

“Being Me” SEPA

Asthma Unit

Lessons 1-5



Lesson 1: What Do My Lungs Look Like?

Focus: Anatomy of the Lungs

Objectives: Students will be able to:

1. identify and locate the lungs in the human body;
2. locate the lobes in the left and right lung;
3. identify the trachea and see how it splits into the bronchi, which in turn branches into the bronchioles; and
4. explain that lungs expand and contract when you inhale and exhale.

Materials List:

- Investigator's Notebooks
- Pig lungs with inflation device
- Pig lung slices on trays
- Mouse lung cell slides
- Disposable gloves
- Paper plates
- Magnifying glasses
- Sponges
- Small bowls with water
- Index cards with sponge experiment questions
- Wentzscope

Teacher Preparation:

- Pass out Investigator's Notebooks.
- Set up the pig lung with the inflation device (See Appendix for Instruction).
- Set up Wentzscope with mouse lung cell slides for student viewing
- Prepare the pig lung slice for the students to explore with magnifying glasses.
- Set up the station with sponges, a bowl of water, and index cards with questions.

Homework Suggestions

The Sounds You Make

The amount of air you blow out from your lungs determines how loud a sound will be, and how long you can make the sound.

- Have the students go outside and try shouting and see what happens. Shouting uses lots of air, so they'll need to breathe in more frequently than if they were speaking normally. They can also try giggling and laughing to see how much air is expelled. Each student should then write 3-4 sentences comparing how much air they expelled when they performed each action.

How Much Air Can You Blow?

Testing each student's lung capacity by blowing up a balloon is similar to an asthmatic using a Flow meter. During exercise, the body's need for oxygen increases dramatically and ventilation rate is increased. The depth of breathing also increases during exercise.

- Give each student two identical balloons to take home. Instruct each student to blow up a balloon as big as they can with only ONE breath, tie it off, and then measure how big around the balloon is with a tape measure, and write down the number. Do the same activity with the second balloon AFTER marching in place for 3 minutes. Finally, have the students write 2-3 sentences describing how exercise affected the amount of air in the balloon.

Vocabulary: breathing, contract, exhale, expand, inhale, lung, respiratory system, lobes, trachea, bronchi, bronchioles.

Procedures

Teacher Led Activity: Introduce the concept of breathing through these inquiry questions:

- What do you know about breathing?
- Why is breathing important?
- Do all animals breathe the same way? (all animals breathe, some like frogs and earthworms can breathe through their skin).
- What do your lungs do?

Student Group Activity: Observing the pig lungs

- Divide the class into groups of 3-4 students.
- Present the pig lung to the class without telling them what it is. Explain that they will have a chance to examine this and figure out what it is.
- Remind the students that they will be recording what they observe and experience with the pig lung in their Investigator's Notebooks.
- Each group will then take turns examining the lung. The teacher guides the lesson with the following inquiry questions.
- The students then return to their seats and record their observations about the pig lung in their Investigator's Notebooks.

Teacher Questions to Lead the Inquiry Lesson of the Pig Lung:

- What are these? What are they used for?
- What do they feel like? Spongy? What does a sponge have? (lots of holes and air)
- Where are the lungs found in your body? (ask students to show you where)
- What is the tube thing sticking out of the top? (label the trachea) What's it for? (to bring air down into the lungs)
- Do you think the tubes go further down and get smaller and smaller?
- What happens to the lungs when you step on the pump? (they expand) what do they expand with? (air)

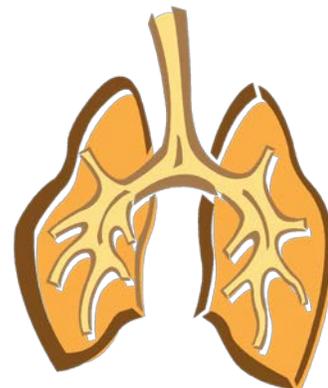
A Common Misconception about the Lungs

The lungs are hollow and fill up with air like a balloon.

It is a misconception that the lungs are hollow, like balloons. In fact, our lungs are more like sponges. When we inhale, we draw air into the little pockets of space and the fibrous tissue absorbs the air through very fine hairs, much like the roots of a flower.

Asthma Facts

- If you have 30 children in a class, you may have at least 3 children with asthma.
- Did you know that up to 20% of elite athletes (including Olympians) have asthma?



- Are the lungs just one big piece or are they divided? (two halves, label the left and right)
- Why is the right side of the lung bigger than the left? Be sure the students include the heart in their drawings of the lungs (the heart is on the left and takes up space.)
- What happens to the lungs when you step on the pump? (they expand) what do they expand with? (air)
- Take a deep breath and exhale. What is happening inside your lungs now?

Student Activity: Sponge experiment

After examining the pig lung and recording their observations in their Investigator Notebooks, have the students go to the station with the sponges and water. The students will then perform the experiment, and record their observations in their Investigator's Notebooks. Students can create a simple comparison chart to record the results of the experiment.

Sponge	Pig Lung
Has holes	Can't see any holes
When dry: hard and scratchy	Soft, smooth, squishy, feels wet
Wet: squishy, soft	Soft, smooth, squishy, feels wet
Expands when wet-fills with water	Expands when filled with air

Index Card Questions:

- Look at the sponge carefully. What do you see? (it's full of holes)
- Ask each group to feel the dry sponge. Does it feel like the pig lung? (no, too hard and scratchy. Pig lung is smooth and spongy).
- Could the dry sponge absorb much water? (no, needs to be damp)
- Wet the sponge. What happens? (it expands *and feels softer*)
- How is the sponge like the pig lungs? How is it different?

Annotated Children's Bibliography

How to Deal with Asthma (Kids' Health) by Lynette Robbins
Grades 2+

This book explains what happens to the body during an asthma attack, and offers suggestions on how children can live a healthy life with asthma.

Abby's Asthma and the Big Race by Theresa Golding and Margeauz Lucas (Illustrator)
Grades K-3

Abby has asthma, but she is still determined to run in the big race. Her friends don't think that she can do it, but with her doctor's advice and by exercising every day, she proves that asthma won't stop her from being a winner.

