



# 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](https://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

# H.E.A.D. Project

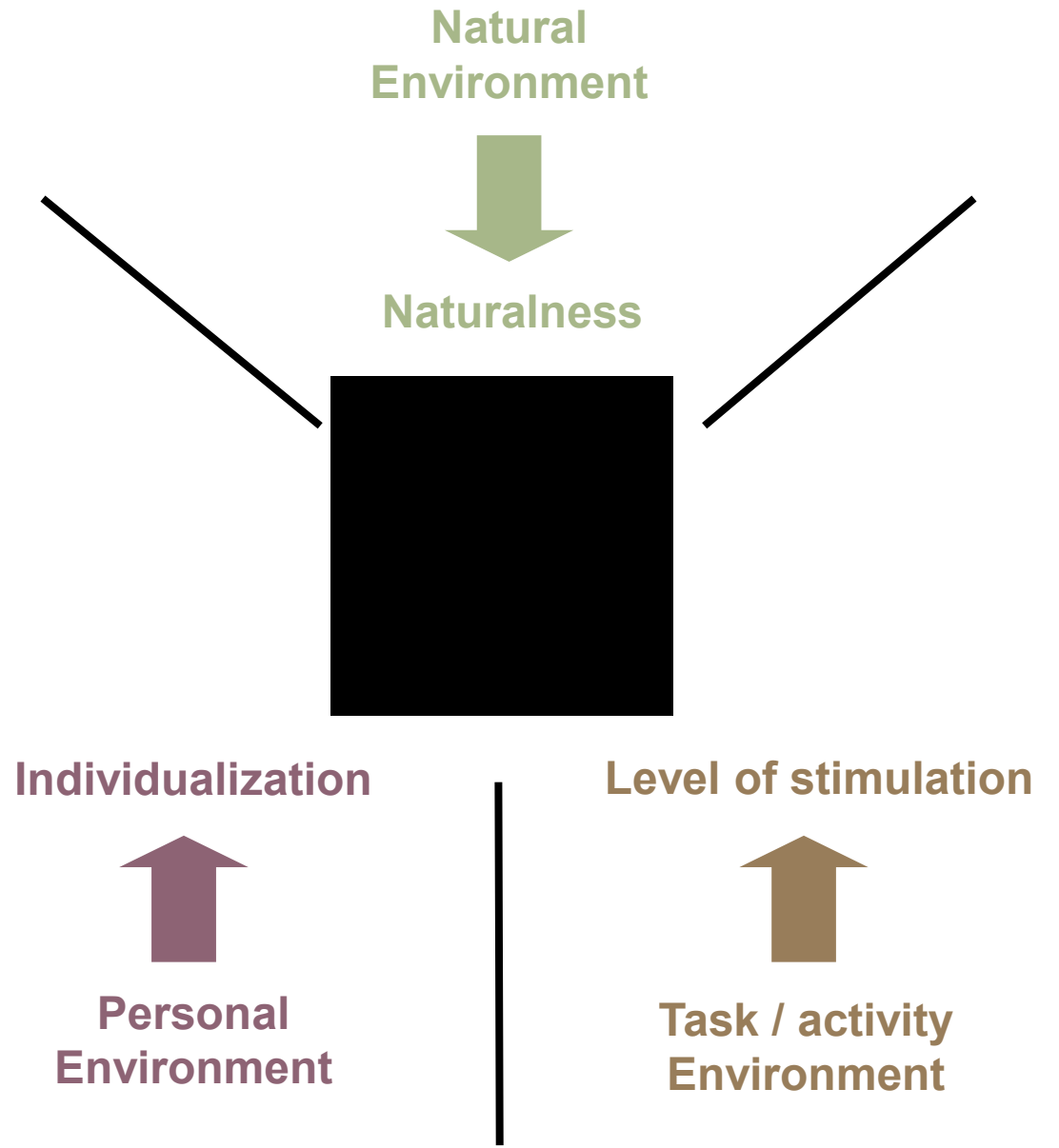
