IN2 ARCHITECTURE

IBI

QUATTROCCHI KWOK ARCHITECTS

Make a Difference:

Design Schools to Benefit Learning

A4LE LearningSCAPES Conference
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Speakers

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Presentation Resources: bit.ly/FacilityDesign

Learning Objectives

- **Learning Objective 1:** Understand how classroom design directly impacts the physical environment and academic performance.
- **Learning Objective 2:** Explore the current research supporting the link between school design and student performance.
- **Learning Objective 3:** Find out the specific classroom physical features proven to improve students' academic performance.
- **Learning Objective 4:** Take away practical ideas for educators and designers to apply these principles to their own spaces and building projects.

Agenda

- Research
- Implementation Tools
- Case Studies
- Design Thinking Exercise

Research

University of Salford MANCHESTER

IBI Education

H.E.A.D. Project

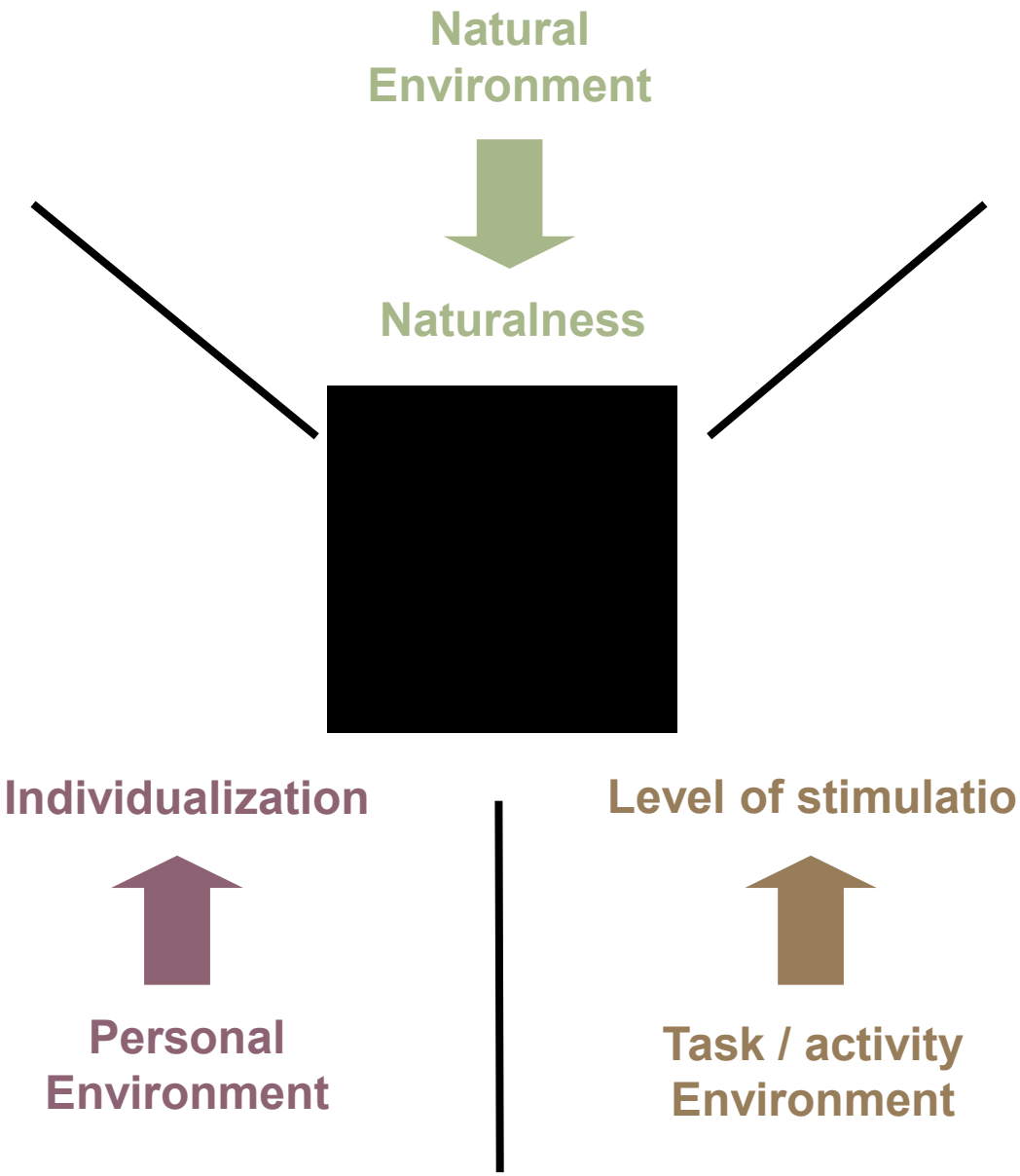
Holistic Evidence and Design

Sensory Impacts & Practical Outcomes

Professor Peter Barrett, University of Salford, Manchester

Overview

- **Purpose:** To explore if there is any evidence for demonstrable impacts of school building design on the learning rates of children in primary schools.
- Realization that dealing with "ill-posed" questions – implicit / intuitive response
- Notion of primary reinforcers – importance of "naturalness" of spaces
- Development role of experience – importance of secondary reinforcers, thus "individualization" of spaces
- Background factor of appropriate "level of stimulation"



