



A Breath of Poor Air: Inspecting Indoor Air Quality in the Classroom

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INTRODUCTION

In this lesson students will learn about IAQ (indoor air quality) and the substances that could be polluting the air in their school. They will check the classroom for possible pollutants and then brainstorm ways to improve the quality of their air.

LESSON OVERVIEW

Grade Level and subject: Grades 7-12; Environmental Science, Health

Length: 1 class period

Objectives:

After completion of this lesson students will be able to:

- Identify possible air pollutants and the problems associated with them
- Evaluate air quality of their classroom and investigate areas and materials that could cause air pollution
- Brainstorm ways to improve the air in their classroom

National Standards Addressed:¹

- **Content Standard:** [NS.9-12.1 SCIENCE AS INQUIRY](#)
As a result of activities in grades 9-12, all students should develop
 - Abilities necessary to do scientific inquiry
 - Understandings about scientific inquiry
- **Content Standard:** [NS.5-8.1 SCIENCE AS INQUIRY](#)
As a result of activities in grades 5-8, all students should develop
 - Abilities necessary to do scientific inquiry
 - Understandings about scientific inquiry
- **Content Standard:** [NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES](#)
As a result of activities in grades 9-12, all students should develop understanding of
 - Personal and community health
 - Population growth
 - Natural resources
 - Environmental quality

¹ Education World (2008) U.S. *National Education Standards*. Retrieved April 6, 2009, from <http://www.education-world.com/standards/national/index.shtml>.

- Natural and human-induced hazards
 - Science and technology in local, national, and global challenges
- **Content Standard:** [NS.5-8.6 PERSONAL AND SOCIAL PERSPECTIVES](#)
As a result of activities in grades 5-8, all students should develop understanding of
 - Personal health
 - Populations, resources and environments
 - Natural hazards
 - Risks and benefits
 - Science and technology in society
- **Content Standard:** [NPH-H.9-12.3 REDUCING HEALTH RISKS](#)
Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks--
 - Analyze the role of individual responsibility for enhancing health.
 - Evaluate a personal health assessment to determine strategies for health enhancement and risk reduction.
 - Analyze the short-term and long-term consequences of safe, risky and harmful behaviors.
 - Develop strategies to improve or maintain personal, family and community health.
 - Develop injury prevention and management strategies for personal, family, and community health.
 - Demonstrate ways to avoid and reduce threatening situations.
 - Evaluate strategies to manage stress.
- **Content Standard:** [NPH-H.5-8.3 REDUCING HEALTH RISKS](#)
Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks—
 - Explain the importance of assuming responsibility for personal health behaviors.
 - Analyze a personal health assessment to determine health strengths and risks.
 - Distinguish between safe and risky or harmful behaviors in relationships.
 - Demonstrate strategies to improve or maintain personal and family health.
 - Develop injury prevention and management strategies for personal and family health.
 - Demonstrate ways to avoid and reduce threatening situations.
 - Demonstrate strategies to manage stress.

Materials Needed:

- Reproducible #1- **IAQ Background Information**
- Reproducible #2- **IAQ Classroom Checklist**

Assessment:

Students will be assessed through the following activities:

- Participation in class discussion and group work
- Completion of **Reproducible #2- IAQ Classroom Checklist**

LESSON BACKGROUND

Relevant Vocabulary:

- **Indoor Air Quality (IAQ):** Measure of the amount of air pollutants in an indoor environment
- **Ventilation:** Method of controlling the environmental air flow to ensure the quality and safety of air in a building.
- **Pollution:** Introduction of contaminants into the environment that cause harm and deterioration.
- **Asbestos:** A natural occurring mineral used for insulation and fireproofing in walls. Too much exposure can cause damage to the lungs, including cancer.
- **Radon:** A radioactive gas created from the decay of uranium in soil. It can leak up into buildings through cracks and is known to cause cancer.
- **Asthma:** A respiratory disease that affects breathing capabilities. It can be triggered by a variety of allergens, cardiovascular activity, and second-hand smoke.

