

BUILDING WALKTHROUGH



DESCRIPTION:

Students conduct a classroom walkthrough following a checklist from EPA *Tools for Schools*. If possible, they accompany a custodian or district facilities manager on a walkthrough of their school.

STUDENT OUTCOMES:

Students will:

- Complete a classroom and building walkthrough at their school
- Make observations of typical pollutant sources, identify problems concerning indoor air quality, and generate solutions

STUDENT PRODUCTS:

- Worksheet 3: *Indoor Air Quality Problems in the Classroom*
- Worksheet 5: *Indoor Air Quality Problems in Your School*

TIME ESTIMATE:



Prep Time: 50 minutes

Activity Time: One to two 50-minute class periods

Pre-Activity Homework: Background Reading #2: *IAQ Backgrounder*

Worksheet 1: *Reading for Understanding Questions*

Day 1: Classroom Walkthrough

Day 2: School Building Walkthrough (optional)

MATERIALS:



Hydroville Science Journal



MATERIALS TO PHOTOCOPY:

One copy per student:

- Background Reading #2: *IAQ Backgrounder*
- Worksheet 1: *Reading for Understanding Questions* Instructions: *Performing a Classroom Walkthrough*
- Worksheet 2: *Classroom Walkthrough Checklist*
- Worksheet 3: *Indoor Air Quality Problems in the Classroom*
- Worksheet 4: *School Building Information and Walkthrough Observations*
- Worksheet 5: *Indoor Air Quality Problems in Your School*

Transparencies:

- *Journal Prompt*
- HMS-A: *IAQ Investigation Guidelines*

TEAMWORK SKILLS:

Teamwork Skill: Stay on task with your group.

Problem Solving Skill: Identify where there is disagreement within the group.

TERMINOLOGY:

Building walkthrough

Indoor Air Quality (IAQ)

Indoor air pollutants

Pollutant sources

BACKGROUND INFORMATION:

Information found in the student background reading, *IAQ Backgrounder*, is critical for an understanding of the indoor air quality problem at Hydroville Middle School. Copies of *IAQ Backgrounder* and *Indoor Air Quality Investigation Guidelines* should be included in all students' Hydroville Science Journals.

A more in-depth coverage of IAQ investigations is found in Section 6: *Diagnosing IAQ Problems* in the publication, *Building Air Quality: A Guide for Building Owners and Facility Managers* (U.S. Environmental Protection Agency, Reference Number 402-F-91-102, December 1991 at www.epa.gov/iaq/largebldgs/baqtoc.html).

The Hydroville website (www.hydroville.org) has many online references about indoor air quality.

**SUGGESTED LESSON PLAN:***Getting Started*

1. If you are doing Day 2, invite your custodian or building manager to work with your classes and provide him/her with the list of questions that the students will be asking. As an alternative, videotape a student asking the custodian or building manager the questions and show the tape to your classes.
2. Assign homework Background Reading: *IAQ Backgrounder* and Worksheet 1: *Reading for Understanding Questions*.
3. **Journal Prompt:** If you were looking for indoor air pollutants that affect the indoor air quality in your classroom, name four pollutant sources you would look for? *Answers will vary, but should be based on their homework reading. Emphasize that "pollutant" and "hazard" is used interchangeably in this problem.*
4. Review homework assignment as an introduction to the activity.

*Doing the Activity***Day 1: Classroom Walkthrough**

1. Put up the transparency: *Indoor Air Quality Investigation Guidelines*. Remind students they are working for Environmental Solutions, Inc., and they will be following these guidelines in investigating the complaints at Hydroville Middle School (HMS).
2. Working in pairs, students follow Instructions: *Performing a Classroom Walkthrough* and fill out Worksheet 2: *Classroom Walkthrough Checklist*. In order for students to understand what happened during the initial building walkthrough of HMS, they

- conduct visual inspection of their own classroom and complete a checklist to identify problems associated with indoor air quality.
3. With permission, send some groups to other unoccupied rooms in the school in order to have a variety of classrooms surveyed or have students take the worksheet to their other classes and complete a checklist of rooms throughout the building.
 4. Students identify possible problems or pollutant sources in their classroom on Worksheet 3: *Indoor Air Quality Problems in the Classroom*.
 5. As a class, brainstorm actions or solutions to correct the problem areas and improve indoor air quality in the classroom and write those actions on Worksheet 3.

