Breathe Easy

For Georgia Healthcare Science Teachers

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Esquared Educational Experiences
Esquaredhomeschool.com

General Disclaimers

- The lessons we are teaching can be found in multiple courses and are often **Repeating** standards; therefore, some of our ideas may have been done in previous courses
- Yes, we have always said the everything old is new again. We are experienced teachers that have taken some old ideas and modernized and improved on them. However, for the most part these ideas are “brand, spanking” new
- Safety is of the utmost. Make sure students are monitored at all times when performing activities. There might not be many or any of these types of activities
- Before performing and after every activity make sure you stress to your students their hands should be washed
- Rubrics should be used only if they apply to you and your class. Sometimes, the teachers have skills sheets/competencies which are better suited to evaluate students

Standards for this Webinar

1.1	**Human Anatomy**	
	1.1.2 b	Muscular System
	1.1.2.f	Respiratory System
1.2	**Diseases and Disorders**	
	1.2.1	Asthma, Cystic Fibrosis, etc.
1.3	**Medical Mathematics**	
	1.3.1.a	Metric
	1.3.1.b	Mathematical
1.32		Demonstrate ability to analyze charts, graphs, and tables to interpret healthcare results
2.1	**Concepts of Effective Communication**	
2.2	**Medical Terminology**	
4.3.2	**Diagnostic services; Therapeutic services**	
7.2	**Personal Safety**	
10.2	**Technical Skills**	

Activities & Discussion

Activities

- Spirometer
- Hang(er) (Wo)man
- Peak flow (if time allows)
- How to make lungs (if time allows)

Discussion

- Quick review of the respiratory system
- Respiratory therapy as a career
- Spirometry

Respiratory System
Case Study

Elijah Wilson, aged 9 years old tiptoed into his parent's bedroom. He hated to wake them, but he felt like he had no choice. He was having trouble breathing and realized this was probably an asthma attack. He had this since he was 2 years old. His mom woke suddenly, realized what was happening, and ran to the place where all his medical supplies were.

Upon returning, Elijah was being soothed by his father. They could not find his quick-relief rescue inhaler so his mom put a mask over his face which had a nebulizer attached to a machine that pumped a stream of medication into his mouth leading to his lungs. After his treatment, Elijah felt better but was still wheezing. His mom decided to take him to the emergency room. When they arrived at the local hospital, Elijah was beginning to wheeze more which made him panic more. Luckily, he was seen by a nurse who placed a pulse oximeter on his finger and monitored his vital signs. His oxygen saturation was at 85% as read by the oximeter. The physician ordered continuous nebulization of albuterol which is a relatively new technique for treating patients who are not responding to typical medication to deal with asthma. Elijah was also given another medication called prednisone.

Respiratory System
Case Study

After the medication was administered, a respiratory therapist brought a spirometer into the cubicle and did a spirometry test on Elijah. The spirometry test had some irregular results. An X-Ray was also done. But, it appeared normal. After a few hours, Elijah was checked again. His oxygen saturation has gone up to 95%, and he was barely wheezing. The physician asked Elijah if he took his daily medicine and used his peak flow meter to help him control his asthma, and Elijah truthfully answered only when he remembered. The physician discharged him with instructions to continue to use his home nebulizer every 4-6 hours and put him on prednisone for 7 days. He was also directed to take his daily asthma medication and measure his peak flow every day. He was to follow up with his pediatrician within the next week, unless his symptoms returned.

Nebulizer

Hang(er) (Wo)Man 

- Male reproductive
- Female reproductive
- Urinary and Excretory
- Digestive
- Muscular (chest, arms & legs)
- Skeletal (chest, arms & legs)
- Respiratory & Circulatory
- Endocrine & Lymphatic
- Nervous (major nerves and brain)

Hang(er) (Wo)Man 

Supplies needed

Scissors Colored paper Tape

Pen/pencil Markers Index cards

Hole punch Yarn

Dry cleaning hangers

Dry cleaner bag or clear rain

Hang(er) (Wo)Man 

Organ system colors

- Use construction paper, card stock paper, bulletin board paper or even foam paper to construct the organs according to color.

