



Achieving Good Indoor Air Quality

NSTA Houston22
April 1, 2022

Learning Objectives

- Describe **what is in our indoor air** and the **health impacts** of pollutants
- Identify the potential **unintended consequences** of emerging technologies on indoor air quality
- Recognize how these unintended consequences were addressed in **real-life scenarios**
- Discuss **strategies** to promote healthy indoor air quality in schools, including **source control, cleaning** and **ventilation**

The Effects of Poor IAQ

- Increased absenteeism for students and staff
- Increased respiratory ailments
- Lower productivity
- Lower student motivation
- Lower test scores and slower learning
- Increased medical costs



Source: U.S. Environmental Protection Agency


The Importance of IAQ

Adequate ventilation in classrooms can:

- Improve the overall health and productivity of teachers
- Improve test scores and student performance
- Reduce absences and the transmission of infectious diseases

We have known this information for decades...

November 2012



EPA

STUDENT HEALTH AND ACADEMIC PERFORMANCE

Quick Reference Guide

All Children Deserve a Healthy Learning Environment

Children are inherently more vulnerable to environmental hazards because their bodies are still developing. Substandard environmental conditions in schools, such as insufficient cleaning or inadequate ventilation, can cause serious health problems for children. Evidence that indoor air quality (IAQ) directly impacts health and student academic performance continues to mount.^{1,2}

IAQ refers to those characteristics of the air in indoor environments, such as levels of pollutants, humidity, temperature, etc., that impact the occupants' health, comfort and ability to perform.

Taking steps to improve the IAQ of schools is critical to bettering student health and academic performance.

Building the Case with Evidence

Scientific evidence has long demonstrated an association between poor IAQ and respiratory health effects, including asthma. Maintenance issues in schools, such as mold and moisture or excessive use of cleaning chemicals, have been shown to trigger asthma and allergies.

According to the Centers for Disease Control and Prevention (CDC), asthma is one of the leading causes of school absenteeism.³ Multiple studies have found that children's overall performance decreases with illnesses or absences from school.^{4,5}

The Scientific Evidence is Mounting

Qualitative and quantitative evidence demonstrating the relationship between IAQ and human performance and productivity has become more robust. Studies demonstrate that improved IAQ increases productivity and improves the performance of mental tasks, such as concentration and recall in both adults and children.⁶ This strengthens the case for schools to develop IAQ management plans, which include critical maintenance tasks, as a key part of an education development strategy.

"Each year since our IAQ management program began, we have been able to boost both reading and math test scores and have created exceptional learning environments that promote student success." — Dave Hill, Blue Valley School District, Kansas

Evidence from Scientific Literature

Scientific evidence shows that there are key areas in which schools can take action to improve IAQ in order to advance the health and performance of students and school staff. In fact, a structured maintenance program is a cornerstone of academic performance and IAQ.

Managing Your School Environment Despite Tight Operating Budgets

School boards and administrators often consider the maintenance budget as *soft money* that they can cut without affecting core academic program needs; however, scientific literature demonstrates otherwise:

- Health, attendance and academic performance can improve with increased maintenance.^{7,8}
- Schools with better physical conditions show improved academic performance, while schools with fewer janitorial staff and higher maintenance backlogs show poorer academic performance.⁹

The Effects of Air Ventilation on Health and Performance

Most schools' ventilation rates are below recommended levels.¹⁰ However, ensuring adequate air ventilation rates in all classrooms can:

- Reduce absences and the transmission of infectious diseases.¹¹
- Improve the overall health and productivity of teachers.
- Improve test scores and student performance in completing mental tasks.^{12, 13, 14, 15, 16, 17}

In one study, students in classrooms with higher outdoor air ventilation rates scored 14 to 15 percent higher on standardized test scores than children in classrooms with lower outdoor air ventilation rates.¹⁸

In addition, ensuring that heating, ventilation and air conditioning (HVAC) drainpans and other components are clean reduces the chance of occupant illnesses.

Indoor Air Quality (IAQ)

Impact of 3D Printers

What pollutants do these printers emit when operating?

What impact does exposure to these emissions have on human health?

What factors impact the type and amount of emissions?

Unintended Consequences



Research Objectives



Characterize and quantify emissions from fused filament fabrication (FFF) 3D printers



Establish a **reproducible** testing method

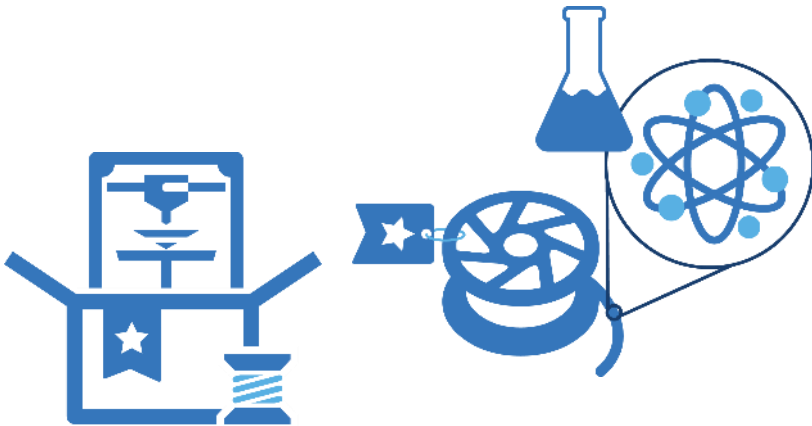


Develop a **consensus standard** for testing method and emissions criteria for 3D printing

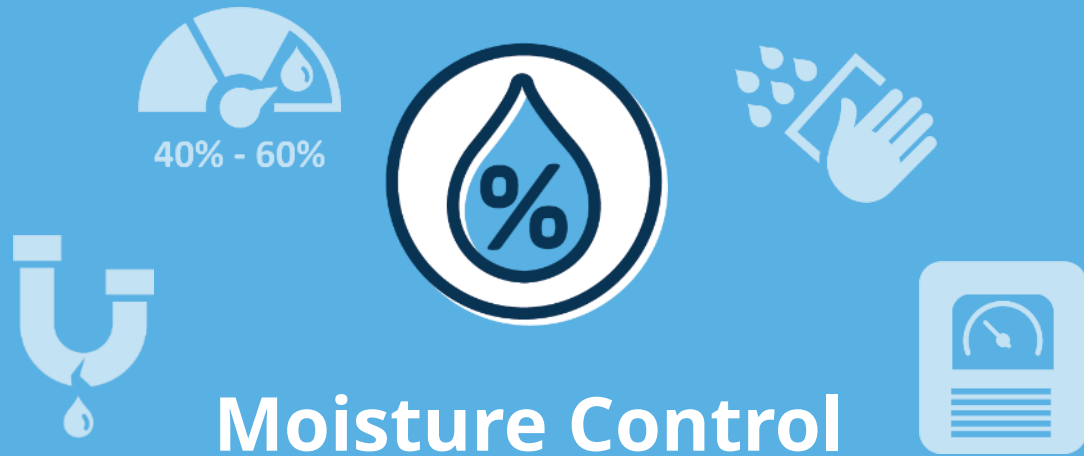
Key Findings of the Research

The amount and type of emissions varied based on:

- Printer and filament brand
- Filament material
- Extrusion and build plate temperature



Ways We Manage Indoor Air Quality...



Thank you

w chemicalinsights.org **e** chemicalinsights@ul.org

Connect with us! Search **Chemical Insights**