Barrett P et al. A holistic multilevel analysis identifying the impact of the classroom design on student learning, *Building and Environment 2012*

School/Classroom Samples

Looked at 153 classrooms in 27 schools, 3766 pupils

- **Observation:** Layout, display, lightings, floor covering, color, view out, window (opening) size and position, etc.
- **Measurement:** lighting level, temperature, noise level and CO2 level, room height, window height, furniture and fixture size.
- **Interview:** sensory comfort, e.g. temperature, glare, noise, smell, size and usage, etc.

1900s

1920s

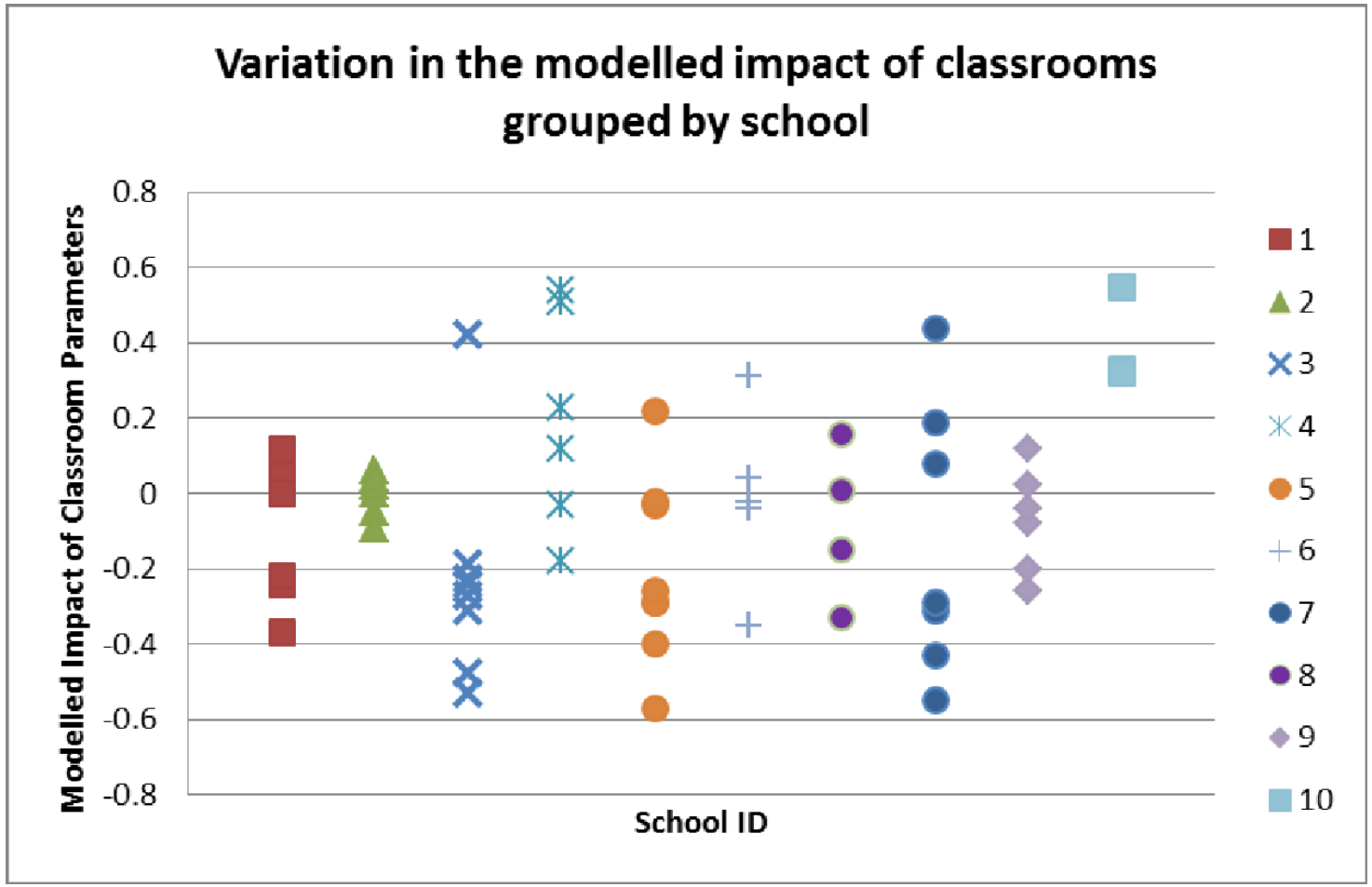
1950s

1970s

2000s

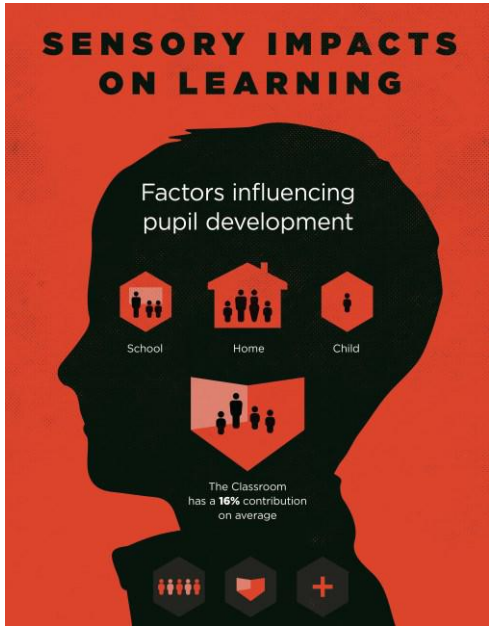
The Importance of Each Classroom

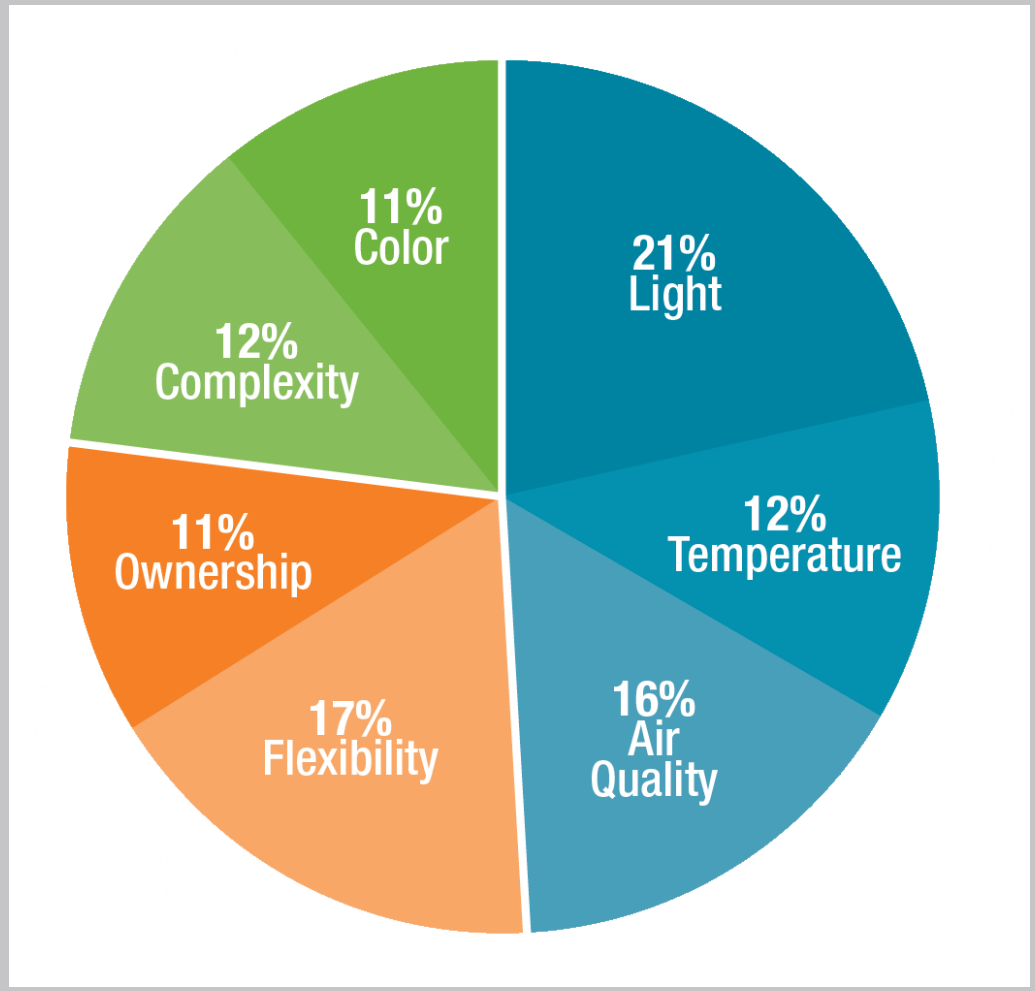
First and foremost the individual classrooms must each be well designed – argument for “inside-out design”



Classroom = Base Unit of Learning

- Classroom environment found to have a 16% impact on pupil performance
- 7 out of 10 parameters had a significant impact





