2do Foro de EDUCACIÓN Fundación Barco

INFRAESTRUCTURA ESCOLAR

Voces que construyen oportunidades

MARTES 4 DE OCTUBRE 2022

Fundación Barco | En alianza con Universidad de los Andes Colombia, Escuela de Gobierno Alberto Lleras Camargo | EL ESPECTADOR | Con el apoyo de isa | Con el patrocinio de Fundación Aurelio Llano Posada, falabella.com | Banco de Occidente | Del lado de los que hacen.

The Evidence for the Impact of School Infrastructure and Classroom Environment on Learning

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2022

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Overview

- Safe and healthy schools
- Optimal learning spaces
- National education infrastructure systems
- Conclusions

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Safe and healthy schools

Peter Barrett, Alberto Treves,
Tigran Shmis, Diego Ambasz, and Maria Ustinova
The Impact of School Infrastructure on Learning:
A Synthesis of the Evidence, The World Bank Group,
Washington, 2019.

Impacts of basic school conditions - pupils

- Lack of basics
  - Electricity
  - Potable water
  - Sanitary drains
  - Waste and garbage
  - Telephone
  - Building condition, esp DAMP

Associated with:

- Violence
- Discrimination
- Limited opportunities to learn
- Absences through infection, asthma, etc

Disproportionate impact on the disadvantaged

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Impacts of basic school conditions - teachers

- Lack of basics
  - Toilet
  - Electricity
  - School library
  - Good maintenance and building condition

Associated with absences from work:

- Health
- Motivation

When addressed has a more powerful effect on retention in the teaching profession than salary

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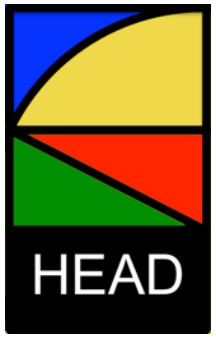
Optimal learning spaces