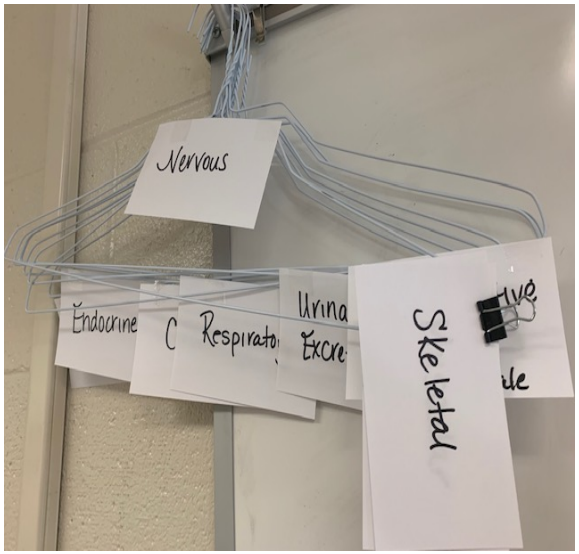
Respiratory= yellow

Muscular= pink

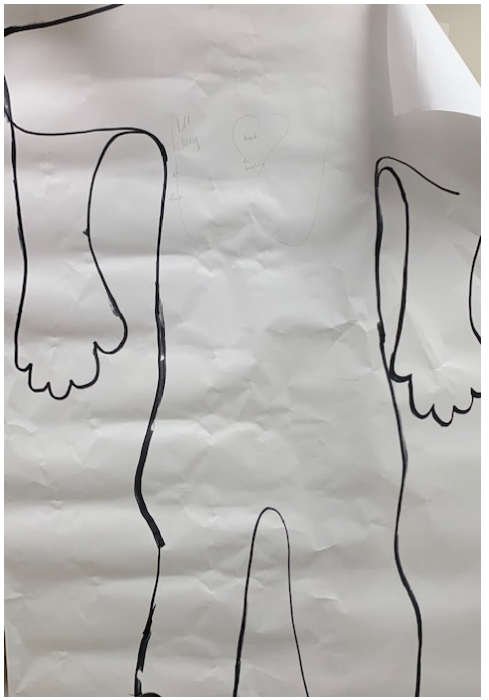
Circulatory = **red**

Hang(er) (Wo)Man

Hangers Prepared