Day 2: School Building Walkthrough (optional)

1. If possible, students accompany the building custodian or a district facilities representative on a walkthrough of the school building. They record their observations on Worksheet 4: *School Building Information and Walkthrough Observations*.
2. Students identify any problems or areas of concern for the indoor air quality of the school and generate solutions for improving the indoor air quality. Answers are recorded on Worksheet 5: *Indoor Air Quality Problems in Your School*.

Wrap-up

1. Have students share the results of their classroom and building walkthroughs. Did they identify similar or different areas of concern?
2. List all the action items suggested by the teams. Students should copy these on Worksheet 5.
3. Each student should write a paragraph answering the questions on the bottom of Worksheet 3 and 5.

ASSESSMENT:

Evaluate students' paragraph on the bottom of Worksheet 3 and 5 about their top priority concern for creativity and feasibility.

Social Studies - Geography

1. If a map is used in the building walkthrough, use the map assessment tool located in Scoring Guides section of binder.
2. Check for understanding of **PLACE** by using classroom walkthrough checklist. All items measured are human and physical characteristics.
3. Check for understanding of **HUMAN/ENVIRONMENT INTERACTION** using the following:
 - Reading for Understanding Question 2
 - "Comments/Actions" column of Student Worksheet 3
 - "Concern" and "Action/Recommendation" column of Student Worksheet 4

RESOURCES:

- “*Building Air Quality: A Guide for Building Owners and Facility Managers*”, U.S. EPA. Section 6: Diagnosing IAQ Problems. December 1991.
- “*Indoor Air Quality Tools for Schools Action Kit*”. *IAQ Tools for Schools Kit*. U.S. EPA. Second edition. August 2000. www.epa.gov/iaq/schools/toolkit.html
- U.S. Department of Labor. Occupational Safety & Health Administration. OSHA Technical Manual, Section III: “*Chapter 2. Indoor Air Quality Investigation*”. www.osha.gov/dts/osta/otm/otm_iii/otm_iii_2.html

TEACHER KEY**Worksheet 1: Reading for Understanding Questions**

1. In your own words, define “indoor air quality”.
Indoor air quality is ...answers will vary.
2. What three consequences of IAQ problems in schools most concern you? Explain why you selected these problems.
 - *increasing the potential for term health problems for students and staff;*
 - *impacting the student learning environment, comfort, and attendance;*
 - *reducing performance of teachers and staff due to discomfort, sickness, or absenteeism;*
 - *accelerating decline and reducing efficiency of the school building and equipment;*
 - *increasing the potential that schools will be closed, or temporarily relocated;*
 - *straining relationships among school administration and parents and staff;*
 - *creating negative publicity that could damage a school's or administration's image and effectiveness; and*
 - *creating potential liability problems.*
3. List five sources of indoor air pollutants that may be present in your school.
See answers in the table, Typical Sources of Indoor Air Pollutant, on page 2 of Background Reading #2.
4. What government agency studies human exposure to air pollutants? Why is indoor air quality a concern?
The U.S. Environmental Protection Agency studies of human exposure to air pollutants indicate that indoor levels of pollutants may be two to five times, and occasionally more than 100 times, higher than outdoor levels. These levels of indoor air pollutants may be of particular concern because it is estimated that most people spend about 90% of their time indoors.
5. How can you improve the indoor air quality in your school? Give two or three specific examples.
Answers will vary.
6. What is the purpose of a building walkthrough?
A building walkthrough identifies problem areas and potential pollutant sources within a school.

Worksheets 2-5

Answers are based on your school's IAQ building walkthrough assessment.

Transparency

JOURNAL PROMPT



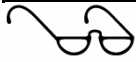
If you were looking for indoor air pollutants that affect the indoor air quality in your classroom, name four pollutant sources you would look for?