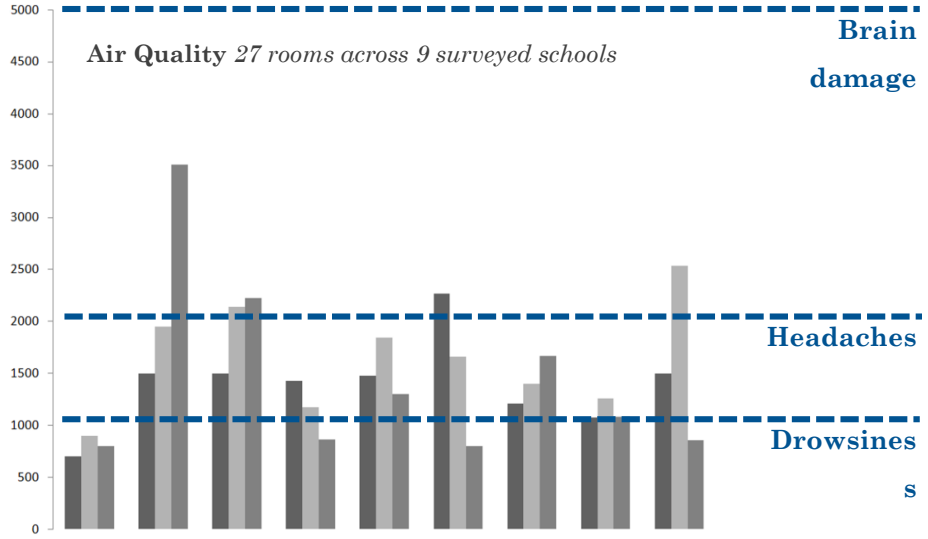
Applying the Results: Naturalness

Naturalness:

-Light

-Temperature

- Air Quality



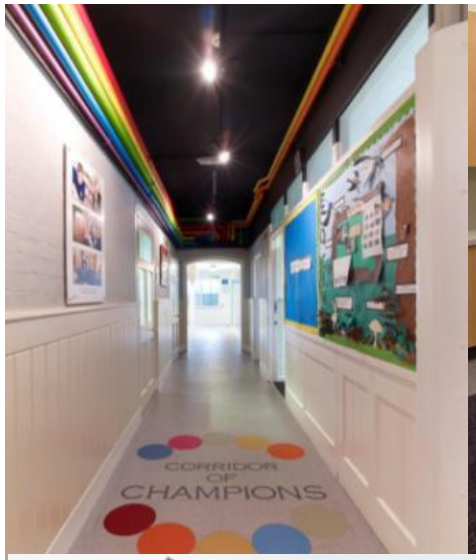
Applying the Results: Individualization

Naturalness:

-Ownership

-Flexibility

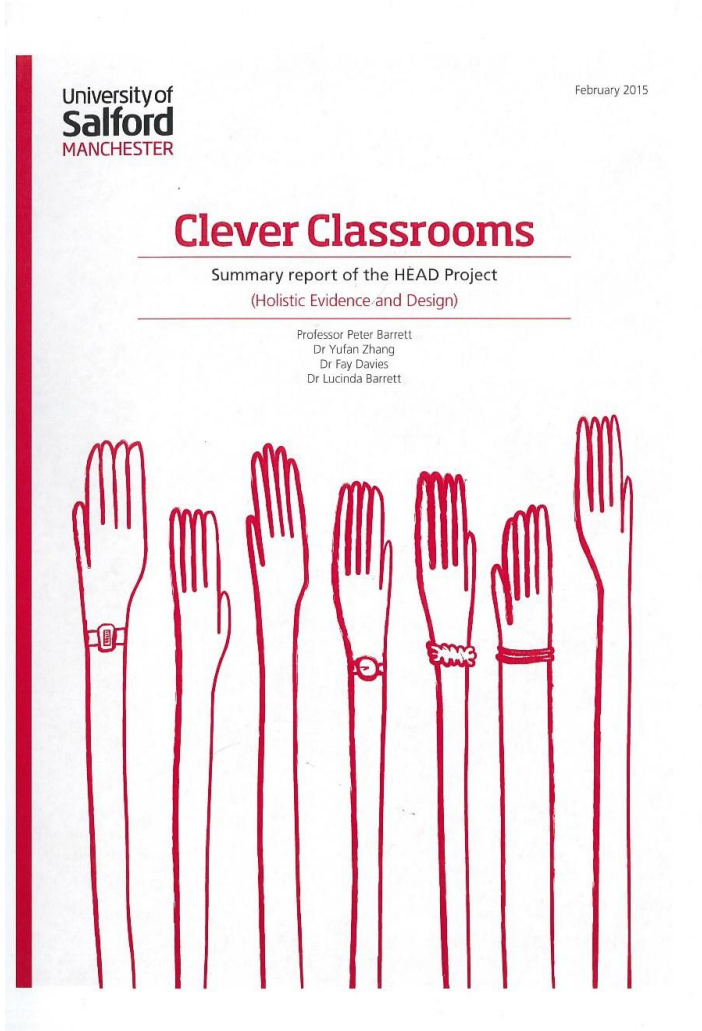
Applying the Results: Stimulation



Stimulation:
-Complexity
-Color

HEAD study showed *students in classrooms with confused or cluttered appearance performed worse.*