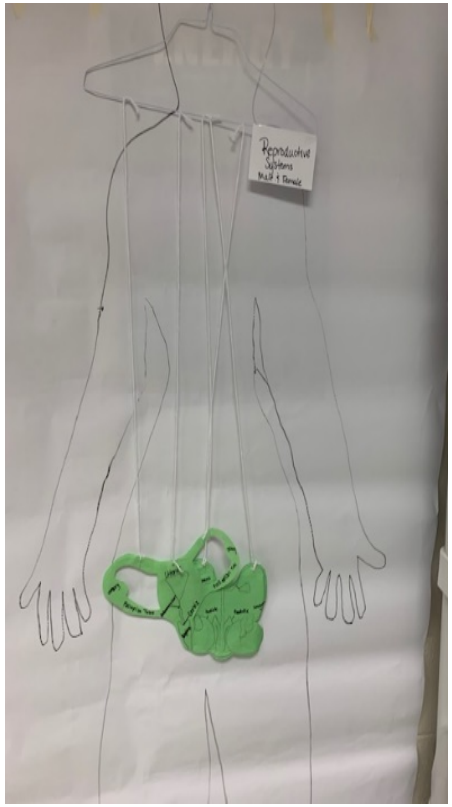
Life size template



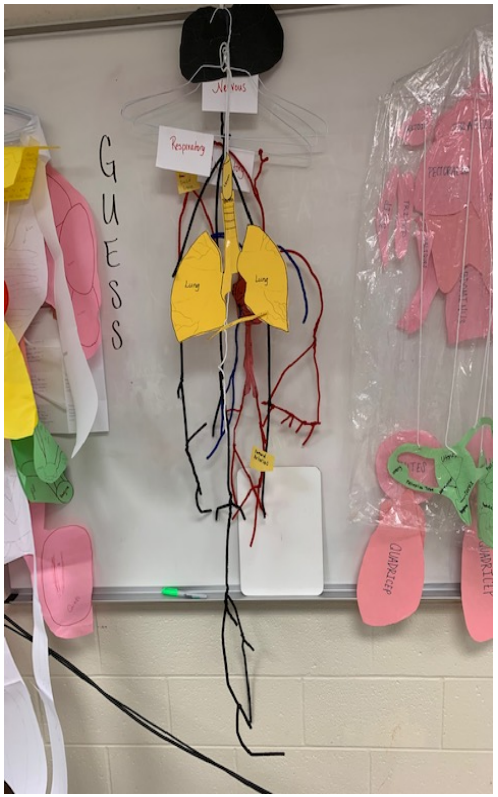
Hang(er) (Wo)Man

Measure to make sure organs are

at correct placement and size



