

## **Partnering with a CTE Program to Use Technology to Study Healthy Lungs**

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### **Activity Introduction**

In many instances, technology is only associated with communications, transportation, construction, or manufacturing. Medical technologies are often overlooked in the public school technology classroom. In this activity, students will learn about how to use a technological product (Stethoscope) with the help of faculty and students from their district's Career and Technical Education (CTE) health sciences program or another nearby district's program. They will learn how this technological product is used to extend human potential to listen to the human lungs. Specifically, students will listen to how the lungs sound using a stethoscope. Using Internet technology, students will research how to maintain healthy lungs through lifestyle choices. Students will also research the impacts that some technological systems can have on human lungs (i.e. transportation systems that produce pollution, power plants that produce pollution, etc.). Students will use English / language arts skills and word processing technology to write a report about how to maintain healthy lungs and about the technological systems that can have an impact on the human lungs.

### **Review of Literature**

Raaschou, Anderson, Hvidberg, Jensen, Ketznel, Sorensen, Loft, Overvad, & Tjonneland (2011) conducted a study titled "Lung Cancer Incidence and Long-Term Exposure to Air Pollution from Traffic". This study used participants from the Danish Diet, Cancer and Health cohort study which was conducted between 1993-1997 using 57,053 men and women between the age of 50 to 64 living in Copenhagen and Aarhus. The researchers checked these study participants for cancer occurrence until June 27, 2006. There were 241 cases diagnosed with lung cancer in the original study by February 16, 2001. By June 27, 2006, an additional 351 lung cancer cases were diagnosed. The study showed an association between lung cancer and residential address in proximity to traffic (Raaschou et al., 2011, p. 865).

The effects of air pollution on health are numerous. Bernstein et al. (2004) conducted a meta-analysis on research discussing the effects of both short and long term effects of pollution on health conditions. Increases exposure to ozone gases is associated with

increases risk of asthma development. In addition, living in close proximity of high-traffic load can increase the risk of asthma related hospitalization. The presences of sulfur dioxide and nitrogen dioxide decreases lung function for both healthy and asthmatic adult subjects within two minutes of exposure. Further meta-analysis by Laumbach and Kipen (2012) demonstrated the effect of traffic pollution and biomass (e.g. wood burning) exposure in developed and not so developed countries. Exposure to both kinds of air pollutants is linked with an increase of various respiratory and cardiovascular conditions such as COPD, childhood and adult asthma, respiratory tract infection, and tuberculosis. It is important to assess the health of lungs, especially those who live near high traffic roads.

Lifestyle choices may also influence healthy lungs. Not smoking and exercising regularly may be common lifestyle choices that can be applied. Dietary intake may also be a lifestyle choice worth considering. Interestingly, Raaschou et al. (2011), referenced the World Cancer Research Fund and the American Institute for Cancer Research conclusions in 2007 as indicating that “fruits probably protect against lung cancer” (p. 865).

A technological device called a stethoscope can be used to listen to the human lungs. The stethoscope was first discovered by Theophile Rene Hyacinthe Laennec (1781-1826). Laennec's inspiration came when he wanted to listen to heart sounds in a young woman. He rolled up a paper notebook making it into a tight roll and much to his surprise; he was able to hear heart beats better than had ever before. The very first stethoscope was made from wood, either cedar, or ebony manufactured by Laennec, himself (Luderitz, 2009). Wooden stethoscopes were used for many years until rubber tubing was developed (Roguin, 2006). Modern stethoscopes consists of three parts, a bell shaped device with a diaphragm on one side that connects to a single rubber tubing that divides and connects to the ear pieces. Both the tubing and metal headset are hollow. Sounds travel through the hollow tubing and headset where they reach the ears through tight-fitting earpieces (Schunk, N.D.).

Listening to body sounds through the stethoscope is called auscultation. Based on the Latin verb auscultare means “to listen,” auscultation is performed when an examiner is listening to assess heart and lung sounds. Auscultation is a listening skill that improves with clinical experience and is as good as the quality of the stethoscope itself. A doctor or a nurse can listen to heart sounds and lung sounds, as well as additional sounds the body makes with the stethoscope (Ferns, 2007). Listening with a stethoscope can provide important life-saving information. The heart and lungs work closely together to provide oxygen to human bodies. When humans breathe, lungs take in oxygen which is a gas. When a human exhales, the body has already removed waste products and toxins (Antinoro, 2005).

There is a simple thing people can do to help keep the lungs healthy. Daily exercise and a healthy diet can defend against both heart and lung disease. The important link here is that the exercise should be exerting enough energy to raise the heart rate. The World

Health Organization (2011) recommends physical activities that may include playing, games, sports and recreation, in addition to planned activities such as community activities.

### Materials for Activity

- Stethoscopes
- Alcohol wipes
- Computer with Internet access
- Web browser
- Word processing software
- Printer

### Activity Learning Objectives

1. After learning about how to use a stethoscope, the student will listen to a classmate's lungs to ascertain how these human organs sound.
2. After listening to how the lungs sound, the student will use Internet technology to research how to maintain healthy lungs through lifestyle choices and to research about the impacts that some technological systems can have on human lungs.
3. Upon completing Internet research on maintaining healthy lungs through lifestyle choices and the impacts that some technological systems can have on human lungs, the student will use English / language arts skills and word processing technology to write a report to summarize the findings.

