Increased Surface Area

Teaching Tip

Lungs: Alveoli

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During this activity your students will learn about grape like structures in the lungs called alveoli and their essential function of increasing the surface area of the lungs to maximize gas exchange. The surface area within the human lungs is estimated between 75-100 meters\(^2\), which is approximately one side of a tennis court.

Introduce the activity by viewing *Art Basics with Dick Termes: Drawing – Cube Basic*. During this episode the artist, Dick Termes, demonstrates how to draw a 3-D drawing of a tissue box.

Display multiple tissue boxes on a table in the middle of the room. Make sure there are different sized boxes with various dimensions and volumes. Have the students select a tissue box and draw it using the techniques covered in the video. Ask the students what is similar and different about the boxes. Discuss the volume of the boxes and how the tissues packed within the boxes are similar to the alveoli in the human lungs. The tissues provide a tremendous amount of surface area within a very small volume.

A model, similar to the one shown in the photos would help the students make the connection between a tissue box and the human lungs. This is a very nice analogy, because every time one of your students uses a tissue or looks below the bathroom sink they will think about the alveoli in their lungs.
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The model was constructed using drain piping for a kitchen/bathroom sink. The fittings and piping are available at any hardware or department store.
Activity: The students (working in groups of 2-3) will compare the surface area of the tissue box with the total surface area of the tissues within it.

- The activity should be completed in a gym or all-purpose room.
- Measure the surface area of the inside of the tissue box (same as outside).
- Measure the surface area (both sides) of an individual unfolded tissue.
- Multiply the surface area of the individual tissue by the total number of tissues.
- Using a tape measure and the gym floor, compare the total surface area of the inside of the box (lung) with the surface area of all the tissues. If time allows – the students should lay out at least 100 tissues to get an idea of how the alveoli drastically increase the size of the surface area.

Taking it to the Next Level: It is estimated that someone who smokes a pack of cigarettes per day will deposit 1 cup of tar in their lungs each year. The students should pour a cup of colored water on their tissues to represent the depositing of tar. (Note: This is a non-scientific demo that provides a visual, best performed outside to reduce the chance of water damage.)

Contact EdServices@sdpb.org for more information about SDPB’s educational resources.