Information:²

A common image of air pollution is a great smokestack belching toxins into the sky. Although it may seem that air pollution only occurs outdoors and in busy cities, in reality air pollution can be found indoors as well. The indoor air quality (IAQ) of your home or school is affected by sources that release gas and particles into the air, creating pollution that is harmful to human health. The ventilation of a room can also affect IAQ - if there is not fresh air flowing in and out of the room then the air pollution will remain inside. Some common sources of air pollution include tobacco products, asbestos in insulation, wet carpeting (mold), household cleaning supplies, pesticide use, and the combustion of oil, gas, coal, and wood.

Poor indoor air quality is hazardous to human health as it can cause dizziness, runny nose, red and scratchy eyes, headache, throat irritation, and asthma. If a person is exposed to pollution over a long period of time it can also lead to cancer, respiratory disease, and heart disease.

Controlling IAQ in schools is especially important because children are more susceptible to pollutants and more likely to develop asthma in response. Three important ways to control IAQ are to control the source of air pollution, increase the ventilation of a room, and use air cleaners to remove particles from the air.

Resources:

- U.S. EPA guide to IAQ: <http://www.epa.gov/iaq/is-imprv.html>
- U.S. EPA IAQ “Tools for Schools”: <http://www.epa.gov/iaq/schools/index.html>
- Indoor Air Quality Association: <http://www.iaqa.org/>

² “An Introduction to Indoor Air Quality.” U.S. Environmental Protection Agency. Retrieved April 7, 2009 from <http://www.epa.gov/iaq/ia-intro.html>.

- Department of Labor's OSHA IAQ requirements:
<http://www.osha.gov/SLTC/indoorairquality/index.html>
- Information on Asthma: <http://www.epa.gov/asthma/>

LESSON STEPS

Warm Up: *Introducing IAQ*

1. Write the word *pollution* on the board and ask students what words come to mind when they think of pollution. Make a list on the board for them to see.
2. Did your students mention air pollution? If so, did they think about air pollution inside their home or school? Have them consider if air pollution occurs indoors, and where it might come from.

Activity One: *What Should We Know About IAQ?*

1. Pass out one copy of **Reproducible #1- IAQ Background Information** to each student. Go through the worksheet with them, discussing IAQ and possible sources of air pollutants in your classroom.

Activity Two: *Inspecting the Classroom*

1. Split students into groups of 2-3. Pass out one copy of **Reproducible #2- IAQ Classroom Checklist** to each group.
2. Have students complete the worksheet by giving them time to inspect the classroom for possible pollutants and IAQ sources. Depending on time and space, have each group inspect all areas, or each group inspect one area and share.

Activity Three: *Thinking of Solutions*

1. Go through the **IAQ Classroom Checklist** and have students share their observations. Discuss trends the students noticed as an entire class.
2. Have students share their ideas for improving the classroom's IAQ. Discuss the benefits and drawbacks of making these changes and brainstorm for the most realistic. Consider ranking the proposed solutions by difficulty to implement.

Wrap Up: *Writing a Pledge*

1. Make a class pledge to improve your classroom IAQ by picking 1-3 possible solutions from the previous discussion and vowing to stick to them. Don't just focus on the easy ones! Think about solutions that will have the greatest impact on student and teacher health.
2. Write the pledge on the board or a large piece of paper, including both the actions you will take and the health problems it will help solve (*for example: We pledge to open the windows on nice*

days to increase ventilation and decrease throat and nose irritation.). Keep this pledge hanging in the classroom and/or hang in the hallway to share with others!

Extension: *Inspecting the School*

Now that students have inspected their classroom have them look over the entire school. If possible, have a custodian or school administrator give them a tour of how the heating, cooling, and ventilation system works. Find more checklists to check IAQ for the entire school at <http://www.epa.gov/iaq/schools/actionkit.html> - Available for Download.

Take your class' pledge to the principal, maintenance crew, or other administrator. Are there ways to expand your pledge if you had their help? Set up a meeting to discuss improving the IAQ at your school!

