

Indoor Air Quality in European Schools



There are currently
95,000,000
pupils in Europe¹.

As children spend around **70%** of their time indoors, a good learning environment is **crucial**.

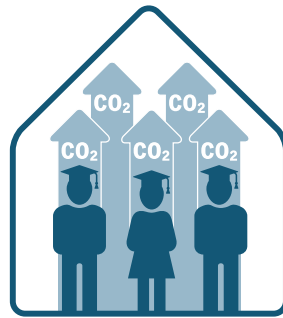


Recommended levels of CO₂

As classrooms are densely occupied spaces with a metabolic production of CO₂ by the occupants, the CO₂-concentration is directly dependent on the ventilation rate.

Recommended values lie between **1,000-2,000 ppm**. While levels below 1,000 ppm are considered as hygienically unproblematic, levels above 2,000 ppm are hygienically unacceptable².

CO₂ concentration in classrooms



Although there have been improvements to school buildings in recent years, many classrooms still don't provide an optimum indoor environment for learning.

Studies have reported that many schools have CO₂ levels above the recommended range of 1,000 to 2,000 ppm³.

Improved indoor air quality = Improved performance



An average increase in performance by 2.8%, and even 15% in specific cases⁴



Increased speed



Higher levels of attention and concentration



Lower rates of absenteeism

Increase in performance = economic growth



An increase of school childrens' performance by 2.8% would lead to a 6.7% - 9.5% increase in the conditional economic growth of the country (based on GDP per capita)^{4,5}.

How to improve the indoor air quality in classrooms



As most schools in Europe have been designed for natural ventilation, more time should be set aside for airing during lessons.



Innovative natural ventilation solutions, e.g. demand-controlled natural ventilation, can maintain the CO₂ level within the recommended range.



Mechanical ventilation systems can ensure an optimum level of air quality without compromising thermal comfort in colder months.



Hybrid solutions can combine the advantages of both natural and mechanical ventilation.

¹ Eurostat: Education Statistics, Distribution of pupils/ Students by level [educ_ilev], extracted on: 21.06.2015.

^{2,3} Umweltbundesamt: Gesundheitliche Bewertung von Kohlendioxid in der Innenraumluft. In: Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz 51(11) (2008), p. 1358-1369.

⁴ Fraunhofer-Institut für Bauphysik IBP, Impact of the indoor environment on learning in schools in Europe, December 2015

⁵ The conditional growth calculation is based on the research of Hanushek, Eric A., and Ludger Woßmann. 2007. "The Role of Education Quality in Economic Growth." Policy Research Working Paper 4122, World Bank, Washington, D.C. This was related to an increase by 2.8% in PISA test scores for maths and reading.