

Indoor environment and health

Indoor climate in schools

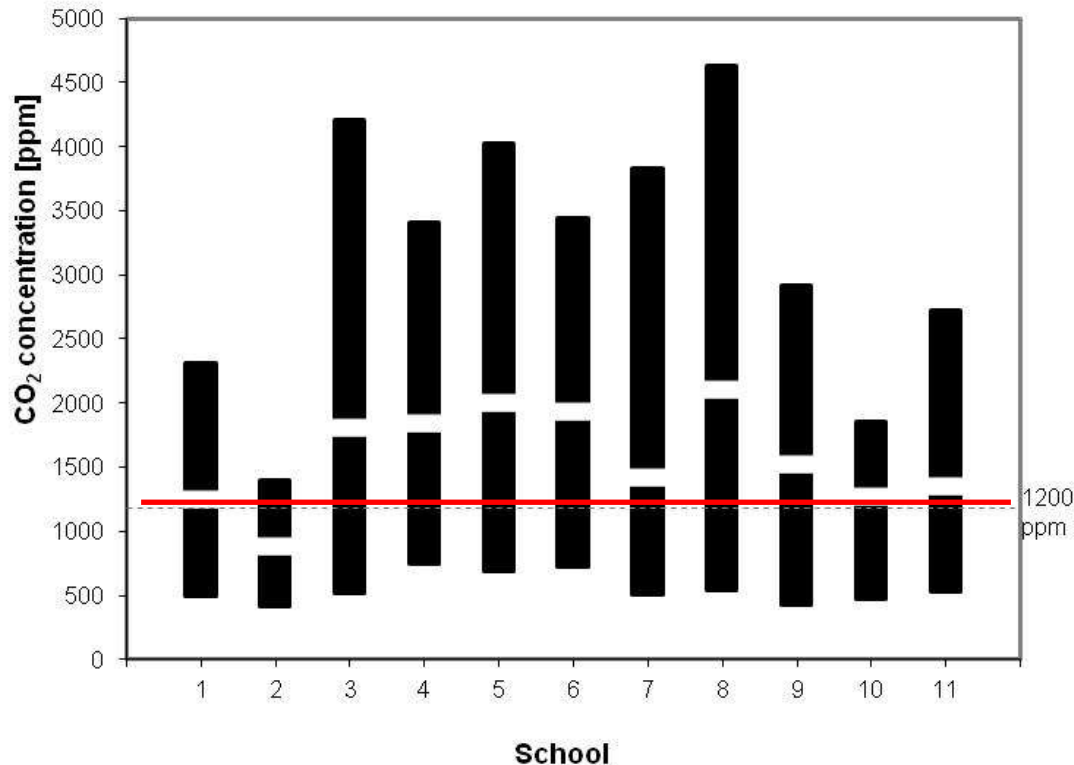
**Quality and compliance - Thermal comfort and
indoor air quality**

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Atze BOERSTRA MSc

BBA Indoor Environmental Consultancy

- Indoor Air Quality in schools is generally poor
 - e.g. in 80% of Dutch schools CO₂ concentrations are above 1200 ppm



■ Direct:

- discomfort (e.g. body odours)
- SBS complaints (headache, irritation of the mucous membranes)
- spread of infectious diseases

■ Leading to:

