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## Lesson Plan

### Stage 1 Identify Desired Results

**Catchy Title:** Every Breath You Take

**Theme/Topic of Lesson:** Investigating Breathing

**Time Commitment:** One 90-Minute Periods/Blocks

**Subject Area(s):**

Mathematics

Science

**Grade Level(s):** 6,7,8

**Standards Alignment:**

**Class Challenge Question:** How, what and why do we breathe?

**Overview:**

In this lesson, students will explore the nature of the air we breathe by observing petri dishes that have accumulated particulate matter from the atmosphere. They will use their observations to make mathematical calculations and inferences about the effect of this matter on breathing. Students will also watch a streaming Internet video about the respiratory system that will aid the students in answering the daily challenge question. This interdisciplinary lesson combines the science of the respiratory system with the mathematics of sampling. Prerequisite skills for teachers include how to use a computer with a projection device and Internet access and how to use Inspiration software.

#### Stage 1

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### Stage 2 Determine Acceptable Evidence

<b>Knowledge of Number Relationships and Computation</b> (6-8)	<b>Maryland Content Standards</b> Students will describe, represent, and apply numbers and their relationships and will estimate and compute using mental strategies and paper/pencil.	<b>Maryland State Indicators</b> <b>6.8.7</b> <i>a. select and apply strategies and mathematical properties to solve problems with rational numbers</i> <ul style="list-style-type: none"> <li>● use <b>estimation</b> to solve problems with rational numbers (MLO 4.4.)</li> <li>● <i>estimate powers and square roots to solve problems</i></li> <li>● <i>estimate the value of radicals and numbers expressed with exponents to solve problems</i></li> </ul> <i>b. apply ratios, proportions, and percents to solve problems</i> (MLO 4.5.) <ul style="list-style-type: none"> <li>● <i>determine equivalent ratios, decimals, and percents</i></li> <li>● <i>determine ratios, rates, unit rates in the context of a problem</i></li> <li>● <i>apply the concepts of ratios, rates, and percents to real-world problems including rate of increase/decrease, discount, commission, sales tax, simple interest</i></li> </ul>
<b>Life Science</b> (6-8)	<b>Maryland Content Standards</b> Students will use scientific skills and processes to explain the dynamic nature of living things, their interactions, and the results from the interactions that occur over time.	<b>Maryland State Indicators</b> <b>3.8.8</b> explain that food, water, and air provides molecules that serve as building materials and supply energy for all organisms. (MLO 3.5.)
<b>Skills and Processes</b> (6-8)	<b>Maryland Content Standards</b> Students will explain how the nature of science has affected scientific inquiry, technology, and the	<b>Maryland State Indicators</b> <b>1.8.3</b> use observations, research, and select appropriate

	history of science.	scientific information to form <b>predictions and hypotheses.</b> (MLO 1.1.3.)
Technology productivity tools (Gr. 6-8)	<p>ISTE Technology Standards</p> <p>3. Technology productivity tools</p> <ul style="list-style-type: none"> <li>Students use technology tools to enhance learning, increase productivity, and promote creativity.</li> <li>Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.</li> </ul>	<p>ISTE Technology Performance Indicators</p> <p>Apply productivity/multim</p> <p>Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum.</p>

### Learning Objectives:

#### The Students will:

- Identify the components of air.
- Estimate by sampling.
- Compute averages.
- Explain how, why and what we breathe.

### Assessment

The content and technology integration of this lesson will be assessed using the Respiration Concept Map Scoring Rubric.