## *Holistic Evidence and Design*

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”**



# 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

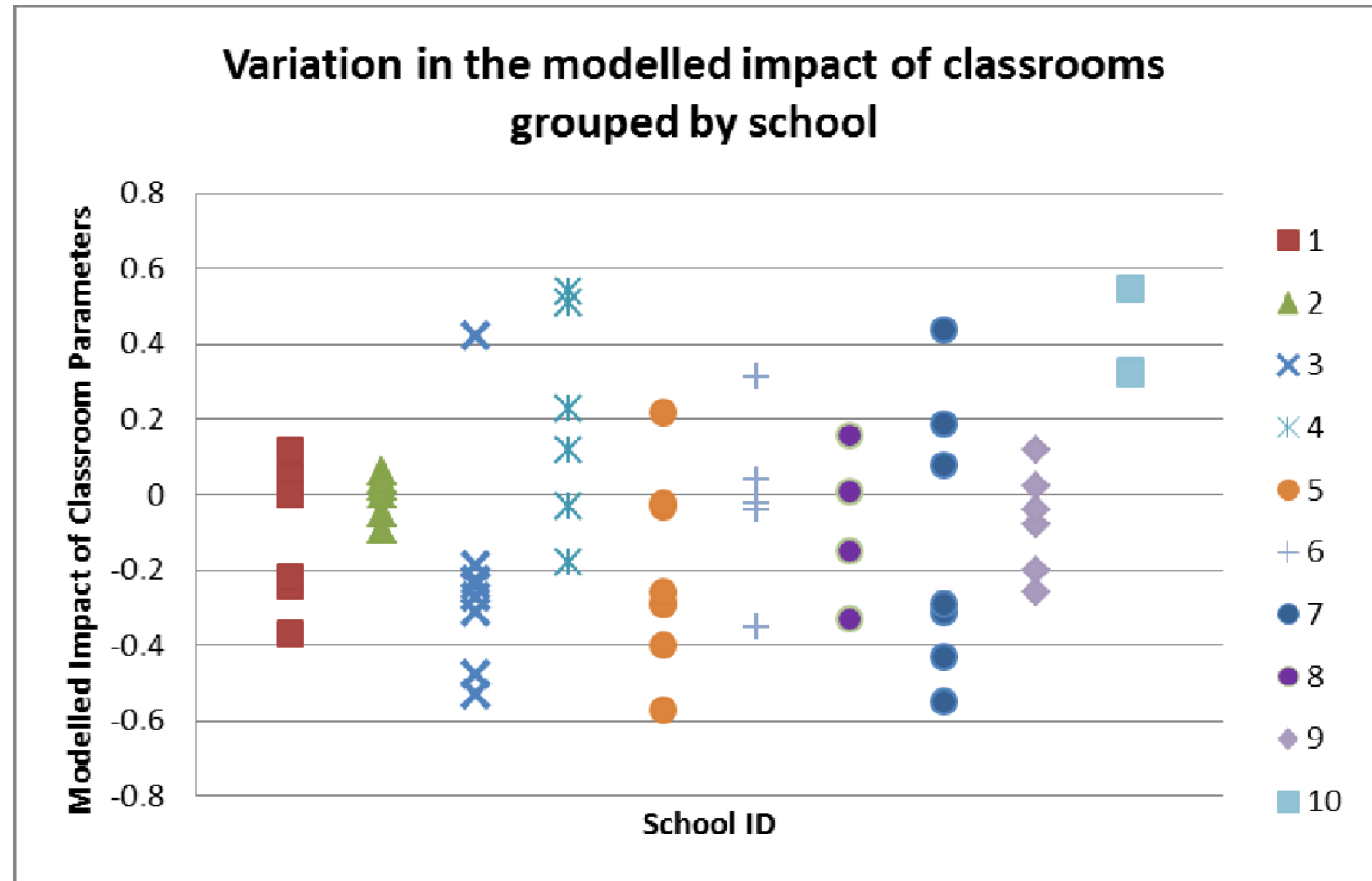


2000s



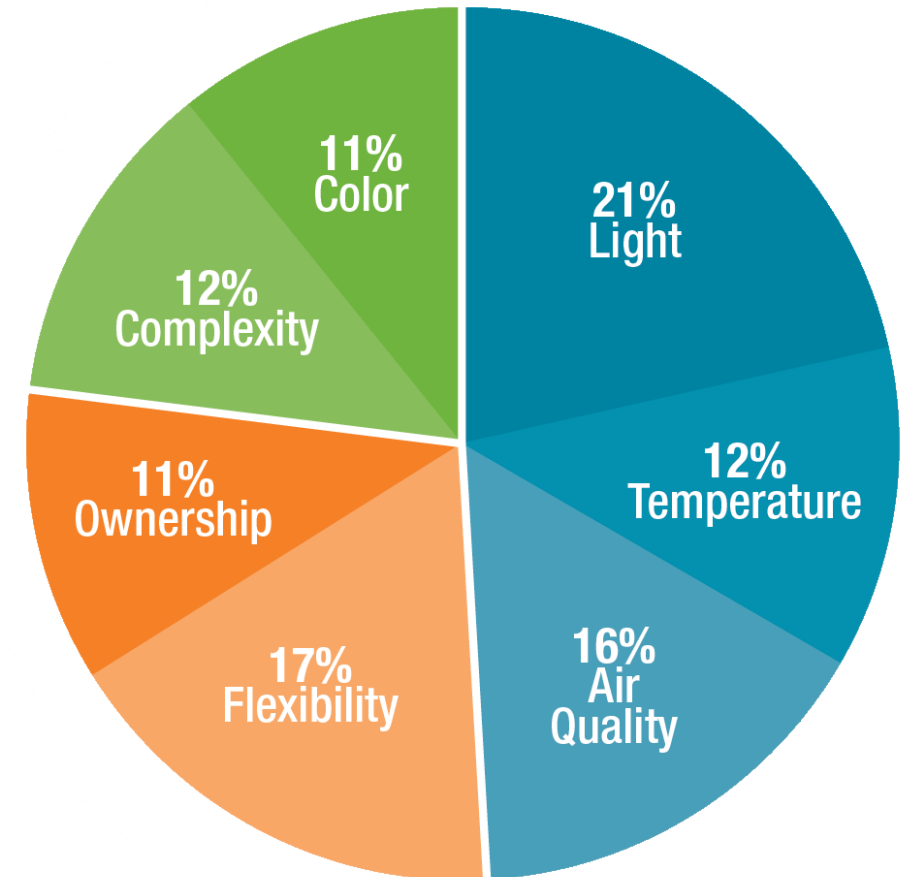
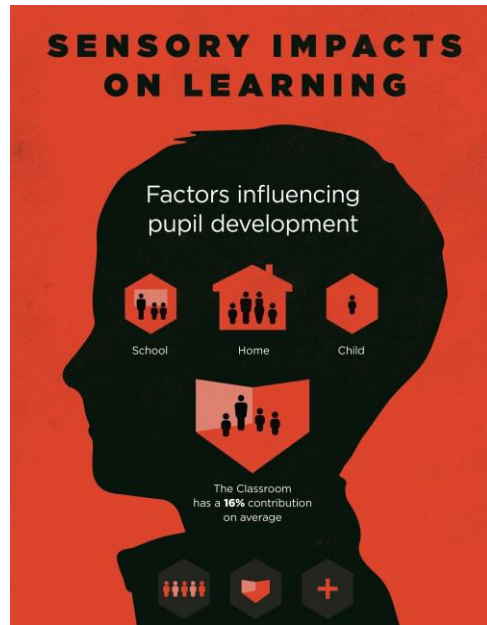
# The Importance of Each Classroom

