

"The state requires that 15 cubic feet per minute (cfm) of fresh air be delivered to the classroom for each occupant."

Dave DeLong & Tim Hardin  
Tacoma Pierce County  
Health Department

# Indoor Air Quality in Northwest Schools

An electronic newsletter for school Indoor Air Quality (IAQ) exclusively for Northwest schools

Fall 2006

## Students monitor indoor environment at Oregon high school

When occupants in a cluster of four classrooms in an old section of a building complained about a strong odor, Science Research Club students at Westview High School were ready.

Located in suburban Beaverton, Oregon, just west of Portland, Westview serves 2,450 students. Like some newer Northwest high schools, Westview has large, open common areas with lots of daylighting. Between classes these areas fill with students, giving the school a mall-like atmosphere.

Typically, when students hear the word "cleaning," they make excuses and back away.

But some Westview students are not only knowledgeable, but fully engaged in learning about – and monitoring – the school's indoor environment. Building upon the Hydroville Curriculum (See *Hydroville Curriculum Focuses on Environmental Health*, Winter 2006 issue), science instructor Debbie Cooper is leading the effort to engage club members in studying the indoor environment.

At the 2005 U.S. Environmental Protection Agency's national symposium, club members Julio Montano and Josean Perez shared a Tools for Schools program award, along with Josean's brother, Jose, and Cooper. Not only did these students win a prestigious award, they found the courage to

See *Oregon high school* on page 10

### School Indoor Air Quality Newsletter for Northwest Schools

A quarterly electronic newsletter exclusively for Northwest schools.

Please circulate this subscription opportunity throughout the Northwest to those who may be interested.

There are two ways to subscribe:

- 1) To view the newsletter, click here: [www.energy.wsu.edu/projects/building/iaq\\_nl.cfm](http://www.energy.wsu.edu/projects/building/iaq_nl.cfm)

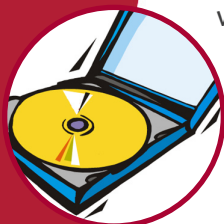
The newsletter contains a link for subscription information.

- 2) Or, send a blank email message to: [subscribe-iaq@listserv.energy.wsu.edu](mailto:subscribe-iaq@listserv.energy.wsu.edu)

You will receive a confirmation message. When you reply to that message you will be subscribed and will receive all future postings. You can easily unsubscribe at any time.

This broadcast email list not only provides automatic delivery of the quarterly School IAQ Newsletter, but includes announcements about news of interest, training events, grant opportunities, and other information useful to school districts, agencies, and stakeholders involved in school IAQ and operations and maintenance.

The newsletter is an opportunity for all interested parties to communicate, and add to the collective wisdom.



## Table of Contents

Healthy Classroom, Healthy Students .....	3
Tips toward healthier air quality .....	4
In the News: Tools for Schools symposium set for December .....	5
Free DVD on residential mold available .....	5
Trainings and Workshops .....	6
Making classrooms "custodially friendly" .....	7
Heating, Ventilation and Air Conditioning basics for teachers .....	8
Indoor air quality monitoring stations available .....	9

© 2006 Washington State University  
Extension Energy Program.  
This publication contains material  
written and produced for public  
distribution. You may reprint this  
written material, provided you do  
not use it to endorse a commercial  
product. Please reference  
by title and credit the  
Washington State University  
Extension Energy Program.

WSUEEP-06-028

October 2006

## Particulates

Many of the products we use contribute to the particulate load in schools. Dust settles on tabletops, computers and shelves. For most of us, it has always been considered an issue of aesthetics, but now we realize it is more.

Dust contains many components, which may be allergenic or even toxic. It may include inorganic materials such as:

- Tire fragments
- Soot
- Fiberglass
- Clothing fibers
- Paper dust
- Pesticide residue
- Heavy metals (lead and arsenic)

Dust may also contain organic materials such as:

- Animal dander
- Skin scales
- Pollen
- Mold spores
- Feather barbules
- Dust mites and their fecal pellets
- Bacteria and viruses

While it may be difficult to determine what health effects are associated with a given dust sample. It is possible to control and minimize dust and the health problems it can cause.

Control dust by:

- Using walk-off mats or wiping feet at doorways
- Damp mopping tiled or hard surface floors
- Keeping rooms clutter free ("custodially friendly")
- Wet wiping horizontal surfaces such as desks and countertops
- Storing materials in easy to clean plastic containers
- Not keeping animals in the classroom
- Removing plush furniture
- Not placing rugs over carpet

Keeping schools clean and free of dust will contribute to the overall health and performance of students and their teachers.