Layer organ systems



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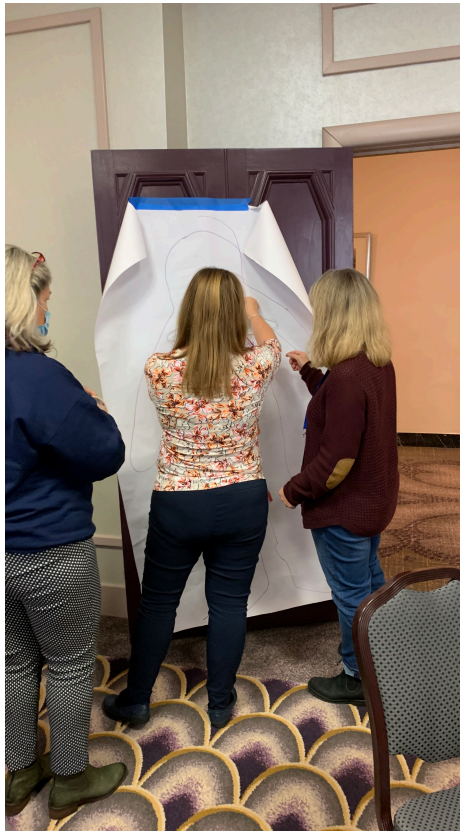
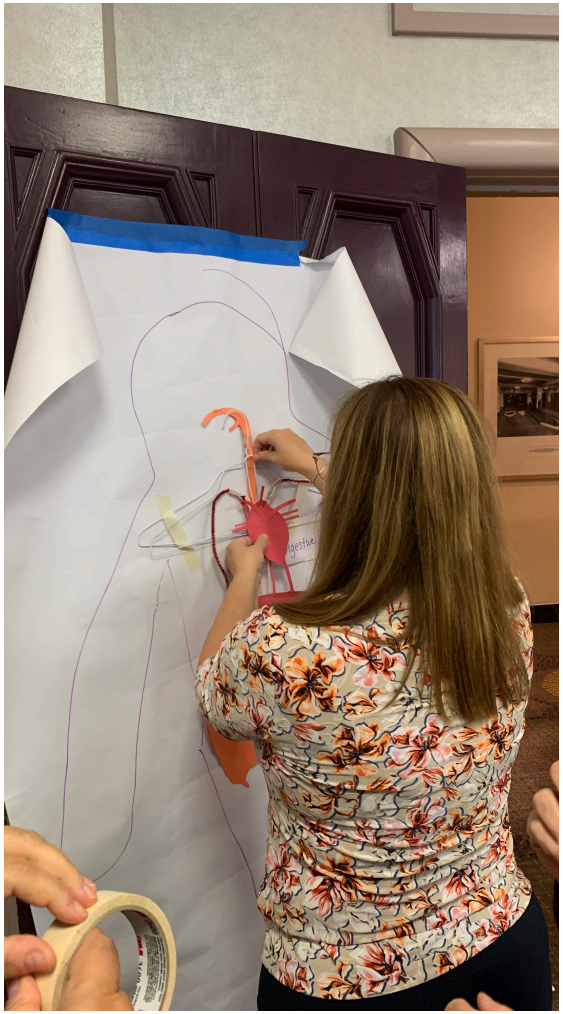
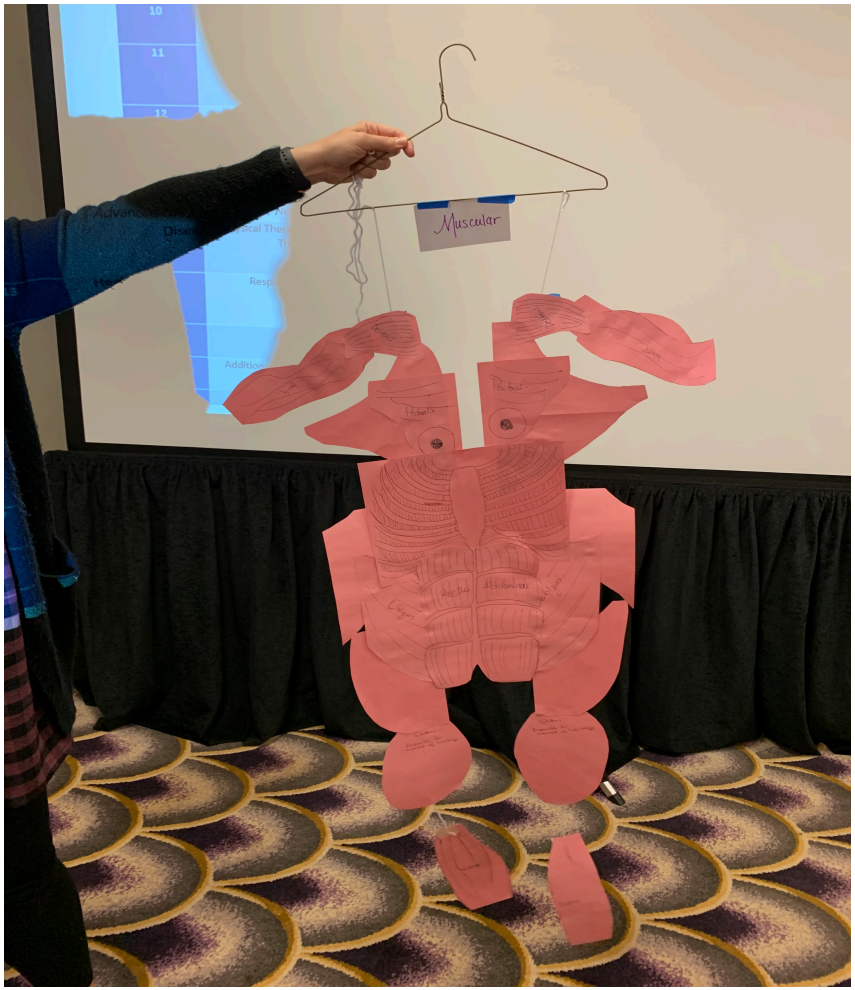