STUDENT PAGES FOR

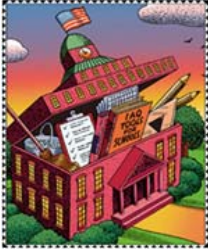
BUILDING WALKTHROUGH

FOLLOW THIS PAGE



IAQ BACKGROUNDER

WHY INDOOR AIR QUALITY (IAQ) IS IMPORTANT TO YOUR SCHOOL



Most people are aware that outdoor air pollution can damage their health, but many do not know that indoor air pollution can also have significant harmful effects. U.S. Environmental Protection Agency (EPA) studies of human exposure to **indoor air pollutants** (hazards) indicate that indoor levels of pollutants may be two to five times, and occasionally more than 100 times, higher than outdoor levels. These levels of indoor air pollutants may be of particular concern because it is estimated that most people spend about 90% of their time indoors.

Comparative risk studies performed by EPA and its Science Advisory Board have consistently ranked indoor air pollution among the top five **environmental health** risks to the public.

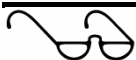
Failure to prevent indoor air problems, or failure to respond promptly, can have consequences such as:

- increasing the potential for long-term and short-term health problems for students and staff;
- impacting the student learning environment, comfort, and attendance;
- reducing performance of teachers and staff due to discomfort, sickness, or absenteeism;
- accelerating decline and reducing efficiency of the school building and equipment;
- increasing the potential that schools will be closed, or the occupants temporarily relocated;
- straining relationships among school administration and parents and staff;
- creating negative publicity that could damage a school's or administration's image and effectiveness; and
- creating potential liability problems.

Indoor air problems can be subtle and do not always produce easily recognized impacts on health, well-being, or the building. Children may be especially susceptible to air pollution. For this and the reasons noted above, the state of the air in an indoor environment, **indoor air quality (IAQ)**, in schools is of particular concern. Proper maintenance of indoor air is more than a "quality" issue; it encompasses safety and maintenance of the public's investment in students, staff, and facilities.

IMPORTANCE OF GOOD VENTILATION

Ventilation is the process by which stale indoor air is exhausted to the outside, and outside air is drawn into the building. Proper room ventilation can assure good indoor air quality. You may either have mechanical ventilation (supplied by fans) or natural ventilation (i.e., operable windows) in a room. Mechanical ventilation can be supplied by unit ventilators that provide heating and air conditioning to a single room or central ventilation unit that supplies many rooms through air supply and return vents.



BACKGROUND READING #2: PAGE 2

SOURCES OF INDOOR AIR POLLUTANTS

Indoor air pollutants can originate within the building or be drawn in from outdoors. If **pollution sources** (such as particles, fibers, dust, and gases) are not controlled, indoor air quality problems can arise. It may be helpful to think of air pollutant sources as fitting into one of the following categories:

Typical Sources of Indoor Air Pollutants			
Building Equipment	Building Materials/Furnishings	Other Indoor Sources	Outside Sources
<p>Heating/Ventilation Equipment</p> <ul style="list-style-type: none"> • Microbiological growth in drip pans, ductwork, coils, and humidifiers • Improper venting of combustion products • Dust or debris in ductwork <p>Non-Heating/Ventilation Equipment</p> <ul style="list-style-type: none"> • Emissions from office equipment • Emissions from shops, labs, and cleaning processes 	<p>Building Materials</p> <ul style="list-style-type: none"> • Microbiological growth on soiled or water-damaged materials • Materials containing volatile organic compounds, inorganic compounds, or asbestos • Materials that produce particles (dust) <p>Furnishings</p> <ul style="list-style-type: none"> • Emissions from new furnishings and floorings • Microbiological growth on or in soiled or water-damaged furnishings 	<ul style="list-style-type: none"> • Science laboratories • Vocational arts areas • Copy/print areas • Food prep areas • Smoking lounges • Cleaning materials • Emissions from trash • Pesticides • Odors and volatile organic compounds from paint, chalk, and adhesives • Occupants with communicable diseases • Dry-erase markers and similar pens • Insects and other pests • Personal care products 	<p>Polluted Outdoor Air</p> <ul style="list-style-type: none"> • Pollen, dust, and fungal spores • Industrial emissions • Vehicle emissions <p>Nearby Sources</p> <ul style="list-style-type: none"> • Loading docks • Odors from dumpsters • Unsanitary debris or building exhausts near outdoor air intakes <p>Underground Sources</p> <ul style="list-style-type: none"> • Radon • Pesticides • Leakage from underground storage tanks

UNDERSTANDING IAQ PROBLEMS AND SOLUTIONS

Over the past several decades, indoor air pollutant levels have increased due to a variety of factors including: the construction of more tightly sealed buildings, reduced ventilation rates to save energy, the use of synthetic building materials and furnishings, and the use of chemically-formulated personal care products, pesticides, and house keeping supplies.