Brianna Breathes Easy: A Story about Asthma by Virginia Kroll, Kathy Tucker (Editor), and Jayoung Cho (Illustrator)
Grades 1-4

Brianna has asthma symptoms while rehearsing for a school play. She is taken to the hospital where the doctor diagnoses with her asthma and explains triggers and symptoms. This book provides helpful information about asthma in an engaging way.

Student Activity: Microscope slides and pig lung slices

- The student groups then take turns looking through the Wentzscope and observing the slides, and examining the pig lung slices.
- The students will draw, illustrate, and record their observations in their Investigator's Notebooks.

Summarizer

Teacher Led Whole Group Activity

The teacher leads the class in an inquiry based discussion about the pig lung and asks the students to share their observations with the group.

- What most surprised you about the pig lungs?
- What did they feel like?
- Why do the lungs expand? What are they filling up with?
- Why do you think it's important for our lungs to be stretchy and able to expand so much?

Investigator's Notebooks:

Encourage students to draw, illustrate, label, or diagram what they've discovered about the pig lung. Challenge students to think of new ways to explore the pig lung, and to record any questions they may have for further discussion.

Extension Activity:

Student Centered Art Activities (Small Group):

Sponge painting of a lung

Materials:

- Pieces of sponges cut into squares, small disposable trays with tempura paint in different colors, black line image of lungs on cardstock.

Procedure:

- Students can model the "sponginess" of the lungs by painting a "texture" onto the cardstock lung image with sponges.

Dr. Ken Shore's Classroom Problem Solver

Dealing With a Student with Asthma

Asthma, an illness in which the airways that carry air into and out of the lungs become inflamed, is the most common chronic childhood illness. The disease affects about one child in 20, so on average, teachers will have one student with asthma in every class.

Asthma is not contagious, so it cannot be passed from one student to another, but it can cause a student to miss much class time. In fact, it is the primary illness-related cause of school absenteeism. Children with asthma are absent from school three times as often as children without asthma. In addition, their frequent trips to the school nurse lessen their time in the classroom. Even when they are in class, these students might have difficulty focusing on classroom lessons. The asthma symptoms and accompanying anxiety can hinder concentration on schoolwork, and asthma-related sleeping problems can cause sleepiness in class. As a result, you might find that a student with asthma has trouble following directions or keeping up with class work.

(Continued on Page 5)

Dr. Ken Shore's Classroom Problem Solver... Continued

Asthma also can give rise to emotional difficulties. Children with asthma can become discouraged by the medical demands of the illness, the frequent attacks, the physical discomfort, and the days spent at home. They might feel different from their peers, and you could see signs of withdrawal or low self-esteem. In providing a "safety net" for a student with asthma, you need to walk a fine line. You want to give him emotional support without accentuating his difference. If asthma is managed effectively, the student need only be minimally affected and can participate in almost all school activities.

WHAT YOU CAN DO

 **Talk with the school nurse about your school's asthma policy.** The nurse should be able to tell you the policy for students' taking asthma medication in school. The American Academy of Allergy and Immunology recommends that "students with asthma be permitted to have in their possession inhaled medications for the treatment and prevention of asthma symptoms when they are prescribed by that student's physician." Although elementary school students might need supervision to ensure that medication is taken properly, most middle and high school students are capable of carrying and regulating their own medication.

 **Talk with the parents.** At the beginning of the school year, you and the school nurse should gather information from the parents about how to manage their child's asthma in school. Even if you are knowledgeable about asthma, you still will need to learn about this student's asthma profile because asthma is different for each person. You might want to inquire about medication and inhaler issues, particular asthma triggers, physical restrictions, and strategies for managing an attack.

 **Develop a written asthma management plan customized to the student.** This management plan, which should include contact information as well as the factors listed above, should be an outcome of the meeting with parents and should be tailored to the child's particular needs. The student's teachers and others in school who work with him also should be aware of the plan.

 **Speak with the student individually.** Talk with the student privately to reassure him that you are aware of his asthma and know what to do if he has an attack. Let him know that he can go to the nurse when he feels an attack coming on or when he feels tired and needs to lie down. Suggest a signal that he can give to you to let you know that he is leaving class.

 **Educate your students about asthma.** Ask the parents and student for permission to talk with the class about asthma. You might want to invite the parents and student to participate in the discussion. Describe for students what an asthma attack is and what they are likely to see. Let them know that it is important that they stay calm and that the student will get better once he takes his medication.

 **Monitor the child's understanding of lessons and assignments.** The asthma symptoms might cause the student to have problems paying attention in class, which could cause him to miss

directions and have difficulty completing class work. Check up on him periodically to make sure he is aware of what he needs to do. Consider assigning a responsible student to sit next to him and help him stay on track.



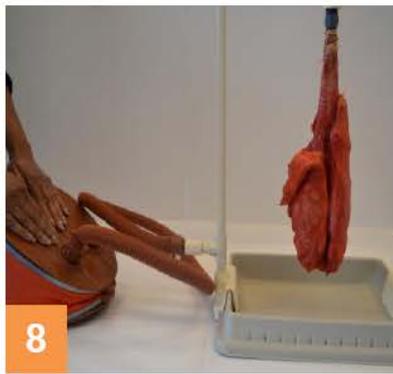
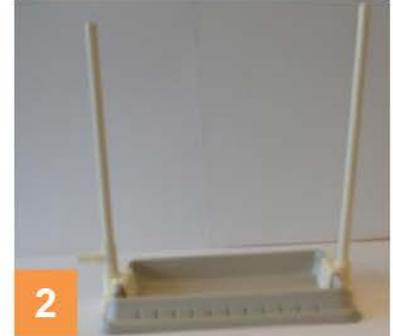
Provide opportunities for the child to make up missed work. This can be a particular problem in high school. You need to develop clear procedures for how the student will make up work and communicate those procedures to the parents. You might arrange for the parents to pick up the work, have it sent home with another student or a sibling, or give it to the parents over the phone.



Try to eliminate asthma triggers from your classroom. Take the student's parents on a tour of your classroom when school is not in session so they can help you identify possible asthma triggers, which might include animals with fur, chalk dust, rugs, science projects with plants or flowers, or new paint.