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



# Classroom = Base Unit of Learning

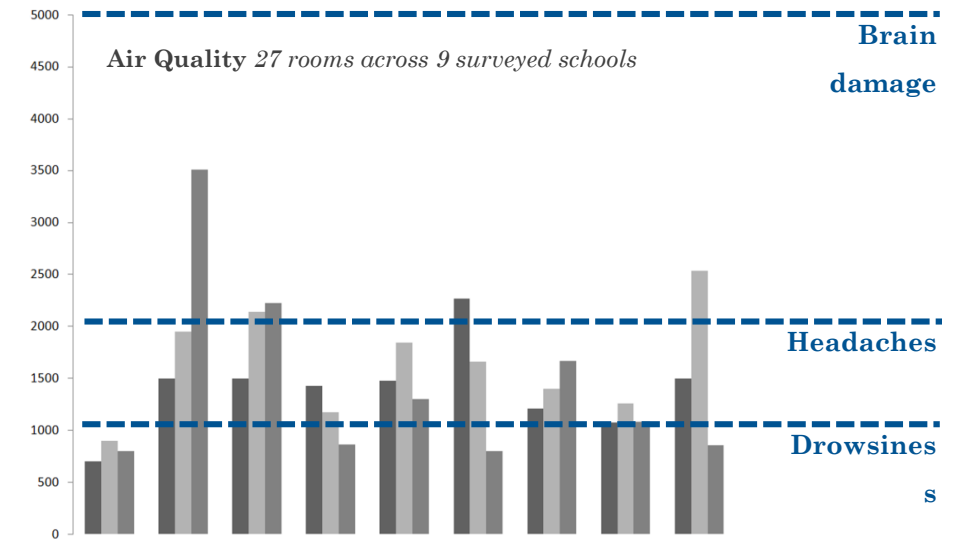
- Classroom environment found to have a 16% impact on pupil performance
- 7 out of 10 parameters had a significant impact



# Applying the Results: Naturalness



Naturalness:  
-Light  
-Temperature  
- Air Quality



# Applying the Results: Individualization



Naturalness:  
**-Ownership**  
**-Flexibility**



# Applying the Results: Stimulation

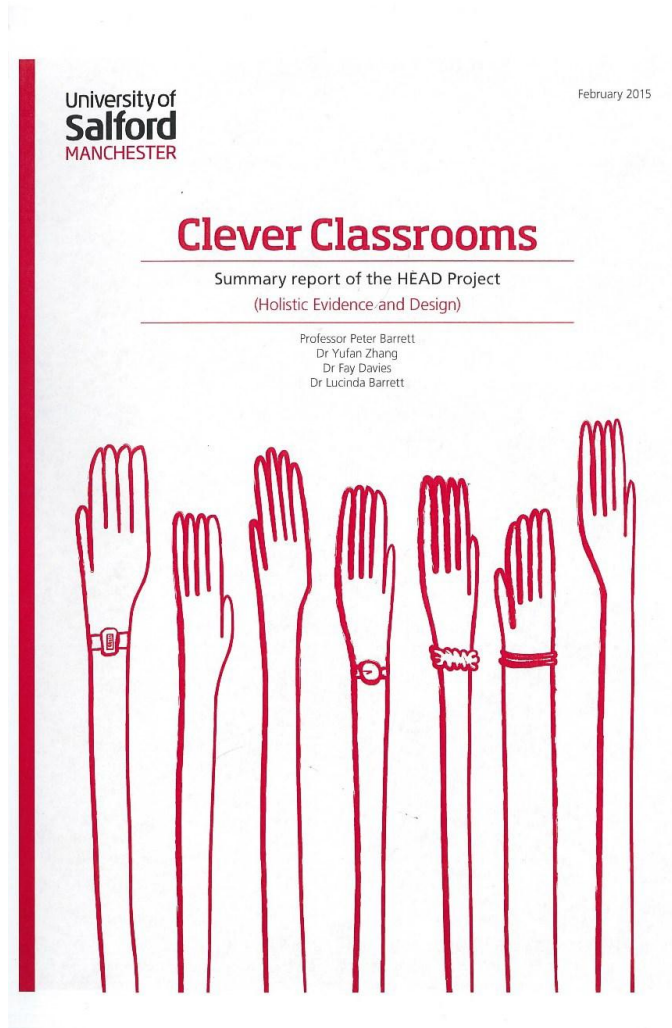


Stimulation:

