



# **Uncharted Territory: Daylight Performance and Occupant Behaviour In A Live Classroom Environment**

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- Present context
- Why ‘uncharted territory’
- Research project aim & objectives
- Methodology
- First observations
- Challenges
- Expected output

In 2013 the UK government  
(Priority Schools Building Programme under the Education Funding Agency)  
published mandatory daylight requirements for schools  
specified by Climate-Based Daylight Modelling CBDM metrics.

**A first**  
for CBDM metrics in daylight policy recommendations.

Question:

Does the existing knowledge on daylighting performance and user acceptability of daylight conditions allow the appraisal of daylighting recommendations whether specified by the DF or CBDM metrics?

Answer:

Parpairi, 2002; Wu, 2005; Axarli, 2008; Konis, 2013; Mardaljevic, 2015  
& others

## WHY 'UNCHARTED TERRITORY'

- Existing light measurement instrumentation  
(points measured & monitoring duration)
- Building System Management installations not monitoring light levels
- Modern teaching methods dependence on Visual Display Technologies  
(smart-boards, projectors, computers, tablets)
- Causing interference on ongoing classes



Studies have recorded physical characteristics of light in classrooms:

- in a sporadic manner
- short periods of time
- when main users (students) are not in class

# RESEARCH PROJECT

- What are the visual needs of modern classrooms?
- Are there identifiable behaviour patterns?
- What is the impact of specifying compliance with CBDM metrics?

## AIM

Explore the extent to which UK government daylight directives result in classrooms that satisfy the lighting needs of the users

## OBJECTIVES

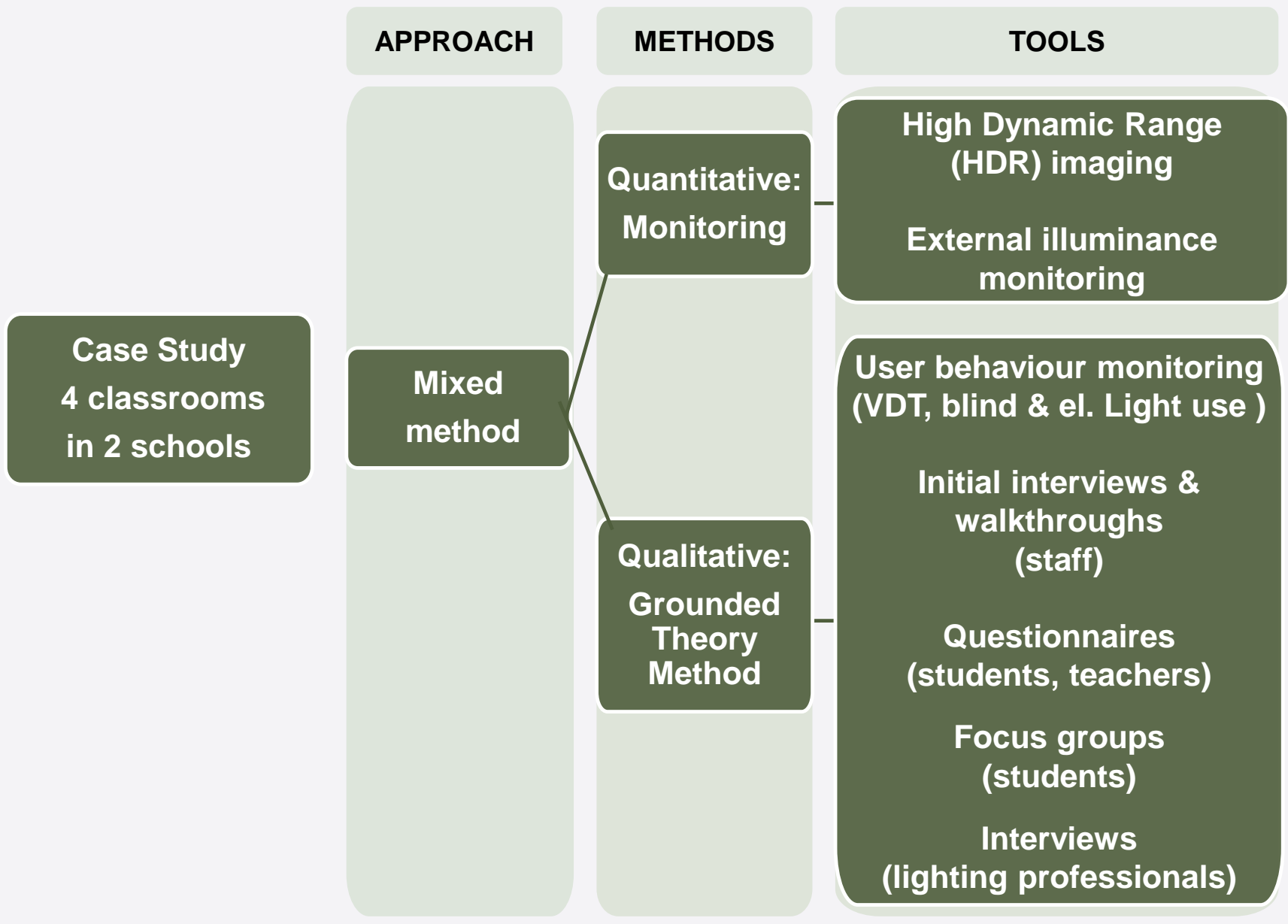
**Quantify**  
experienced  
daylight in  
'live' learning  
environments

