

How better indoor air quality can transform health, productivity and operations in education

Discover how the air students breathe impacts their health, wellbeing and ability to learn. Then see how smart schools and colleges are tackling indoor air quality to achieve better educational outcomes and improve their operational efficiency too.



Foreword



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When it comes to education, we want to be sure that these buildings are safe spaces where the wellbeing of students and staff is a priority.

Yet there is growing awareness that poor indoor air quality (IAQ) in these learning environments can have a detrimental effect on the people in them - not only in terms of their health, but also their learning and teaching capabilities. Children are of particular concern as they are known to be [more sensitive](#) to atmospheric pollution than adults.

It's a worrying picture. Contamination levels inside can be up to [five](#) times higher than outdoors. If we also consider that young people in industrialized nations now spend around [85%](#) of their time inside – a large proportion of which is spent in education – the need to take action is clear.

Substances such as radon gas, CO₂ and VOCs (volatile organic compounds), known to be

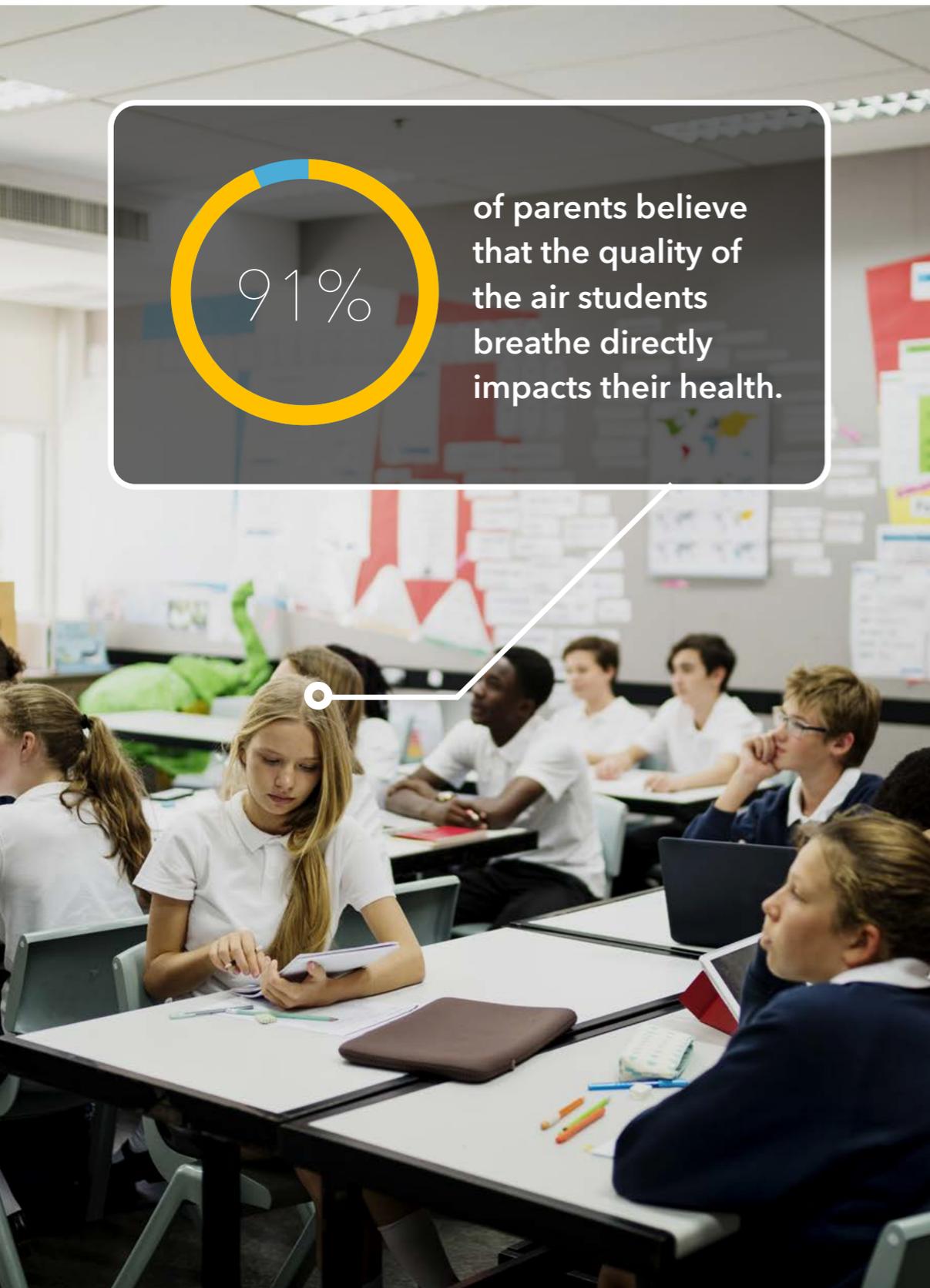
[harmful](#) at high concentrations, can build up in classrooms, gyms or cafeterias if left unchecked. Meanwhile, factors like humidity, temperature and pressure can also interfere with concentration, engagement and the capacity to [learn](#).