For more information, contact Dave DeLong, 253-798-6499, [ddelong@tpchd.org](mailto:ddelong@tpchd.org), or Tim Hardin, 253-798-6466, [thardin@tpchd.org](mailto:thardin@tpchd.org), both of the Tacoma Pierce County Health Department, or visit the School Safety website at [www.tpchd.org/page.php?id=82](http://www.tpchd.org/page.php?id=82).

# Healthy Classroom, Healthy Students

A few simple practices can dramatically improve the air quality of your classroom, and contribute to students' health and success by reducing illness and improving attentiveness.

## Maintain Adequate Ventilation

Fresh air ventilation is required (15 cubic feet per minute per occupant) in school buildings. If your room has no mechanical ventilation, periodically open the window for a fresh air flush. Do not turn off ventilation units. Do not store anything on your ventilation unit, and do not block vents with furniture, artwork or other items.

## Reduce Clutter

Maintain a cleanable classroom. Put loose items into bins and pick up items off the floor, to allow for vacuuming and dusting.

## Remove Food

It is best not to bring food into the classroom. If food is brought in, it should be consumed the same day. Any food that must be stored in a classroom should be stored in a sealed plastic or metal container to reduce the likelihood of pest infestation.

## Remove Old Furniture & Rugs

Remove fleecy, stuffed items, and old upholstered furniture, pillows or cushions that may contain dust, dust mites or other contaminants.

## Manage Chemicals

Any chemicals, such as cleaners, disinfectants, pesticides and art supplies, must be monitored for safety and proper storage. Do not bring chemicals for use at school.

## Limit Classroom Animals

Animals should be visitors, not classroom residents. They should not roam freely in the classroom, and should be kept away from carpets, upholstery and air vents. Some people are sensitive to furry or feathered pets and should not be exposed to them.



## Avoid Fragrances

Minimize the use of fragrances in personal care items, including perfumes and essential oils. Avoid the use of room deodorizers, sprays or plug-ins, fragrant markers, and spray adhesives.

## Maintain Integrity Of Ceiling

Any items hung from ceiling grids should not collect dust, block ventilation, displace ceiling tiles or present a fire hazard. No items should be hung from light fixtures.

## Report Problems

Water leaks, damp or musty materials, signs of pest infestation, strong odors, ventilation unit problems and air quality concerns should be reported to the building administrator and facilities staff.

*This document was produced by the Philomath School District IAQ Committee, Philomath, Oregon, 2006.*

## Tips toward healthier air quality in the classroom

From the Northwest Clean Air Agency and the Washington State University Extension Energy Program

*Note: Depending on your school district's resources and flexibility, some of these objectives may be difficult or impossible to achieve. However, these guidelines provide a target to work toward over time.*

- Educate yourself about indoor air quality and asthma and allergy triggers.
- Try to maintain cleanable horizontal surfaces.
- If your room has carpet:
  - Don't allow food or beverages;
  - Check to make sure the custodial staff use high efficiency vacuums to capture the particles;
  - Help the custodians by having students put chairs on the desk at day's end;
  - Check with custodial staff to ensure the carpet is cleaned appropriately:
    - Hot water/steam extraction is best;
    - No strong chemicals or soaps;
    - Carpet dried thoroughly within 24 hours after cleaning;
    - Carpet cleaned at least quarterly.
- Wet-wipe dusty surfaces weekly. Pick up on Fridays so janitor can dust. (Do not use a feather duster.)
- Avoid clutter – put loose items and piles into plastic boxes that can be wet-wiped.
- Avoid hanging items that collect dust, such as streamers, projects, papers and piñatas.
- Pets should be visitors, not permanent residents.
- Remove fleecy items that can harbor allergy triggers, such as old overstuffed furniture, area and throw rugs, pillows, blankets or stuffed animals that can't be properly and regularly cleaned.
- Avoid use of "stinky" dry-erase board markers and cleaners.
- Avoid use of spray adhesives, contact cement, and volatile paints. Use non-toxic water-based materials whenever possible.
- Avoid bringing chemicals, paints or sprays from home without clearing them with the maintenance staff.