- 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

SV Research	Impact on Academic Motivation
 <p>53% of students feel like they don't have a voice in decision making at school.</p>	 <p>7x When students believe that they have a voice and that teachers are willing to listen and learn from them, they are 7x more academically motivated!</p>
 <p>48% of students believe that their teachers don't care if they're absent from school.</p>	 <p>5x When students have a sense of Self-Worth, and that teachers care about them, they are 5x more academically motivated!</p>
 <p>43% of students think school is boring.</p>	 <p>16x Students that are meaningfully Engaged and feel that what they are learning will benefit their future, are 16x more academically motivated!</p>
 <p>34% of students believe that teachers know their hopes and dreams.</p>	 <p>18x Students that have a sense of Purpose, believe they can be successful, and are supported by their teachers, are 18x more academically motivated!</p>
 <p>76% of students feel that their teachers believe in them and expect them to be successful.</p>	 <p>8x When students feel that they are encouraged to try their best and are supported by their teachers, they are 8x more academically motivated!</p>
 <p>35% of students feel that students respect each other in their school.</p>	 <p>4x When students feel that students in their school are supportive and respect each other, they are 4x more academically motivated!</p>



# 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<sub>2</sub>) **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

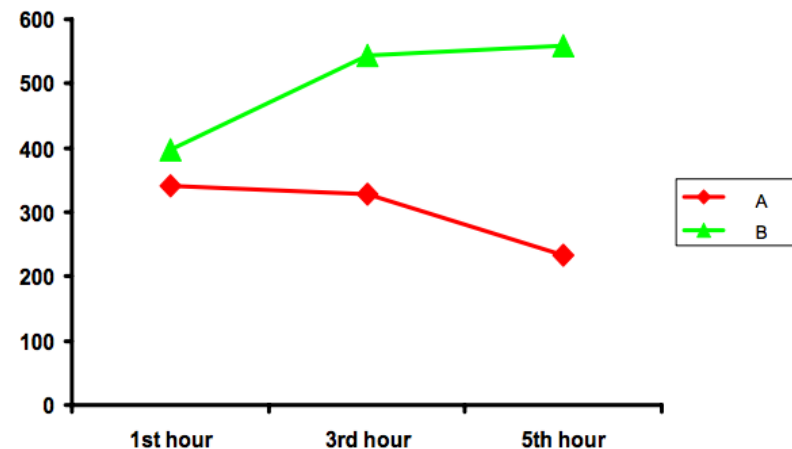
Dr. Dieter Breithecker

# 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).

Research: .. movement also benefits the head  
(Breithecker 2005)



Researches have shown that giving students (Class B) increased opportunities to move while seated – rocking, swiveling – triggered far-above-average levels of attention and concentration during test taking.

# 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

**Student  
Performance  
& Health**



```
graph TD; A[Student Performance & Health] --> B[Conserve Resources]; B --> C[Protect the Environment];
```

**Conserve  
Resources**

**Protect the  
Environment**



# 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 3<sup>rd</sup> 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

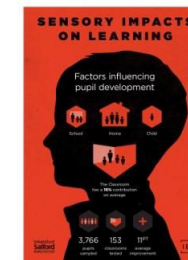
- Tool for evaluating and documenting existing schools
- 6 Categories:
  - Indoor air quality
  - Energy efficiency
  - Visual quality
  - Acoustics
  - Thermal comfort
  - Water conservation
  - Waste reduction



# 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



**A means to evaluate existing learning environments to maximise pupil performance.**

The HEAD study (Holistic Evidence and Design) was undertaken in collaboration with Salford University to determine if there was a direct link between the classroom environment and the performance and learning rates of children in primary schools. 153 classrooms across seven schools were studied using a range of environment aspects and compared against the performance results of 3,766 children.

**The findings showed that the classroom environment has a 16% impact on the performance of the child. The results indicated a difference in progress equivalent to one years development between the worst and best studied classrooms.**

These findings are important not only to Architects, but also Teaching staff, School Bursars, School Governors – in fact anyone involved in the day to day running of schools.