This is why attention is increasingly turning to IAQ monitoring systems. Sophisticated devices can track conditions and provide real-time data for the entire building. This information can then be used to make informed decisions to improve conditions and create optimal environments for learning.

Not only that, this data-driven approach can also deliver significant cost savings in terms of energy and cost efficiencies - welcome news to operational teams working with tight budgets. In this guide, we explore the challenges and problems caused by poor IAQ and discuss the advantages of adopting effective IAQ monitoring systems in educational buildings.

Why indoor air quality matters in educational buildings





Children spend more [time](#) in educational establishments than in any indoor environment besides the home. In North America and Europe, the average [length](#) of schooling is between ten and twelve years. Then, many go on to undertake further education at colleges and universities.

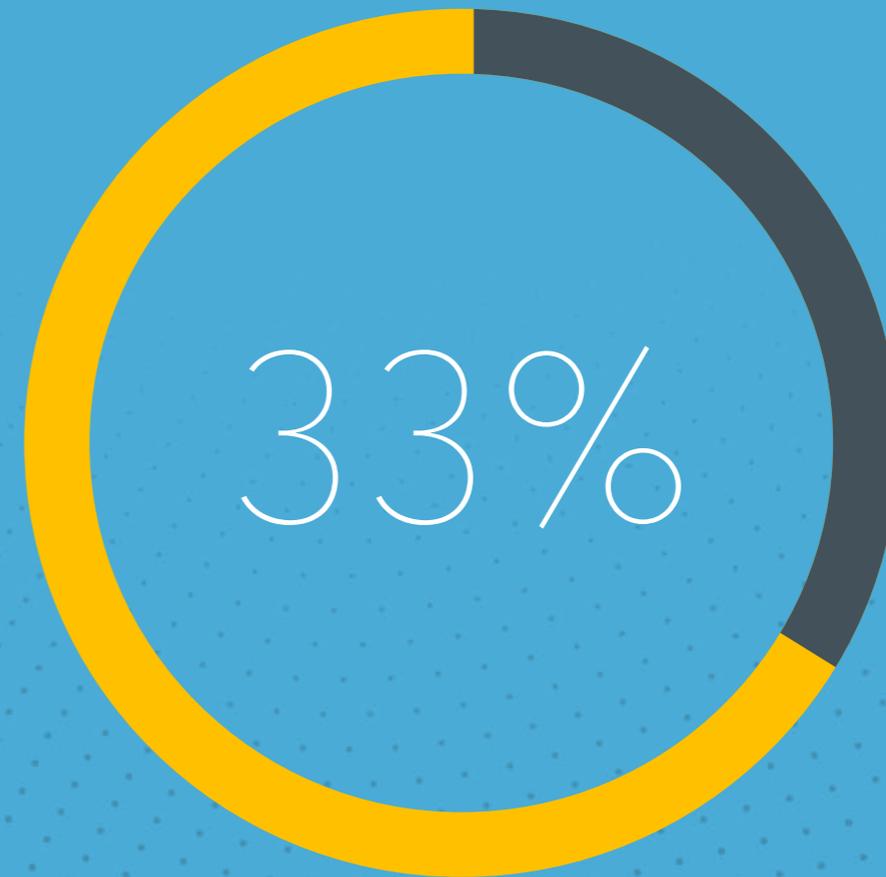
Moreover, today's graduates are [more likely](#) to go into further postgraduate education, including Master's degrees and PhDs. This means that we are studying inside educational buildings for longer than ever before. So it's not surprising that the quality of the air in these buildings is under increasing scrutiny.