Clever Classrooms



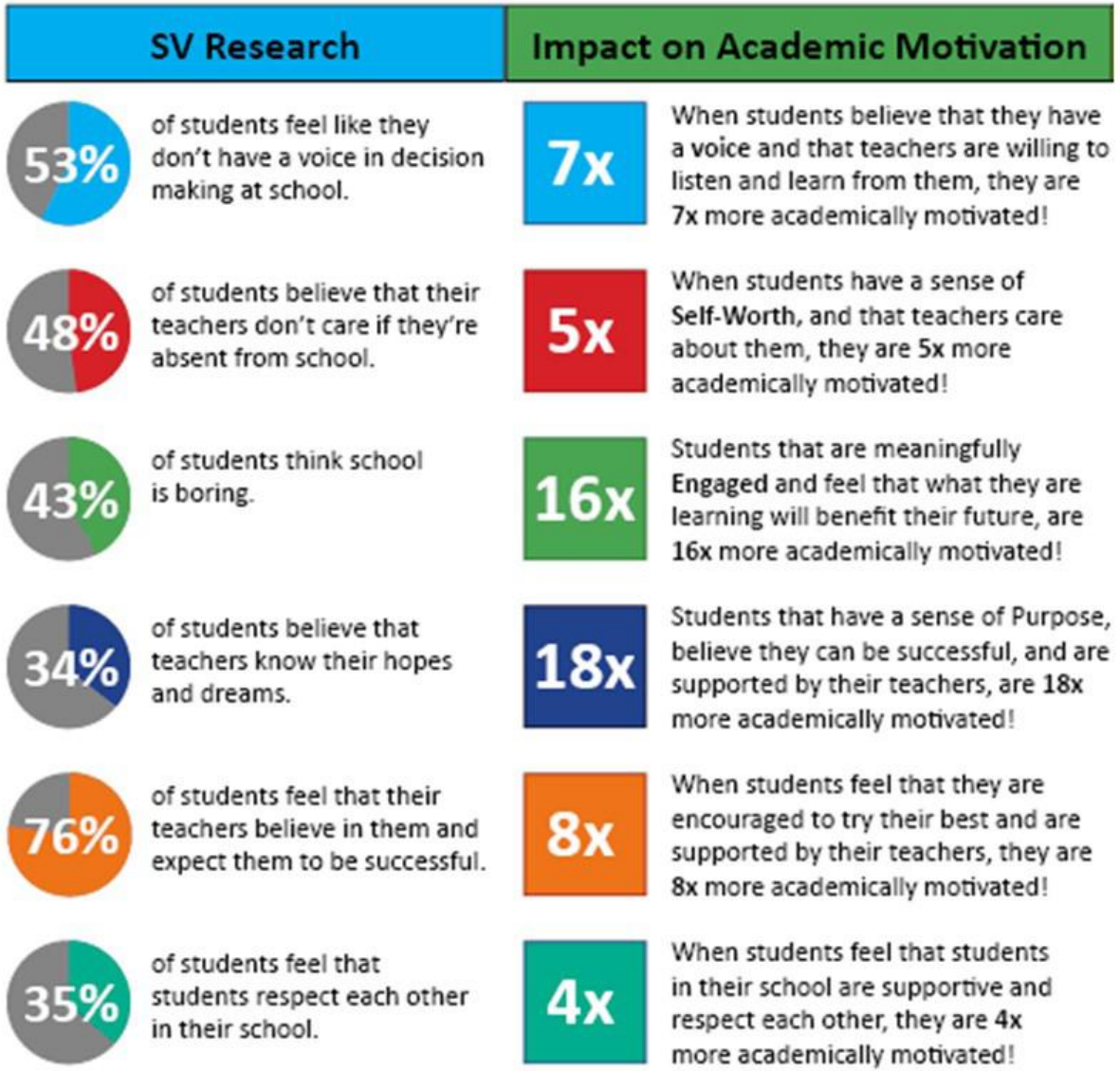
Student Voice

Dr. Russell Quaglia

Overview

My Voice National Student Report (Grades 6-12)

August 2014



Exposure Study of Green and Conventional Office Environments

Harvard T.H. Chan School of Public Health's Center for Health and the Global Environment, SUNY Upstate Medical University, and Syracuse University

Overview

People who work in **well-ventilated offices** with below-average levels of indoor pollutants and carbon dioxide (CO_2) **have significantly higher cognitive functioning scores**—in crucial areas such as responding to a crisis or developing strategy—than those who work in offices with typical levels.

