



POOR IAQ IMPACT ON PEOPLE

Information is from EPA Reports

Recent Data suggest that poor IAQ can reduce a person's ability to perform specific mental tasks requiring concentration, calculation, or memory.

Problems can result in increased absences because of respiratory infections, allergic diseases from biological contaminants, or adverse reactions to chemicals used in schools. Building factors or pollution in buildings most frequently and consistently associated with respiratory health effects are the presence of moisture, water damage, and microbiological pollutants, animal and other biological allergens, and combustion products, including nitrogen dioxide. Other risk factors for respiratory health effects include: moisture or dirt in HVAC systems, low ventilation rates, formaldehyde, chemicals in cleaning products, and outdoor pollutants or vehicle exhaust.

(Comments by Walter in bold blue)

ALL of the above pollutants are removed by the GENANO UNITS, except possibly some unusual chemical gases

Children's overall performance decreases due to sickness or absence from school. Building-associated health effects can increase student or teacher absences from school and degrade the performance of children or teachers while in school. Respiratory health effects, such as respiratory infections and asthma, are the illnesses most closely associated with increased absenteeism. In fact, asthma-related illness is one of the leading causes of school absenteeism, accounting for over 14 million missed school days per year.

Early studies in schools have found that air conditioning is associated with lower absentee rates or improved performance, and that schools with humidification systems are also associated with lower absentee rates.

More recent and more rigorous **studies in offices**, however, show **the opposite** to be true. This discrepancy may be explained by the fact that, while air conditioning and humidification systems are designed to control temperature and humidity (a positive effect), they may also become contaminated with biological pollutants (a negative effect) if they are not judiciously maintained. A review of building investigation reports also suggests significant benefits to health and performance from good HVAC maintenance.

When GENANO UNITS Remove Particles down to 1 nano this eliminates the mold spores and dirt that plagues the HVAC Systems. When systems are cleaner they will last longer and have minimum maintenance.

A big factor for buildings where HEPA Filters are NOT mandated is that smaller motors and fans can be utilized, creating less costs up front and less energy usage during its Life Cycle.

Some studies show **health and comfort benefits** from efforts to reduce airborne particles. One such study in an office building showed **a statistically significant**** reduction in mental confusion when **95 percent of airborne particles between 0.3 and 0.5 microns** in size were removed by filtration. The study also showed reduced fatigue and improved productivity, although these results were not statistically significant.

**** Statistically significant means, as a rule of thumb, between 8% to 10% or more.**

In the data and charts given to you, percentage savings have been intentionally stated low to alleviate the thinking that we are overstating the real picture. In fact, the real data shows that the percentages we use are significantly lower than the research has shown to be real.

IAQ problems can result in increased absences because of **respiratory infections, allergic diseases** from biological contaminants, or adverse reactions to **chemicals** used in schools.

Common Symptoms of Discomfort:

- 1. Dry eyes**
- 2. Itchy or watery eyes,**
- 3. Dry throat,**
- 4. Lethargy,**
- 5. Headache,**
- 6. Chest tightness**

Evidence from adults, however, suggests that continued environmental stress can drain a person's physical and mental resources and ultimately affect their performance.

For example, evidence from office workers suggests that, when individuals experience:

1. Just **two symptoms** of discomfort, they begin to **perceive a reduction in their own performance.**
2. That perception increases as the number of symptoms increases, **averaging a 3-percent loss** with **three symptoms**, and

3. An **8-percent loss with five symptoms.**

Again, the percentage facts are greater than the percentages used in our illustrations and charts.

This suggests that when large numbers of students and staff experience signs of discomfort related to the air inside their school, teaching and learning performance will degrade over time

Studies of adults in office settings generally support these associations. In a controlled study of **30 female adults** working in an office environment, a 20-year old used carpet, which served as a pollution source, was periodically introduced on racks behind a screen so that subjects had no way of knowing when the carpet was present.³⁰ The subjects were tested in typing, arithmetic, logical reasoning, memory, and creative thinking during several trials with and without the carpet present. These tasks are similar to the kinds teachers and students perform in school. During the trials without the carpet, **the subjects' performance improved in all tasks by 2 – 6 percent.** When the carpet was present, the prevalence of headaches during tasks requiring concentration increased, suggesting that at least part of the effect on performance was from pollution-related adverse health effects. In a later study using the same procedure, increasing ventilation rates with the carpet present resulted in statistically significant improvements in performance.

In a similar, although more limited, study of typing performance and perceptions of air quality, computers were used as the pollution source. Computers can emit a variety of VOCs as internal temperatures of various components rises. In this study, the air was perceived to be fresher and typing performance improved in the absence of the computers.

We do not mention VOCs often, but our GENANO UNITS cover these as well.

Recent studies relate direct performance measurements to changes in indoor air quality. In the study, student scores on the concentration test were lower and their health symptom responses to the questionnaire were inferior when carbon dioxide levels increased.

Another study of students shows similar results when using subjective reports of performance, while laboratory studies of the effects of a mixture of VOC on adults shows that elevated volatile organic compounds (VOCs) can decrease performance of sensitive adults.

How Does Indoor Air Quality Affect a Child's Ability to Learn? Evidence continues to emerge showing that poor indoor air quality (IAQ) can cause illness requiring absence from school, and can cause acute health symptoms that decrease

performance while at school. In addition, recent data suggest that poor IAQ may directly reduce a person's ability to perform specific mental tasks requiring concentration, calculation, or memory. . Air in most indoor environments contains a variety of particles and gaseous contaminants.

GENANO UNITS have charcoal beds that remove many gases, not all.

Thus, the evidence is increasing in studies of both schools and other settings that inadequate ventilation can decrease student and teacher performance. These studies reinforce others that relate degradation in indoor air quality with increased frequency of adverse health symptoms or absenteeism.

Asthma Management: A Priority for Businesses and Schools

- An average of one out of every **13** school-age children has asthma – 10% of the population has asthma.
- Asthma is a leading cause of worker's and school absenteeism
- **14.7 million school days** are missed each year due to asthma..
- Asthma can be controlled through medical treatment and management of IAQ.

Asthma is a serious, sometimes life-threatening respiratory disease that affects **20 million** Americans, including **6.1 million children**, with environmental triggers

- **Pests** - Cockroach body parts, secretions, and droppings, as well as the urine, droppings, and saliva of other pests are all IAQ problems.
- **All airborne particles, no matter the source, are removed by the GENANO UNITS.**
- **Mold** - Mold can grow indoors when mold spores land on wet or damp surfaces. Mold can grow anywhere that moisture is present.
- **Mold spores are removed from the air prohibiting the growth of mold.**
- **Dust mites** are too small to be seen but can be found in almost every home, school, and building.
- **Dust mites are within the efficiency range of the GENANO UNITS, they are removed and killed.**