Hang(er) (Wo)Man Hang(er) (Wo)Man





Careers in Respiratory Therapy

Respiratory Therapists are specialized health professionals who help people who are ill from respiratory and heart diseases and disorders such as asthma, bronchitis, emphysema, and cystic fibrosis along with many other diseases and disorders

- **Duties**: Diagnosing lung and breathing disorders and determining the best therapy for a patient by doing physical exams and interviews, analyzing breath and blood specimens to determine the level of oxygen, handling ventilators and other mechanical airway devices for patients, and education of patients and family members

Careers in Respiratory Therapy Continued

- **Education**: a minimum of two years. This will include Respiratory therapy technicians (note: their salary is less that a respiratory therapist). They work under the supervision of respiratory therapists and give respiratory treatments, perform diagnostic tests, and inform the therapists of patient progress. At this point an associates degree is awarded. However, many employers favor a candidate who has a Bachelor's degree in the field, which takes about four years to complete. A Bachelor's or Master's degree may lead to more job opportunities. Before employment, the students will need to complete either an Associates degree in Respiratory Care of a Bachelor of Health Science in Respiratory Care, pass credentialing examinations, and obtain licensure in a particular state.

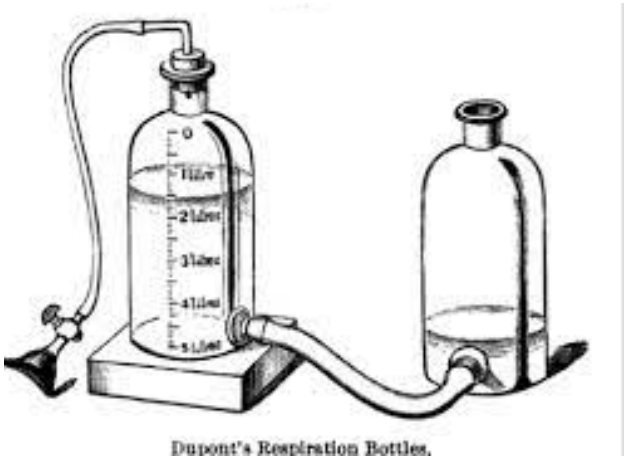
Careers in Respiratory Therapy Continued

Examples of different jobs for different degrees include an Associate's degree for a sleep study technician, a Bachelor's Degree for a Respiratory Therapist, and a Master's Degree for a Respiratory Therapist Educator

- **Salary:** The pay for a respiratory therapist was $62,810 per year in 2020, $54,750 for a respiratory therapy assistant
- **Job Outlook:** Employment of respiratory therapist is expected to grow 19% from 2019 to 2029 according to the Occupational Outlook Handbook. This is considered much faster than the average for all professions.

Spirometer

A medical spirometer can cost thousands of dollars. I am providing the instructions to make a "homemade spirometer". This will not be as pretty, have cool technology, and work seamlessly. However, in studying the basics of spirometry, this will serve its purpose.



Dupont's Respiration Bottles.

Spirometery

Spirometry measures:

- how much air that can be inhaled
- how much air that can be exhaled
- how fast air is exhaled from the lungs
- total lung capacity – the volume of air in the lungs upon the maximum effort of inhalation

Spirometery – Student Activity

Materials per student

1. 60 cm (or 2 feet) of vinyl tubing

For every group (about 4 students)

1. 1 gallon clear plastic jug (3.8L)
2. 250 ml measuring cup
3. Bucket (many household supplies will suffice)
4. Masking tape
5. Sharpie or permanent marker
6. Funnel
7. Food coloring (optional)
8. Sponge to clean up

Spirometery – Procedure

1. Put masking tape along the side of the jug from bottom to top

2. Take the measuring cup and while using the funnel to fill the jug with water, label the tape every 250ml levels of water as the jug is filled. Place a mark starting at 250 and continue upward until the jug is full. If you cannot see the water, add food coloring to be able to see the level. Place aside and note the amount of mls.

3. Add water to the tub to 10 cm or about 4 inches.

Spirometery – Procedure

4. Hold your hand over the opening of the jug filled with water and tip it upside down in the tub, not allowing any water to escape the jug. Remove your hand and remain holding the bottle upright so it does not tip.

5. Slip one end of the tubing into the mouth of the jug with the mouth of the jug underwater. This will take practice and has to be done carefully. It will extend to the end of the jug approximately.

6. Breathing normally, exhale once through tubing. Write down how much water is displaced from the jug. This measurement is tidal volume (air inhaled or exhaled during normal breathing.

Spirometery – Procedure Continued

7. Refill the jug of water and repeat steps 4 and 5. The next time exhale one normal breath through the tubing and continue to force as much air as possible out of the lungs. Write down this measurement. This is tidal volume+ residual volume. Remember, residual volume is the air forced out after normal exhalation.

8. Refill the jug of water. Take a deep breath (as hard as possible) and exhale as much air as possible through the tubing. Record this volume as forced vital capacity (maximum air exhaled during forced breathing).

