



# U.S. EPA / Region 9 San Francisco

Indoor Air Quality



Tools For Schools

## Indoor Environments Team

Katie Stewart

415-947-4119

Stewart.kathleen@epa.gov

Shelly Rosenblum

415-947-4193

rosenblum.shelly@epa.gov

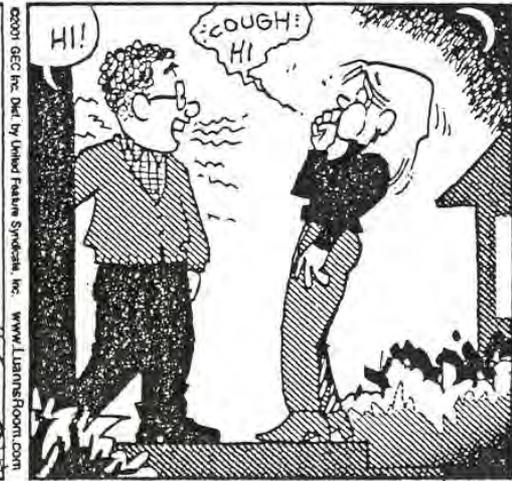
Monique Nivolon

415-947-4195

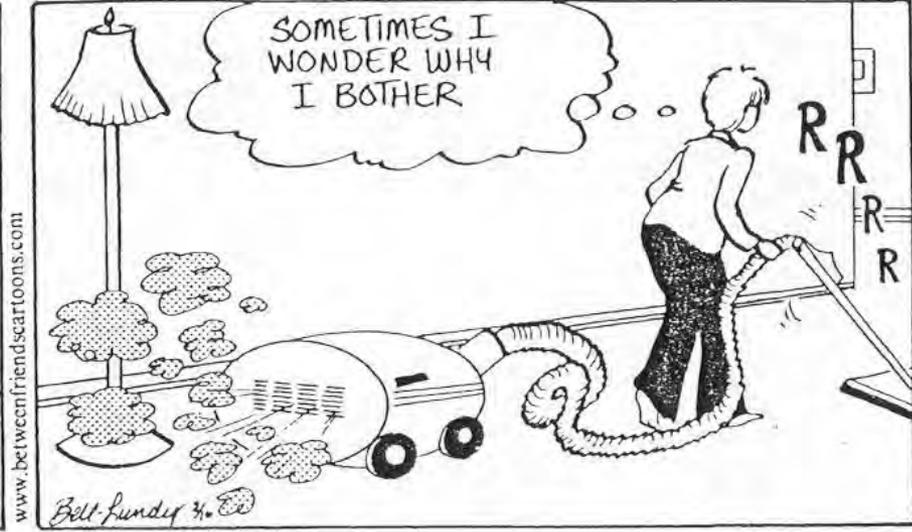
Nivolon.monique@epa.gov

[www.epa.gov/iaq](http://www.epa.gov/iaq)

LUANN



BETWEEN FRIENDS





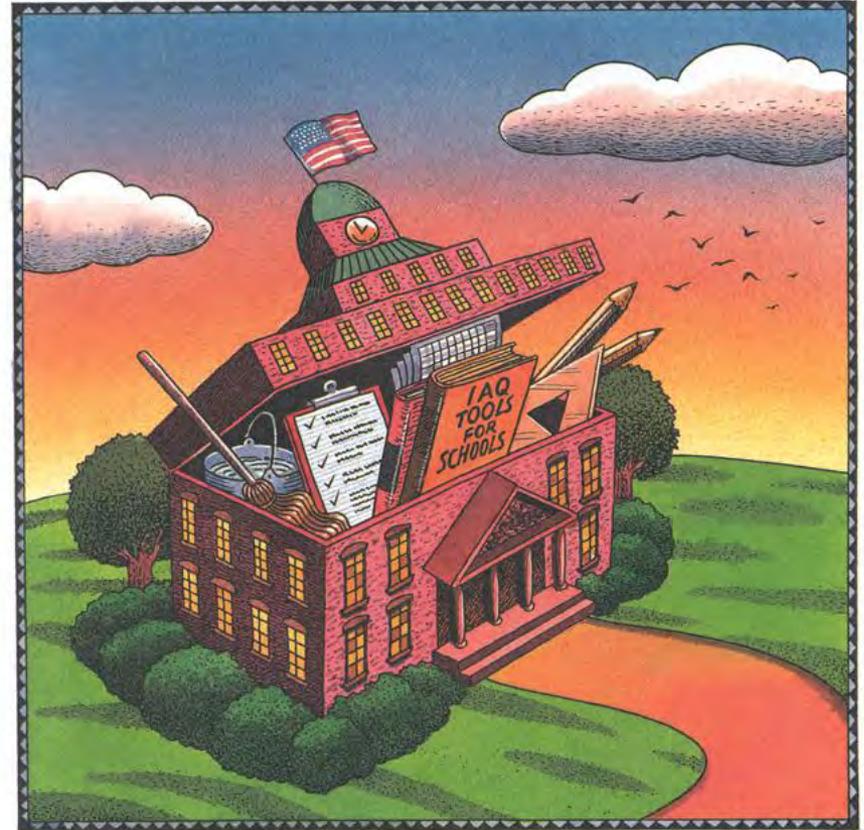
# The U.S. Environmental Protection Agency's

*Voluntary*

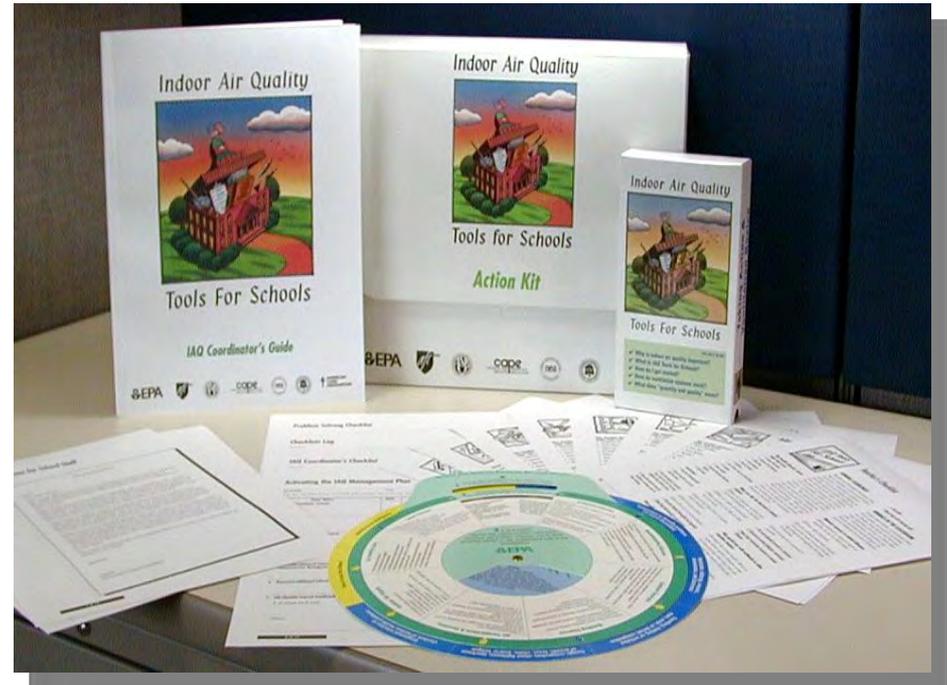
*Common sense*

*Follow-the-dots to good IAQ*

# Indoor Air Quality



# Tools For Schools



*Used by thousands of schools across the country.*

*It works.*

*We have lots of experience with working with it in many different kinds of districts: small & large; rural & urban; rich and poor.*

*It can help conserve your resources and sometimes your sanity.*

*Tailor it. Modify it. Adapt it. Abbreviate it. Expand it.  
Get students to do it but ...  
Make it yours!*