**Identify**  
behaviour patterns  
corresponding to  
daylight design  
elements of the  
case studies

**Assess**  
impact of using  
traditional daylight  
metrics to specify  
compliance

**Investigate**  
effects of  
using CBDM  
metrics to  
specify  
compliance

# RESEARCH DESIGN

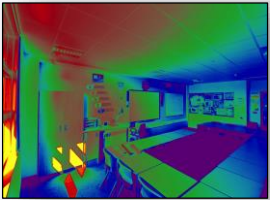
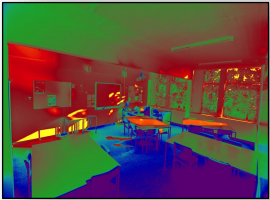
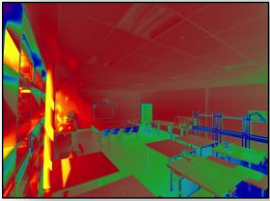


## High Dynamic Range (HDR) Imaging



**Measure** physical  
parameters

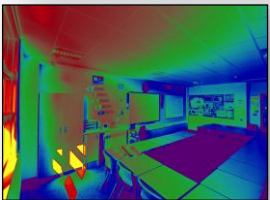
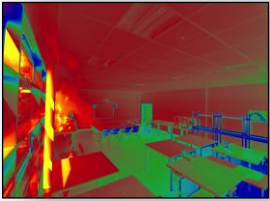
High Dynamic Range  
(HDR) Imaging





**Measure** physical  
parameters

High Dynamic Range  
(HDR) Imaging

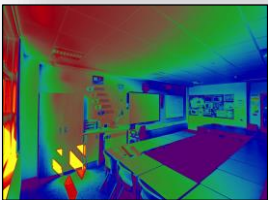
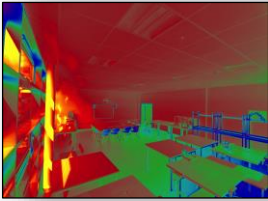


**Observe** use of:

- Blinds
- Electric lights
- Visual Display Technologies (VDT)

**Measure** physical parameters

High Dynamic Range (HDR) Imaging



**Observe** use of:

- Blinds
- Electric lights
- Visual Display Technologies (VDT)



Apply **Grounded Theory Method**:

Interviews & walkthroughs



Teacher survey



Student questionnaire




Focus groups



Industry interviews

## CHALLENGES


- Extensive ethics requirements
- Data management and volume of HDR images (1 HDR image ~ 50MB)
- Software & equipment interoperability
- Security of high-cost equipment against theft & vandalism
- Avoidance of acoustic interference during teaching
- Creation and maintenance of good communication links with all school stakeholders
- Skill set and methodological diversity of mixed method research



**UNIVERSITY**  
**of Loughborough**

**SURVEY**

**THANK YOU for participating in the Classroom Disgusting Study!**



Please fill out the following information

My name is: \_\_\_\_\_

I have taught in Melton Vale Primary 16 Centre building (MV16) for a total of \_\_\_\_\_ years and \_\_\_\_\_ months

MV16 classroom I currently teach		Subject I teach	I've taught in this room for approximately	I use the data projector in the classroom
Example 1	515	History	2 years/months / weeks / days	yes/no / monthly / weekly / daily
2			weeks/months / weeks / days	yes/no / monthly / weekly / daily
3			weeks/months / weeks / days	yes/no / monthly / weekly / daily
4			weeks/months / weeks / days	yes/no / monthly / weekly / daily
5			weeks/months / weeks / days	yes/no / monthly / weekly / daily

MV16 classroom I've previously taught in		Subject I taught	I taught the subject in this room for approximately
1		Psychology	weeks/months / weeks / days
2			weeks/months / weeks / days
3			weeks/months / weeks / days
4			weeks/months / weeks / days
5			weeks/months / weeks / days
6			weeks/months / weeks / days

**Q1a. The following words describe conditions in an indoor space. For each word enter the classroom(s) that contains it most amongst those you have identified above?**

**(classrooms can be entered more than once)**

Ex. gloomy	FR. 1101
gloomy,	
dark	
dull	
suffocating	
hazy	
stale	
satisfactory	
hot	
bright	
sunny	
pleasant	

Add other descriptors \_\_\_\_\_

**Q1b. For each row, choose only one classroom from your Q1a answers.**

gloomy	Q11b	FR. 1101
gloomy		
dark		
dull		
suffocating		
hazy		
stale		
satisfactory		
hot		
bright		
sunny		
pleasant		

Other descriptors \_\_\_\_\_



# FIRST OBSERVATIONS

NE windows



SE windows





# FIRST OBSERVATIONS

NE windows



SE windows



# FIRST OBSERVATIONS

NE windows



SE windows



# FIRST OBSERVATIONS

NE windows



SE windows



‘Sometimes in the morning, even sunlight that comes through the small holes of the shut blinds is annoying because you get a string of very bright dots right on the whiteboard’  
Teacher #2.L7.1a

Evidence of:

- the visual demands of modern secondary classrooms
- the actions users take to meet their visual needs
- the users' perception of the luminous environment
- the implications of assessing daylight in classrooms with CBDM metrics

Explore the predicted vs actual daylighting performance gap for the four case studies in collaboration with the parallel project of Eleonora Brembilla on CBDM applicability (Brembilla, 2015a,b).

Contribute to a better understanding of the users' needs and perceptions of daylight in order to produce insights and evidence that may improve the design and evaluation of the luminous environment in modern classrooms.