9. Repeat steps for each member of the group. It is important that each student use their own tubing.

Spirometery – Procedure Continued

10. This exercise should be repeated three times to get appropriate consistency.

11. With the measurements noted, calculate residual volume and complemental air for each of the students in your group.

12. Use a data table like the one down below and show tidal air, residual volume, complemental air, and vital capacity for each group member.

13. Compare each group member and compare each of the groups. Are they close in numbers? If not, why do you think they are not? You might have to do a medical history on each student such as if they are smokers, athletes, have lung problems etc.

Spirometery – Procedure Continued

In order to get residual volume, one has to do #6 (Breathing normally, exhale once through tubing. Write down how much water is displaced from the jug. This measurement is tidal volume (air inhaled or exhaled during normal breathing) and measure. Then, the student does #7. (Refill the jug of water and repeat steps 4 and 5. The next time exhale one

Spirometery – Procedure Continued

normal breath through the tubing and continue to force as much air as possible out of the lungs. Write down this measurement. This is tidal volume+ residual volume. Remember, residual volume is the air forced out after normal exhalation). In order to get complemental air, the student has to add TV and RV and subtract from TVC or Forced Vital Capacity.

Spirometery – Procedure Continued

Data Table per group

Name				Normals ~
Tidal Volume				500 ml
RV				800-1110 ml
CA (IRV)				2100-3000ml
Forced Vital Capacity (TVC)				3000-5000ml

Tidal Volume – air inhaled or exhaled during normal breathing
Residual Volume – the amount of air remaining in a person's lungs after fully exhaling
Complemental air (IRV) – maximum amount of air inhaled during forced breathing
Forced Vital Capacity or TVC - volume of air in the lungs upon the upmost effort of inhaling and exhaling

Forced Vital Capacity Compared with Other Groups in the Class

	Group 1	Group 2	Group 3	Group 4	Group 5
FVC					

Total Lung Capacity – maximum amount of air your lungs can hold. About 6 L

Peak Flow/ Peak Flow Meter

A peak flow meter is a device used to measure how hard and fast air comes out of the lungs when exhalation is done forcefully. This measurement is called peak flow. It is used unfailingly if one has asthma or another respiratory disorder.

Peak Flow/ Peak Flow Meter

Directions: Obtain a peak flow meter. If you cannot get one in a medical supply place, Amazon, or EBay, ask an allergist or pediatrician.

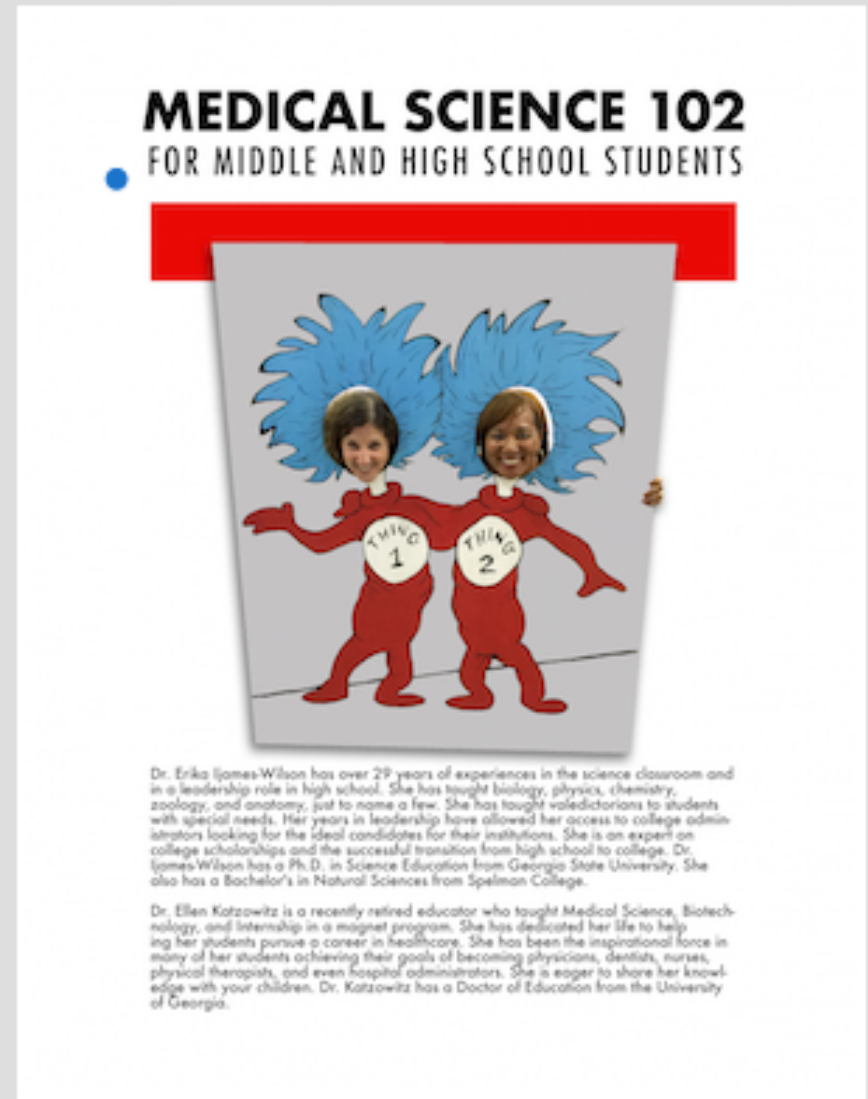
Fill out the chart. Perform peak flow and put measurements in chart. The student should be able to find their personal peak flow best