In order for indoor air quality in schools to improve, everyone needs to learn more about indoor air pollutants. The EPA *Tools for Schools* program encourages administrators and facilities managers to conduct a thorough **building walkthrough**. A building walkthrough is an inspection which follows specific steps to identify potential problem areas in the school that may contribute to indoor air quality.

The next step is to generate solutions to the problems and take corrective action. The solutions can be as easy as replacing a filter in the heating and ventilation system or replacing the cleaning products with odorless and safer alternatives. The best part of improving the air quality in your school is that you can be part of the solution. Think about how you can contribute to making your school a healthier place.



WORKSHEET 1: PAGE 2

Name _____

Date _____ Period _____

TERMINOLOGY

Define the words or terms from the background reading that are new to you.

Indoor Air Quality (IAQ)

Environmental Health

Air pollutants (hazards)

Pollutant sources

Building walkthrough



INSTRUCTIONS 1: PAGE 1

PERFORMING A CLASSROOM WALKTHROUGH

Introduction



A **building walkthrough** is an inspection of **pollutant sources** or other conditions that might affect the **indoor air quality (IAQ)** within your school or classroom. During a walkthrough you can learn a lot by using your sense of sight, smell, feeling, and hearing to gather information.

- **Observe** the cleanliness of the room. Is there a lot of clutter or dust? Look for sources of pollutants such as animals, dirty carpets, evidence of leaks, blocked airflow, improperly stored chemicals.
- **Smell** for any unusual chemical or musty odors. Make note of where they are coming from.
- **Feel** for uncomfortable temperatures, humidity, drafts, and air flowing in and out of air vents and around doors and windows.
- **Listen** to the occupants of the room. What do they complain about? Temperature? Smells? Dirty carpets? Or do they provide clues to problems, e.g., “I turn off the ventilator because it is too noisy” or “I let my students eat in the classroom because otherwise they show up late.”

Materials

- Worksheet 2: *Classroom Walkthrough Checklist*
- Worksheet 3: *Indoor Air Quality Problems in the Classroom*

Procedure

1. Working in pairs, spend ten minutes using your senses to gather information about the indoor air quality of your classroom. Record your observations in your Hydroville Science Journal.
2. Fill out Worksheet 2: *Classroom Walkthrough Checklist* as best you can. Use “NA” beside the boxes if the question does not apply to your room.
3. With your partner, review your classroom walkthrough checklist. Record possible IAQ problems and pollutants in Worksheet 3: *Indoor Air Quality Problems in the School*. Share your observations or problems with the class.
4. As a class, brainstorm a list of actions to correct these problems. Looking at each problem, generate one to two actions or solutions that could be taken to improve the air quality of the classroom. Write these recommended actions on Worksheet 3.

**INSTRUCTIONS 1: PAGE 2**

SCHOOL BUILDING WALKTHROUGH (OPTIONAL)**Introduction**

If you are to analyze the indoor air quality of a building, you must know something about the construction, heating and ventilation system, and possible pollutant sources in the building. From interviews with building personnel and a building walkthrough, you will gain important information about your school.

Materials

- Custodian interview (taped, written, or personal)
- Worksheet 4: *School Building Information and Walkthrough Observations*
- Worksheet 5: *Indoor Air Quality Problems in Your School*

Instructions

1. Using information gathered from the interview and your observations on your school building walkthrough fill out Worksheet 3.
2. List any areas of concern and propose actions or solutions that might be done to improve the indoor air quality of your school.