The HEAD Project

Holistic Evidence and Design – sensory impacts, practical outcomes

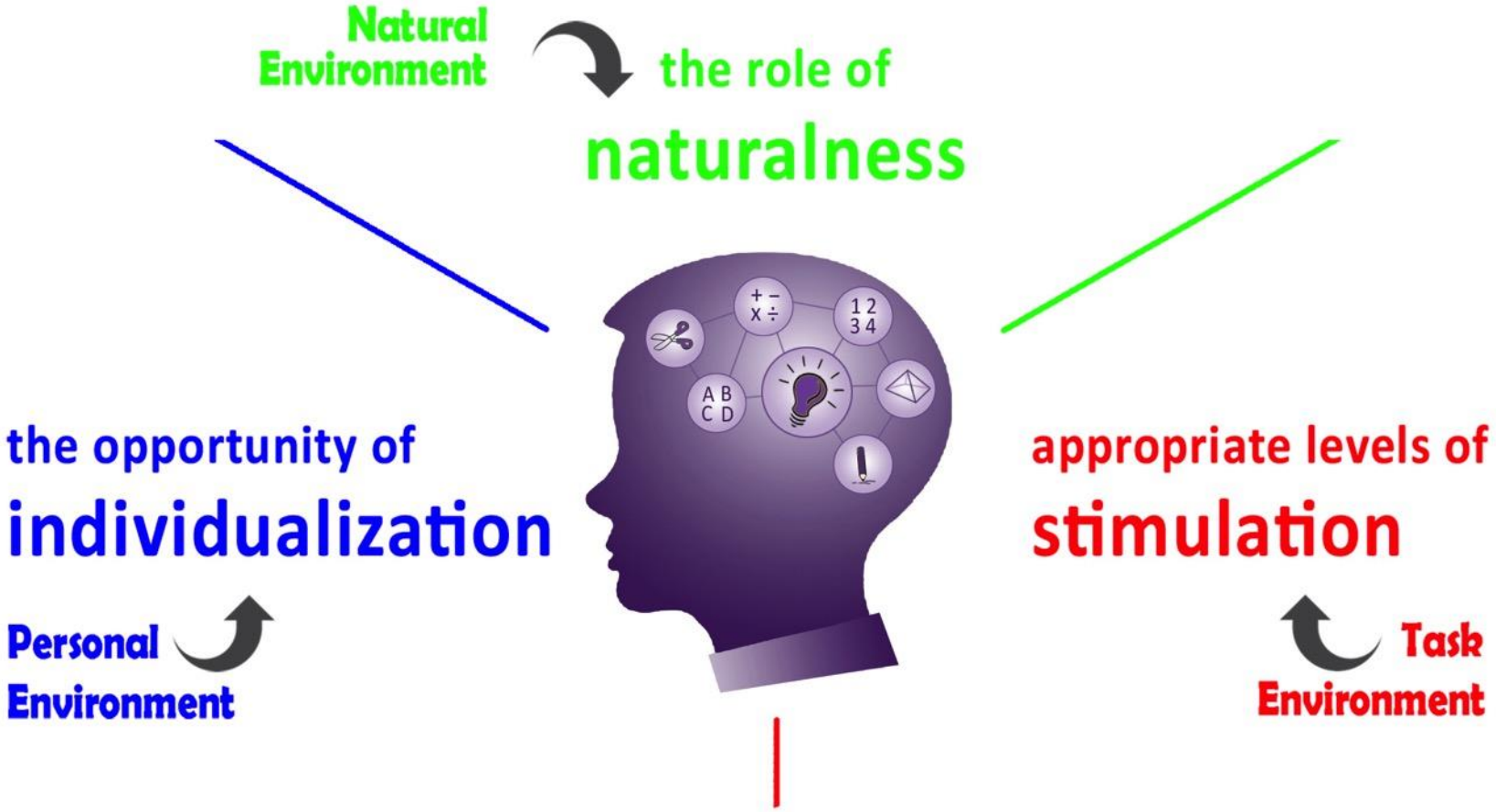


To explore if there is any evidence for demonstrable impacts of school building design on the learning rates of children in primary schools

Primary schools present a real opportunity as pupils mainly in one space and there are annual measures of academic progress – relatively **simple**

Pilot phase funded by Nightingales now IBI
HEAD Project funded by EPSRC 2012-15

The SIN design principles



P. Barrett and L. Barrett (2010). "The Potential of Positive Places: Senses, Brain and Spaces". *Intelligent Buildings International,* 2: 218-228.

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Big / diverse study sample

Looked at 153 classrooms in 27 schools, 3766 pupils

- **Observation** – layout, display, lightings, floor covering, colour, view out, window (opening) size and position etc.
- **Measurement** – lighting level, temperature, noise level and CO_2 level, room height, window height, furniture and fixture size
- **Interview** – sensory comfort, e.g. temperature, glare, noise, smell, size and usage etc.

1900s

1920s

1950s

1970s

2000s

Headline results

The SIN principles explain 16% of the variation in learning achieved by the pupils over a year

(Using National Curriculum sublevels in Reading, Writing and Maths at the start and end of the year, and fixing all except built environment factors to their means)

Multilevel modelling factored out other influences

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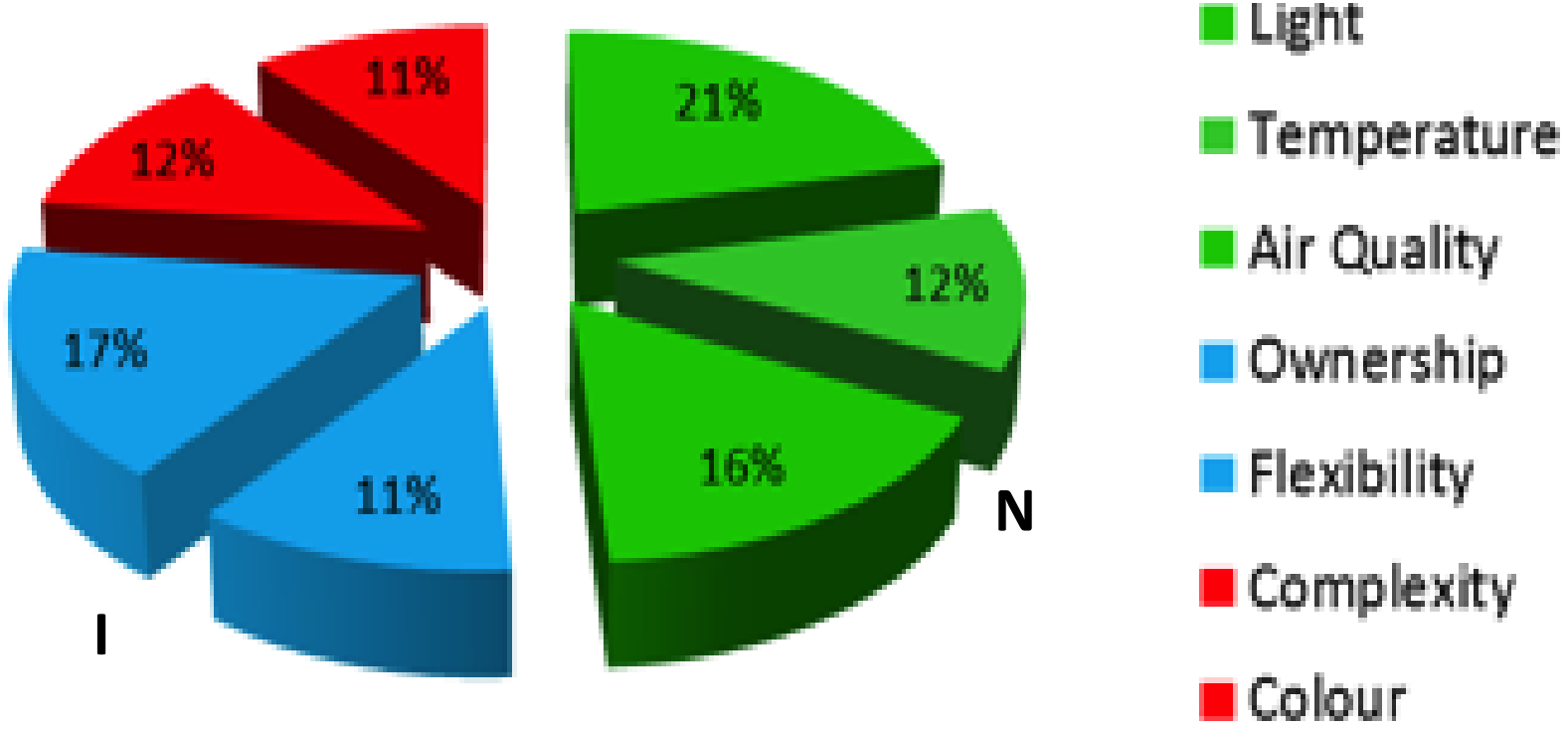
Contribution from each classroom measure



