

# Indoor Air Quality in Schools



WorldGBC believes in green buildings for everyone, everywhere. Schools are no exception. We call for schools that are energy efficient, have low greenhouse gas emissions, and schools which are designed and operated for children's health, wellbeing and performance.

To help, WorldGBC has produced a series of briefing notes, focusing on four features of indoor environmental quality. These are intended for school board decision-makers, as well as school designers and facility managers, to share how design and operation features affect students' health and, in turn, their academic performance. By combining health, wellbeing and low carbon operation, we can ensure students spend their days in truly green school buildings.

## PROBLEM:

Poor indoor air quality in schools can have a negative affect on children's health and academic performance.

## PREVALENCE:



More than 25 million children, nearly 50% of students in the United States, attend schools without an IAQ management plan. <sup>1</sup>

## SOLUTION:

Thoughtful school design and operation can improve indoor air quality and improve student health and performance. This can also most often be done without increasing greenhouse gas emissions.

## What is indoor air quality?

Indoor air quality (IAQ) is defined by the concentrations of various pollutants, including:

- + Carbon dioxide (CO<sub>2</sub>)
- + Volatile organic compounds (VOCs)
- + Moulds
- + Dusts
- + Airborne fungi

Specific concentrations of these pollutants, as well as ventilation rates, have been linked to sick building syndrome (SBS).

## What is Sick Building Syndrome?

Sick Building Syndrome is characterised by a number of symptoms, including: <sup>2</sup>

- lethargy
- dry and itchy skin
- headache
- sore throat
- nasal stuffiness and dryness
- dryness, pain and itching in the eye

Children are more susceptible to SBS because they inhale more pollutants per body weight than adults, due to higher breathing rates. <sup>3</sup>

# Indoor air quality affects children's health and comfort



## Indoor exposure to VOCs

has been associated with SBS symptoms<sup>4</sup> in schoolchildren<sup>5</sup>



## Elevated CO<sub>2</sub> levels

have been linked to symptoms of wheezing among children<sup>6</sup>



## Low ventilation rates have been

associated with increase incidences of SBS<sup>7</sup> and nurse visits<sup>8</sup>

# Indoor air quality affects children's performance at school

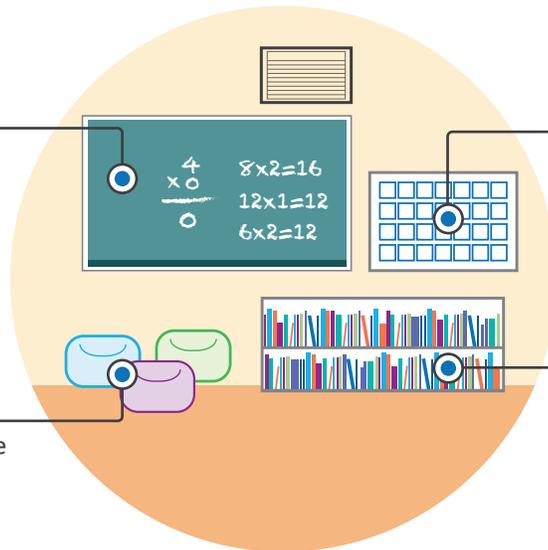
## Examples of Positive Impact



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 litre per second per person increase in ventilation rates<sup>9</sup>



**Higher ventilation rates** have been associated with faster and more accurate student responses for colour, picture memory and word recognition<sup>10</sup>



## Examples of Negative Impact



**A 1000 parts per million (ppm)** increase above ambient levels of CO<sub>2</sub> has been linked to a **10-20% increase in days** away from school<sup>11</sup>



**Every 100 ppm increase in** CO<sub>2</sub> was associated to roughly one-half day per year reduction in school attendance<sup>12</sup>

# A truly green school has good indoor air quality and low carbon emissions, achieved through:

- **Natural ventilation**, when possible, which can refresh indoor air without increasing energy consumption, but this requires good outdoor air quality.
- **Hybrid or mechanical ventilation**, when needed, with appropriate filtration systems, which can be powered using on-site and/or off-site renewable energy to reduce overall carbon emissions.
- **Low or zero-VOC furnishings, materials and cleaning products**, which can help reduce baseline IAQ levels.

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