From kindergarten to high school, the young are actively growing and breathe higher volumes of air than adults relative to their body weight. This means that poor air quality will have a [greater impact](#) on them. This considered, it's no wonder parents are voicing their concerns; [91%](#) believe that the quality of the air students breathe directly impacts their health.

But it's not just students who are affected. The staff, carers, teaching assistants and administrative team also all spend their working days in this environment. With 33% of an average employee's life spent at work, it's not surprising that IAQ is now a key issue for many - particularly among the next generation of faculty staff who value the working environment ahead of benefits and salary.

These worries are not unfounded. Poor IAQ has been linked to a range of symptoms from headaches, depression and skin irritation to infectious diseases and even cancer in the case of radon.

It is also known to aggravate respiratory issues, which is particularly serious for the growing number of children diagnosed as asthmatic. This condition is the leading cause of school absences due to chronic illness in the US.



**of an average employee's life spent
at work**

“Poor indoor air quality (IAQ) can be a severe health concern for those with asthma and allergies.”



Asthma and Allergy Foundation of America



There are also consequences in terms of learning and teaching performance. Educational institutions strive to position themselves as places where students can excel and reach their full academic potential, but neglecting IAQ can undermine these lofty ambitions.

[Attendance](#), concentration and [performance](#) can all suffer as a result of poor IAQ. In an educational setting, this risks a lack of engagement on the part of both students and teaching staff. This set of circumstances has the potential to cause overall test results to drop and dissatisfaction to rise.

For those responsible for the health and wellbeing of students and staff, monitoring IAQ throughout a busy building with varying occupancy and activities can initially appear complex and costly.

That's why it's so important to understand what IAQ means, why it matters and how it can be managed effectively. As will be seen, educational institutions can even realize operational benefits and cost savings by keeping a better watch on IAQ.

Causes and consequences of poor IAQ

IAQ largely comes down to a number of key contaminants and components, which are known to play a role in the comfort, health and performance of both staff and students.



Radon – Naturally-occurring, invisible and odorless, this gas seeps into educational buildings through the foundations and can build up in those that are particularly well-insulated. Responsible for up to 22,000 lung cancer deaths in the US [every year](#), it is the leading cause of lung cancer among non-smokers.



VOCs (volatile organic compounds) – These substances are emitted from standard cleaning products and equipment, such as cleaning agents, floor and wall coverings, paints and furniture. Levels can be further boosted by heat from computers and other electronic devices. They cause [short-term](#) issues, like headaches, inflammation of the nose, throat and eyes, and flare ups of pneumonia or bronchitis. They can contribute to long-term problems like cardiovascular diseases and lung cancer and have also been associated with aggravating respiratory issues, including [asthma](#).



Carbon dioxide - Emitted naturally by breathing, CO₂ can build up in poorly ventilated lecture theaters, office areas and classrooms, particularly where air is recycled. High concentrations are linked to poor decision-making, low productivity, infectious disease transmission, and sick leave.



Humidity, temperature, and air pressure - These conditions affect how students and staff feel and perform. They are [linked](#) to complaints like dry or irritated eyes, coughs and colds, headaches and migraines variations in [blood pressure](#), and joint pain.



