



# MAKING UAE SCHOOLS HEALTHY | 2

Expanded In-depth  
Measurement of Indoor  
Air Quality

*Concise Report*

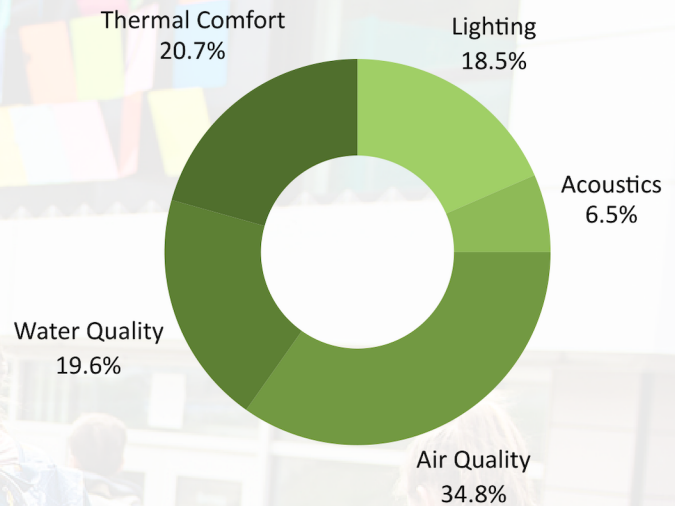


## Executive Summary

Emirates Coalition for Green Schools, one of the Educational Programs of the Emirates Green Building Council, aims to create a sustainable and resilient educational landscape in the UAE, envisioning a nationwide network of environmentally conscious schools aligned with global green education standards and the UAE's Net Zero goals by 2050.

A green school is a healthy environment conducive to learning while minimizing energy and resource consumption.

At the beginning of 2023, in efforts to raise awareness on green schools, and to better understand the concerns of parents and the school communities regarding the school environment, the Emirates Coalition for Green Schools, shared a survey with several schools across all the Emirates. When asked about which topic/s of the school environment, the Emirates Coalition for Green Schools should focus its research on, 35% of the participants from 80 entities shared that the topic of indoor air quality (IAQ) should be the primary topic of concern compared to other issues. The results of the survey are depicted in the following chart.



Indoor air Quality is a part and parcel of student wellbeing at the school premises, due to its substantial influence on students' health, productivity, performance, and both physical and mental development. Due to that, the **EmiratesGBC** and its member **Johnson Controls** (JCI) partnered to conduct a study that evaluates and raises awareness on Indoor Air Quality (IAQ). The study fills, partially, the gap in understanding local IAQ levels for schools of the UAE and will lead to influencing guidelines that ensure the healthiest spaces for students.



*The study covered the analysis of IAQ for 28 schools, 4 in each Emirate of the UAE*





The study builds on the previous research done in 2021 under the umbrella of the Emirates Coalition for Green Schools to measure IAQ in educational facilities. Similar to the Emirates Coalition for Green Schools' previous publication on Making UAE Schools Healthy, the parameters measured for this study were temperature, humidity, carbon dioxide (Co2), volatile organic compounds (VOCs), in addition to particulate matter (PM). Furthermore, the following study expanded on the previous one to cover more schools, in all the UAE, to take into consideration varying weather conditions and identify trends in IAQ.

## Methodology

The **methodology** of the study relied on on-site IAQ measurements using **Johnson Controls IAQ audit service**.

“ *The study spanned two months, starting in May and concluding in June 2023.* ”

During the course of the analysis, 6 IAQ devices were installed per school, at a height of 1.5m, to take measurements for 24 hours a day, for one full week.

## Findings

One key discovery indicates that newer schools consistently outperform the older ones.