## Stage 3 Plan Learning Experiences

### Resources

Other Technology	Computer connected to a projection device Computer connected to a projection device Computers with Inspiration software installed Overhead Projector
Software	Inspiration software <a href="http://www.inspiration.com">http://www.inspiration.com</a>
Internet Sites	Brain Pop An online educational video site. Select the movie called Respiratory System for the first activity. <a href="http://www.brainpop.com">http://www.brainpop.com</a>

### Materials

#### Per class

- Internet-connected computer connected to a projection device

#### Per student team/group of 4

- Computer with Inspiration software installed
- Microscope
- Petri dishes with grid, coated with a thin layer of petroleum jelly
- Respiration Concept Map Scoring Rubric

#### Per Student

- calculator (optional)

- Breathing Particles handout
- What's in the Dish? handout

#### Not Specified

- Breathing Particles ([View](#))
- What's In the Dish ([View](#))
- Respiration Concept Map Scoring ([View](#))
- Focus for Media Interaction Cards ([View](#))

#### Vocabulary

- **Alveoli** - air cells in the lungs
- **Cilia** - small hairlike projections throughout the nasal passages and upper respiratory tract that capture particulate matter
- **Lung** - one of a pair of saclike organs that constitute the basic respiratory organ of air-breathing vertebrates
- **Particulate Matter** - minute separate particles suspended in the air

#### Procedures

This lesson includes a variety of instructional strategies. Technology is integrated into the lesson. The class will watch a streaming Internet video as well as create a concept map using Inspiration software. Individuals will be responsible for recording specific data and observations after looking at particulate matter through the microscope.

All activities are structured to accommodate different learning styles and abilities. Modifications can be implemented throughout this lesson to provide for the success of all students. Heterogeneous groups are a good way to provide support for lower performing students. Also, the use of graphic organizers and allowing extended time will assist those students with disabilities. Specifically, the streaming Internet video can be replayed for students or groups who need to see and hear the information again.

In order to complete this lesson, an Internet-connected classroom computer and a projection device is needed. For the first activity, it is necessary for each group of four students to have access to a computer with Inspiration software.

#### Day 1: Every Breath You Take/Investigating Respiration

**Daily Challenge Question:** How, what and why do we breathe?

1 Day

##### Set-up Directions:

At least a week before starting today's lesson, the teacher needs to place petri dishes coated with a thin layer of petroleum jelly at appropriate outdoor sites. The petri dishes will collect particulate matter that will be studied during the lesson. The teacher needs to gather enough microscopes for each team of four to have one. The teacher should also make copies of Breathing Particles handout and What's In the Dish handout for each student. Copies of the Respiration Concept Map Scoring Rubric should be made for each group. The teacher should also copy and cut out the Focus for Media Interaction cards for each group. Students should be organized into heterogeneous groups of four students. The teacher should also set up the computer and projection device and bookmark the Brain Pop site: [www.brainpop.com](http://www.brainpop.com). The teacher should download the Respiratory System video before the students arrive, as it can be slow downloading depending on the speed of your internet connection.

##### Teacher Presentation & Motivation:

The teacher should begin the lesson by saying, "We breathe to bring oxygen into our bodies. What else, other than oxygen, is in the air that we breathe? Oftentimes, we equate air with oxygen when really what we breathe is a combination of gases and particulate matter with oxygen making up about 21 percent of the gases. By completing today's activities, you will be able to answer today's daily challenge question. The Daily Challenge Question is How, What and Why do we breathe??"

Be sure that the daily challenge is written prominently on the chalkboard.

##### Activity 1 - Respiratory System Video (25 minutes)

In this activity, students will watch a short video on the respiratory system and then create a concept map using Inspiration software. Each group will be given a different focus for media interaction. Pass out a Focus for Media Interaction card to each group.

##### Focus for Media Interaction

**Focus for Media Interaction:** The focus for media interaction is a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

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##### Viewing Activities

What will your students be responsible for while viewing this piece of multi-media or video?

Before playing the video, make sure each student group knows their specific focus for media interaction. Say to the students, "I am going to play the video one time and I just want you to listen. Pay close attention to the information that relates to your specific group question. Then I will play the video again so you can take notes that will help you to create a concept map that answers your assigned question."

Push Play.

Push Pause after you hear, "an invisible gas called oxygen." Ask the students, "What is the body able to store?" and "What isn't the body able to store?" Call on students to answer these questions.

Push Play.

Push Pause after you hear, "they send carbon dioxide out." Ask the students, "How do we breathe?" Call on students to share information about how our lungs work physically.

Push Play.

Push Pause after Moby the robot blows up a balloon and lets it go flying through the air. Ask the students, "Why do you think Moby blows up the balloon and lets it fly through the air?" Have students share their ideas.