# *A New Issue?*

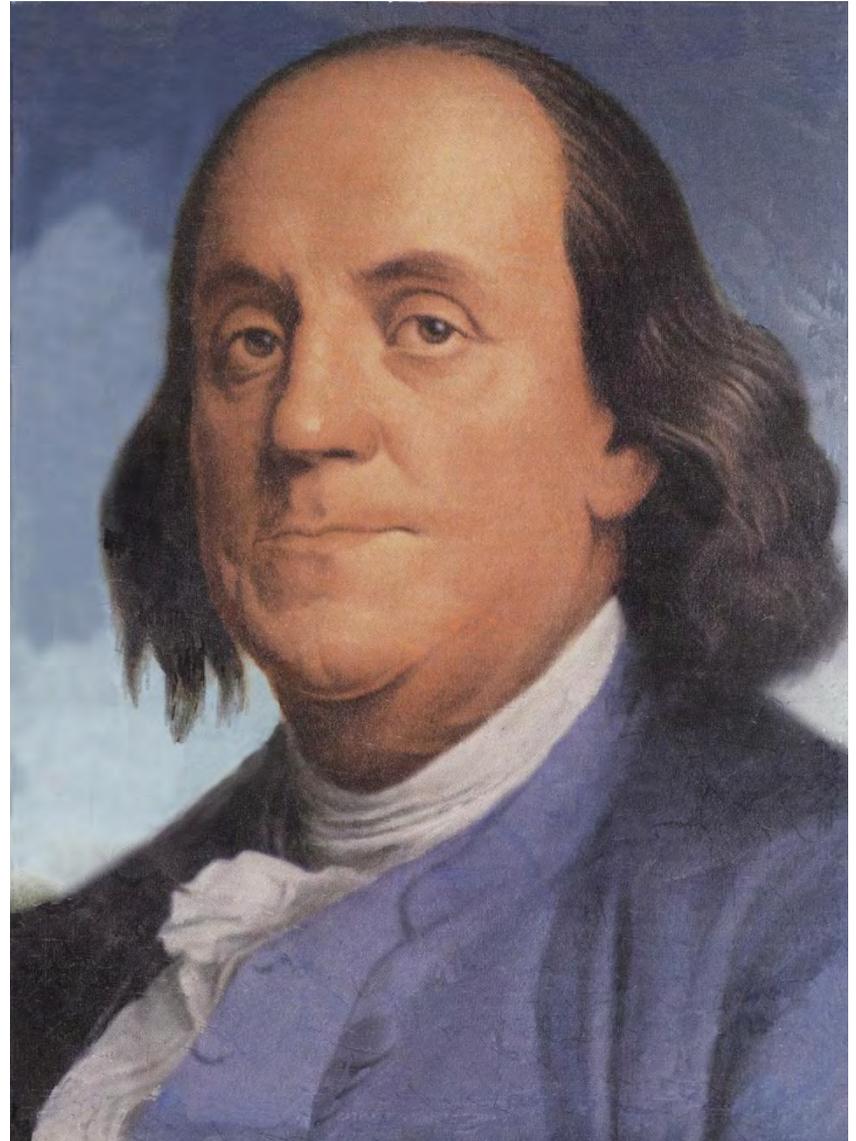
*In the construction of buildings, whether for public purposes or as dwellings, care should be taken to provide good ventilation and plenty of sunlight. ... school rooms are often faulty in this respect. Neglect of proper ventilation is responsible for much of the drowsiness and dullness that ... make the teacher's work toilsome and ineffective.*

*Health Reformer, 1871*



An early protector of  
the indoor habitat.

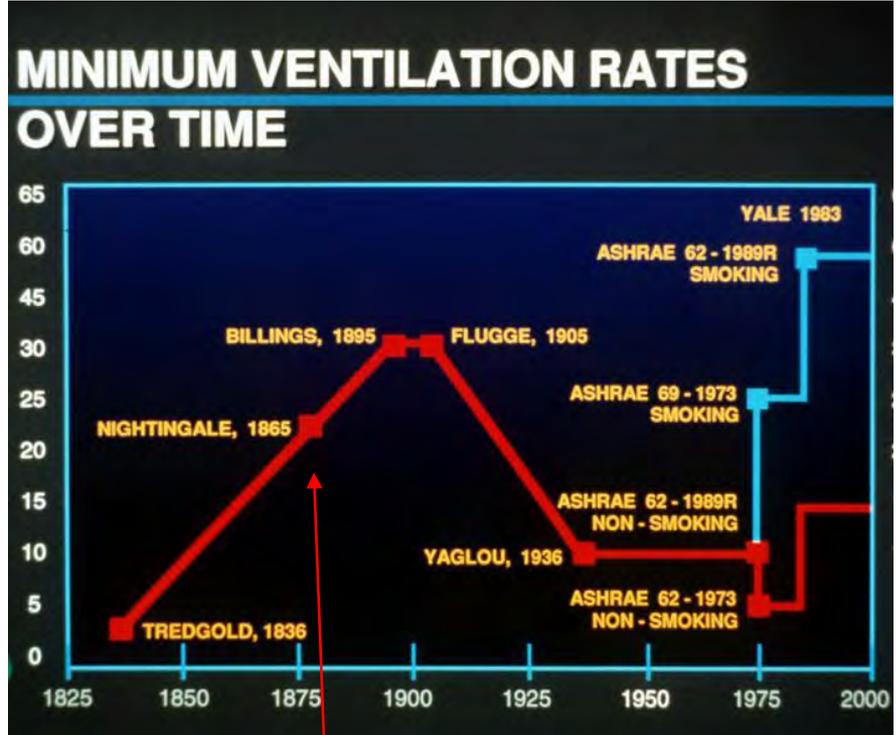
“I am persuaded that  
no common air from  
without is so  
unwholesome as air  
within a closed room  
that has been often  
breathed and not  
changed.”





THE TERRY PICTURE

FLORENCE NIGHTINGALE



**Florence Nightingale**

# 1893 New Hampshire Ventilation Codes

*It is certain that the additional annual expense per pupil of the best ventilation need not exceed the price of one or two cheap lunches.*

*The effect of perfect ventilation, where it has been tried, is to increase the pupil's power of work about 50 percent ...*

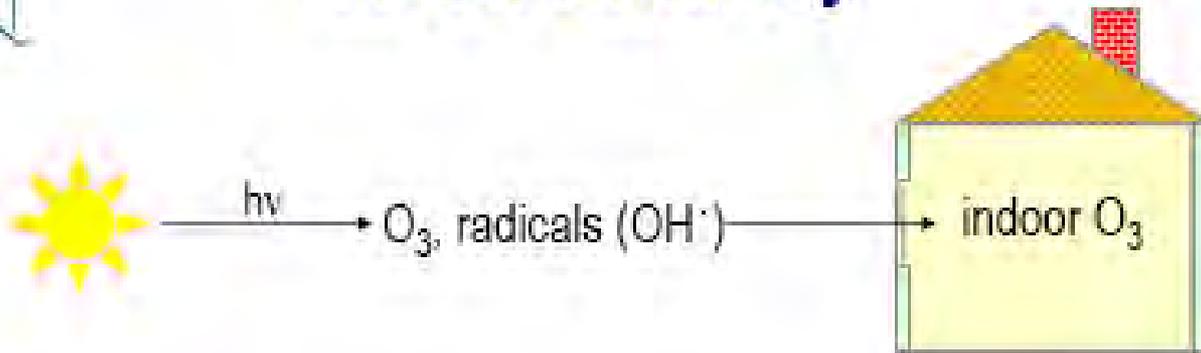
# Why is IAQ important?