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What surprises were there? – The muted effect of “school” level factors

School Level Factor	Measures
School Naturalness	Outside Learning zones, Play ground Area
School Individualisation	Site area, Building floor area, Number of pupils
School Stimulation, Appropriate level of	Building Façade, Complexity of layout, Alternative learning rooms

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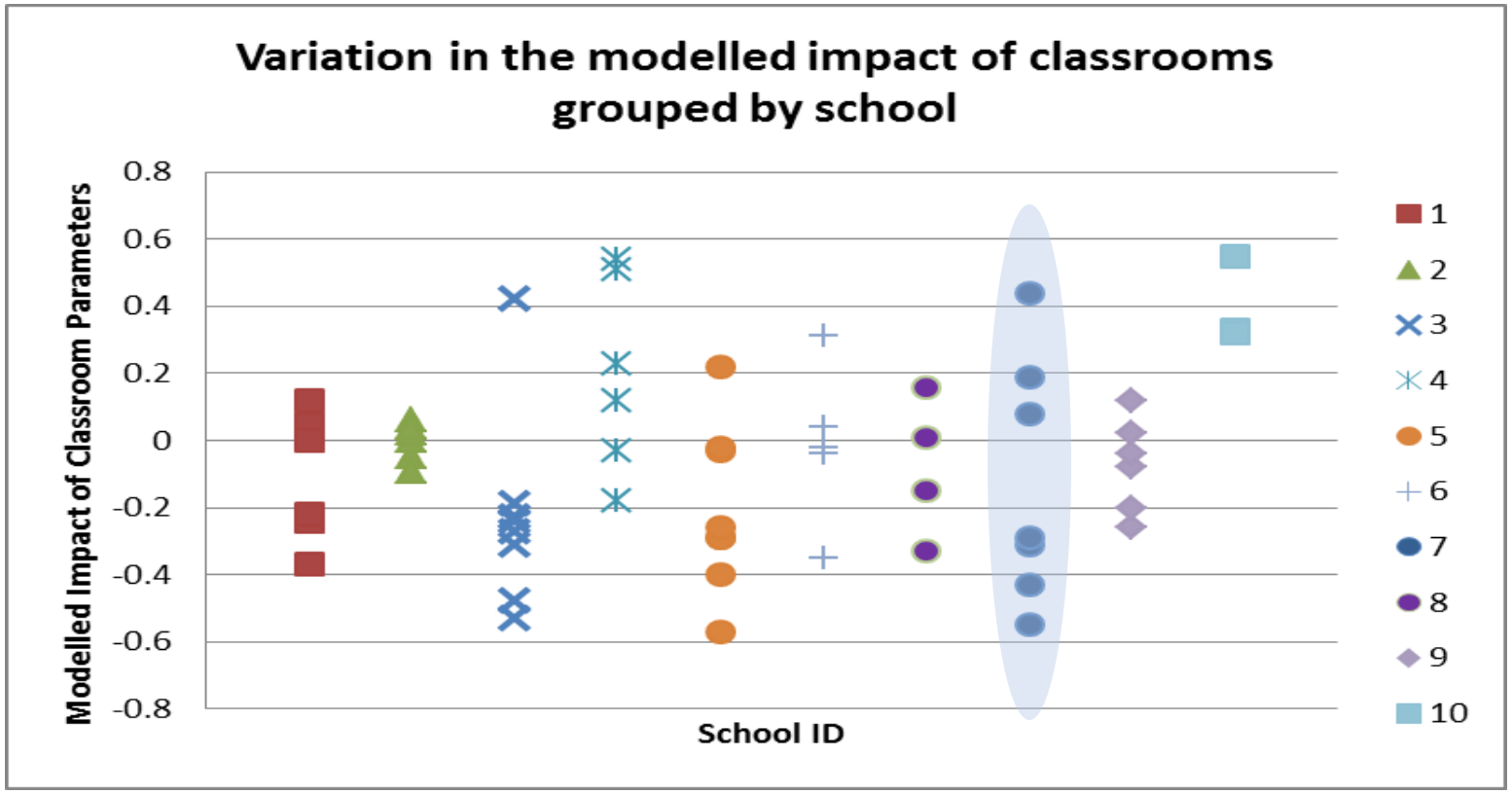
Surprisingly big variations ***within*** schools