- Avoid use of room deodorizing sprays or plug-ins.
- Absolutely do not use ozone machines in occupied areas.
- Inventory your supplies and materials in terms of indoor air quality. Are they low-odor? Can they create dust or other particles? Do they harbor allergens?
- Report water leaks, water stains, damp materials, and musty or moldy smells immediately.
- Don't allow stained ceiling tiles to remain – they can harbor mold, and it's hard to tell if or when they get wet again.
- Communicate with the facility staff regarding the mechanical systems for your classroom. Keep your room comfortable – learn how to operate your heating/cooling system for comfort and energy efficiency.
  - Help ensure your students are getting adequate fresh air.
    - Do not block air supply or exit grills.
    - Do not turn off ventilators – work with maintenance staff to fix noisy units, control temperatures and control drafts.
    - In with the fresh, out with the stale: If your classroom doesn't have mechanical ventilation then at least open windows and doors frequently to provide a quick flush-out of the stale air.
    - Request a ventilation system that supplies the state code minimum of 15 cubic feet per minute per person outside air at all times the school is occupied.
- Monitor your windows – they should not show condensation except on the very coldest days. Condensation suggests a moisture problem or inadequate ventilation (or both!).
- Notify maintenance if you smell odors or particle matter from other zones in the building, such as shops; science room; laminator; locker

See *Healthier air quality* on page 9





## Federal agency offers indoor air quality management awards

The U.S. Environmental Protection Agency's Indoor Air Quality Tools for Schools Program is celebrating schools that are effectively addressing indoor air quality!

Do you feel you have a stellar IAQ management program in your school district? Are you just beginning an IAQ management program and want to recognize the initial strides you are taking? If so, please apply for one of EPA's prestigious Indoor Air Quality Tools for Schools awards.

The program recognizes schools and school districts demonstrating a strong commitment to improving children's health and indoor air quality. Typical award recipients are those schools and school districts that assume a leadership role, heighten overall public awareness of IAQ issues, and encourage public support for programs aimed at improving children's health in our nation's schools.

With four tiers of awards (Great Start, Leadership, Excellence, and Model of Sustained Excellence), EPA recognizes schools and districts at various stages of implementing IAQ management programs. This system allows schools to receive recognition at each step as they institutionalize effective IAQ management. To download application forms and learn more about the awards, visit EPA's IAQ TFS Awards Program website at [www.epa.gov/iaq/schools/iaqtfsawards.html](http://www.epa.gov/iaq/schools/iaqtfsawards.html).

Apply for these awards and receive recognition for your efforts to protect the health of students and staff. For more information, contact Michele Curreri, Indoor Air Quality Tools for Schools Program, EPA, 202-343-9099, [curreri.michele@epa.gov](mailto:curreri.michele@epa.gov).



## Free DVD on residential mold available

Let's face it, school students, staff and faculty spend the majority of their time in their own homes, where they may be exposed to allergens and other indoor air quality problems. It makes sense for schools to help everyone limit exposures in the home. A new video on mold can help.

The Northwest Clean Air Agency, in Mount Vernon, WA, has produced a 12-minute video titled "Mold in Your Home – Causes, Prevention, Cleanup." The video, targeted to the unique climate of the Northwest, covers mold in a residential setting. School occupants may be exposed to mold at home, which can impact their attendance, health, and performance, so this video is timely and useful.

Copies are free, and recipients are encouraged to make additional copies for distribution.

To get this complete introduction to mold, contacting Dave Blake at NWCAA, [dave@nwcleanair.org](mailto:dave@nwcleanair.org), 360-428-1617 Ext. 212.

For additional information, check out the Northwest Clean Air Agency website at [www.nwcleanair.org/aq/Programs/indoorAir.htm](http://www.nwcleanair.org/aq/Programs/indoorAir.htm).

Blake is in the process of creating another free DVD titled "Asthma: Understanding Triggers and Avoidance." It is expected to be available around November 2006.

## Trainings and Workshops

### *Tools for Schools symposium set for December*

Northwest schools have a well deserved reputation as leaders in school indoor air quality management, and have always had a large contingent at the U.S. Environmental Protection Agency's Indoor Air Quality Tools for Schools National Symposium. The 7th annual symposium is set for December 7-9, 2006, in Washington D.C.

Mark Your Calendar

Destination healthy schools for healthy kids: The road-map to successful IAQ management

Learn how to improve children's health and performance with an effective IAQ management program at your school. Join more than 500 of your peers to:

- Find out about the latest research linking school indoor air quality to student health and performance;
- Participate in problem solving discussions with peer faculty;
- Share best practices for launching and maintaining successful IAQ management programs, and;
- Celebrate the 2006 National Excellence Award winners.