*Americans spend about 90% of their day indoors - in classrooms, in offices, at home.*

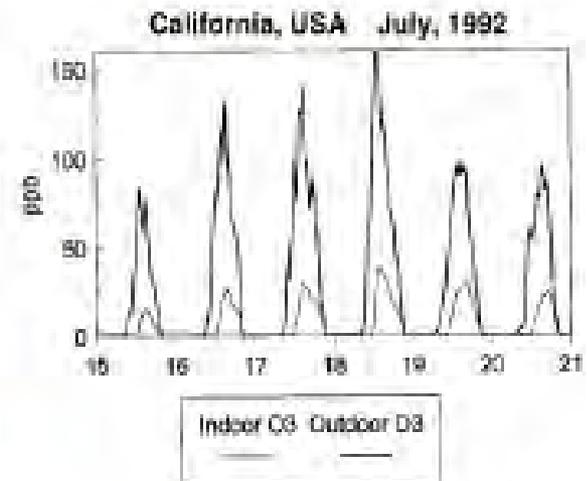
*Pollution indoors is two to five times - and occasionally more than 100 times - higher than out door levels.*



# Indoor chemistry



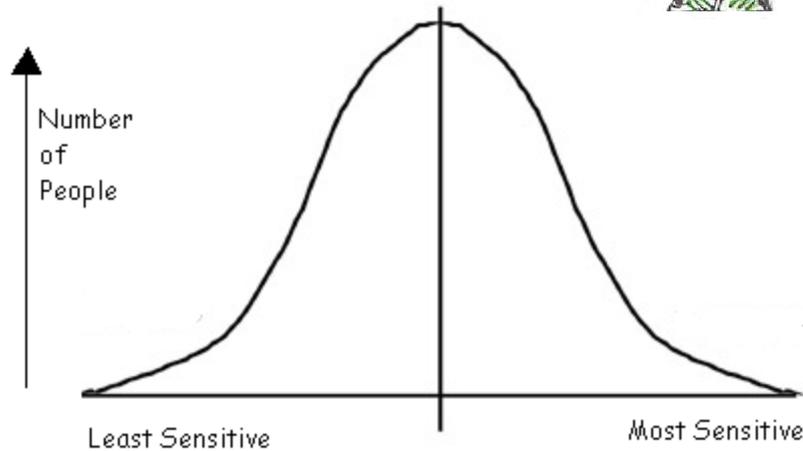
- $\text{O}_3 + \text{surfaces} \rightarrow \text{less O}_3$ 
  - Sabersky, Sinema & Shair, ES&T, 1973
- $\text{O}_3 + \text{carpet} \rightarrow \text{aldehydes, less O}_3$ 
  - Weschler, Hodgson & Wooley, ES&T, 1992
  - Morrison & Nazaroff, ES&T, 2000, 2002
- $\text{O}_3 + \text{terpenes} \rightarrow \text{OH}\cdot, \text{particles, formaldehyde}$ 
  - Weschler & Shields, ES&T, 1996, 1997
  - Weschler & Shields, Atmos. Environ., 1997, 1999



Weschler et al.  
Indoor Air, 2000

Courtesy of Brett C. Singer & Hugo Destailats; Indoor Environment Dept., Lawrence Berkeley National Laboratory

We're all different\*

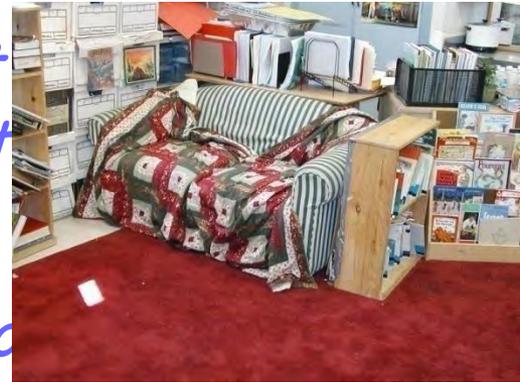


\*Some more than others!

# How does our indoor air get contaminated?



Environment  
at. Pollut  
ckly!



and a few peo  
ishings, etc  
to the air  
go?



# Chemicals in Perfume and the Symptoms they cause



**The 20 Most Common Chemicals Found in 31 Fragrance Products and Some of Their Effects (From 1991 EPA Study)**

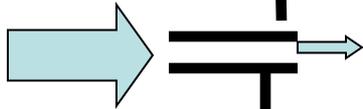
Reference: Lisa Wilcox, Environmental Protection Agency  
 Phone (703) 648-4287  
 Compiled by Julia Kendall (1995 - 1997)  
 References: Material Safety Data Sheets (MSDS)  
 Excerpts from "Health Hazard Information"  
 Distributed by The Environmental Health Network (EHN) [of California] 3  
 P.O. Box 1155, Larkspur, CA 94977-1155 tel: 415 541 5073 T

Flyer Design Concept: Barbara Wilkie  
 Flyer Design and Production: Peter Beeler

*If you've got good air exchange - ventilation - you can get away with adding contaminants to your air - to some extent.*



*If you don't, make  
sure you know how to  
keep your bubble of  
air as clean as possible.*



*Meets state  
ventilation code*



X 30

*Doesn't meet state  
ventilation code!*



X 35

## *TfS is not about testing the air!*

*Add fewer pollutants*

- Learn where and how pollutants are added.*
- Occupant activities as well as maintenance activities.*

*Remove pollutants quickly*

- Learn where and how pollutants are removed.*
- Learn where and how fresh air is added.*
- Learn about operation of HVAC controls.*

# There are two sides to IAQ “coin”

## District

- *Building structure*
- *Ventilation*
- *Landscaping / pest control*
- *Etc.*

## School Occupants

- Art & science materials
- Household cleaners
- Personal care products
- Activities, awareness, etc.



←→  
**Communication**



# CTA IAQ/Asthma Poster

(available to your schools)

- Unblock vents
- Avoid toxic and scented products
- Prevent mold
- Avoid clutter
- Keep pests out
- Choose allergy-friendly pets
- Be an early warning system

**Improve Your IAQ IA**  
Indoor Air Quality

**Avoid Asthma and Allergy Triggers in the Classroom**

- Unblock Vents and Keep Air Flowing**  
Inadequate ventilation can cause headaches and drowsiness. Keep fan controls set to "ON." Attach a string to a pole to check vent airflow.
- Use Less Toxic Instructional, Art and Science Products**  
Avoid chemical irritants by using products such as water-based, low-odor whiteboard pens. Tightly close supplies.
- Help to Prevent and Eliminate Mold**  
Clean and dry classroom spills thoroughly. Alert building staff to leaks, and wall and ceiling discolorations.
- Contact Your Local Teachers Association**  
Help is available to address issues at your school site.  
EPA's IAQ Tools for Schools kit can help districts and teachers work together. [www.epa.gov/iaq](http://www.epa.gov/iaq)
- Avoid Scented Products**  
Air fresheners, candles, perfumes and personal products can add contaminants to the air.
- Avoid Upholstered Furniture and Clutter**  
A custodian-friendly room makes it easier to remove dust mites, pet dander and mold. Vacuum couches often.
- Use District-Approved Cleaning Products**  
Clearly label all products and keep tightly capped. Ask if your district can use less toxic green cleaning products.
- Choose Allergy-Friendly Classroom Pets**  
Avoid furry animals, or keep them caged and away from ventilation systems and sensitive students.
- Don't Invite Pests into the Classroom**  
Store food in airtight containers. Encourage your district to use less toxic integrated pest management.
- Be an Early Warning System**  
Report unhealthy and uncomfortable conditions to building staff, including problems with odors, pests, mold, exhaust, temperature and ventilation.

**Indoor Air Quality Impacts the Ability of Teachers to Teach and Students to Learn**

**California Teachers Association**  
Community Outreach  
(650) 552-5468  
[www.cta.org](http://www.cta.org)

**Healthy Air, Healthy Kids**  
A PROJECT OF THE CALIFORNIA TEACHERS ASSOCIATION

**Teachers for Healthy Kids**  
(916) 443-8811  
[www.teachersforhealthykids.com](http://www.teachersforhealthykids.com)

Thanking The California Association

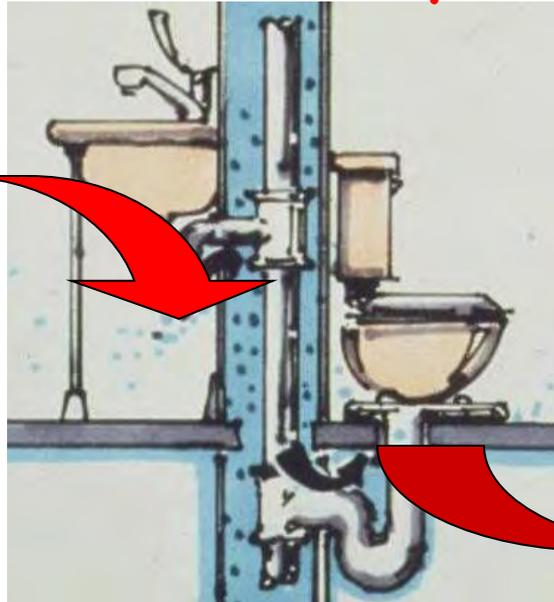
[http://www.teachersforhealthykids.com/Indoor\\_Air\\_Quality/index.html](http://www.teachersforhealthykids.com/Indoor_Air_Quality/index.html)

# What does it take to create an IAQ problem?

Pathway

Receptor

Source



Driving Force

# Major causes of poor IAQ

- *Pollution sources*
- *Improperly operated and maintained HVAC*
- *Building occupants and their activities*

But these aren't Root Causes !