First and foremost the individual classrooms must each be well designed – argument for "inside-out design"

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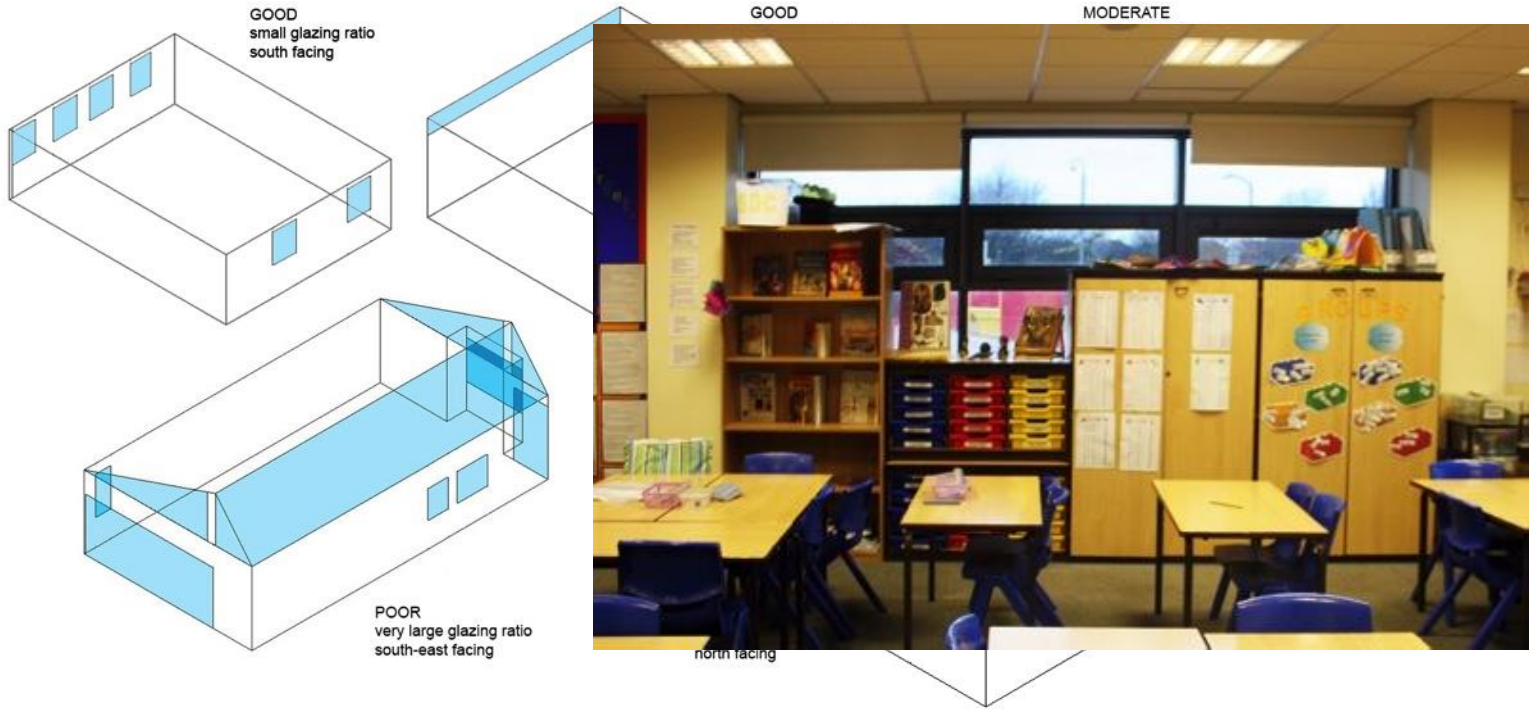
Health / Naturalness
Light
Air Quality
Temperature
Links to nature
Acoustics