From Education World: http://www.educationworld.com/a_curr/shore/shore077.shtml

PIG LUNG SET UP



OBSERVATIONS ORGANIZER

Writing Frame

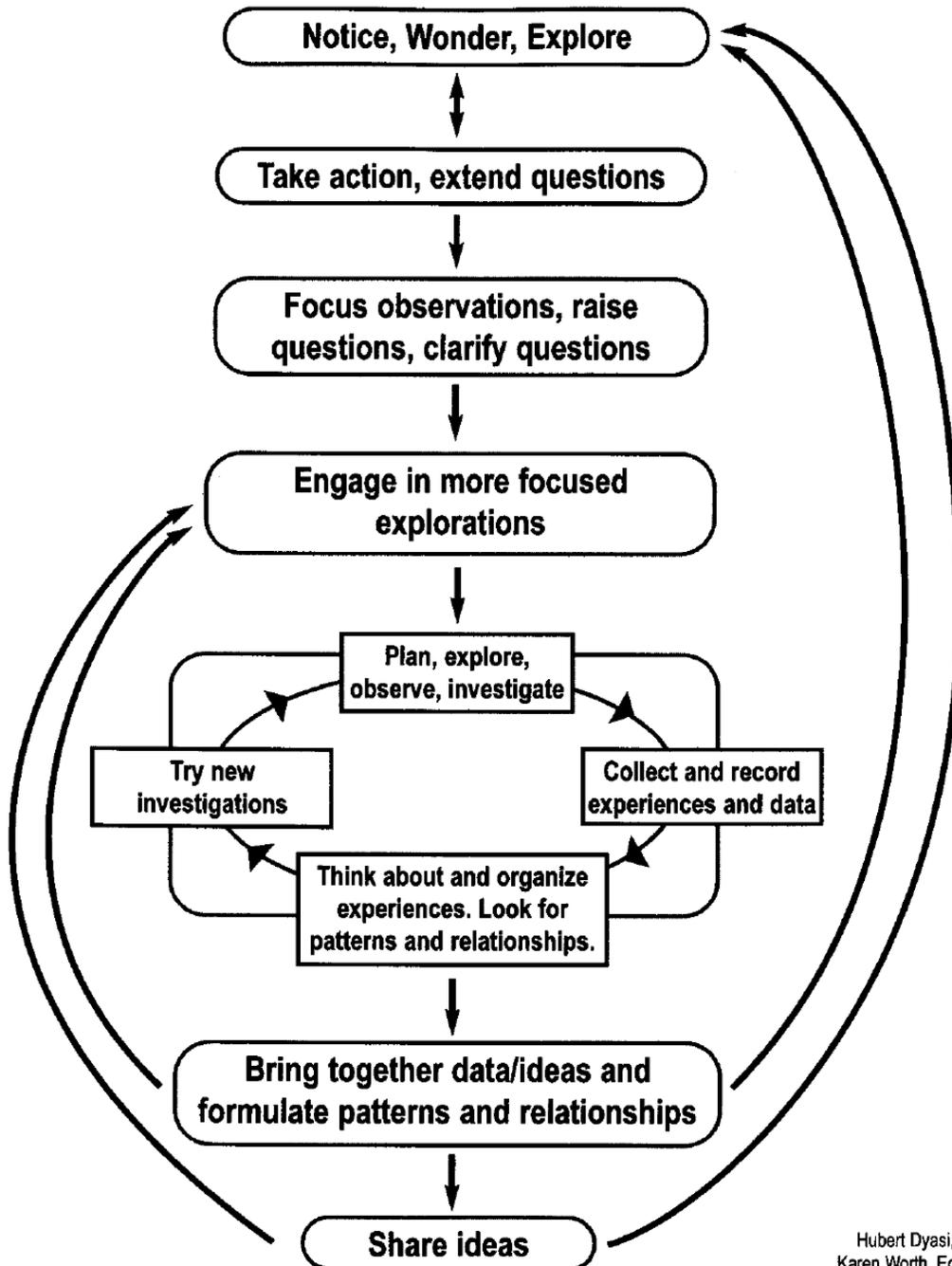
<i>Think of properties you can see such as size, shape, color, lines, texture, pattern, behavior...</i>	I observed...
<i>Think of the other senses of smell, sound, touch, and perhaps taste!</i>	I noticed...
<i>Connect it with something that you already know.</i>	It reminds me of...
<i>Add more detail as needed.</i>	This is so because...
<i>Be curious and ask questions you could investigate.</i>	<p>I am curious about...</p> <p>It surprised me that...</p> <p>OR</p> <p>I wonder what would happen if...</p>

Figure 3.1
Five Essential Features of Inquiry

Essential Features	Variations			
	More Self-Direction and Less Teacher Direction			Less Self-Direction and More Teacher Direction
1. Learner engages in scientifically oriented questions.	Learner poses a question.	Learner selects among questions, poses new questions.	Learner sharpens or clarifies question provided by teacher, materials, or other source.	Learner engages in question provided by teacher, materials, or other source.
2. Learner gives priority to evidence in responding to questions.	Learner determines what constitutes evidence and collects it.	Learner directed to collect certain data.	Learner given data and asked to analyze.	Learner given data and told how to analyze.
3. Learner formulates explanations from evidence.	Learner formulates explanation after summarizing evidence.	Learner guided in process of formulating explanations from evidence.	Learner given possible ways to use evidence to formulate explanation.	Learner provided with evidence.
4. Learner connects explanations to scientific knowledge.	Learner independently examines other resources and forms the links to explanations.	Learner directed toward areas and sources of scientific knowledge.	Learner given possible connections.	Learner given connections.
5. Learner communicates and justifies explanations.	Learner forms reasonable and logical argument to communicate explanations.	Learner coached in development of communication.	Learner provided broad guidelines to use to sharpen communication.	Learner given steps and procedures for communication.

Adapted from National Research Council (NRC). 2000. *Inquiry and the National Science Education Standards*. Washington, DC: National Academy Press.

YOUNG CHILDREN'S INQUIRY



Hubert Dyasi, CCNY;
Karen Worth, Education
Development Center, Inc.