# Take control of your IAQ by understanding the root causes of poor IAQ

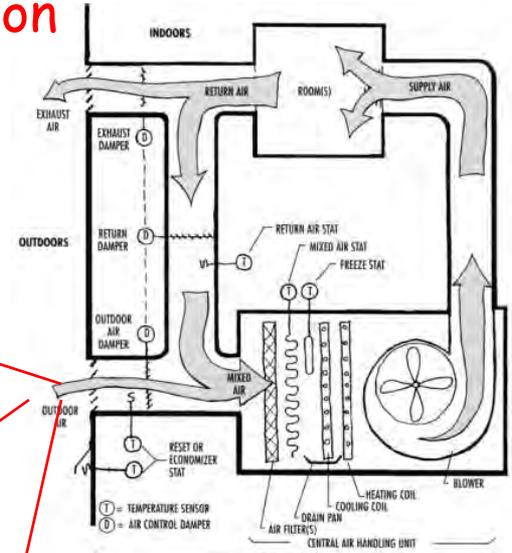
- *Basic knowledge*
- *Typical activities*
- *Poor Communication*

Look for these in the photos

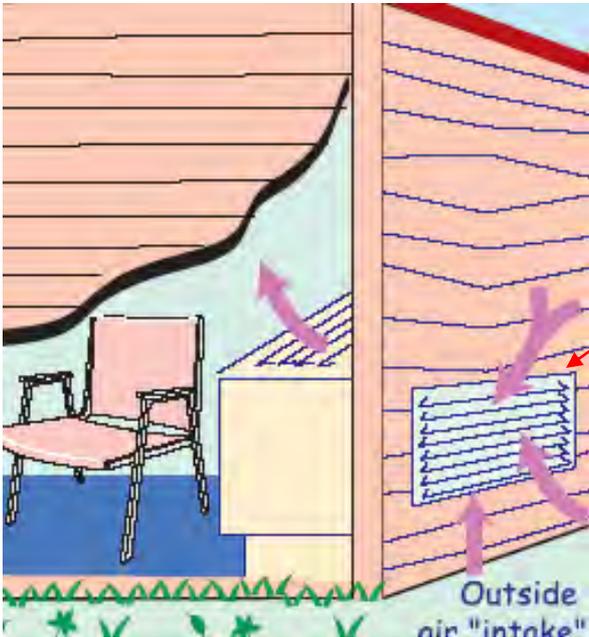




School occupants need to learn a little about how the ventilation system works.



Outside air gets pulled in here.



# Bus Stop





Well, I'm allergic to you too!

How about cleaning my cage?!





*This will be a challenge!*

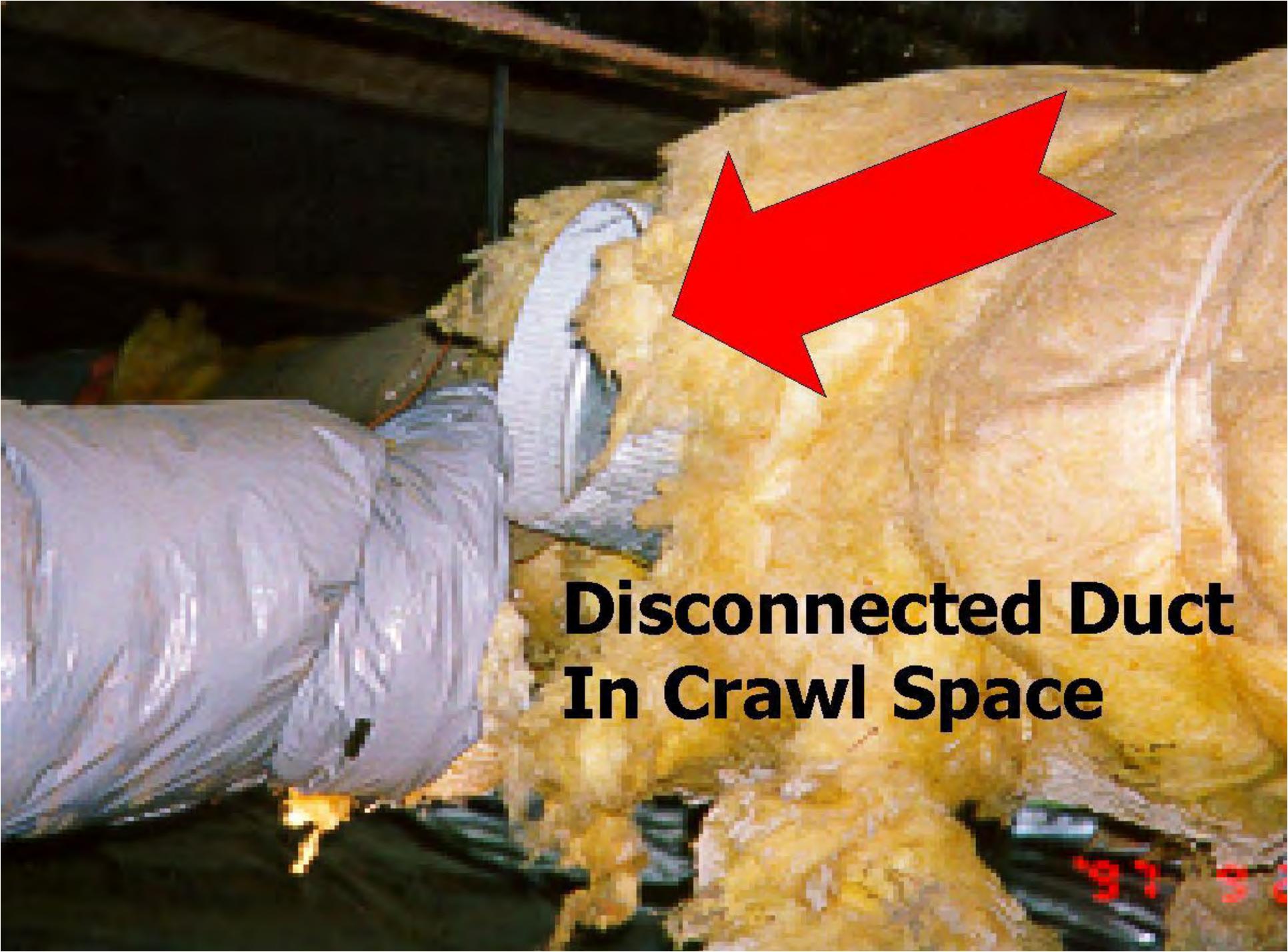




**Achoo!**

Can you picture the headline in the newspaper?





**Disconnected Duct  
In Crawl Space**

09 1 3 2

Nothin'  
says lovin  
like plastic  
from the  
oven!