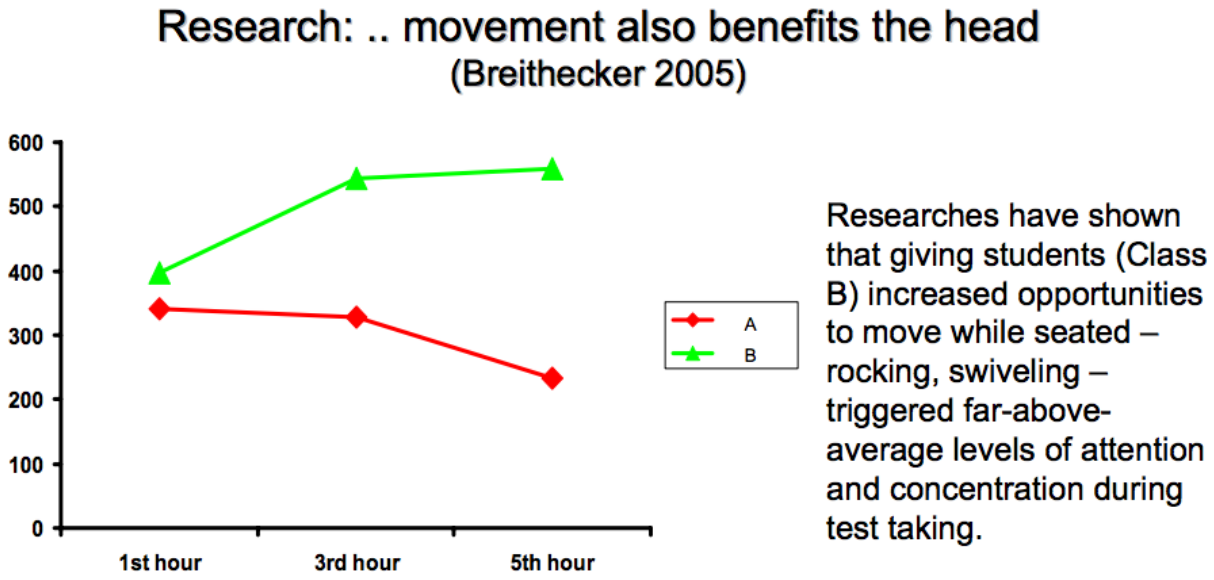
Bodies in Motion

Dr. Dieter Breithecker

Overview

"Simple biology supports the obvious link between movement and learning" (Jensen, 2005, p. 62). Oxygen is necessary for brain function, more blood flow equals more oxygen—physical activity increases blood flow (2005).

Other benefits include: more cortical mass, greater number of connections among neurons, and gene expression to improve learning and memory (Jensen, 2005). It has also been documented that stimulating the vestibular (inner ear) and cerebellar (motor activity) system through **movement activities (spinning, crawling, rolling, jumping, bending ect.) can result in "significant gains in attention and reading"** (Jensen, 2005, 62).