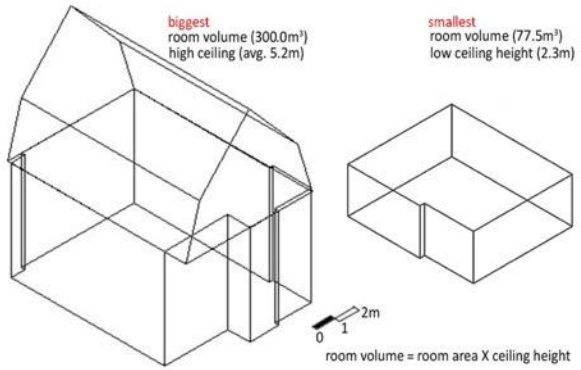
Light

- High levels of natural lighting, but without glare
- Good quality of artificial lighting
- Good quality, easy-to-operate blinds – down and up!



Air quality

- Large, varied openings good, especially at high level
- Large room volume can help

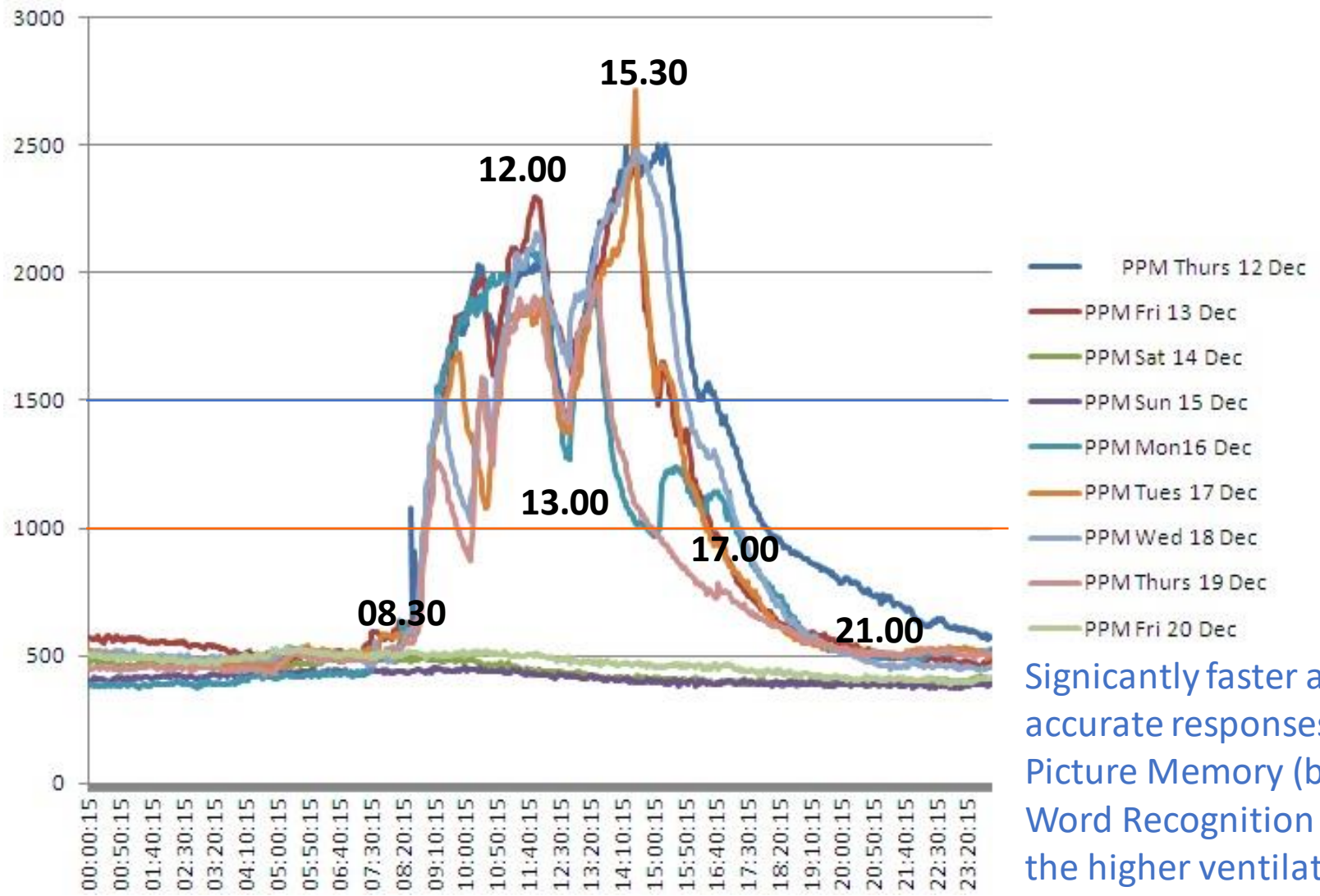


Average time for a class of pupils to "create" poor air quality … ?