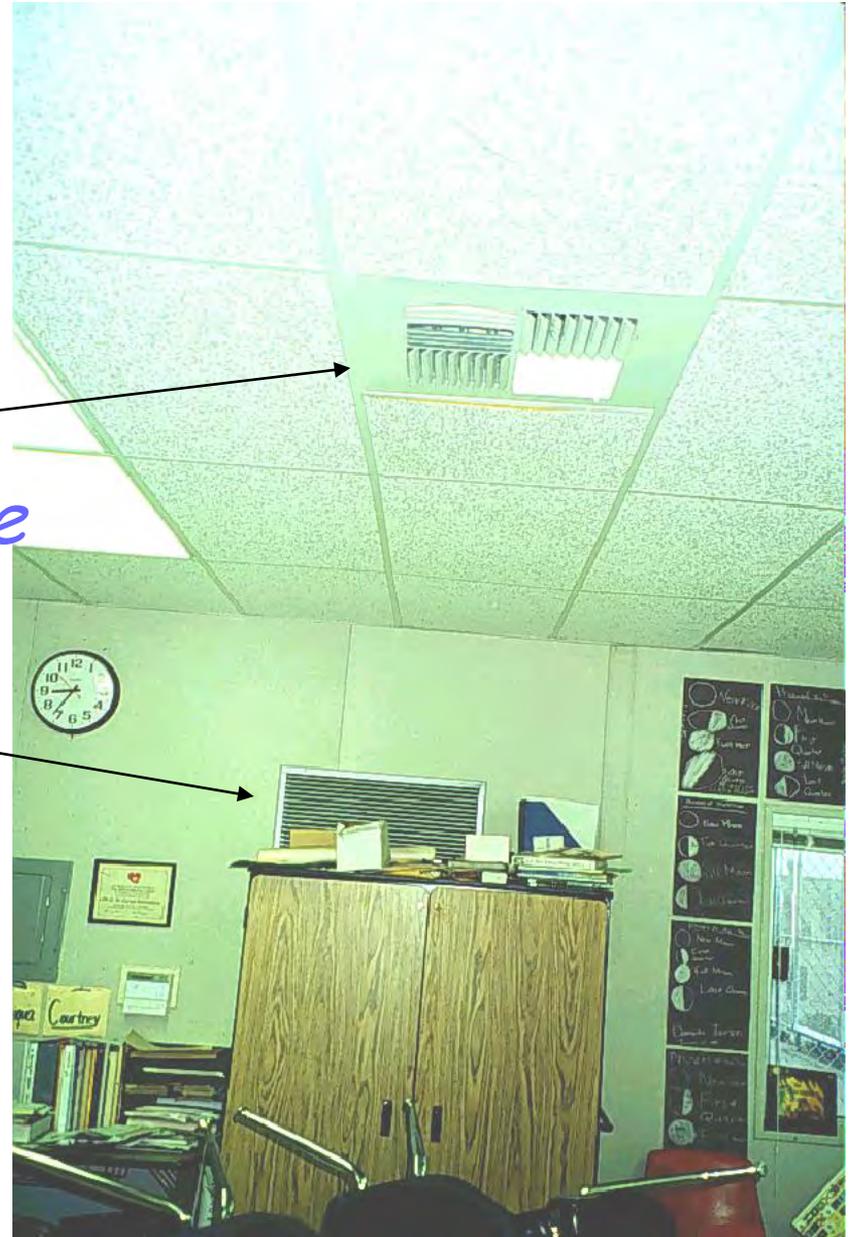


**You don't have to test to know  
you have a problem and what  
to do about it!**

*For air to come out of here*

*It has to get in there*

**A waste of energy, money  
& staff time.**





CO<sub>2</sub> SAMPLE  
4069 PPM

High CO<sub>2</sub>

- CO<sub>2</sub>
- TEMP
- HUMIDITY
- CO
- SAMPLING MODE
- CLEAR MEMORY
- SAMPLE
- TIME CONSTANT
- STATISTICS
- PRINT

**A waste of energy, money  
& staff time.**

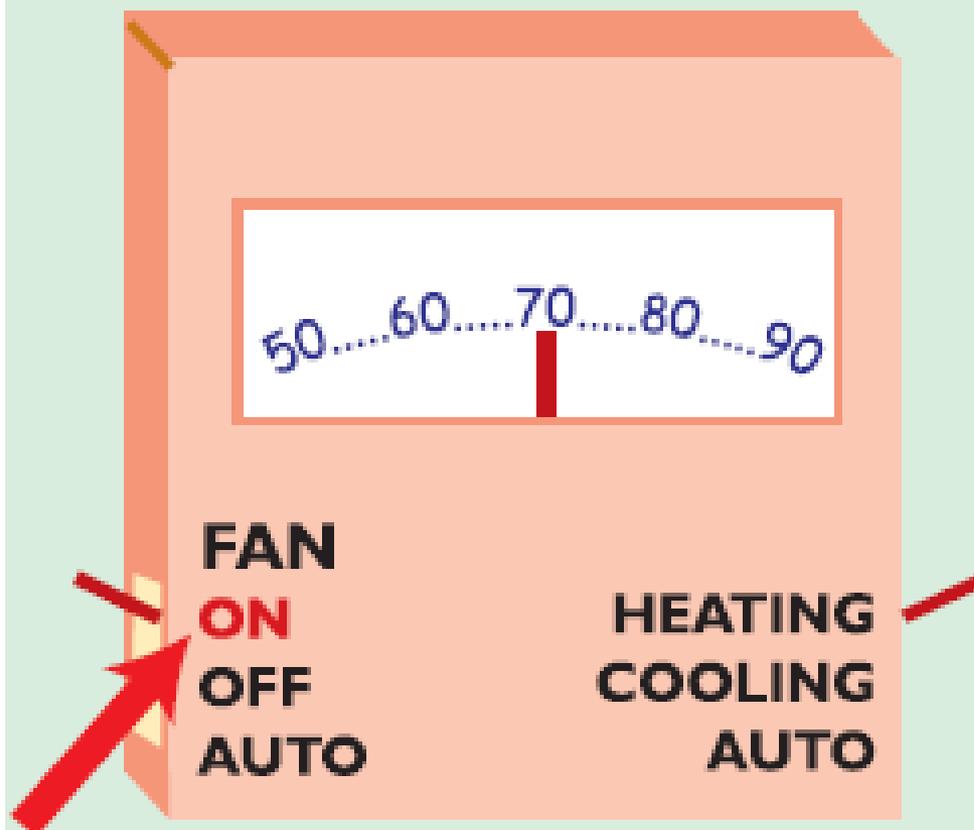
*No wonder the air  
wasn't moving!*

*Somebody missed  
this filter!*

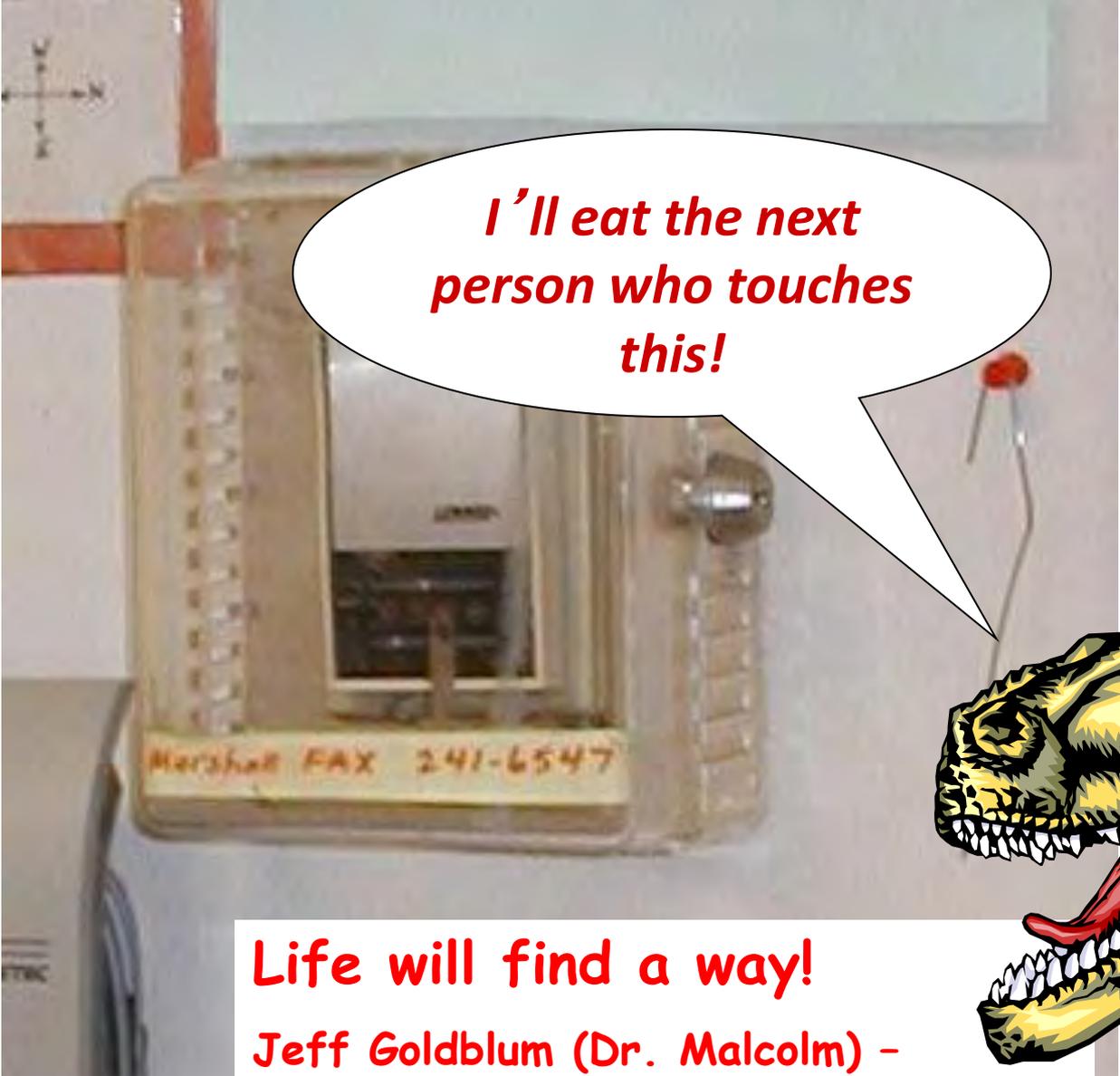




Keep the fan "ON" when people are there.



With the fan switch in the "ON" position, fresh air will be brought in continuously. The air conditioner or heater will cycle on and off to adjust temperature.



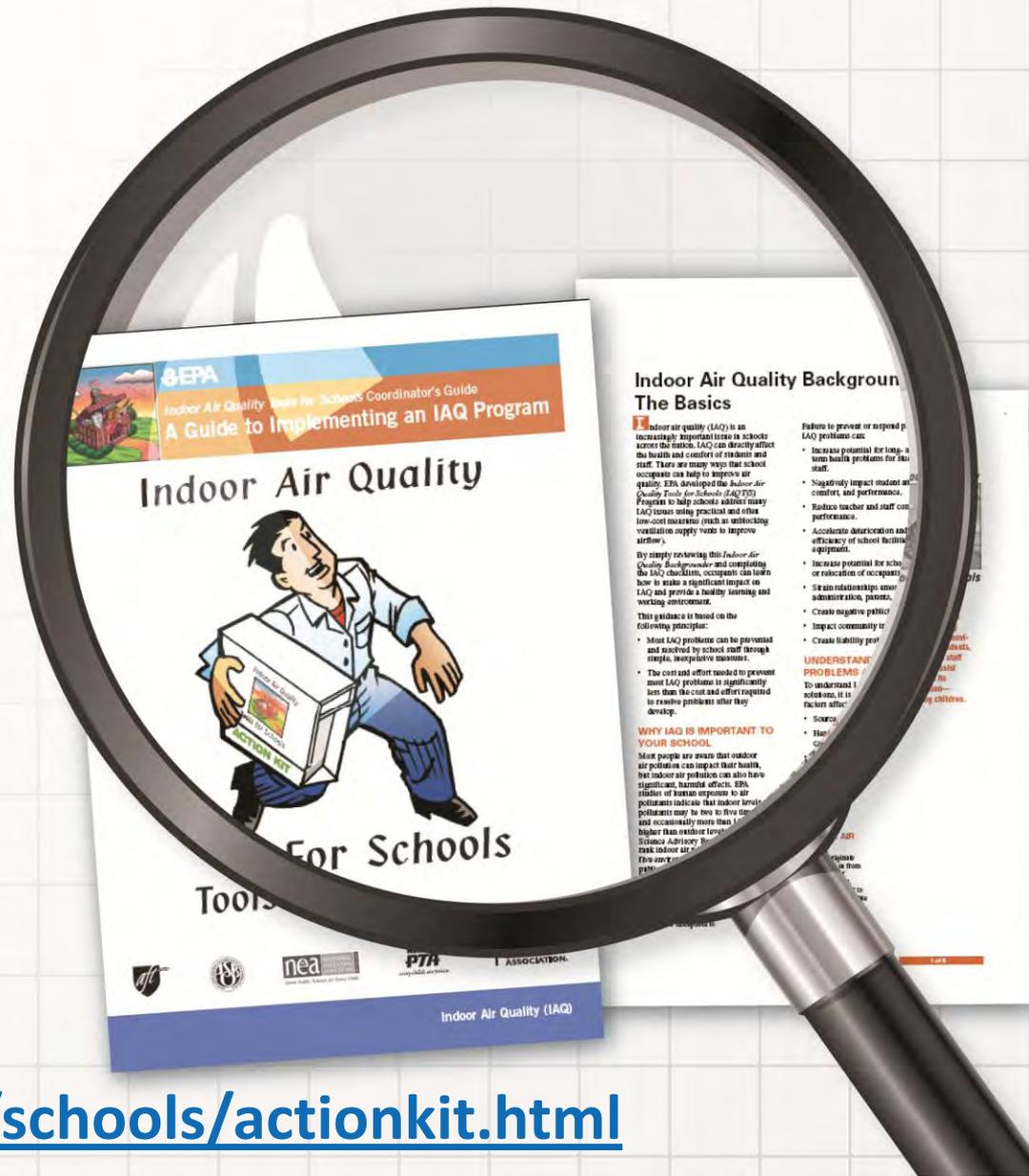
*I'll eat the next  
person who touches  
this!*

**Life will find a way!**

**Jeff Goldblum (Dr. Malcolm) -  
Jurassic Park**



# The IAQ Tools for Schools Action Kit



<http://epa.gov/iaq/schools/actionkit.html>

# The Framework for Effective School IAQ Management: Key Drivers

## ORGANIZE

- Develop Systematic Approach
- Identify Existing Assets
- Design SOPs
- Empower an IAQ Leader
- Build an Effective Team
- Create Champions
- Secure Senior Buy-In

**Organize**

## COMMUNICATE

- Share Your Goals
- Make IAQ Meaningful
- Be Transparent & Inclusive
- Communicate Results (ROI)

**Communicate**

## EVALUATE

- Solicit Feedback
- Capture ROI

**Evaluate**

## ASSESS

- Walk the Grounds
- Listen to Occupants
- Use Technology
- Determine a Baseline
- Keep Customers Satisfied
- Identify and Prevent Risks

**Assess**

## ACT

- Educate Staff About IAQ to Change Behavior
- Train Occupants to Address IAQ Risks
- Address the Source of Problems

**Act**

## PLAN

- Prioritize Actions
- Put Goals in Writing
- Start Small
- Work in Stages
- Plan for the Future