Rising to the IAQ challenge

Developing an IAQ program for educational institutions is not without its challenges. These buildings are dynamic spaces, where changing occupancy levels and different activities can make a significant difference to air quality throughout the day. For example:



The college gym will have much higher levels of CO₂ and humidity compared to the library.



A cafeteria is likely to harbor VOCs from the use of certain equipment and cooking fumes.



A roomful of energetic pre-schoolers will naturally raise the level of CO₂, as well as the temperature and humidity of the air.

The design of educational buildings can also vary - particularly where extensions have been added to accommodate a growing student body or specialist units have been built to improve facilities.

Then we also have to consider the issue of operational efficiency. High-performing buildings look completely different when viewed from the perspective of air quality. For example:



Maximizing room usage may help to accommodate busy timetables but leaves little time for ventilation between classes. This can result in harmful levels of CO₂ and associated restlessness, drowsiness and, in extreme cases, a [10-20%](#) increase in days away from school.





Buildings may be well ventilated to comply with environmental and energy efficiency standards, but at the same time risk a build-up of potentially harmful radon gas.



Windows may be sealed to reduce energy loss but this lack of ventilation has been linked to Sick Building Syndrome. This condition affects people of all ages but particularly children.

For educators tasked with a duty of care, it's a question of looking at the bigger picture to see how investment in IAQ programs can deliver a significant return in more ways than one.

Good IAQ creates an optimal learning environment





When you monitor and manage IAQ, students and staff are happier, healthier and more capable. They think more clearly, concentrate better and are more engaged in the educational process.

These behaviors help to create the ideal learning environment, where teaching staff are fully present and focused on the task at hand, and students' ability to learn is not compromised by external factors. This is supported by a growing body of compelling evidence.

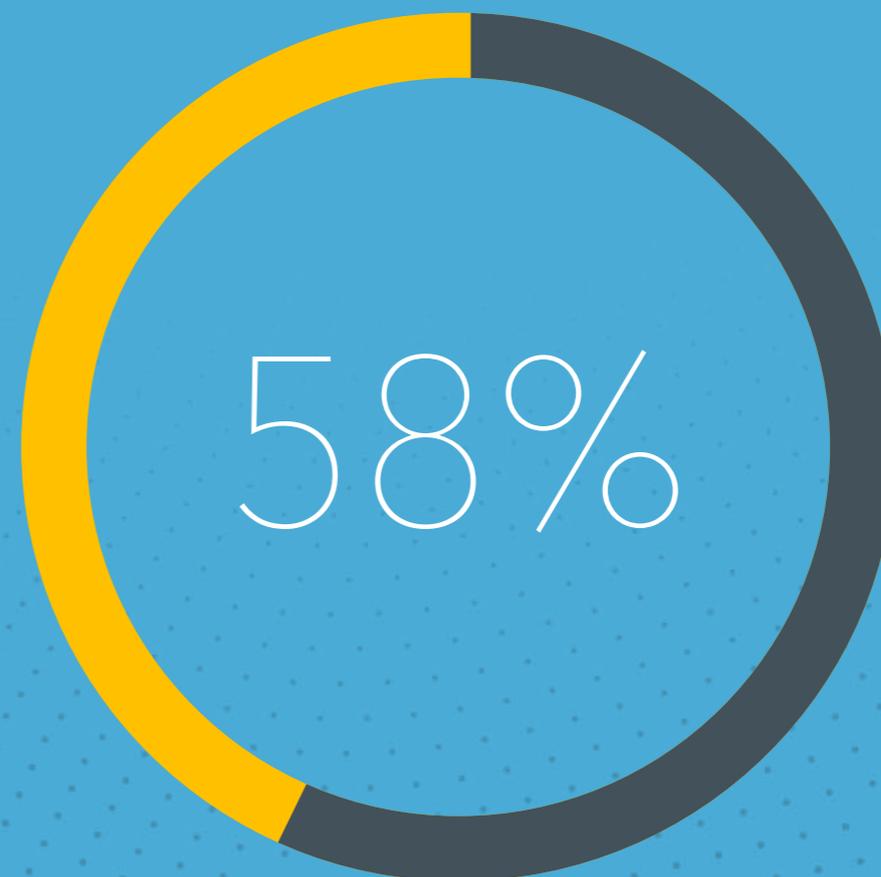
Improved academic performance:

