

Thermal Comfort 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, Better Places for People 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 thermal comfort in schools can negatively affect children's health and academic performance.

PREVALENCE:



of schools in the Toronto District School Board have no air conditioning, which can help moderate temperature and humidity. ¹

SOLUTION:

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

What is thermal comfort?



Thermal comfort is a human's perception of comfort with respect to objective measures, such as temperature, humidity, and air velocity.

Factors affecting personal comfort include: ² ³ ⁴ ⁵

- + Gender
- + Age
- + Race
- + Size
- + Weight metabolic rates
- + Insulation through clothing

Thermal comfort affects children's health and comfort



Children are more sensitive to higher temperatures

than adults because of their higher core body temperature and less developed thermoregulation capabilities. **6**



Higher humidity increased the rate of

Sick Building Syndrome symptoms in a study of over 1,000 Polish students. **7**



Respiratory complaints

were associated with "too hot" or "too cold" classrooms in a 2016 study of over 4,000 Finnish students. **8**

Thermal comfort affects children's performance at school



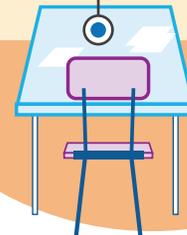
A study of 75,000 New York City students showed **a 0.2% decrease in test scores for every 1°F increase in temperature** **9**



Students citing their classroom as 'comfortable' **achieved 4% more correct answers** in a math test compared to those who were hot, according to a survey of more than 4,000 Finnish students **10**



Each 1°C decrease in classroom temperature showed a 12–13 point increase in math scores in a study of more than 3,000 US students **11**



A truly green school has good thermal comfort and low carbon emissions, achieved through:

- **Setting temperature points** to meet children's needs, as opposed to adults', which in colder climates, reduces energy costs associated with heating, as children prefer lower temperatures. **12**
- **Natural ventilation** from properly designed and placed windows, if appropriate for the climate and outdoor air quality, which can moderate the temperature and reduce energy needed for cooling and associated carbon emissions.
- **Energy-efficient and renewably-powered mechanical ventilation**, if necessary, which can provide a comfortable temperature and humidity level.

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