The HEAD Study indicates seven key issues for consideration:

- **Light:** Natural and Artificial
- **Flexibility:** Teacher Empowerment
- **Ownership:** Pupil Empowerment
- **Temperature**
- **Colour:** Considered use of colour
- **Complexity:** Focusing the pupils' attention
- **Air Quality**

The study has shown that the correct application of these issues may contribute up to 16% towards the child's development. This gives us as designers a powerful tool for helping schools assess their existing and new classroom developments.

University of  
**Salford**  
MANCHESTER

# 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

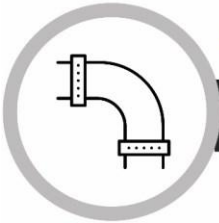
# Overview

- 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



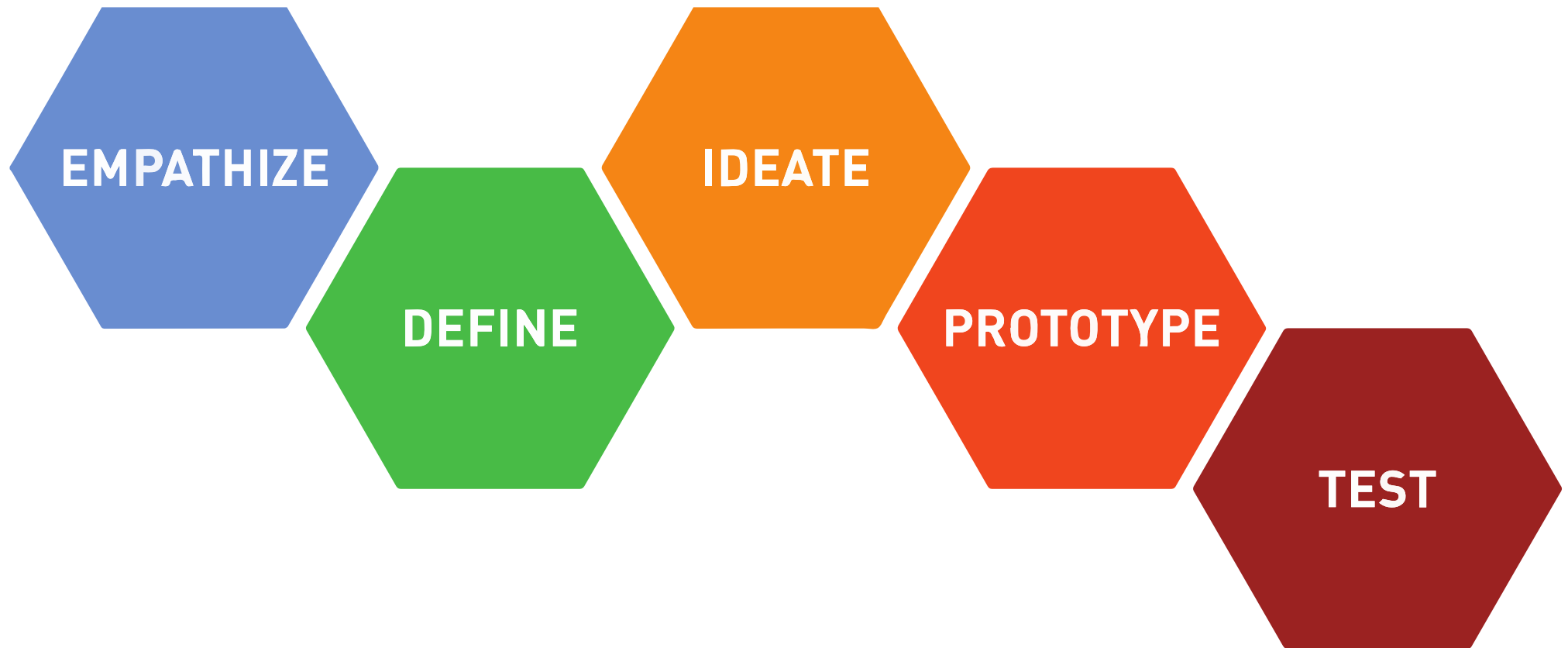


New Learning Spaces

# 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?



# Thank you!

*Presentation Resources:*

[bit.ly/FacilityDesign](https://bit.ly/FacilityDesign)