- ⤴ A controlled [field experiment](#) in Denmark found that improving classroom ventilation helps to increase the speed at which 10 and 12-year old students perform numerical and language-based tasks.
- ⤴ In a [study](#) of 100 US elementary classrooms, there was a 2.9% and 2.7% increase in math and reading scores, respectively, for each liter per second per person increase in ventilation rate.
- ⤴ A [study](#) of 8 primary schools in the UK associated higher ventilation rates with faster and more accurate student responses for color, picture memory and word recognition.

Better attendance:

- ⬇ In 2018, the World Green Building Council published a report that shows a healthier work environment can reduce sick leave by 58% - the equivalent of four days per worker, per year.

For teachers and students working through a curriculum or preparing for exams, this is valuable time to win back.



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Monitoring IAQ delivers better operational efficiency



A well-conceived IAQ program also delivers important cost savings by improving operational efficiencies, freeing up budget which can be used elsewhere to fund pressing projects.

Modern IAQ monitoring systems provide both real-time and historic data for CO₂ levels, building a detailed picture of occupancy levels throughout the building. This data can then be used to inform strategic operational decisions. For example:



Energy usage

Heating, ventilation and air conditioning can be used selectively to benefit students and staff while also saving energy. For example, instead of heating a lecture theater or classroom for the entire day, they can be scheduled to turn on during periods of high occupancy. This capability is particularly valuable when it comes to large spaces, such as the gym, which are not in constant use. Equally, ventilation can be reduced during evenings, weekends, school holidays and field trip days when occupancy is low or virtually nil.





Cafeteria

Meal preparation can be coordinated with actual student footfall each day. Armed with a clearer idea of student and faculty attendance, kitchen staff will be able to manage stock levels more efficiently, which means less wastage and valuable savings over the long term.



Cleaning schedules

With greater knowledge of occupancy levels in each part of the building, priority areas for cleaning can be identified, supporting a better use of these valuable resources.

Taken as a whole, the results of this integrated approach can be remarkable.

One school district in the US achieved annual energy savings of more than [US\\$928,000](#) and significant IAQ improvements by understanding the relationship between energy management activities and IAQ.