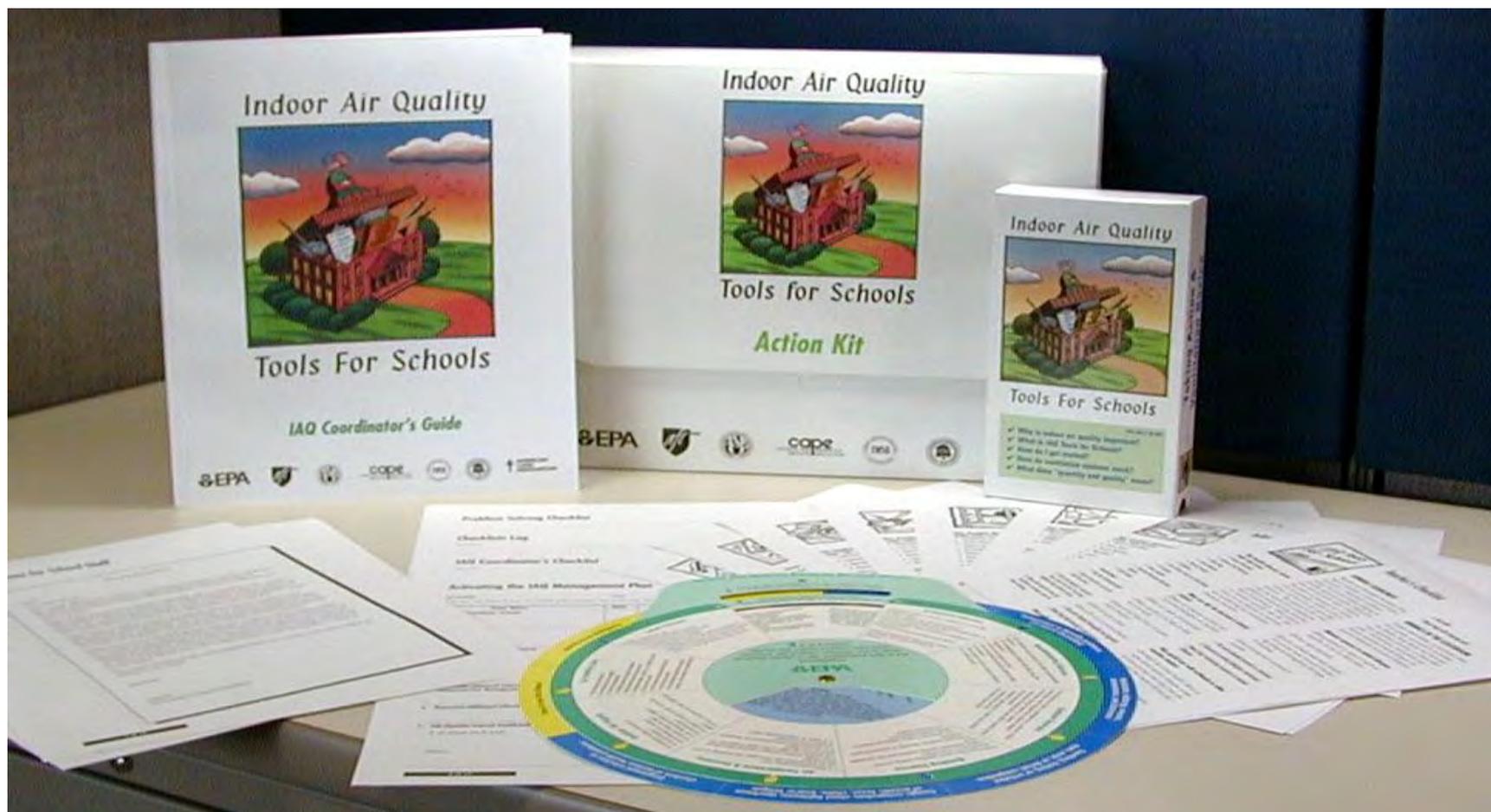
**Plan**

### ACTION KIT

- ★ HVAC
- ★ Moisture/Mold
- ★ IPM
- ★ Cleaning & Maintenance
- ★ Materials Selection
- ★ Source Control

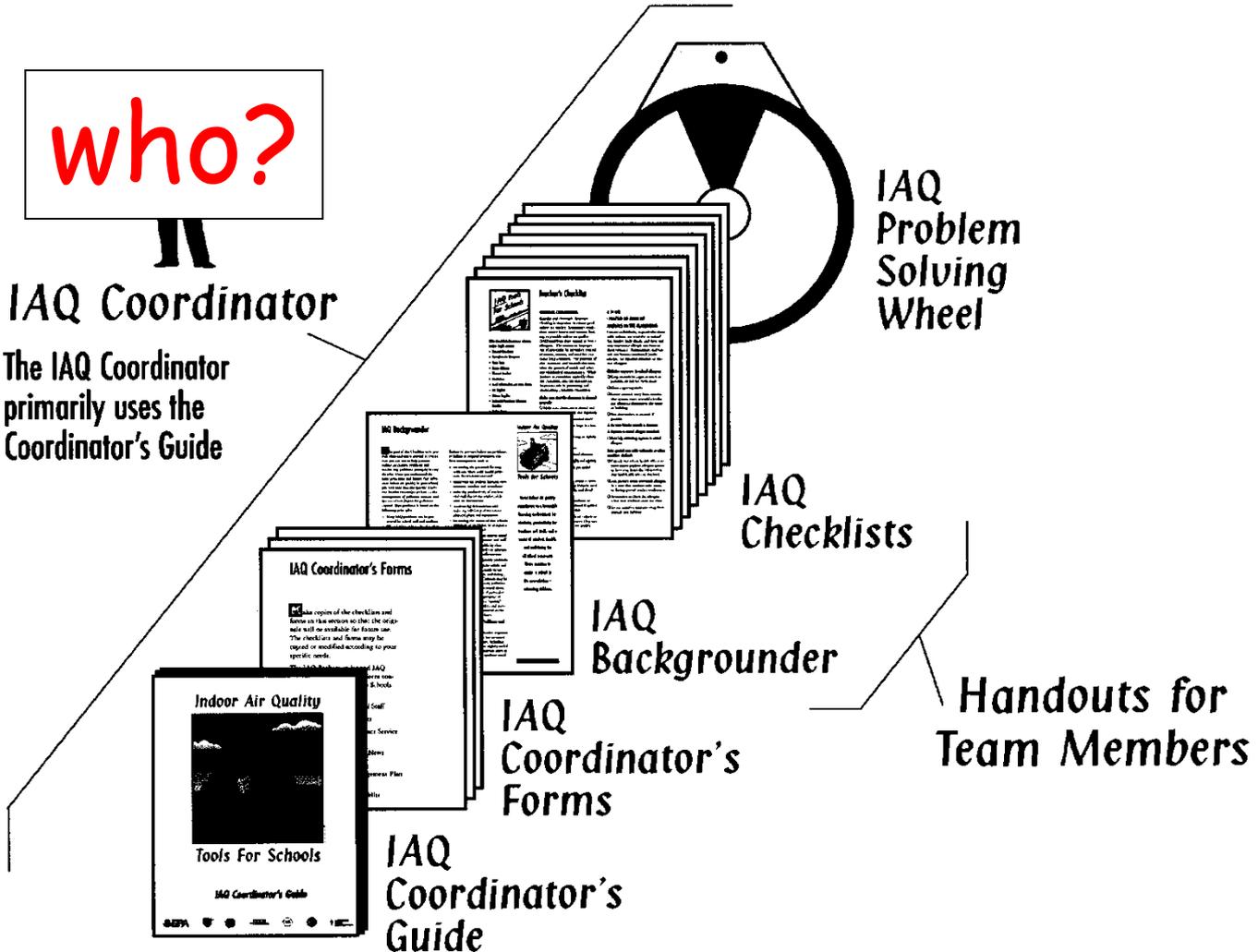


# The Solution



[http://www.epa.gov/iaq/schools/actionkit\\_text.html](http://www.epa.gov/iaq/schools/actionkit_text.html)

# IAQ Tools for Schools Action Kit





Students



Nurses

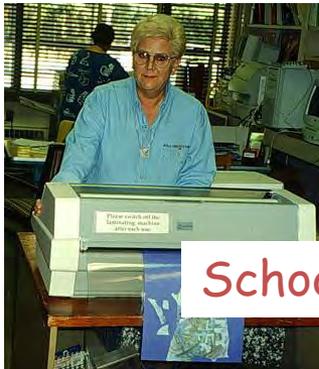


Planning / Contracting



Parents

# The IAQ Team



School staff



School Board



Facilities / Maintenance



Teachers

# “Doing” Tools for Schools

*I can help!*

- *IAQ Coordinator or Team at each school*
- *Checklists: teacher, maintenance, HVAC filled out*
- *Walkthrough / Priorities / Simple things fixed, difficult things ...*