Lesson 2: A Body's Work

Focus: The Respiratory System

Objectives: Students will be able to:

1. describe the process of breathing (inhale the air through the mouth or nose, the air flows down the trachea, and the air goes into the lungs);
2. identify why the human body needs air;
3. understand that your body breathes in oxygen and exhales carbon dioxide; and
4. describe the function of the respiratory system (to supply the blood with oxygen in order for the blood to deliver oxygen to all parts of the body, and to expel carbon dioxide).

Materials List:

- Investigator's Notebooks
- Respiratory system poster
- Model Magic (various colors)
- 2 bendable straws per student cut in half
- One bendable straw per student.
- Markers
- Glue
- One pinwheel per student
- 1 stopwatch per group (or watches with second hands)
- One small clear plastic cup per student ($\frac{1}{2}$ filled with lime water)
- Lime water (available from Flinn Scientific: www.flinnsci.com)

Teacher Preparation:

- Pass out Investigator's Notebooks.
- Set up the pig lung demonstration
- Pour lime water into individual cups (one per student)
- Pinwheel experiment: one pinwheel per student, one stopwatch per group.
- Limewater experiment: one clear acrylic container with limewater per student, one straw per student.
- Model Magic[®] Lungs: one packet of Model Magic[®] per student, 2 bendable straw pieces per student.

Homework Suggestions

Comparing Breathing Rates

During exercise, the body's need for oxygen increases dramatically, and the breathing rate increases.

- Have students count their breaths per minute (oxygen intake) during different activities- before getting up in the morning, running, walking up stairs, doing jumping jacks, playing soccer etc. , and have them keep a record of the activity, time of day, and rate. As a class, construct a graph to show the respiration rates per minute of the various activities.

Comparing Breathing Rates between Adults, Children, and Animals

In adults, normal resting respiratory rate is between 14-20 breaths/minute; for children it is 20-30 breaths/minute; for dogs it is 10-30; and for cats 30 breaths/minute. Have each student count for 15 seconds and multiply that number by 4 to get the breaths per minute.

- Students can also go home and count the breaths per minute of a child, an adult, and a pet (dog, cat, etc.) at rest, and record the results (if they do not have a pet, just a child and an adult will do). As a class, construct a graph and compare the breathing rates between adults, children, and animals. Why would these rates be different?

Vocabulary: breathing, bronchi, bronchioles, exhale, inhale, lungs, trachea, gas exchange, respiratory system

Procedures

Teacher Led Activity: The breathing pig lung

The teacher shows the class the pig lung again, and this time asks them to watch how it inflates and deflates. Using the respiratory system poster, the teacher shows the students the respiratory path not visible on the pig lung. Through the following inquiry questions, the teacher guides the students to understand the process of gas exchange in the body.

- What do we breathe in? (oxygen)
- What do we breathe out? (carbon dioxide)
- How does the oxygen get into the lungs? (teacher points out the trachea, bronchi on the pig lungs.)
- Where does the oxygen go once it's in the lungs? (to the rest of the body)
- How does the oxygen get to the rest of the body? (via the bloodstream)
- Where does the carbon dioxide that we exhale come from?

Student Group Activity: Pinwheel race:

To demonstrate lung capacity, and the importance of healthy, well functioning lungs, the students will participate in a pinwheel race (pinwheels are often used as therapy tools to improve lung function in children with asthma).

- The teacher divides the class into groups of 3-4 students
- Each student is given one pinwheel.
- One student will be the “experimenter” and will blow on the pinwheel, another will be the timekeeper, and another will record the times in their Investigator’s Notebook.
- When the teacher says, “go,” the experimenter will take a regular breath, (and with only one breath) keep the pinwheel spinning as long as she can.

CAUTION: Explain that this is not a contest (so no one passes out).

It is only showing that people of different sizes, shapes, and physical fitness will be able to blow for different amounts of time.

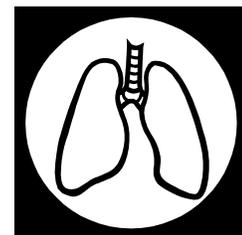
A Common Misconception about Breathing

The air that we exhale is pure carbon dioxide because the lungs remove all the oxygen.

Most students believe that we inhale oxygen and exhale carbon dioxide. It is a common misconception that exhaled air is pure carbon dioxide. In reality, the air that we breathe out is composed of 78% nitrogen, 13.6% - 16% oxygen, and only 4-5% carbon dioxide.

Fun Facts about Breathing:

- The lungs don't collapse when we breathe out because we don't breathe out all the air in our lungs with each breath. There is always a residual amount of air left in the lungs to keep the alveoli from collapsing.
- An average person breathes over 5,000 times per day.



Inquiry Questions for the Pinwheel Race:

- Have the students put their hands on their chests and feel what's happening when they blow air out.
- What gas did you breathe out? (carbon dioxide)
- Why did one person have more air in their lungs than another? (possible answers: size, fitness)
- Do you think that being able to keep the pinwheel going for a long time is a sign of healthy or unhealthy lungs?
- How long do you think a fit athlete could keep the pinwheel going on one breath?
- Why is it important for an athlete to be able to take in a lot of oxygen in one breath? (increased lung capacity is a sign of greater physical fitness).

Student Activity: Lime water breath experiment:

The students will do an experiment to demonstrate that the gas we exhale is carbon dioxide. The exhaled carbon dioxide will cause a chemical reaction in the test tube that produces a precipitate of calcium carbonate with the lime water.

Procedure:

- Students will observe the color of the limewater is before starting the experiment.
- Students will insert a bendable straw into the container with limewater.
- Being careful not to inhale, students will GENTLY "blow" air into the limewater.
- Students will then observe how the limewater changed after blowing into it.
- The carbon dioxide that we breathe out reacts with the limewater and makes a milky color. That's how we can prove that we exhale carbon dioxide gas.
- Students will then record their observations in their Investigator's Notebooks.

Annotated Children's Bibliography

The Remarkable Respiratory System: How Do My Lungs Work? (Slim Goodbody's Body Buddies) by John Burstein
Age 8+

This book explains how the respiratory system and the lungs function. It also includes information on respiratory illnesses and tips for keeping your lungs healthy.