30 minutes

CO2 in one classroom over a week

An example



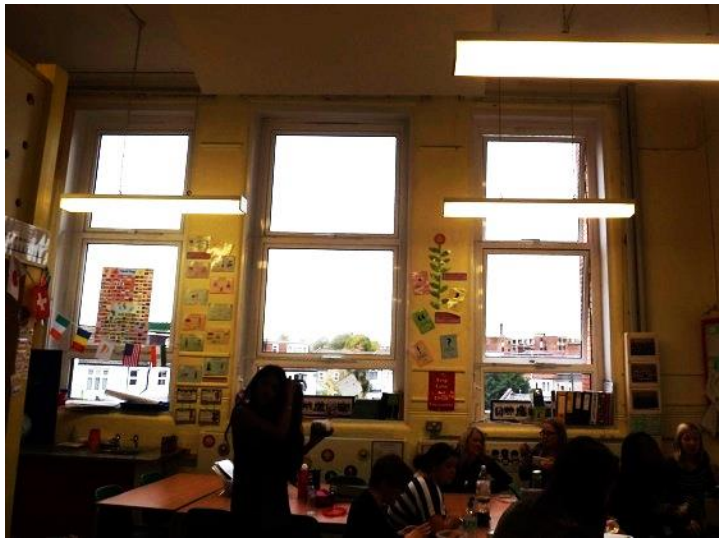
Signicantly faster and more accurate responses for Picture Memory (by 8%) and Word Recognition (by 15%) at the higher ventilation rates

Bako-Biro et al, 2011

Temperature

- Heating control in each classroom critical
- Heat gain from sun can be a problem