CONCLUSION

By studying indoor air quality students will learn how to create a safer learning environment for themselves and their peers. During this lesson they will explore where indoor air pollution comes from, what the possible sources are in their classroom, and which solutions will improve their classroom air quality.

IAQ Background Information

What Is Indoor Air Quality?

IAQ is a measure of how much pollution is in the air inside a building. It is caused by the release of gases or particles into the air, either from items inside the building or from those that drift indoors from outside.

What Should You Do to Prevent Air Pollution in Your Classroom?³

Be Clean!

A dirty classroom means growth of mildew and mold that triggers allergies and irritation. It also attracts insects and small animals that can set off allergies. Plus, pesticides will be needed to remove them, and these are a common source of indoor air pollution.

Keep Dry!

When liquids are left around without being cleaned up they create mold and can trigger asthma. Make sure to clean up spills right away and check the classroom for leaky pipes or areas of condensation.

Ventilate!

Moving fresh air into the classroom and stale polluted air out can help improve IAQ. Put a tissue in front of the vent to make sure air is flowing out, and never obstruct the vent with books, papers, etc. Also check to make sure your ventilation system is efficient and not just carrying the polluted air to another part of the building.

Check Supplies!

What supplies are being used in your classroom? School supplies can be toxic and give off pollutants during use and storage. Cleaning supplies also have a lot of chemicals in them that can linger after you've cleaned up. Check the ingredients in your supplies to ensure that they are non-toxic and make sure containers are tightly sealed.

What are Sources of Indoor Air Pollution?

- Tobacco products
- Combustion of wood, gas, coal, etc.
- Cleaning products
- Asbestos in insulation
- Mold and mildew
- Pesticides
- Radon
- Outside air pollution
- School supplies



³ Information adapted from "Background Information for Teacher's Classroom Checklist." U.S. Environmental Protection Agency. Retrieved April 7, 2009 from <http://www.epa.gov/iaq/schools/actionkit.html>

Names _____

IAQ Classroom Checklist!

Use the following checklist to determine the IAQ of your classroom.⁴ Circle Y for yes, N for No or N/A if the information is not available. Be sure to add any additional comments or observations in the space provided at the bottom!

Cleanliness

Are the countertops, desks, etc. dust free?	Y	N	N/A
Does the carpeting look like it has been vacuumed?	Y	N	N/A
Has the trashcan been emptied recently?	Y	N	N/A
Is the classroom free of any pests?	Y	N	N/A
Have all food items been properly stored or taken home for the night?	Y	N	N/A

Any other observations or comments?

Moisture

Are the windows and window sills free of condensation?	Y	N	N/A
Is the sink area free of leaks?	Y	N	N/A
Do the ceiling or walls appear to not have leaks?	Y	N	N/A
Have all recent spills been properly cleaned up?	Y	N	N/A
Is the humidity of the room low?	Y	N	N/A

Any other observations or comments?

Ventilation

Is air flowing out of the vents?	Y	N	N/A
Is the vent free from obstruction such as books or paper?	Y	N	N/A
Does the air coming out of the vent smell normal?	Y	N	N/A
Does the room have fans or windows that can be opened?	Y	N	N/A

Any other observations or comments?

⁴ Information adapted from "Teacher's Classroom Checklist." U.S. Environmental Protection Agency. Retrieved April 7, 2009 from <http://www.epa.gov/iaq/schools/actionkit.html>

Supplies

Are school supplies non-toxic?	Y	N	N/A
Are school supplies stored in containers?	Y	N	N/A
Are cleaning supplies free of chemicals and toxins?	Y	N	N/A
Are cleaning supplies tightly closed?	Y	N	N/A

Any other observations or comments?

Checklist Results

How many times did you circle Yes? _____

How many times did you circle No? _____

How many times did you circle N/A? _____

What conclusions can you make from your results?

Did you find anything in your classroom that surprised you?

Did you find anything in your classroom that could cause allergies or other kinds of reactions?

Do you think your classroom has low or high indoor air quality? Why?

What can you do in your classroom to improve the IAQ?