**WORKSHEET 2: PAGE 1**

Name _____

Date _____ Period _____

CLASSROOM WALKTHROUGH CHECKLIST

General Cleanliness: Regular and thorough classroom cleaning is important to ensure good indoor air quality. Chemicals used improperly or without proper ventilation can be a source of indoor air pollutants. The presence of dirt, moisture, and warmth also stimulates the growth of molds and other biological pollutants. Unsanitary conditions attract insects and vermin, leading to possible indoor air quality (IAQ) problems from animal or insect allergens.

Y	N	NA	Classroom is cluttered and appears dirty or dusty.
Y	N	NA	Classroom looks to be dusted and vacuumed too seldom.
Y	N	NA	Spills are not cleaned up promptly.
Y	N	NA	Trash is overflowing; it does not appear to be emptied daily.
Y	N	NA	Food is kept in classroom overnight.
Y	N	NA	Classroom has furry animals.
Y	N	NA	Animal food is stored out in the open, not in sealed containers.
Y	N	NA	Animal cages are dirty and not cleaned regularly.
Y	N	NA	Classroom has pests such as insects, spiders, cockroaches or mice.
Y	N	NA	Classroom has a musty smell.
Y	N	NA	Scented cleansers are used in the classroom.
Y	N	NA	Chemicals can be smelled when you enter the room.
Y	N	NA	Vehicle exhaust can be sometimes smelled.
Y	N	NA	Classroom has whiteboard with erasable markers and white board cleaner.
Y	N	NA	Classroom has been renovated or painted within the six months.
Y	N	NA	Classroom has new cabinets, bookshelves, desks or carpeting.
Y	N	NA	Chemicals are stored in the classroom.
Y	N	NA	There is a computer and laser printer in the classroom.
Y	N	NA	Projects are done in the classroom that uses spray paint, rubber cement, or latex paint.

Thermal Comfort: Temperature and relative humidity can affect comfort and indoor air quality.

Y	N	NA	Room is usually uncomfortable – either too hot or too cold.
Y	N	NA	There are drafts in the room.
Y	N	NA	There is direct sunlight shining on students.
Y	N	NA	Room is often humid and sticky.

**WORKSHEET 2: PAGE 2**

Name _____

Date _____ Period _____

Excess Moisture in Classrooms: Excess moisture contributes to mold growth. Mold can trigger allergic reactions and asthma in sensitive individuals.

Y	N	NA	There is condensate (condensed water or fog) on windows, and window sills.
Y	N	NA	There is condensate on cold water pipes.
Y	N	NA	There is condensate on indoor surfaces of exterior walls.
Y	N	NA	There is evidence of leaks around or under classroom sinks.
Y	N	NA	There are brown water stains or discoloration on ceiling tiles or walls.



Ventilation

Ventilation is the process by which stale indoor air is exhausted to the outside, and outside air is drawn into the building. You may either have mechanical ventilation (supplied by fans) or natural ventilation (i.e., operable windows).

Determine how your classroom is ventilated		
Y	N	Unit ventilator located.
Y	N	Air supply and return vents located (central heating and air conditioning unit).
Y	N	Windows are operable.

Air Supply: If you have mechanical ventilation, confirm that air is flowing into the room from the air supply vent(s).

Check for airflow by holding a piece of tissue paper near the air supply vent(s); if air is flowing, the tissue will flutter away from the supply vent. Make sure that the airflow is not diverted or obstructed by books, papers, furniture, or other obstacles. Never place anything on top of unit ventilators.

Y	N	Air flowing from air supply.
Y	N	Furniture, books, papers or other obstacles block air supply.

Air Return: if you have mechanical ventilation, confirm that air is flowing from the room into the air return grille(s).

Check for airflow at air return grille(s) in the same manner as with previous activity. If air is flowing, the plastic or tissue will be pulled toward the return. A piece of plastic that nearly covers the grille will stick to the face of the grille if air is flowing. Make sure airflow is not obstructed by books, papers, furniture, or other obstacles.

Y	N	Air is flowing into air return grill(s).
Y	N	Furniture, books, papers or other obstacles block air return.
Y	N	Air return grill is clean and does not show evidence of debris.

Unexplained odors: Improperly operated or poorly maintained ventilation systems may cause IAQ problems. Odors, or the need to use scented air fresheners, may indicate a ventilation problem. The ventilation system can carry air contaminants from another location in the school to your classroom.