### Activity Procedure:

1. With the help of faculty and students from their district's CTE health sciences program or another nearby district's program, the instructor will explain to the students that a stethoscope is a technological device that is used to extend human potential to listen to the human lungs. **See Figure 1.**

**Figure 1**



2. The instructor will request that each student team up with a classmate. Each student team will be provided with a stethoscope.
3. The student team will clean the stethoscope prior to use by using alcohol wipes to clean the ear pieces and the flat side of the stethoscope (also called the diaphragm). See **Figure 2**.

**Figure 2**



4. After the stethoscope is clean and dry, one student team member will rotate both chest pieces of the stethoscope in a forward position. See **Figure 3**.

**Figure 3**



5. The ear pieces will be placed in the ears so that they feel slightly snug. **See Figure 4.**

**Figure 4**



6. The flat side of the stethoscope (also called the diaphragm) will be placed over the anterior wall of the chest.
7. The diaphragm should be auscultated from side-to-side, and top-to-bottom. Compare the sounds from one side with the other. The sounds being omitted will be air flowing in and out, or the different sounds the lungs can make if an individual is sick or if the lungs or airways are obstructed. It is also possible to hear the heart beating. **See Figure 5.**

**Figure 5**



8. Students will write a description of the sounds that are heard during the experience.

9. The instructor will discuss with the students about how lifestyle choices can have an impact on the human lungs.
10. The instructor will discuss with the students about how technological systems (i.e. transportation systems that produce pollution, power plants that produce pollution, etc.) can have an impact on the human lungs.
11. The student will use a computer with Internet access to research information about how to maintain healthy lungs through lifestyle choices.
12. The student will use a computer with Internet access to research information about how technological systems can have an impact on the human lungs. **See Figure 6.**

**Figure 6**



13. The student will use English / language arts skills and word processing technology to write a report summarizing the findings of the Internet research.
14. The finished word processed report should be printed and submitted to the instructor for evaluation.

**Activity is in Alignment with ITEEA Standards for Technological Literacy Content Standards (ITEEA, 2011):**

**The Nature of Technology**

Standard 3. Students will develop an understanding of the relationships among technologies and the connection between technology and other fields of study.

**Technology and Society**

Standard 5. Students will develop an understanding of the effects of technology on the environment.

**Abilities of a Technological World**

Standard 12. Students will develop abilities to use and maintain technological products and systems.

### The Designed World

Standard 14. Students will develop an understanding of and select and use medical technologies.

Standard 17. Students will develop an understanding of and select and use information and communication technologies.

### References

- Antinoro, L. (2005). Breathe Easy: Adopt a lifestyle that supports healthy lungs. *Environmental Nutrition*, 28(5), 3-4.
- Bernstein, J. A., Alexis, N., Barnes, C., Bernstein, I. L., Nel, A., Peden, D., ... & Williams, P. B. (2004). Health effects of air pollution. *Journal of Allergy and Clinical Immunology*, 114(5), 1116-1123. doi: <http://dx.doi.org/10.1016/j.jaci.2004.08.030>
- Ferns, T. (2007). Respiratory auscultation: How to use a stethoscope. *Nursing Times*, 103(24) 28-29.
- ITEEA. (2011) Listing of STL content standards. Retrieved from: [www.iteea.org/TAA/PDFs/ListingofSTLContentStandards.pdf](http://www.iteea.org/TAA/PDFs/ListingofSTLContentStandards.pdf)
- Laumbach, R. J., & Kipen, H. M. (2012). Respiratory health effects of air pollution: Update on biomass smoke and traffic pollution. *Journal of Allergy and Clinical Immunology*, 129(1), 3-11. doi:<http://dx.doi.org/10.1016/j.jaci.2011.11.021>
- Luderitz, B. (2009). The discovery of the stethoscope by T.R.H. Laennec (1781-1826). *Journal of Interventional Cardiac Electrophysiology*, (26) 151-154. doi 10.1007/s10840-009-9407-6
- Raaschou-Nielsen, O., Anderson, Z. J., Hvidberg, M., Jensen, S. S., Ketzel, M., Sorensen, M., Loft, S., Overvad, K., & Tjonneland, A. (2011). Lung cancer incidence and long-term exposure to air pollution from traffic. *Environmental Health Perspectives*, 119(6) 860-865.
- Roguin, A. (2006). Rene Theophile Hyacinthe Laennec (1781-1826): The man behind the stethoscope. *Clinical Medicine & Research*, 4(3) 230-235.
- Schunk, K. (N.D.). What is a stethoscope and how does a stethoscope work? *Acoustic Heart*  
Retrieved from <http://acousticheart.com>
- World Health Organization (2011). Global Recommendations on physical activity for health. Retrieved from <http://www.who.int/dietphysicalactivity/physical-activity-recommendations-18-64years.pdf>