Lungs: Your Respiratory System by Seymour Simon;
Grades 3-6

This book follows the journey of a breath through the body, and discusses the parts of the respiratory system and how they work. The book includes color x-rays of the trachea, nasal cavities, and the heart.

Limewater Experiment Inquiry Questions:

- What color is the liquid in your cup? (clear)
- When you blow bubbles through a straw into your milk, what happens?
- What happened when you blew into the limewater? (It turned a milky color.)
- What caused the limewater to change color?
- What was in the air that you exhaled? (carbon dioxide)
- So, did carbon dioxide do something to the liquid in the cup? (It caused a chemical reaction and caused a milky substance to form.)
- After doing this experiment, how did we prove that the gas that we exhale is carbon dioxide?

Extension Activities

Student Activity: Art Model Magic® Lung Models

The students make their own model of the respiratory system.

- Each student will observe the pig lung, and then create a model of the lungs (showing the trachea and bronchi) from Model Magic® and straws.
- If time permits, the students can present their models to the class, demonstrating the process of breathing (i.e. air enters through the nose or mouth, moves down the trachea, into the lungs, back up the trachea, and is exhaled out of the nose or mouth).

Alternative Activity to Pinwheel Race

Blowing Bubbles and Asthma

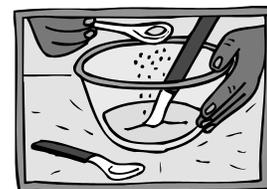
You more actively engage your lungs and respiratory muscles when blowing bubbles. This activity naturally stimulates breathing, and is a great exercise for those with asthma.

Have the children use items from around the house for bubble wands; frozen juice concentrate cans with ends removed, a slotted spoon, funnels, fly swatters, 6-pack rings, or strawberry baskets.

Bubble Recipe:

- 2/3 cup Dawn dishwashing soap
- 1 gallon water
- 2 to 3 tablespoons of glycerin or white Karo syrup (glycerin is available at the pharmacy or chemical supply house.)

Gently stir the ingredients and leave in an open container overnight.



Lesson 3: Troubled Breathing

Focus: Asthma

Objectives: Students will be able to:

1. compare and contrast the healthy bronchi with inflamed constricted bronchi;
2. explain how air moves through healthy bronchi;
3. explain how air moves through inflamed constricted bronchi; and
4. explain how mucus causes asthma symptoms.

Materials List:

- Investigator's Notebooks
- Wrapped straws (one per student)
- Borax (20 Mule Team Borax is available in grocery stores)
- PVA (Polyvinyl alcohol; available from Flinn Scientific)
- Small cups (1 per group)
- Popsicle sticks (1 group)
- 2 -10 ml graduated cylinders per group
- 16 inch clear flexible plastic tubing (1 ½ inch diameter) with colored tinsel tapped around the outside of one end.
- Hair dryer

Teacher Preparation:

- Pass out Investigator's Notebooks
- Tape tinsel to one end of clear plastic tubing.
- Pass out one straw per student.
- Prepare a 4% Borax solution. Mix 1 tablespoon Borax to 8 oz water. Prepare enough Borax solution for all groups.
- Assemble the "mucus making" set up for each group. Fill one 10ml graduated cylinder with 8 ml PVA, and the other with 3 ml Borax, 1 small cup, and 1 popsicle stick

Homework Suggestions

What does it feel like when you have an asthma flare-up?

Some people describe it as "like breathing through a straw" or "drowning above water." When I have breathing trouble, my throat loses the moist feeling. I feel like no air will go through or down my throat, like a boulder rolled over my throat blocking and, and It can feel pretty scary sometimes. Like someone once said about having asthma, "I feel like a fish out of water".

- Have the students interview someone or use the written story, and ask them to give you 3 words that best describe what it feels like to have asthma. The students will write the words on index cards to be displayed on a classroom poster or bulletin board. Tell each child to do this activity with an adult present!!
- Send each child home with 3-4 straws. Have them pass out the straws to family members and have everyone breathe through the straws (NOT through their noses!) Then have everyone pinch the straws halfway shut, and then try breathing through the straws again. This simulates what it feels like to have asthma. Ask the adults to write 2 sentences about what it felt like to breathe through the straw, and share with the class.

Vocabulary: asthma, bronchi, constricted, environment, inflammation, lungs, mucus, symptom, wheezing, tightness in chest, trigger

Procedures

Teacher Led (Whole Group): Breathing through a straw experiment:

The teacher introduces asthma to the students by doing an experiment that mimics what it feels like to have asthma.

- The teacher gives every student a straw.
- As a group, the teacher asks the students to pinch their noses shut and breathe through the straw for about 30 seconds (use a timer).
What did that feel like? How much air were you getting?
- Now, repeat the experiment only pinch the straw shut SLIGHTLY (only about halfway shut.)
- Now breathe through the straw again.
- What did that feel like? How much air were you getting?
- Why did you get so little air? (the diameter of the straw was reduced.)
- What is asthma? (a person with asthma has chronically inflamed air passages that can sometimes constrict and become clogged with mucus).
- How is breathing through the straw like someone who is having an asthma attack? (the bronchioles constrict and limit the amount of air passing through).
- How do you think it feels to have an asthma attack? (like a fish out of water).
- How do you get asthma? (not everyone has it, and it's not contagious).
- What symptoms do you think someone with asthma has? (shortness of breath, wheezing, coughing, chest, tightness, or even pain).
- Based on what you know about asthma, do you think that having an asthma attack is a serious medical emergency?
- What would you do if a friend was having an asthma attack? (tell teacher or a responsible adult)

Student-Centered (Small Group): Make some mucus

The students make slime to represent the mucus that can clog airways and cause asthma symptoms.

Common Misconceptions about Breathing

Asthma is curable...

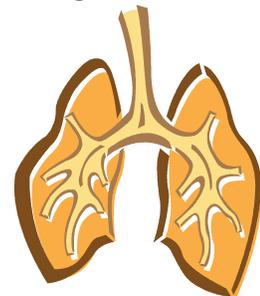
There is no known cure for asthma, but with proper medical treatment, it can be controlled.

Children will eventually outgrow their asthma symptoms...