Orientation and shading devices



Poor: no external or internal shading control

Good: abundant sun heat but with external canopy

Individualisation

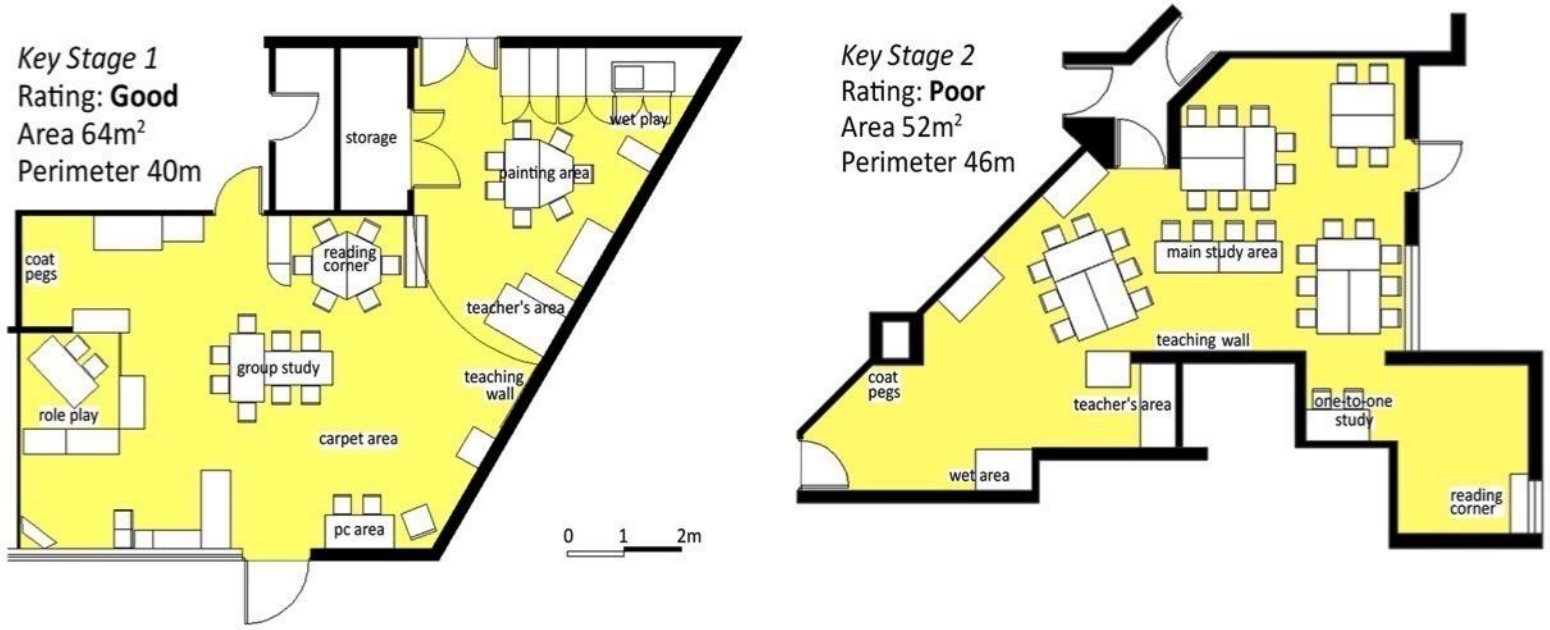
Flexibility

Ownership

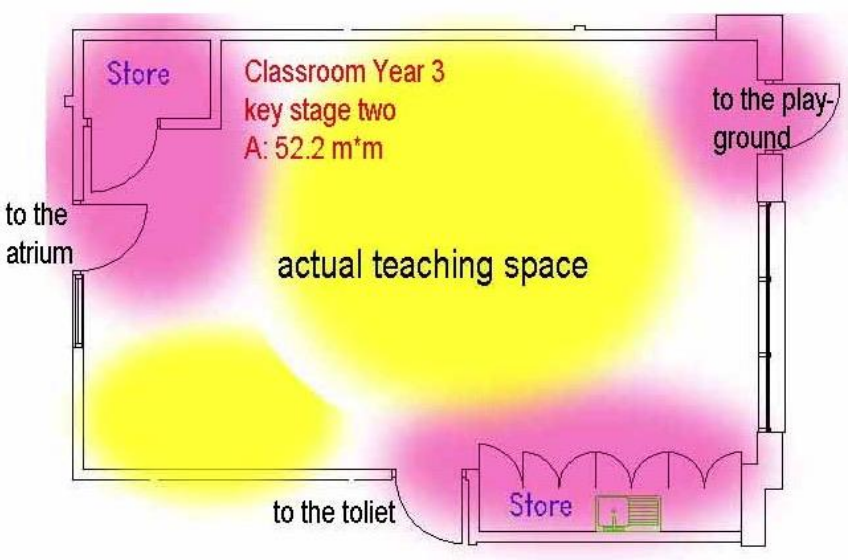
Connection

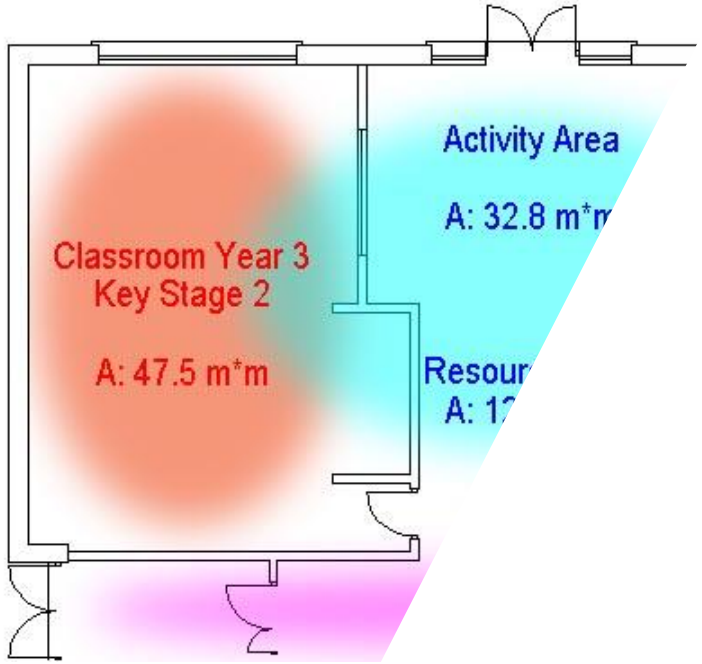
Flexibility / choice

- Break out spaces / zones attached to classrooms work well
- Ample wall display area is beneficial
- More complex plans with varied learning zones are appropriate for KS1 “play-based” learning
- Bigger / simpler plans for more formal learning in KS2



Open and flexible … ?





No

Yes

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Ownership

- Aspects that helped pupils identify with “their” classroom;
- Aspects that are child-sensitive, eg furniture, window heights.

class-made display

personal storage

lots of class-made art work on display in varied formats and sizes.

Try too hard? … Half-made spaces …

The “den”

The “cave”

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Level of stimulation

Visual complexity
Colour

Visual complexity

Which is best?