Peak Flow Readings

PF	Mon	Tue	Wed	Thu	Fri	Sat	Sun

Personal Best =

Social Media Information



YouTube Channel

- E2 Educational Experiences
- Facebook
- Teachers Pay Teachers (TpT)

E2 Educational Experiences Website

- Esquaredhomeschool.com

Thank You

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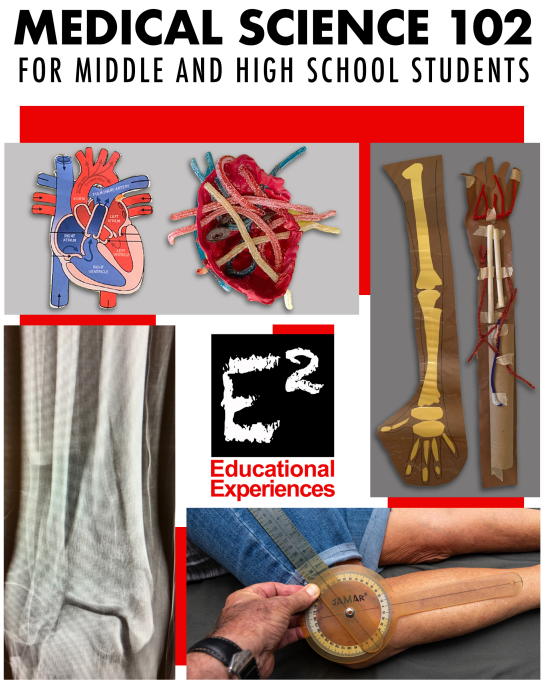
Medical Science 101 & 102 Books

Dr. Erika Ijames and Dr. Ellen Katzowitz



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Fun Facts

What is the difference between boogers, snot and sputum?

Sputum is commonly known as phlegm or loogies. Sputum is a combination of mucus and saliva that is coughed up when a germ has invaded our body. Sputum is the body's attempt to contain the germ and expel it from our bodies.

This sputum is often examined and analyzed to aid in medical diagnosis. The color, thickness, and amount provide clues to the pathogen that has entered your body and how to treat it. Yellow or green sputum may signal a viral infection like influenza or the common cold. If there is blood in the sputum, it can indicate inflammation and can result from pressure when coughing. Black or brown sputum is usually an indicator that the person smokes or has inhaled excessive smoke.

Fun Facts

What are boogers?

Mucus is the sticky, slimy substance produced by the mucosal membrane and glands that line and protect the entire respiratory system. The moist mucus acts as a lubricant but also captures the particulates and collect them into clumps.

Ironically, the boogers are only found in the nose. Often the particulates and slimy mucus are captured and taken to the stomach.