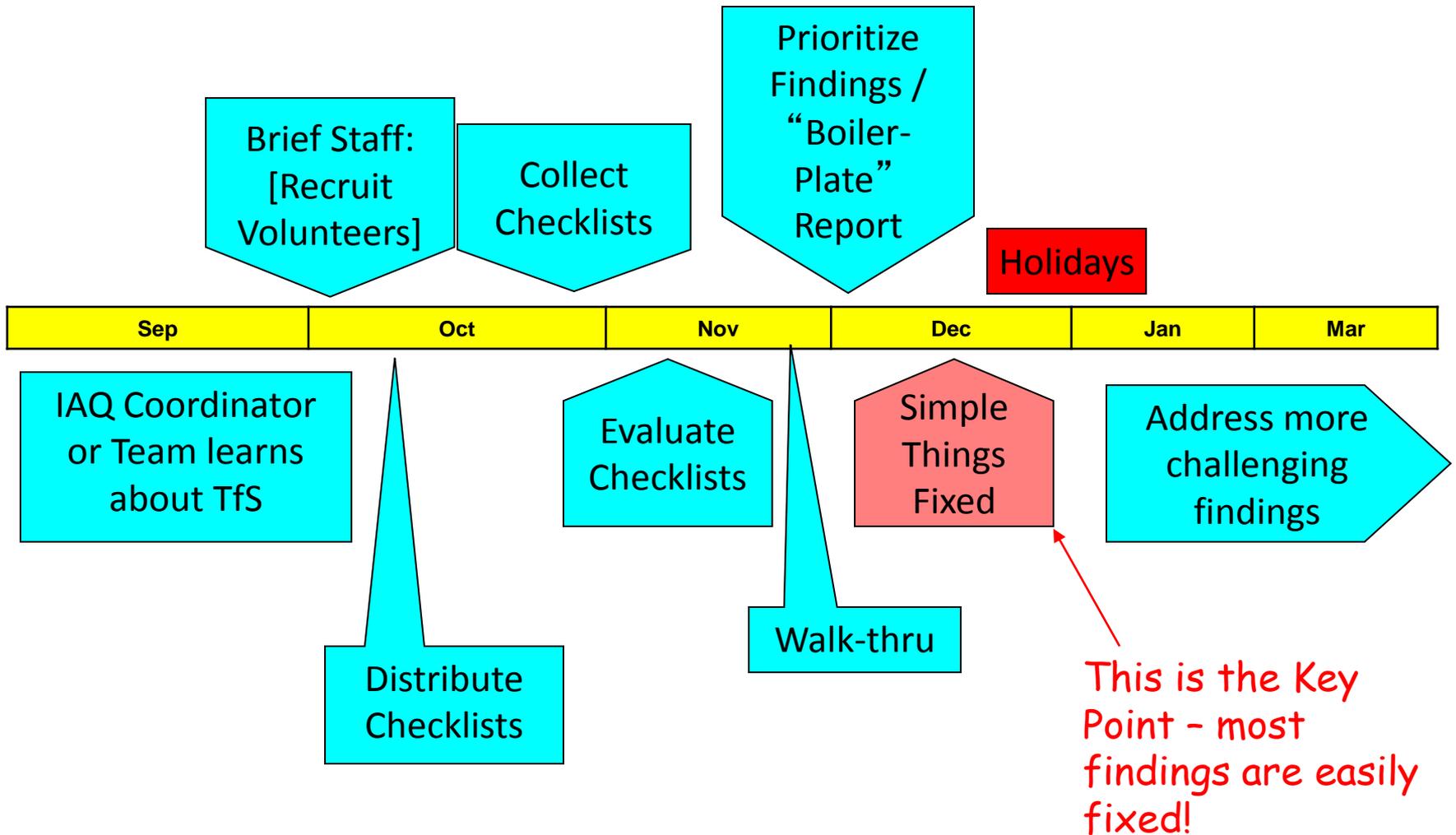
## Findings and Priorities

School Name: Shelly's School			
Row #	Priority Level 1,2, or 3	School Responsibility	District Responsibility
1	1	Clutter in classroom	
2	1,2 ?		Closed intakes
3	1	How to adjust HVAC control	Instruction on HVAC control

1. Easily fixed or urgently important.
2. Some resources required.
3. Wish list.

# Middle Tools for IAQ Schedule Management Plan!

(Activities by both site and district personnel.)



What comes out of the process?

*A healthier and more  
productive place for teachers  
to teach and children to learn!*

# Protect our indoor habitat for our native species.

I can't believe you put that under the scope!

Gross!

Let me look!

Boys!  
What can you expect?!





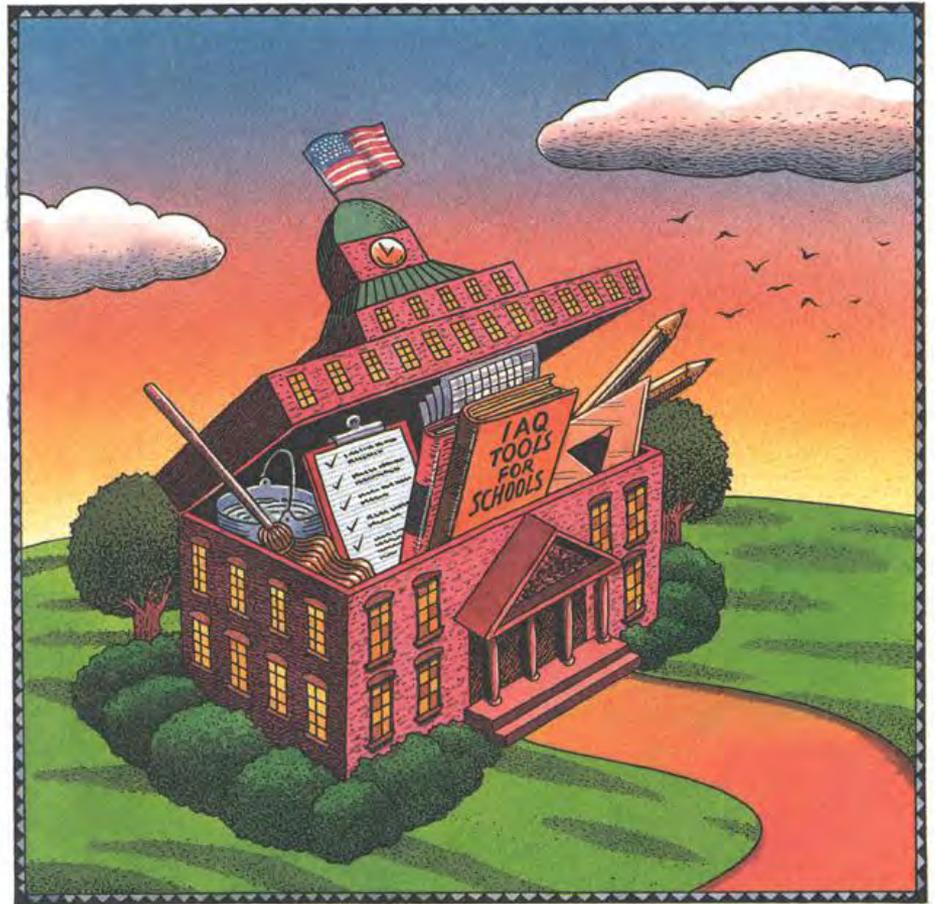
# Healthy Indoor Environments in Schools Resources

- *IAQ Tools for Schools* Guidance: [www.epa.gov/iaq/schools](http://www.epa.gov/iaq/schools)
  - Action Kit: [www.epa.gov/iaq/schools/actionkit.html](http://www.epa.gov/iaq/schools/actionkit.html)
  - Framework: [www.epa.gov/iaq/schools/excellence.html](http://www.epa.gov/iaq/schools/excellence.html)
- *IAQ Tools for Schools* Connector E-Newsletters and Emails:
  - Send an email to: [IAQTfSConnector@cadmusgroup.com](mailto:IAQTfSConnector@cadmusgroup.com)
  - View archives at: [www.epa.gov/iaq/schools/bulletins.html](http://www.epa.gov/iaq/schools/bulletins.html)
- Schools IAQ Connector Listserv:
  - Send a blank email message to [schools\\_iaq\\_connector\\_subscribe@lists.epa.gov](mailto:schools_iaq_connector_subscribe@lists.epa.gov). Then, check your email inbox for your confirmation and membership details.
- *IAQ Tools for Schools* Webinar Resources  
[www.epa.gov/iaq/schools/webconferences.html](http://www.epa.gov/iaq/schools/webconferences.html)

*Thanks  
for your  
attention!*



# Indoor Air Quality



# Tools For Schools