Be part of the national effort to ensure good indoor air quality for every student in America's schools. IAQ Tools for Schools is a nationwide initiative to help school officials improve student health and productivity by addressing and preventing IAQ problems.

Interactive sessions led by IAQ experts and peer faculty will focus on key drivers that lead to successful IAQ management programs. Themes include: communicating your IAQ successes; strategies for taking action to improve IAQ and maintain healthful buildings; creating a plan to address IAQ issues; assessing your facilities, and; organizing, launching and sustaining an effective IAQ management program. Special technical sessions will address managing mold in schools, the fundamentals of risk communication, high-performing schools, green cleaning products and practices, managing health risks from radon, asthma-friendly schools, and more.



*The Capital dome in Washington D.C.*

Everyone interested in safe and healthy school environments should attend – including school board officials, decision makers, administrators, architects, school nurses, teachers, facility managers, school and health association members, parents, and others interested in maintaining good indoor air quality in our nation's schools.

Space is limited, so register and see the symposium agenda today at [www.iaqsymposium.com](http://www.iaqsymposium.com).

The symposium will be held at the Grand Hyatt Hotel, located at Metro Center in downtown Washington, D.C. See more hotel information at <http://grandwashington.hyatt.com/property/index.jhtml>

Clean classrooms not only look nice but they also provide a healthy learning environment. We used to clean our school spaces because it made them aesthetically appealing, but this is no longer the most important reason. We have learned that cleaning enhances the learning environment by removing many allergens, irritants and toxins. Students learn better if they are not ill or suffering from asthma or allergies.

Factors that may impact performance include: proper lighting, appropriate sound control, good indoor air quality, and attention to cleanliness.

Teachers can contribute to cleanliness by promoting what we call "custodially friendly" classrooms. The custodial staff has very limited time, so it is important that individual class spaces are cleaned in the most efficient manner. To help accomplish this, teachers should:

- Remove items from the classroom if they have not been used in a year.
- Remove fleecy furniture, which harbors allergens and dust mites. Fleecy items can be cleaned but it is time consuming and needs to be done at least monthly.
- Remove rugs over carpet. Rubber backed rugs over



carpet contribute to mold growth by trapping moisture in the carpet. Rugs that breathe can be used, but they must be removed to allow for carpet cleaning.

- Store all items in cleanable plastic tubs (cardboard boxes contribute to the problem).
- Have the students help by cleaning out desks on a routine basis.
- Have the students place their chairs on their desks at the end of the day.

- Animals should be only temporary visitors to the classroom, and then only as part of the curriculum.
- Plants can contribute to classroom ambiance, but should be in glazed ceramic or plastic containers to limit mold growth.
- Mobiles and wall displays should be rotated on a routine basis, as these too will collect dust.
- Maintain personal space. Custodians are not allowed to move or disturb your desk and other personal items.
- Bring only King County Directors Association purchased products to school. Remember, products like bug spray and spray paint contain toxic materials and can contribute to an unhealthy school environment.

For more information, contact Dave DeLong , 253-798-6499, [ddelong@tpchd.org](mailto:ddelong@tpchd.org), or Tim Hardin, 253-798-6466, [thardin@tpchd.org](mailto:thardin@tpchd.org), at the Tacoma Pierce County Health Department; or visit the department's School Safety website at [www.tpchd.org/page.php?id=82](http://www.tpchd.org/page.php?id=82)

## Heating, Ventilation and Air Conditioning (HVAC) basics for teachers

Schools are ventilated with mechanical systems. This process requires pushing air through the space by means of fans. It is an effective way to provide ample air to the occupants and a comfortable environment that is also healthy. Under-ventilated spaces present an increased risk of disease transmission. These spaces may also accumulate allergens, irritants and dust, which may exacerbate asthma and allergies.

Air moving through these systems can be divided into three categories:

- Outside or fresh air;
- Return air (brought into the system from the occupied space);
- Supply air (the mix of outside and return air that is delivered to the space).

The state requires that 15 cubic feet per minute (cfm) of fresh air be delivered to the classroom for each occupant. In a classroom of 25 this would mean that 375 cfm of fresh air be brought into the space every minute. We produce carbon dioxide (CO<sub>2</sub>) as a byproduct of metabolism. We can assess the ventilation rate by measuring the levels of CO<sub>2</sub> in the space. In general, we want class spaces to remain below 1,100 parts per million (PPM) of CO<sub>2</sub>.