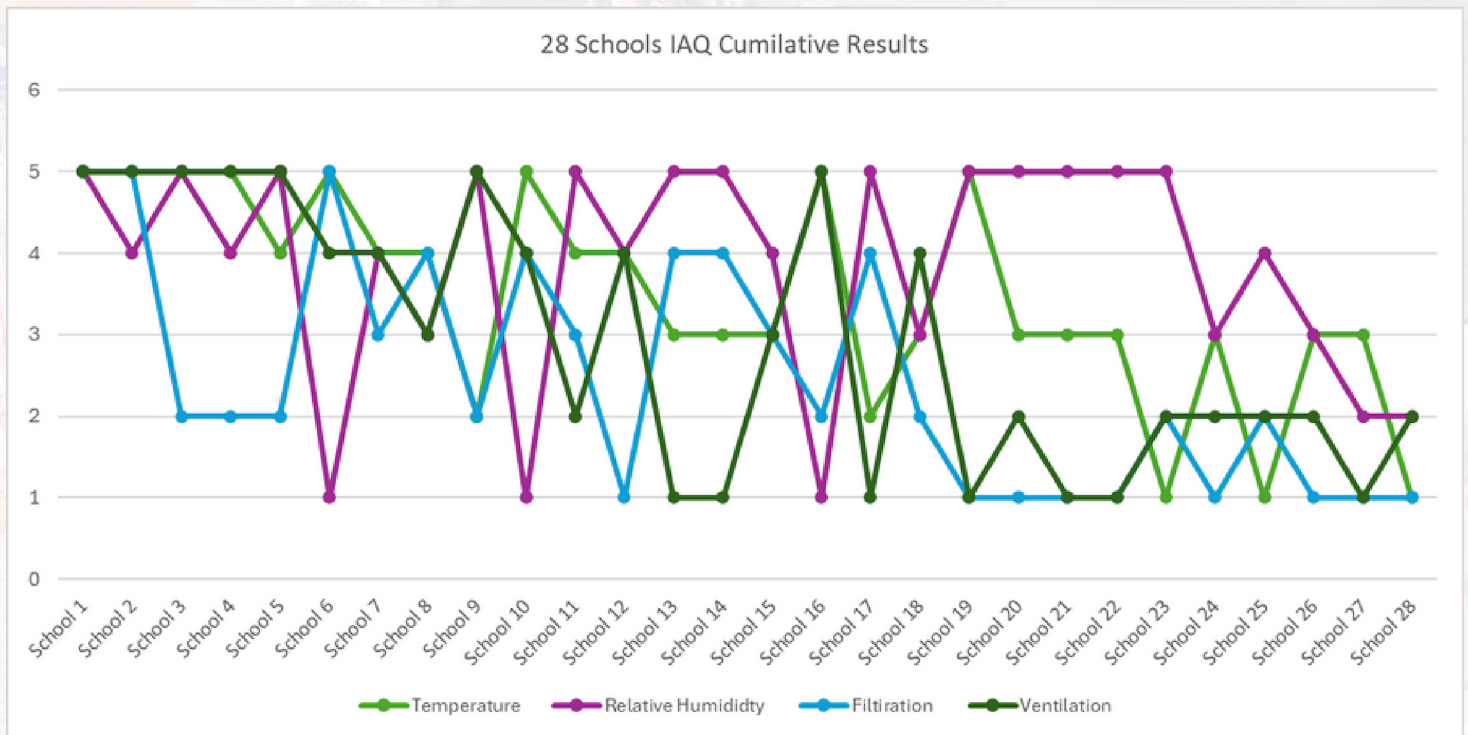
Furthermore, PM levels and CO2 levels tend to be higher in old schools signifying the need for ventilation and filtration improvements. PM levels were consistently high in 18 of the 28 schools, where PM 2.5 levels greater than 12 µg/m3 were registered more than 50% of the time. That is due to the high outdoor PM levels; the Air Quality Index in Dubai is 17.4 times the WHO annual air quality guideline [2]. Moreover, the poor filtration capabilities of wall mounted air-conditioners also lead to higher indoor PM values. As for VOCs, TVOC levels were acceptable.

Another finding is that 25% of schools are operating at less than 25% of the industry recommended outside air ventilation rates.



The reduced outside air ventilation rates signals increased CO2 levels in several schools, highlighting the need to increase fresh air intake. Additionally, in relation to thermal comfort, as per ASHRAE, relative humidity is within comfort level for 90% of the investigated schools, and temperature is also within comfort level for 82% of the schools.

The graph below maps out the different results of the four indicators of IAQ that were measured, revealing that filtration and ventilation need more attention as we progress into retrofitting and building schools that are more sustainable and climate resilient.



## Recommendations:

Two years after the initial IAQ study by the Emirates Coalition for Green Schools, the subsequent study suggests similar recommendations based on its findings:

1. Identify cost-effective means to add outside air ventilation to classrooms of older schools.
2. Increase level of filtration in all schools through:
  - a. Upgrading existing filters to higher efficiency filters where possible.
  - b. Installing portable in-zone filters (permanent ceiling mount units or portable floor mount units).



### 3. IAQ tune up for schools through:

***a. Test and balance to ensure proper ventilation rates.***

***b. Demand Control Ventilation to save energy in intermittently used spaces.***

EmiratesGBC and JCI are proud to contribute to the understanding of IAQ at schools in the UAE. The data collected will benchmark how schools are performing with regards to IAQ and will encourage more schools to assess their IAQ for the sake of ensuring the healthiest spaces.

The study also emphasizes the importance of various essential general actions:

**1. Develop guidelines and regulations suited to school spaces.**

**2. Raise awareness on the school environment and building to the school community and professionals.**

The above-mentioned recommendations and actions, although reiterated in the 2021 IAQ report, remain valid, underscoring the importance of expediting the shift towards improved indoor air quality conditions in schools. In the 28 schools, specifically the older ones, filtration and ventilation remain the most critical issues in the analysis of IAQ at schools.

## Conclusion:

In conclusion, students' academic attainment is directly related to IAQ. Improving IAQ can improve progress in math and reading, while high levels of PM and CO<sub>2</sub> can lead to reduced cognitive performance [3]. Understanding individual school IAQ will help develop a targeted strategy of intervention to alleviate the indoor air quality of schools [4].



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The Making UAE Schools Health|2 Expanded In-  
depth Measurement of Indoor Air Quality, concise  
report results, findings and conclusions are based  
on research, and measurement analysis.

EmiratesGBC and Johnson Controls do not assume  
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Due to confidentiality guaranteed to those who  
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participating individuals and organizations  
cannot be disclosed

#### About Emirates Green Building Council

Emirates Green Building Council (EmiratesGBC) is a  
business forum based in the United Arab Emirates  
formed in 2006 with the goal of advancing green  
building principles. The Council gathers member  
companies and partners representing a diverse  
range of stakeholders from within the building  
industry, government, and academia. EmiratesGBC  
functions as a common platform for all  
stakeholders to meet, discuss, interact, and  
exchange ground-breaking ideas which helps to  
promote a sustainable built environment in the  
UAE and the surrounding region.

#### About Johnson Controls

At Johnson Controls (NYSE:JCI), we transform the  
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the performance of buildings to serve people,  
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blueprint of the future for industries such as  
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Today, with a global team of 100,000 experts in  
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## Sources

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