TOO LITTLE

ABOUT RIGHT

TOO MUCH

Appropriate level of stimulation is curvilinear for learning – not too exciting, not too boring

Colour

- Relatively calm backdrop of wall colour – curvilinear again, not all white or all bright yellow!

- Against this, points of brighter colour in the furniture etc

TOO LITTLE

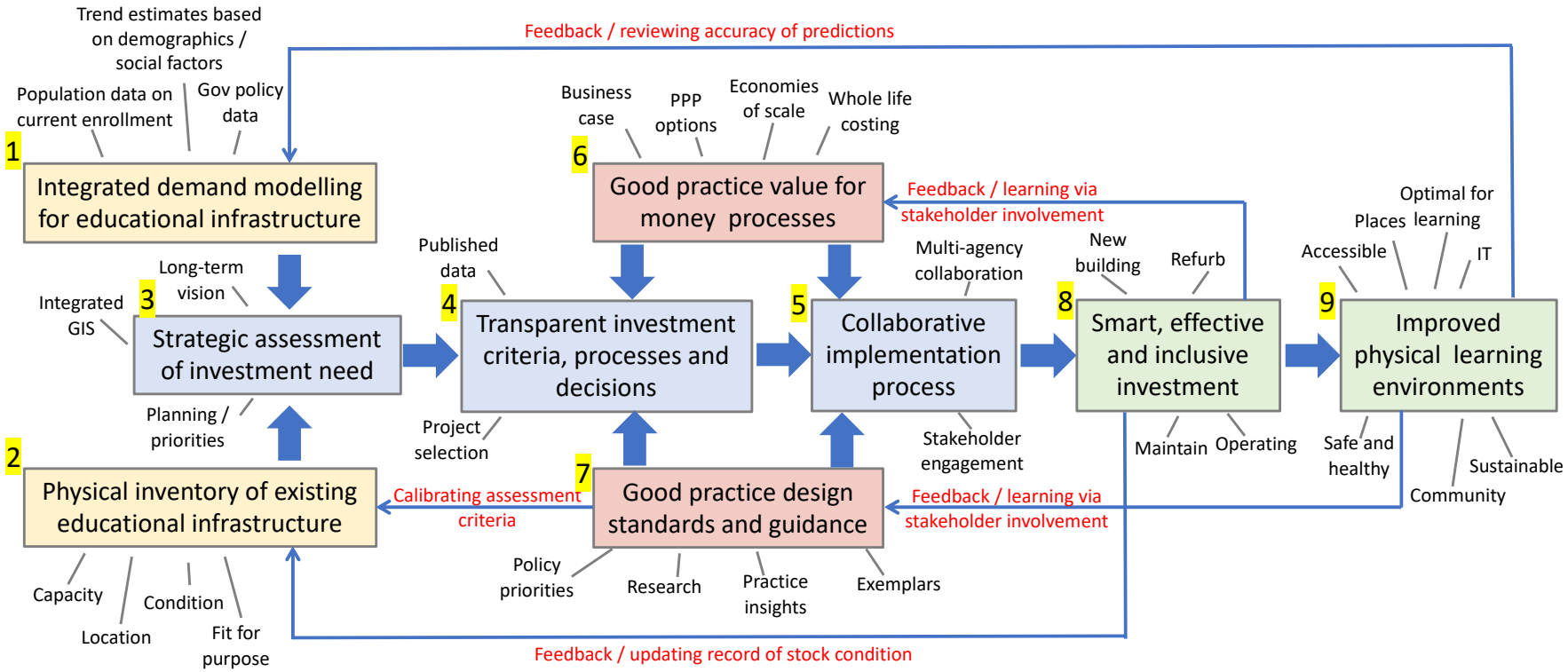
ABOUT RIGHT

TOO MUCH

National educational infrastructure systems

National systems – EU study

EC (2022) *A study on smart, effective, and inclusive investment in education infrastructure*, European Union, Luxemburg



Systemic characteristics:

1) Data, analyses and processes all at a level of granularity that gives visibility to, age, level of education, special needs, mix of subjects, location
2) Levels from national – regional – local – project, connected synergistically and provided with appropriate integration and user support.
3) Stakeholders at all levels aware of opportunities and processes and engaged in the active improvement of what is done and how it is best achieved.

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Conclusion

Summary

- Safe, healthy, well maintained schools have positive impacts on:
  - The health, and so attendance, of pupils and teachers
  - Retention of teachers in the profession
- Optimal learning spaces have positive impacts on:
  - The academic progress of pupils
  - The options for teaching open to the teacher
- Long-term, evolutionary national investments in school infrastructure reap lasting improvements

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