Push Play and show the rest of the video.

Play the video one more time all the way through.

### Post Viewing Activities

How will students utilize the information they gathered while viewing the multi-media or video?

After gaining information about the respiratory system, students will work in teams to prepare a team concept map answering the specific question that they were assigned. Each group should receive a copy of the Respiration Concept Map Scoring Rubric. Allow the students fifteen minutes to complete the team concept map.

### Activity 2 - Petri Dish Observations (30 minutes)

In this activity, student groups will make observations of particulate matter collected in the petri dishes by observing particles under a microscope. Distribute the What's in the Dish? handout to each student. Petri dishes should be set on a clear grid transparency (1 cm. Squares) under the microscope or you can use the petri dishes that already have grids on the bottom. Instruct each student in turn to study the particles they see in one square. Each student in the group should observe a different area of the dish. They should record their data and observations for four different squares, listing the number of particles found in each square according to size (small, medium, large) and providing a brief description of the material they observe. Encourage students to attempt to identify what they see whenever possible, e.g., hair, insect piece, leaf piece, etc. Ask students to determine the area (or approximate area, if students are not familiar with finding the area of a circle) of the petri dish surface in square centimeters. Within their groups, students should tally totals and find the average number of smallest, medium, and largest particles. This is the average number of each size particle found per square centimeter. Using those figures, students should estimate the amount of each size particle found in the petri dish by multiplying the average for each square by the area of the dish.

### Activity 3 - Breathing Particles Experiment (15 minutes)

Ask students to think about what it means to say "catch your breath." Ask them what they are "catching" when they breathe, and what is happening when they are having trouble "catching their breath." Also, ask students whether they think it is better to breathe through their nose or their mouth. Take a tally of the students who think it is better to breathe through their nose versus those who think it is better to breathe through your mouth. Pass out the Breathing Particles handout and have students follow the directions. After the students have completed the brief writing on the back, ask students if they would like to change their vote. Have students share their ideas as to why they think the nose or the mouth is better to breathe through. The teacher will say, "When we breathe, much of the particulate matter is captured by the cilia, small hair like structures, lining the nose and bronchial passages. The nasal passages twist and turn, forcing the air from each breath to travel through more area of cilia than when we breathe through our mouth. The moisture and mucus capture what the cilia do not capture. One reason for breathing through the nose is that the air is more effectively filtered by the time it gets to the lungs. Smoking, especially cigarettes, overwhelms and destroys the cilia lining the nasal and bronchial passages, which is one reason smokers develop "smokers' cough" - their bodies are trying other ways to rid themselves of the grit and grime from the air."

### Wrap Up:

After completing activities two and three, the students may have additional information that they would like to include on their Team Concept Maps. Give the students 10 minutes to add any new information to the concept map. Have the groups present their concepts using a projection device or by printing the concept map out onto a transparency.

### Enrichment Options

**Community Connection**

Invite a doctor to speak to your class about respiratory health and health problems.

**Cross-Curricular Extensions****Mathematics**

The students can brainstorm other times that sampling would be used rather than counting every individual item. For example, scientists use sampling to find out the crab population of the bay.

**Science**

Students can extend their observations of particulate matter in the atmosphere by comparing different indoor environments, or comparing indoor and outdoor environments by placing petri dishes with petroleum jelly in different locations for a specified amount of time. Students could also study particulate matter suspended in the air for longer periods by hanging the petri dishes in different locations to capture what is floating.

**Health**

Students could study the effects of "red alert" days on the breathing of people who suffer from asthma.

**Physical Education**

Students can experience different types of breathing through the practice of yoga.

**Stage 4****Teacher Reflection**

As a reflective practitioner, note how this lesson could be adjusted after its initial implementation. How successful were the students? What did the assessment demonstrate about the students' learning? What skills do the students need to revisit? What instructional strategies worked and what made them successful? What will you change the next time you use this lesson? Why?

**Author:** Sheryl Barr and Bob Keddell

**Modified by:** Felicity Ross

**Program:** EnviroHealthLink