While the systems that provide this air vary, they all rely on similar means to provide this dilution ventilation. There are several common system types:

- Univents are large machines located under the windows in classrooms. These self-contained units bring fresh air from the outside into the machine, where it is mixed with recycled air from the room and delivered as supply air;
- Constant air volume systems are zonal systems that handle large areas of the building. These units provide constant air movement and ventilation;
- Variable air volume systems are zonal systems, which cycle off and on as temperature needs vary. This can result in uneven ventilation and pollutant build up. The good news is that most of these systems can be adjusted to run continuously during the time the space is occupied;

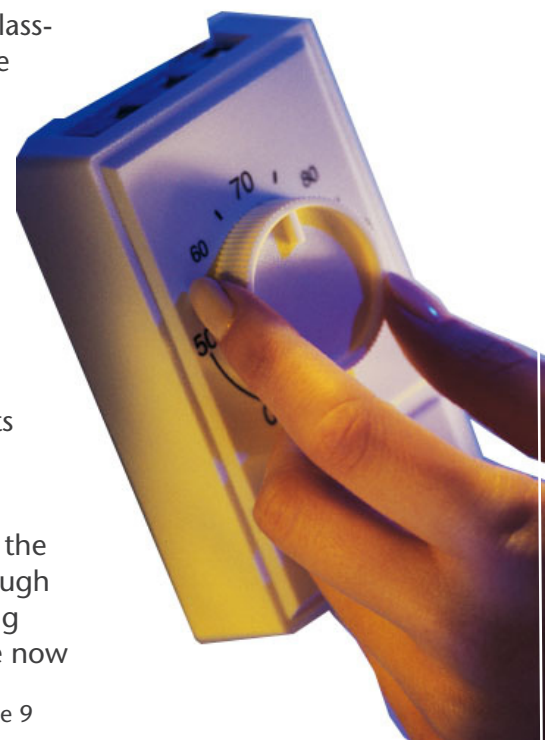
- Heat pumps are systems that provide heating or cooling but rely on terminal fans to provide dilution ventilation;
- Hydronic loops and steam heat are similar to heat pumps, which provide heating but rely on fans placed in the system to move air into and out of the space;
- Hybrids: As most schools are not new, they have a mix of systems that vary both by age and effectiveness.

HVAC controls vary, as do the systems they control. Most new systems will rely on direct digital controls (DDC). This control method operates from a centrally located computer that allows the operator to modify system parameters from a terminal. This means of control is fairly easy to modify. If you have issues discuss them with your maintenance staff.

Thermostats may be located in the space. These units allow temporary adjustments in the default settings and both temperature and fan speed can be modified. It is important to remember that if the fan is not “on” there is no air moving in the system and no dilution ventilation is being provided. Your fan setting should always be in the “on” position during the times you are in the classroom and students are present. This is especially true in portables.

We have documented CO<sub>2</sub> levels in classrooms with the fan “off” at 3,400 PPM. These rooms feel stuffy, smell stale and do not provide the healthy spaces students need to excel.

Filtration is accomplished as the air moves through the air-handling unit. Filters are now



See *HVAC* on page 9



## HVAC

*Continued from page 8*

rated in minimum efficiency reporting value (MERV), and the 30 percent efficient filters are equivalent to a MERV 8 rating. These filters provide good filtration of particulates and these should be the preferred form of filtration for the school environment. Stand-alone filters work to provide filtration for a very limited area and are not encouraged.

Teachers may ensure a healthy learning environment by:

- Reporting HVAC system problems;
- Not modifying the system controls;
- Not blocking or obstructing grills or vents from the HVAC system;
- Maintaining an animal- and clutter-free class space, and;
- Instituting “custodially friendly” classroom practices.

Under-ventilated school areas contribute to lower performance and increased risk of disease transmission. These areas may also contribute to an increase in asthma and allergy symptoms. Under-ventilation may be the most likely cause of complaints in a school setting.

For additional information contact Dave DeLong, 253-798-6499, [ddelong@tpchd.org](mailto:ddelong@tpchd.org), or Tim Hardin, 253-798-6466, [thardin@tpchd.org](mailto:thardin@tpchd.org), both of the Tacoma Pierce County Health Department; or visit the department’s School Safety website at [www.tpchd.org/page.php?id=82](http://www.tpchd.org/page.php?id=82).

## Indoor air quality monitoring stations available

The Washington State Department of Health has provided funding for five IAQ monitoring stations in Washington schools. The department is acting on two key principles: Schools can’t control what they can’t measure, and; what gets measured gets fixed.