Sometimes children will be symptom free for many years, but asthma symptoms can reappear at any time during a child's lifetime. Once someone has asthma, they will always have asthma.

Asthma Facts

- There are two different types of asthma; allergic (caused by an allergic reaction to an asthma trigger) and non-allergic (asthma symptoms can be caused by other factors such as respiratory infections.)
- The early warning signs of an asthma episode are: coughing, shortness of breath, mild wheeze, and a tight feeling in the chest.



...Procedures Continued

- The teacher divides the students into groups of 3-4 students.
- Ask the students if anyone has ever coughed up mucus from a cold.
- Explain that when someone has asthma, bronchi can become inflamed and constricted making it hard to breathe, but mucus from colds can also clog airways and cause the same symptoms.
- The teacher will give each group one “mucus making” set up; 2 small plastic graduated cylinders (one marked PVA and the other Borax filled with 8 ml PVA and 3 ml Borax) one popsicle stick for stirring, one small plastic cup.
- Direct the students to pour both liquids into the cup and mix.
- Ask, “What happened to the two liquids? Do they still look like liquids?”
- The students will observe that the two liquids combined to make a gooey solid.
- Ask the students what would happen if we stuck some of this mucus in a straw. Would they be able to breathe through it?
- What would happen if some of this gooey stuff got stuck in someone’s airways? Would it make it harder to breathe?
- “Let’s do a demonstration to find out.”

Teacher Led (Whole Group) Demonstration: Mucus clogging an airway

The teacher demonstrates what happens when mucus clog someone’s airway.

- Demonstrate (by blowing air with the hair dryer into the tube) how easily air passes through this tube. Ask the students to watch the tinsel strands flying outward.
- Now ask several students to bring their “mucus” up and stuff it into the end of the tube (make sure the tube is not completely blocked so some air gets through).

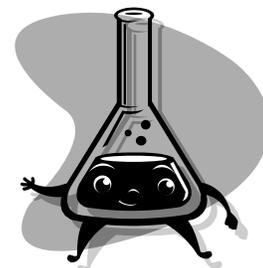
Annotated Children’s Bibliography

The Book of Slime by Ellen Jackson
Grades 2-4

This book discusses organisms that produce mucus and slime and why it is important. There are also recipes for slime and mucus, jokes, and colorful illustrations on each page.

Make Some Mucus Art!

After the students have made and observed the mucus, have them draw a picture of the mucus being dripped and poured from the cup in their Investigator’s Notebooks.



...Procedures Continued

- Ask the students, “What will happen now if I blow air into the tube with the mucus stuck in there?”
- The teacher now blows air from the clear end of the tube past the clogged end.
- The students will observe how much air is getting through by watching the movement of the tinsel strands.
- The students will see that very little air gets through the mucus plug at the end.
- The teacher then asks the students how that might feel to someone with asthma?
- Ask, “What would help someone with mucus plugging their airways?” (get rid of the mucus.)
- Remove the mucus from tube and explain that there are medicines that can thin the mucus so that it can be expelled.

Extension Activities:

Student Centered Art Activity: Make an asthma alien

Explain to the students that asthma is a lifelong and incurable disease. Some children can be symptom free for years, and suddenly have an attack. When someone has asthma it can feel like he has some kind of “alien” just waiting to pop out and cause problems.

Students will then create their own mini “asthma alien” using Model Magic, pipe cleaners, goggly eyes, and feathers. Each “alien” is a reminder that although you may be symptom free, your asthma is always there.

Materials:

- Model Magic® (2-3 different colors)
- Goggly eyes
- Feathers
- Pipe cleaners
- Beads
- Sequins

Lesson 4: The Air We Breathe

Focus: Environmental Substances and Asthma Triggers

Objectives: Students will be able to:

1. identify and sort substances as either beneficial or harmful to breathing;
2. understand and identify asthma triggers; and
3. suggest ways to avoid or eliminate certain asthma triggers.

Materials List:

- Investigator's Notebooks
- Natural orange air freshener
- Baby powder
- One gallon Ziploc® bag
- Large basket
- Items (for basket) to represent asthma triggers: dog collar (pet dandruff), plastic roach (roach droppings), empty plastic milk carton (milk allergy), feathers or feather duster (dust), silk flowers or grass clippings (pollen), can of hair spray (strong odors), image of cigarette package (smoke), image of air pollution (cars in traffic).
- Beads (4-6 per student): sports shaped beads (exercise induced asthma triggers), yellow beads (pollen), grey beads (smoke), and animal shaped beads (pet dander).
- Yarn (or rawhide) for bracelets.

Teacher Preparation:

- Pass out Investigator's Notebooks
- Set aside natural orange air freshener
- Set aside baby powder and Ziploc® bag
- Prepare items for basket.
- Prepare containers with an assortment of beads and yarn (or rawhide) for each group of 4 students.

Homework Suggestions

Identifying Asthma Triggers Outdoors

Children are one of the sensitive groups at risk for health effects from air pollution, in part because their lungs are still developing. The Air Quality Index (AQI) is an important tool for letting children know when the air quality in their area is unhealthy, and how they can protect their health. The AQI uses a color-coded scale and maps to provide daily air quality information and is available on the Internet, in local newspapers, and on television and radio stations.

- Have each student record 3-4 asthma triggers that they noticed on their walk/ride home from school, i.e. car exhaust fumes, newly mown grass, tree pollen etc.
- Air pollution as an asthma trigger: Have the students check the TV or newspaper for the daily air quality levels and air pollution forecasts in your area.

Online Resource:

http://www.airnow.gov/index.cfm?action=aqikids_home.index

Asthma Triggers Hunt

- Using the asthma triggers handout, have the students go on an "asthma triggers hunt" in their own homes. Have them circle the pictures of any asthma triggers that they find that might make someone's asthma symptoms worse, and then write down what should be done to fix them.

Vocabulary: beneficial, breathing, environment, harmful, lungs, substance, asthma trigger.

Teacher Led Activity: Asthma triggers The students engage in an inquiry-based discussion about breathing, breathing difficulties, and asthma triggers.