Y	N	Smells of vehicle exhaust.
Y	N	Smells of kitchen/food.
Y	N	Smells of chemicals.
Y	N	Smells of mold or mildew.

Science Laboratories:

Science laboratories should have separate exhaust systems to vent chemical odors to the outside and not recirculate them into other rooms. They also should have a fume hood to isolate chemicals from the room.

Y	N	Laboratory has a separate exhaust fan to vent the room.
Y	N	The fume hood is in good repair and not pulling away from ceiling or wall.

Blank Page


WORKSHEET 4: PAGE 1

Name _____

Date _____ Period _____

SCHOOL BUILDING INFORMATION AND WALKTHROUGH OBSERVATIONS
General Building Information:

- Building age: _____
- Age of latest building addition: _____
- Number of floors: _____
- What type of space use is in the building (classrooms, offices, gymnasiums, laboratory, food service): _____
- Number of building occupants: _____
- Days per week the building is occupied: _____
- Hours per day the building is occupied: _____

Building Exterior:

- Exterior wall construction (brick, concrete, stone, wood siding, metal): _____
- Roof construction (shingles, metal, slate): _____

Building Interior:

- Interior walls: _____
- Floors: _____
- Windows: _____

Building Ventilation System:

- Is the ventilation natural (windows open) or mechanical (provided by the heating and ventilation (HVAC) system)? _____
- Does your building have air conditioning? _____
- Is the HVAC system centralized? How many zones? _____
- Is the HVAC system in individual rooms? _____
- What type of heating equipment is used? (steam or hot water boiler, forced air, heat pumps, electric baseboard) _____
- Are there unit ventilators? Which rooms? _____

Pollutant Sources (Outdoor):

- Garbage dumpsters: _____
- Motor vehicle/bus traffic: _____
- Construction activities: _____
- Industrial stacks: _____

Pollutant Sources (Indoor):
*Water Damage -Evidence of **past** water damage*

- Basement: _____
- Roof: _____
- Mechanical space: _____
- Occupied space: _____
- Floors damaged: _____

*Water Damage -Evidence of **current** water leakage or damage*

- Basement: _____
- Roof: _____



WORKSHEET 4: PAGE 2

Name _____

Date _____ Period _____

- Mechanical space: _____
- Occupied space: _____
- Floors damaged: _____

Building Renovations

- Has painting occurred in the last year? Where?

- Has new carpeting been installed in the last year? Where?

- Has the building been re-roofed in the last year? _____
- Has new furniture or cabinets been installed in the last year? Where?

Cleaning Schedule

Carpet/Flooring

- Vacuuming: _____
- Wet mopping: _____
- Finishing/Waxing: _____

Bathrooms: _____

Trash emptied: _____

Other: _____

Cleaning Materials in Custodian's Closet

Type	Product	Use
Window cleaner		
Floor cleaner		
Floor finisher		
Carpet cleaner		
Furniture cleaner		
Kitchen cleaner		
Bathroom cleaner		
Disinfectant		
Liquid hand soap		
Other:		

Pest Control:

- Frequency of Exterior Pesticide Application _____
- Date of last Exterior Pesticide Application _____ Product Used?

- Frequency of Interior Pesticide Application _____
- Date of last Interior Pesticide Application _____ Product Used?

- Is pesticide storage on or off site? _____ If on site, where is it stored?

Special Use Spaces:

- Do the bathrooms have their dedicated (separate) ventilation and exhaust systems?



WORKSHEET 4: PAGE 3

Name _____

Date _____ Period _____

- Does the kitchen have its own dedicated ventilation and exhaust systems? _____
- Does the building have any laboratory areas or other rooms: art, printing, vocational, computer? _____ If yes, enter the information in the following box:

Room Number	Type	Dedicated Ventilation System?	Dedicated Exhaust System?

**WORKSHEET 5**

Name _____

Date _____ Period _____

INDOOR AIR QUALITY PROBLEMS IN YOUR SCHOOL

List any indoor air quality problems in your school. Record where it is located and generate one to two actions or solutions to correct each problem.

Location in School	Problem	Action or Solution

List below the problem in your schools that you think has top priority. Include the reasons and data to support your selection.