US\$928,000

annual energy saving

IAQ management adds a competitive edge

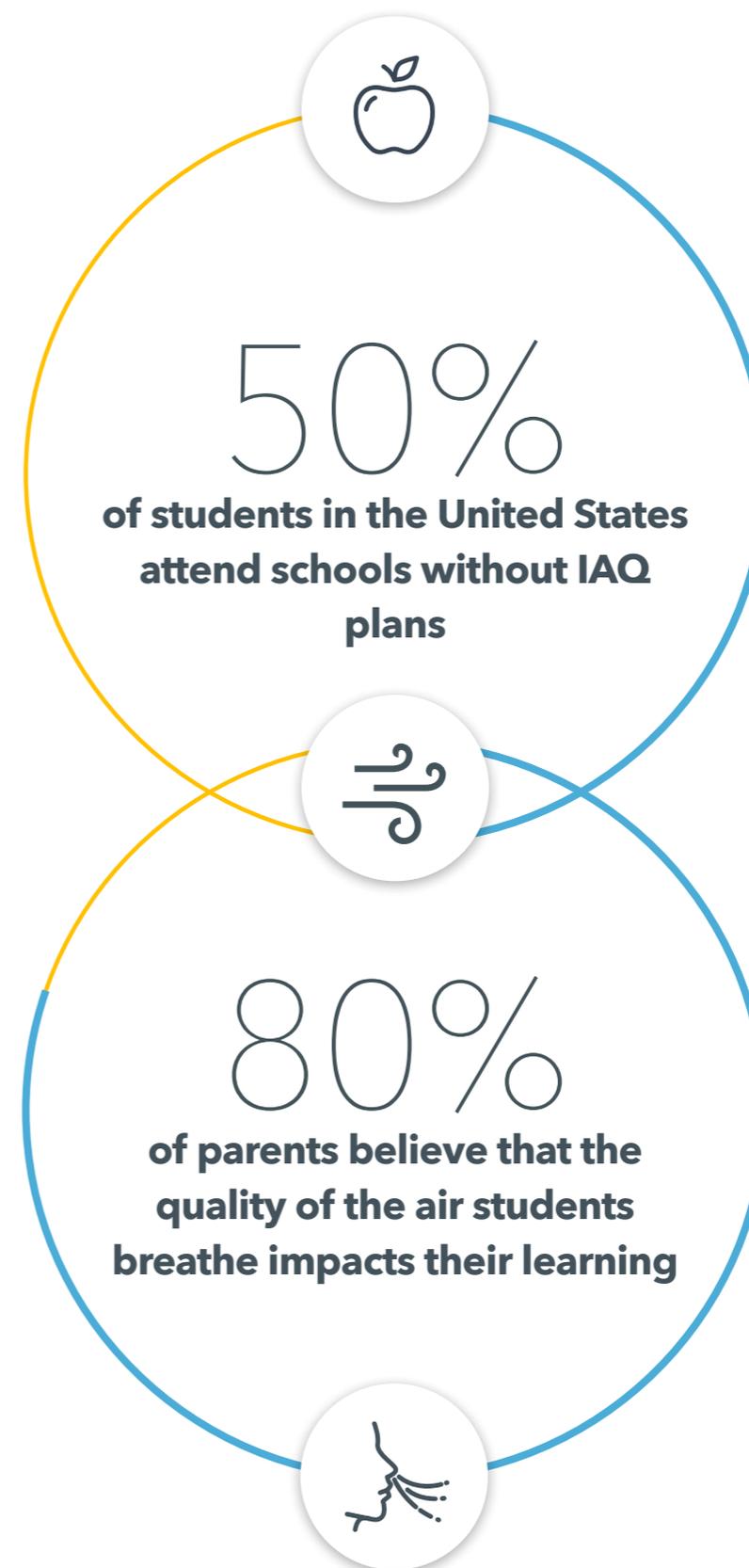


Demonstrating a clear commitment to the health and welfare of students will also create a clear point of difference in a highly competitive field.

Every educational institution strives to create the best learning environment for its students, but not all have a robust IAQ strategy in place. In fact, nearly [50%](#) of students in the United States attend schools without IAQ plans.

If we also consider that [80%](#) of parents believe that the quality of the air students breathe impacts their learning, this represents a significant opportunity for ambitious schools and colleges to stand out from the crowd.

It's an equally strong message to communicate to prospective students. Not least because the younger generations are prioritizing their wellbeing and making [choices](#) accordingly. So when it comes to education, the quality of the learning environment and the air that they breathe will be a part of their decision-making process.





Having the foresight to invest in IAQ is also highly likely to appeal to donors, who can see the benefits of this approach and its long-term impact both on attracting students, and in terms of academic performance and rigor.

Let's not forget that over the last ten years or so, there has been growing focus on the role schools play in supporting key aspects of student wellbeing.

Ensuring cafeterias provide healthier food options and making physical activity a core part of the curriculum have been two of the main areas of attention. So doesn't it also make sense for ambitious educators to include indoor air quality in their student wellbeing strategy?

Conclusion





Educators have an ethical duty to protect those in their care - and that extends to the quality of air in the buildings.

But without intervention, educational institutions can harbor harmful substances and create conditions which are not only detrimental to health, but also to the capacity to teach and learn.