- The teacher asks students to think about a time when they had difficulty breathing. How did it feel? Can you describe it?
- “We all need to breathe air. How does it feel when the air around you is not fresh and clean?”
- There are things in the air that can help or hurt our bodies.
- “What kinds of things do you think might trigger breathing problems?”
- The teacher then sprays a small amount of natural orange air freshener around the room.
- The teacher asks, “Can everyone smell that? You can smell it, but can you see it?”
- “How many people are okay with that smell? Raise your hand if that smell is too strong and bothers you.”
- “How many people have been on a bus or in an elevator with someone wearing strong perfume? Did it bother you?”
- “How do you think someone with asthma might react to that strong smell?” (It might irritate their lungs and cause their airways to constrict causing an asthma attack).
- There are substances in the air that we breathe that we can’t see, but can cause breathing problems.
- The teacher then pours a small amount of baby powder into the gallon Zip loc bag and then gently blows the powder so it makes a fog inside the bag.
- “What do you see? If I blew this baby powder into the air, do you think that all those white particles would get into our lungs?”
- “How do you think that white powder would affect someone with asthma?”
- “What other things are in the air that you can’t see but may cause breathing problems?” (possible answers: dust, air pollution, pollen, smoke, strong perfumes)
- Remember, every time we breathe, whatever is in the air gets into our lungs.

A Common Misconception about Asthma

An asthma attack is always accompanied by wheezing. If a child is just coughing hard, he isn’t having an asthma attack.

False. Coughing is also a sign of tight or clogged airways. It’s your body’s way of trying to clear the airway. Many times coughing may be the only symptom during an asthma attack. Not all asthmatics will experience wheezing.

Asthma Facts

- Various types of foods such as eggs, cow’s milk, peanuts, and certain food preservatives can also trigger asthma attacks.
- A cold or the flu can trigger an asthma attack, and certain injections and nasal spray vaccinations aren't recommended for people with asthma.

Student Centered Group Activity: Identifying potential asthma triggers

- The teacher divides the class into groups of 3-4 students.
- The teacher shows the basket of items to the students and explains that every item in the basket represents some type of asthma trigger.
- Each group will then choose 2-3 items and discuss why each item represents an asthma trigger. Each group will also suggest ways to avoid or eliminate those triggers.
- After 5 minutes of discussion, each group will report back to the class on how each item could be an asthma trigger and how to avoid that asthma trigger.
- As a class, the students will then suggest healthy choices of environmental substances.

Student Activity: Asthma triggers bracelets

Students will understand that an important part of controlling asthma is recognizing individual asthma triggers. In this activity, students will create an asthma triggers bracelet with individual beads representing asthma triggers. This will be a useful reminder both to those who have asthma, and those who have friends with asthma.

- The teacher passes out the beads and yarn (or rawhide) to each group of 4 students to share.
- Students will then create their own individual asthma triggers bracelet.
- Students can then share with the class what each bead on their bracelet represents.
- Then choose 2-3 items and discuss why each item represents an asthma trigger. Each group will also suggest ways to avoid or eliminate those triggers.
- After 5 minutes of discussion, each group will report back to the class on how each item could be an asthma trigger and how to avoid that asthma trigger.
- As a class, the students will then suggest healthy choices of environmental substances.

Annotated Children's Bibliography

Zoallergy: A Fun Story About Allergy and Asthma Triggers by Terry Ravanelli
Grades K-4

Justin goes to the doctor and is diagnosed with asthma. After learning all about asthma and allergies, he and his friend go to the zoo where they make a game out of identifying various asthma triggers.

Harmful and Beneficial Substances Chart:

Students can create a chart in their Investigator's Notebooks listing substances that are harmful or healthy to breathing.

Harmful (Potential Triggers)	Healthy
Cigarette smoke	No smoking areas
Gas fumes	Natural air fresheners
Air pollution	Clean air
Strong smells (perfume)	Sunshine
Dust	Dust free home
Pollen	Wear face mask when cleaning
Freshly cut grass	Check for air quality

ASTHMA TRIGGERS



Cat



Dog



Pollen



Grasses



Perfume



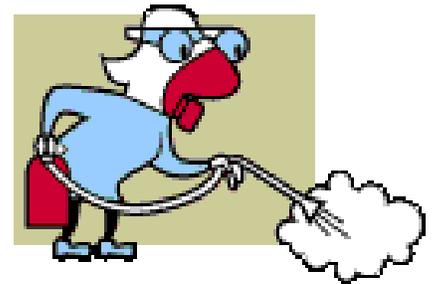
Smoke



Air Pollution

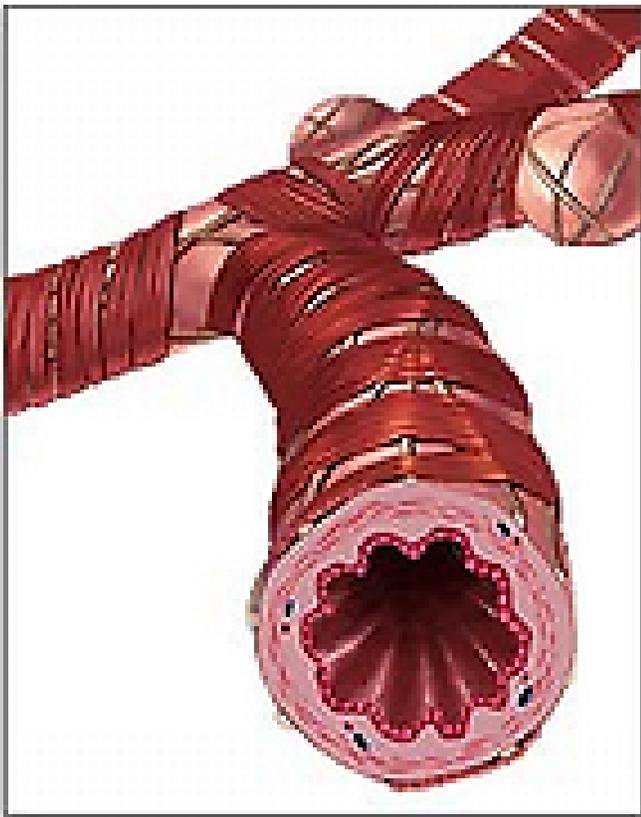


Roach



Pesticides

Normal bronchiole



Asthmatic bronchiole



Image of the Inside of the Lungs During an Asthma Attack

Lesson 5: Keeping Your Lungs Healthy

Focus: Healthy Choices

Objectives: Students will be able to:

1. understand why breathing and clean environments are important for a healthy life; and
2. suggest ways to stay healthy and to eliminate or avoid asthma triggers both at home and at school.

