)

A Digestive System Surprise!

From end to end the total distance is amazing!



Combine measuring with learning about digestion in this activity as each student creates a paper model equal to the total length of his or her own digestive system.

To Do and Notice

1. Taking turns with a partner, use a meter stick, a metric ruler, metric measuring tape, and/or a piece of string to measure the equivalent lengths for each section of the digestive system as listed below. Round off each of the measurements to the nearest centimeter and record the results.

Section of digestive system	**For an equivalent length measure the:**	**Function of the digestive section**
"Mouth" (oral cavity) (defined as from the lips to the back of the throat.)	Corner of the mouth to the nearest ear lobe	The digestive process begins here as food is chewed, broken up in small pieces, and combined with saliva to make swallowing easier. Enzymes in the saliva mix with the food and break down the food's starches into smaller molecules such as sugars.
Esophagus	Bottom of chin to the bottom of the sternum (feel down the middle of the chest until no bone is felt under the skin)	A tube connecting the mouth to the stomach - has a muscular lining, which flexes to push food downward to the stomach.
Stomach	Tip of the thumb to end of the little finger when the fingers are spread out.	A large sack-like organ that churns the food and bathes the food in a strong acid (gastric acid) to partly digest the food.
Small Intestine	Measure the height (could be done while lying down) and then multiply the measurement by 4	The caustic stomach acids are neutralized by the addition of bile. The neutralization occurs in a relatively short segment of the small intestines (about 25 cm/10"). Absorption of food's nutrients occurs in the remainder of the small intestine.
Large Intestine	Use the height measurement	Mainly responsible for reabsorbing the water accompanying the undigested food that passes out of the small intestines
Rectum and anal canal	Width of 2 fists placed side by side	Solid waste is stored in the rectum until it is excreted via the anus

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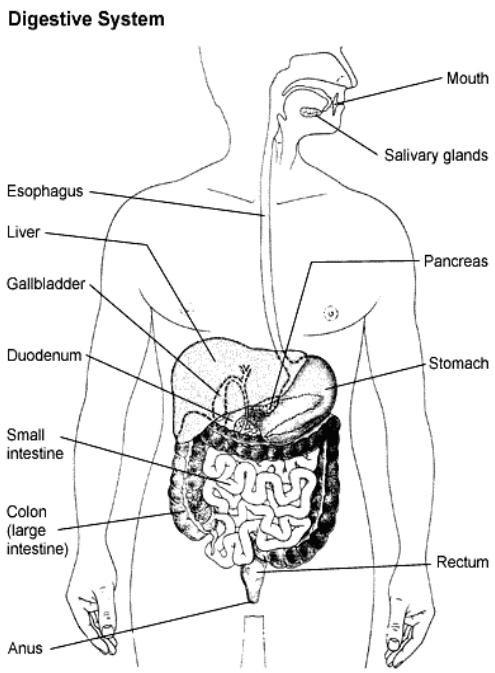
2. Each student will need a length of adding machine tape that is about 6 times the height of the tallest student.
3. Begin at one end of the adding machine tape, use a meter stick to measure and mark off the length of each section of the digestive system in turn, end to end. Cut the tape at the end of the last digestive section.
4. Label each segment on the tape with the corresponding digestive pathway, length, and function. The total length represents the distance that food travels through the student's digestive system everyday.
5. Optional: Indicate where organs such as the liver, gall bladder, and pancreas interact with the digestive process.
6. Label the back of each tape with the student's name.
7. Roll up the tape for easy transport and storage.
8. Optional: calculate the ratio (percentage) of the length of each section to the length of the total digestive system.

The Science Behind the Activity

The human digestive system is a series of connected hollow organs that process and breakdown food into nutrients that are absorbed by the body. In an adult it is over 9 meters (30 feet) in length. The function of each section is described in the table on the previous page. There are other organs that participate in digestion: the liver which produces bile and the gall bladder which stores the bile until it is needed and the pancreas that produces hormones (including insulin) and enzymes. In a healthy adult the digestive process can take between 24 and 72 hours to complete.

Other details about the Human Digestive system:

- Food becomes a gooey mass called a bolus which is easy to split into proteins, carbohydrates, fats, vitamins, and minerals.
- The muscle contractions that push food through the system are called peristalsis.
- Stomach acid (HCL) turns bolus into a semi-fluid paste called chime.
- Chemical digestion occurs because enzymes, secreted along the digestive system, break down the large macromolecules.



Taking it Further

- Create a pie chart of the digestive system or a bar chart comparing the length of each section.
- Create a chart of all students' measurements. Calculate the mean, median and mode for each measurement.
- Using the model write and illustrate a story about what happens to a piece of bread traveling through the digestive system.

Web Resources (Visit www.raft.net/raft-idea?isid=586 for more resources!)

- How the human digestive system works - http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/#why
- Diagrams and glossary - http://www.enchantedlearning.com/subjects/anatomy/digestive/