Implementation Tools

COLLABORATIVE FOR
HIGH PERFORMANCE
SCHOOLS

Better buildings. Better Students

High Performance > Green

Learning Environment Quality

+

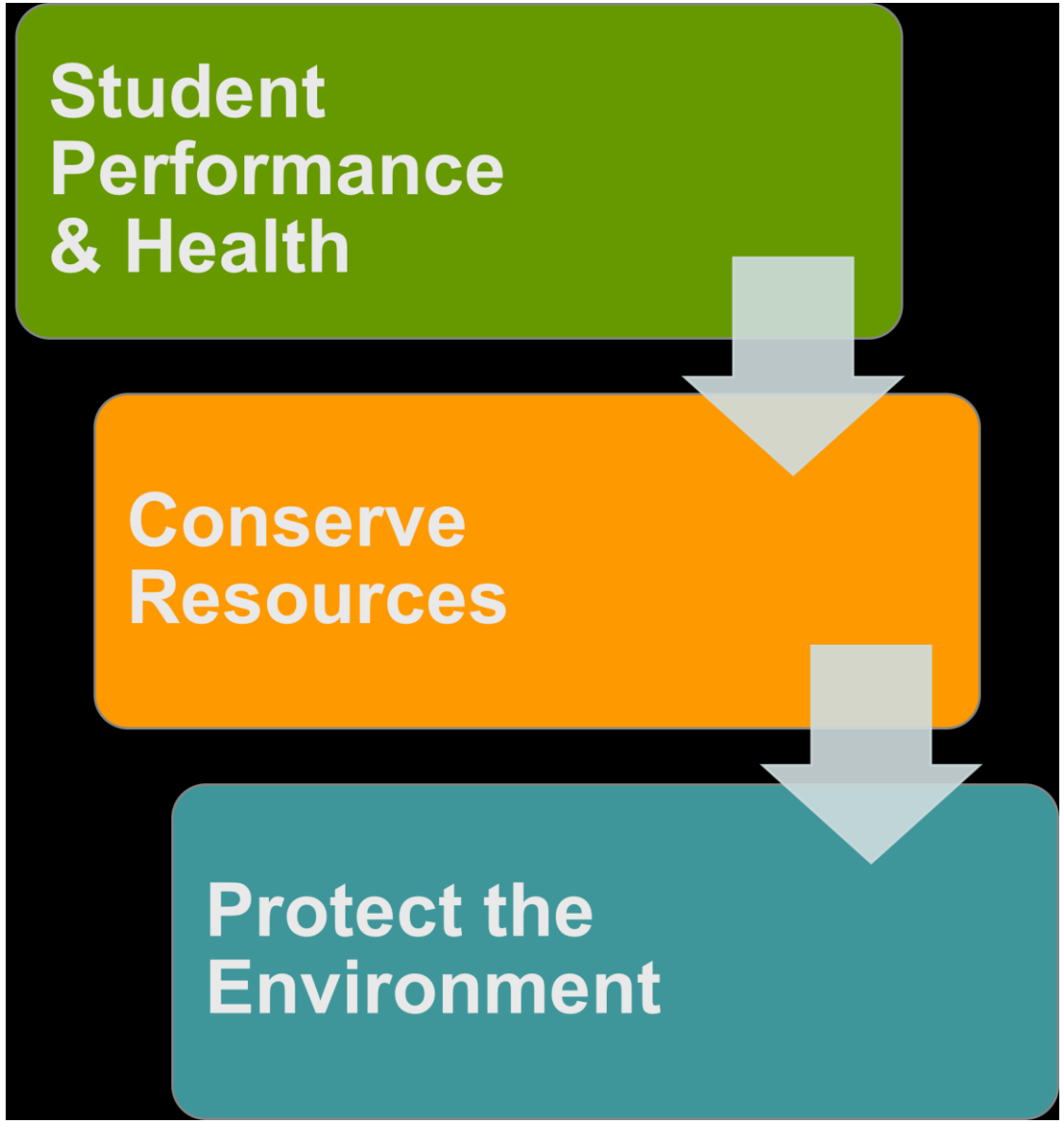
Sustainability

=

High Performance

CHPS Priorities

1. Protect student and staff health and enhance the learning environment to improve student performance
2. Conserve energy, water and other resources thereby reducing operating costs
3. Minimize waste, pollution and environmental degradation



CHPS Criteria

- 250 point rating system for school facilities
- Research based criteria tied to CHPS Priorities
- CA version aligned to CALGreen and CA Energy Code
- Tool to ensure schools exceed standards for sustainability and environmental quality

CHPS Categories

- Integration
- Indoor Environmental Quality
- Energy
- Water
- Site
- Materials and Waste Management
- Operations and Metrics

COLLABORATIVE FOR
HIGH PERFORMANCE
SCHOOLS

EQ 11.0, 11.1 Daylighting

EQ 11.0, 11.1 Daylighting

- Standards based on multiple research studies showing students learn better in daylit spaces
- Qualitative requirements for Glare Protection in classrooms
- Specific requirements for amount and distribution of daylight in classrooms and public spaces
- Multiple documentation options for demonstrating that design exceeds requirements

Recognition

- Two levels of recognition
- **CHPS Verified:** independent 3rd party verification of compliance with each criteria
- **CHPS Designed:** Self-certification with design professionals
- Multi-stage CHPS recognition through High Performance Transition Plan

Operations Report Card

- Tool for evaluating and documenting existing schools
- 6 Categories:
  - Indoor air quality
  - Energy efficiency
  - Visual quality
  - Acoustics
  - Thermal comfort
  - Water conservation
  - Waste reduction

orc OPERATIONS REPORT CARD

Learning Environment Assessment Tool

A means to evaluate existing learning environments to maximize pupil performance.

- Based on the HEAD Study findings and IBI's extensive experience
- IBI Team assess the learning space based on the key factors
- Support design decisions throughout a project
- Assist teachers in understanding how to make the most of the space at their disposal

Case Studies

Applying the research to existing schools

Neil Cummins Elementary School

Corte Madera, CA

Overview

- Renovation of traditional 1960s elementary school to create more dynamic learning spaces
- Limited project budget with needs for infrastructure renovations and summer construction schedule
- Created Learning Suites to support collaborative teaching and learning
- Completed in 2015

Learning Suites Cut-Out Model

Learning Suites

Before and After

North Richland Middle School

North Richland Hills, TX

Overview

- New school to replace very outdated 1940s building
- Existing building was an energy hog even with geothermal system
- Classrooms were small and many did not have natural light
- Renovation costs exceeded the cost of a new school
- New school to be designed with STEM focus