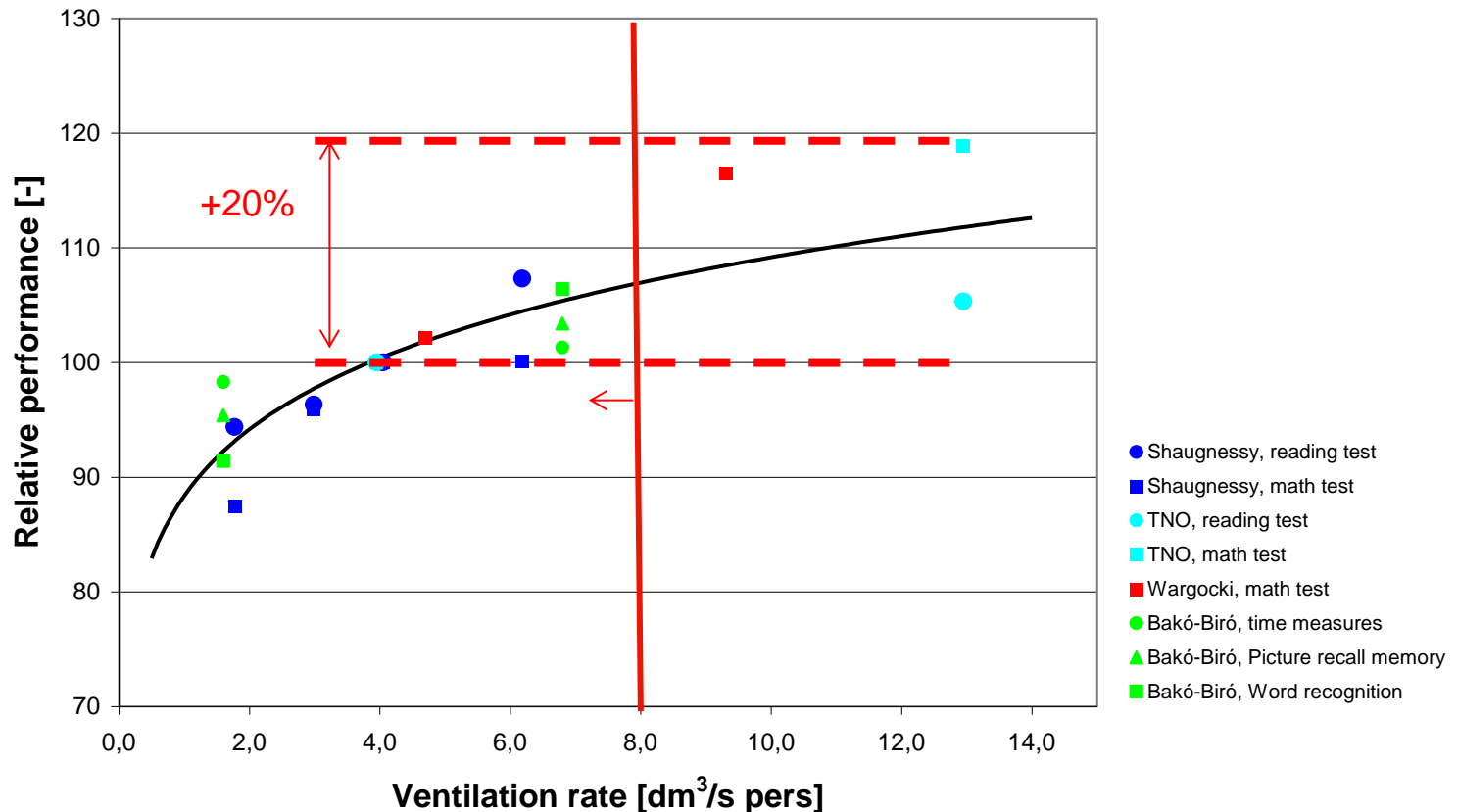
- increased sick leave
- decreased (learning) performance
- extra costs



- $\text{CO}_2 > 1000$ ppm above outdoors:
 - 10–20% increase in student absence
 - Shendell et al., 2004
 - 434 classrooms in 22 American schools

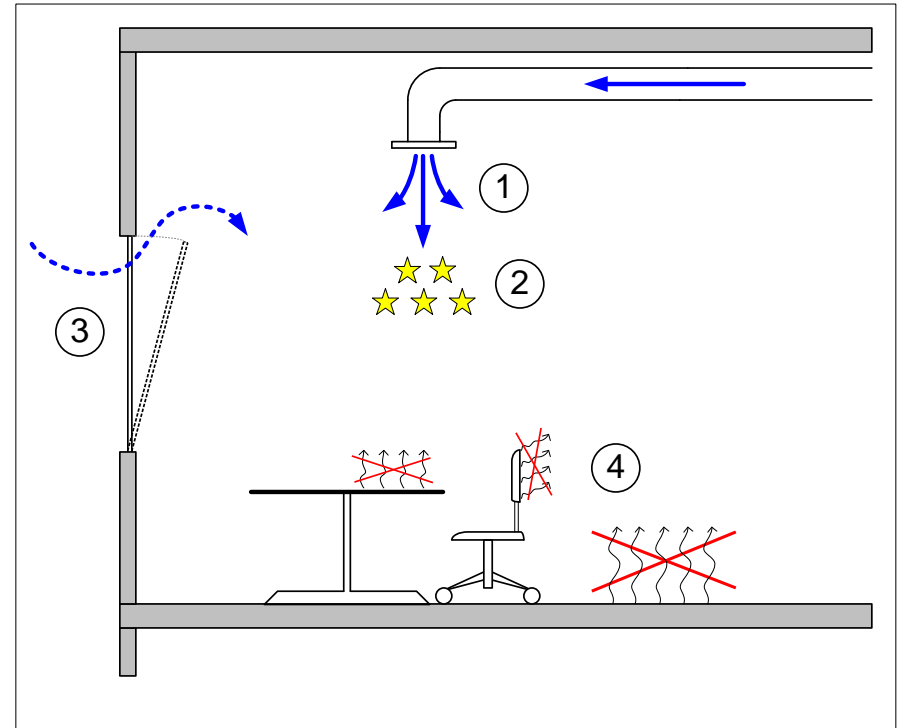


- Ventilation rate < 8 l/s/person:
 - decrease of learning performance



■ Basic rules:

1. Adequate air supply
2. Quality supply air = outdoor air
3. Operable windows
4. Low polluting materials



■ *Basic assumptions:*

- *The room is used as designed*
- *Adequate outdoor air quality*

■ Basic rules

1. Adequate heating (winter)
 - active / passive cooling
2. No overheating (summer)
3. Avoid local thermal discomfort
4. Personal control



- High occupant ratio
 - High supply rates, no draught
- Low maintenance design
 - Often there's no budget...
- Keep it simple!



**Thank you for your
attention!**

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ab-bba@binnenmilieu.nl
www.binnenmilieu.nl