The stations consist of an audio/visual cart outfitted with two high-quality meters: a multi-function meter and a particle counter. The multi-function meter records carbon monoxide, carbon dioxide, temperature, and relative humidity. The particle counter records six different size ranges of airborne particles. The carts include an information rack with handouts explaining the measurements and general school IAQ, as well as information about resources such as the U.S. Environmental Protection Agency’s “Tools for Schools” Kit.

Laptop computers and a user’s guide for downloading and analysis of the data are included with the stations.

Contact Rich Prill at the Washington State University Extension Energy Program to get on the list to use a station in your district, [prillr@energy.wsu.edu](mailto:prillr@energy.wsu.edu)

---

## Healthier air quality

*Continued from page 4*

room, graphics, custodial or storage areas; combustion equipment; kitchen; or buses at the curb. Air should move from clean areas to dirty areas.

- Install walk-off mats that provide “four good footsteps” at all outside entry doors.
- Hallways should be hard-surfaced, not carpeted.
- Assign an indoor air quality (IAQ) person to whom all IAQ issues (moisture, odor, mold, etc.) are directed.
- Make sure all teachers and staff knows who the IAQ person is.

For more information contact: David Blake, Northwest Clean Air Agency, 360-428-1617, Ext. 212; or Rich Prill, WSU Energy Program, 509-477-6701

## Oregon high school

Continued from page 1

speak to more than 500 symposium participants in a general session. Instead of resting on their laurels, they came back to Westview and put what they learned at the symposium into action.

It's no surprise that Westview occupants experience IAQ problems from time to time. As most schools are beginning to recognize, the current "science" of IAQ doesn't allow schools to anticipate every issue. It's doubtful any school has the resources to prevent all air quality concerns. So Westview takes a practical approach:

1. Do your homework: Know your building and its challenges;
2. Adopt good practices that prevent most IAQ problems;
3. Listen to the occupants, and;
4. Respond quickly and credibly to their concerns.

### Problem Investigation

Science Research Club members used the scientific method to investigate an odor in room N127. They gathered information, tapped into expert advice and formed some hypotheses.

From December 13, 2005, through February 9, 2006, Montano and Josean Perez tested air in the room. They thought the source of the problem came from the wall, while the district maintenance department thought it came from the floor tiles. The year before, the maintenance department put wax over the tiles to stop the odors, but it wasn't successful.

Montano and Perez used an AirAdvice monitor donated by Linda George of Portland State University to test the room for carbon dioxide, humidity, particulates, temperature, and volatile organic compounds. They first tested December 13-16 (before winter break), because the maintenance staff was going to replace the room's floor tiles and they

wanted to get samples before and after the change. Here is what they found.

They tested the room again February 3-9, after the tiles were replaced. The room smelled better with the new tiles and the occupants' symptoms, headaches and nausea disappeared. The source of the IAQ problem in the room was the front tiles, next to the wall.



Montano and Josean Perez

Beaverton

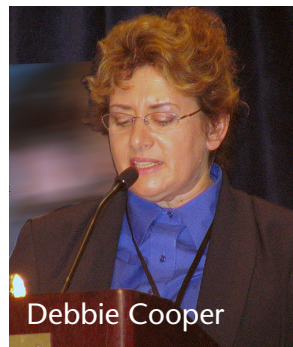
### Current Activities

Westview High School acquired IAQ monitoring equipment and is in the process of using it to monitor classrooms and other areas in the building. The Science Research Club is checking the equipment, choosing monitoring sites and analyzing the data.

Rich Prill, IAQ specialist with the Washington State University Extension Energy Program, was invited for an intensive day of hands-on training consisting of a top-to-bottom, inside-and-out IAQ walk-through assessment of the campus.

Prill observed some typical deficiencies at Westview:

1. A large storage room with strong chemical and wet mop odors is un-vented;
2. Restroom and locker room exhaust fans are ineffective;
3. Floor drain traps beneath the science eye-wash stations are dry, and;
4. General cleaning appears to be insufficient.



Debbie Cooper

Prill also introduced students to some more advanced IAQ equipment and assessment tools, including particle counters, a portable microscope, a laser temperature meter, decibel and light meters, and a digital pressure gauge.

Westview High School is an example of how faculty and students can gain unique hands-on experience and help improve the learning environment. The dollars saved by not hiring a consultant were spent on monitoring equipment that is now used for routine checks of the building: A win-win for everyone.

For more information, contact Debbie Cooper at Westview High School [Debra\\_Cooper@beavton.k12.or.us](mailto:Debra_Cooper@beavton.k12.or.us)