

Science Strand 4: Changes in the ecosystems and interactions of organisms with their environment.

CLE: 4.2 Matter and energy flow through the ecosystem

Health Profession: Paramedic

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Reference(s)

Principles of Biology, Biotic components of an ecosystem. Retrieved on January 24, 2008, from <http://www.arnica.csustan.edu/Biol1010/index.htm>

Potter-Perry (2005). Fundamentals of Nursing. St. Louis: Mosby

Objectives:

At the completion of this presentation the high school student will be able to:

- 1. Explain how nitrogen, oxygen and carbon are recycled through the ecosystem.**
- 2. Students will demonstrate the importance of the recycling of oxygen and carbon dioxide in the body through an experiment.**
- 3. Identify the importance of this information related to Paramedics.**

Background Summary of Information as Related to Paramedics and CLE:

The atmosphere is where the carbon cycle occurs. Photosynthesis removes CO₂ from the atmosphere then respiration and combustion add CO₂ back into the atmosphere.

Nitrogen is about 78% of the atmosphere, yet it is a limiting factor for agricultural productivity it quickly depletes the soil so it is constantly being added back in fertilizers. Without the constant recycling of oxygen, nitrogen, carbon and other elements in the ecosystem, life on earth would not be possible.

As with the ecosystem our bodies must maintain a balance (homeostasis) or recycling of elements in order to survive much like the ecosystem. Our bodies must have enough energy by converting food like carbohydrates into energy. Without this energy we would not have the strength to breathe and be able to convert CO₂ and O₂ when we take a deep breath. If we couldn't do that our brains would not get the O₂ that it needed to function. Also when our bodies have an invasion of either a bacterial or viral infection in our respiratory tract like bronchitis, this also effects how the well the body is able to oxygenate the blood and body by inhaling and exhaling (breathing in and out).

When we inhale we are breathing in Oxygen from the environment in order to reach the cells in our bodies, when we exhale we are expelling CO₂ or Carbon Dioxide from our cells and bodies. If we were unable to convert these two gasses internally our bodies would not be able to maintain the balance.

Paramedics can be and many times are the life-line between patients and hospitals. They are able to assess at a moments notice what a patient needs and get it for them. They are aware that the earth needs oxygen, nitrogen and carbon for the earth to survive. Without the recycling of these gasses on earth, we would not have oxygen for us to breath and recycle with carbon dioxide in our bodies.

Scenario:

John, a 17 year old young man has been smoking for about a year now. John also has not been feeling well and just left the doctor's office with a diagnosis of Bronchitis. Ignoring his doctors' orders he goes home and doesn't stop to fill his prescription at the pharmacy. After a couple of hours and a few good "coughs" he thinks he is feeling better and is really craving a cigarette. Again ignoring what that the doctor told him not to smoke especially while his body is fighting the bronchitis, decides to have a cigarette anyway. Halfway through his cigarette his chest starts feeling really tight and he is having difficulty breathing. Just then his mother comes home from work and finds him wheezing and unable to catch his breath; in a panic she calls 911. Upon arrival the Paramedics have to assess the patient and determine a treatment plan within seconds! John looks very pale and uncomfortable; he is leaning over a chair and says that was making him feel "a little better." The paramedics decide to start him on some Oxygen.....

--What would be a good indication to the paramedic that he needed the oxygen?

Answer- The paramedics start him on Oxygen because John said he was having a hard time catching his breath, he is pale, he is positioning himself over a chair for comfort which to the paramedic means that he is trying to expand his airway better when he breathes and they can hear his wheeze which means that his airway is so tight that when they air is trying to get through that it is whistling.

--What other information does the paramedic need?

Answer- The paramedics will need to know that he went to the doctor and has a diagnosis of bronchitis, that he smokes and how many cigarettes per day. And they will if they haven't already get the rest of his Vital Signs like his Heart Rate (Pulse), his Temperature, his Respiratory Rate (a count of how many times he takes a breathe in 1 minute) and his Pulse oximetry which will tell them the amount of oxygen saturated blood that is throughout his body.

--What caused the patient to be pale?

The harder it was for John to breathe, the less effective his breathing was. Therefore, he was not saturating his blood with the oxygen that the blood needs making him pale in color.

Activities

Have students that would like to participate (approximately 5-10 students) come to the front of the room.

Under supervision each student will breathe out of a regular size straw through their mouth only demonstrating a slight constriction of airway caused by bronchitis at the early stage. Have student jog in place for about 30 seconds and then have them breathe out of a regular sized straw in order to demonstrate the effects of bronchitis after a couple of days. Then have students jog again for 15-30 seconds and then breathe through the smaller straw to demonstrate Bronchitis and smoking on the bronchioles and breathing, thus effecting the changing of CO₂ and O₂ and depleting the brain of the oxygen that it needs. At each stage have the student rate the difficulty of breathing to the other students using a 0-10 scale. Have the student put into words/describe what it felt like and ask them if they would be able to stay calm and concentrate on their breathing or if they thought they would panic.

Supplies needed

Regular sized drinking straws: enough for each volunteer to have one

Stir stick sized straws: enough for each volunteer to have one

Note to Instructor:

Please do not allow a student to participate in this activity if they have Asthma or have recently had any Upper Respiratory infections like Bronchitis, or have recently been ill. This activity could cause dizziness or a student to pass out if done incorrectly or done by a student who has asthma or is already ill.

Several community colleges and vocational-technical schools also offer training for EMS careers:

- Cass Career Center, 816-380-3253 ext. 221
- [Central Jackson County Fire Protection District](#), 816-229-2522
- Excelsior Springs Career Center, 816-630-9240
- [Johnson County Community College](#), 913-469-8500 ext. 3419
- [Kansas City Kansas Community College](#), 913-334-1100
- [MAST](#), 816-300-8802
- Northland Career Center, 816-858-5505
- [Penn Valley Community College](#), 816-759-4000
- [Raytown Emergency Medical Services](#), 816-737-6030 or emsedu@raytown.mo.us

Or if you go to <http://www.marc.org/emsjobs/training.htm> you can directly click on those links from above for more information.