Materials List:

- Investigator's Notebooks
- Construction paper cut outs of hands (one per student)
- Markers
- Enough jump rope beads and rope for each student.
- 3 laminated photos; a smoggy street full of cars, a factory belching smoke, and a person standing on a mountaintop.

Teacher Preparation:

- Cut out paper "hands," enough for each student.
- Prepare a sign for the bulletin board (or the class poster) saying, "Healthy Lungs, Healthy Me."
- Prepare materials for the "make your own jump rope activity."
- Pass out Investigator's Notebooks

Homework Suggestions

Healthy Food, Healthy Lungs

There is evidence that antioxidant-rich foods are good for your lungs.

- Have the children research foods that can protect your lungs (such as broccoli, cauliflower, cabbage, bok choy, kale) and then draw (or make a collage from magazine clippings) a poster advertising foods that are good for your lungs.

Athletes with Asthma

- Have each student research stories on the internet on an athlete with asthma, such as Jackie Joyner Kersey or Amy Van Dyken, and write down two things that they do to keep their asthma under control (i.e. *To control it, I stay away from things that trigger my asthma, use my inhaler when necessary, and take my medication every day.*)



Vocabulary: asthma, beneficial, bronchi, cilia, environment, harmful, substances.

Teacher Led Activity:

The teacher facilitates an inquiry-based discussion about how different types of environments can affect how people breathe.

- The teacher asks everyone to take a deep breath and slowly let it out.
- “Why is breathing important? What happens when we can’t breathe well?”
- “Do you think breathing and having healthy lungs is important whether you have asthma or not? Why?”
- “Close your eyes and imagine the perfect place where you are comfortable and relaxed and can take deep easy breaths.”
- “What did your place look like? Did it look like this?” the teacher shows the photo of the smoggy street scene.
- “Or did it look like this?” The teacher shows the photo of a factory belching smoke into the air.
- “Most of us think of places like this.” The teacher shows the mountaintop photo. “These places have clean air, and it feels good to breathe the fresh air.”
- “Would you breathe more easily here than in a smoggy city? Why?”
- “What about in a dusty and dirty warehouse. What would be happening inside your lungs in a place like that?”
- “If breathing is important, then it is very important to keep the place that we live in clean and healthy.”
- “Lately our air has gotten more polluted, and because of that, more children are developing asthma than ever before.”
- “So, clean air and clean places to live in are important for healthy lungs and healthy lives.”
- “Let’s think of some ways that everyone can keep your lungs healthy and strong.”

Student Centered Activity (Pairs):

The students will create a “circle of hands” poster or bulletin board with “Handy Tips” to keep our lungs healthy and avoid asthma symptoms.

- The teacher explains that everyone needs to have healthy lungs whether they have asthma or not.
- The teacher will then divide the students into “pairs” and pass out different colored cut outs of “hands,” one for each pair.
- The teacher will then ask each student pair to think about and discuss tips that everyone can use to keep their lungs healthy.

A Common Misconception about Asthma

Asthmatic children are better off indoors away from air pollution and outdoor allergens.

A study by researchers at Johns Hopkins University found an association between increasing levels of indoor particulate matter pollution and the severity of asthma symptoms among children. Since children spend 80% of their time indoors, it is very important to improve the quality of indoor air both at home and at school.

Asthma Facts

- Extreme conditions of heat, cold, or rainy, windy weather can trigger an asthma attack in some people.
- More Americans than ever before are suffering from asthma. It is one of this country's most common and costly diseases.
- Breathe through your nose! Children often breathe through their mouths, rather than their noses. This route bypasses the cilia and mucous found in the nose that trap foreign particles in the air and stop them from entering the lungs.

...Procedures Continued

- Each student will write 2 tips in their Investigator's Notebook.
- The teacher will then ask each pair to share their tips with the class.
- The teacher then writes each tip on the board.
- If it is a new tip, then the student can write it on their "hand" to be displayed on a poster or bulletin board circled around the words, "Healthy Lungs, Healthy Me!"

Examples of "Handy Tips":

- Get enough exercise
- Eating a healthy diet with lots of fruits and vegetables can improve breathing.
- Avoid colds and flu
- Wash your hands often
- Clean and dust your house
- Avoid pollen during allergy season
- Avoid strong odors
- Clean air: make sure you help improve the air quality around your home and school
- Don't use strong chemical cleaners
- Be careful around newly mown grass
- Do not be around people who smoke
- Brush the dog or cat outside to avoid pet dander in the house.
- Vacuum often to remove pet hair
- Use air cleaners

Student Activity: Make your own jump rope:

Exercise is an important part of keeping your lungs healthy. Everyone should engage in some sort of aerobic activity to keep their heart and lungs healthy, and their muscles strong. Even people with asthma benefit from regular exercise; it helps to increase lung capacity therefore allowing the lungs to function more efficiently. The best way to exercise is to do something that you enjoy.

- Students will create their own jump rope to encourage healthy lungs and heart, and a healthy lifestyle.
- The teacher will hand out enough rope and colored plastic jump rope beads for each student.

Annotated Children's Bibliography

The Monster Health Book: A Guide to Eating Healthy, Being Active & Feeling Great for Monsters & Kids! by Edward Miller

Grades 2-5

This book discusses nutrients, foods labels, and counting calories. Readers will also learn how to develop healthy habits, such as making time for breakfast, tips for packing the best lunch, and how to make healthy food choices.

Be Fit, Be Strong, Be You (Be The Boss Of Your Body) by Rebecca Kajander, C.P.N.P. M.P.H. and Timothy Culbert, M.D
Ages 8+

This book takes a positive approach to health and well being, and includes tips on healthy snacks and meal planning. It also suggests trying new and fun ways to exercise and stay emotionally centered through activities such as yoga and aromatherapy.