“Good IAQ contributes to a favorable environment for students, performance of teachers and staff and a sense of comfort, health and well-being. These elements combine to assist a school in its core mission – educating.”

US [Environmental Protection Agency](#) (EPA)



This is why it's so important that steps are taken to develop and implement effective IAQ programs to safeguard both students and staff. As the issue of air quality continues to gather pace, the scientific [case](#) is building, [environmental bodies](#) are raising the alarm and [regulatory](#) guidance is growing and developing.

Educational organizations that choose to act now will be seen as putting the health and wellness of staff and students first – a policy that is sure to strengthen their reputation across key target audiences including parents, prospective attendees, faculty staff and donors.

Not only that; analysis of IAQ data will yield insights that enable greater energy efficiency throughout buildings. This brings a boost to the bottom line and to the organization's green credentials, another great point of difference sure to appeal to students, parents, donors and prospective recruits.

Takeaways





Young people spend more time in educational establishments than any indoor environment other than the home.



Poor indoor air quality in educational buildings can have a negative effect on young people's health and academic performance.



Improving IAQ creates an optimal environment for learning and wellbeing, where teachers and students can excel.



Putting an effective IAQ monitoring system in place means the whole building can operate more efficiently, with energy savings helping to reduce cost and environmental impact.



Cutting-edge IAQ monitors can gather information on contaminants and air quality factors like radon, TVOCs, CO₂, humidity, temperature, and pressure.

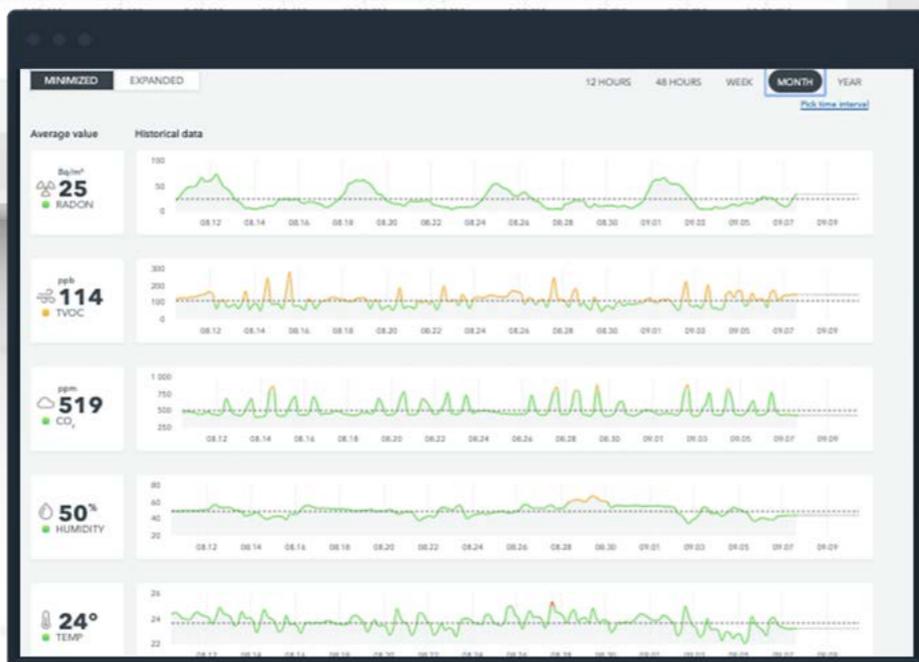


Implementing an IAQ program demonstrates that the health and wellness of staff and students comes first, and provides a key point of positive difference for the institution.



Occupancy

This heatmap shows the occupancy of the room where the device is placed. It allows you to see when occupancy is at its highest, and make changes to your indoor air quality based on this. We recommend selecting a week or longer to get the best results and more precise statistics.



See how Airthings Healthy Building Solution helps you deliver a healthy, efficient, optimal learning environment.

[FIND OUT MORE](#)