Existing Building

New Exterior

New Main Entry

New Hallways

New Learning Commons

William R. Blocker Junior High School

Texas City, TX

Overview

- The site was the site of two landmark school buildings in the heart of the district that needed to be re-designed.
- Phased in 3 phases, this project was designed alongside the community, to TX-CHPS standards.
- Created learning spaces to support collaborative teaching and learning
- Completed in 2014

Overview

PHASE 1

New Central Plant

PHASE 2

Early Childhood Center + Head Start Program and Community Teen Health Clinic Addition

PHASE 3

Exterior and Interior Renovations to Existing Facilities

Existing Building

New Exterior

New Main Entry

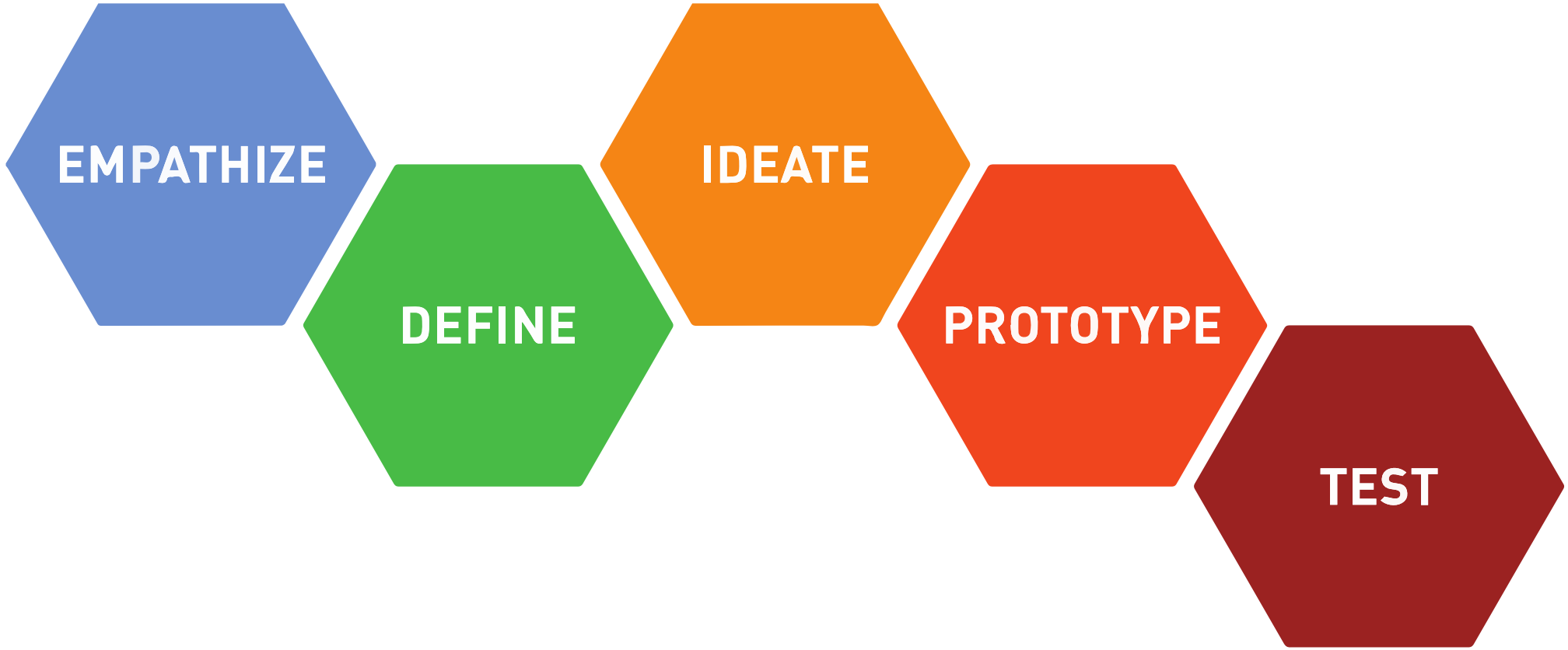
New Hallways

New Learning Spaces

Design Thinking Exercise

Design Thinking Method

Stanford d.school



Prototyping Exercise

Take a look at the room you're in…

A Prototype is a way to convey an idea quickly

A prototype is a ***disposable tool***, used not only to validate ideas, but to generate them. By making something ***tangible***, it allows you to test, share, question and build upon your ideas.

Task

Develop a Prototype of one or more ideas.
A Prototype can be a:

- Model
- Video
- Drawing
- Skit
- Any method to get the idea out of your head

Task

Solicit feedback about your Prototypes from your neighbors. Ask:

- “I like…”
- “I wish…”
- What if…?”

Questions?

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Thank you!

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