

# Optimizing Daylighting- **A New Approach:** Daylighting and Smart Lighting Controls in the Classroom

April 1, 2019

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THE WEIDT GROUP®



# Agenda

1. Why Daylighting Matters
2. Synergies and Tradeoffs
3. Experiences from the Classroom
4. Closing / Questions

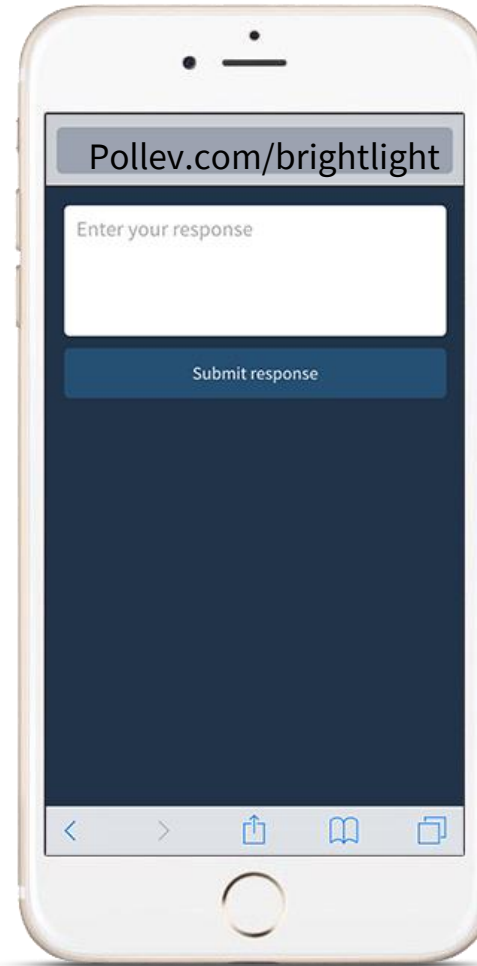


# Smartphone Polling

Text Brightlight to 22333 to enable polling



Text voting



Web voting

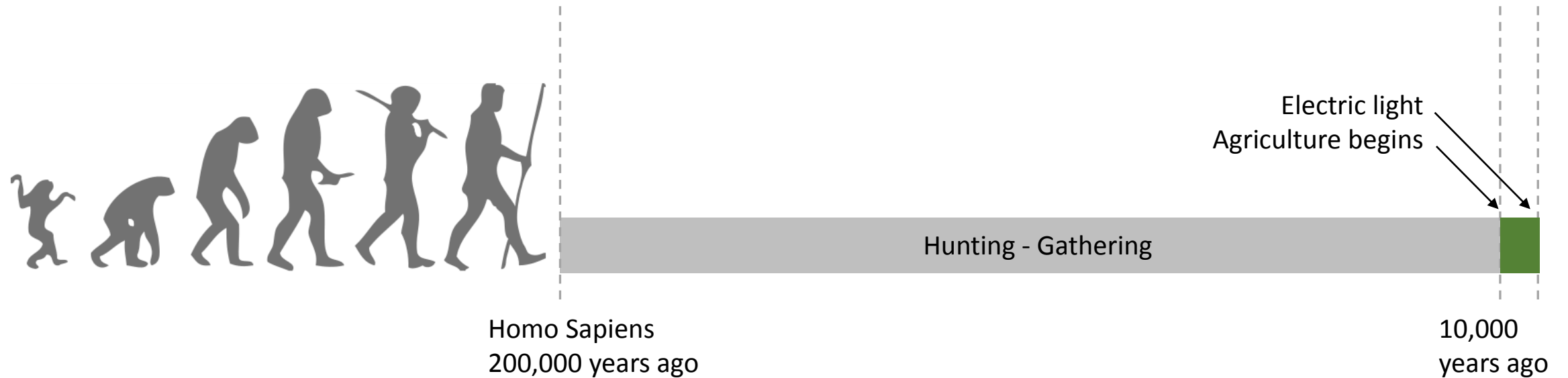
# Why Daylighting Matters



# Advancements in Classroom Design



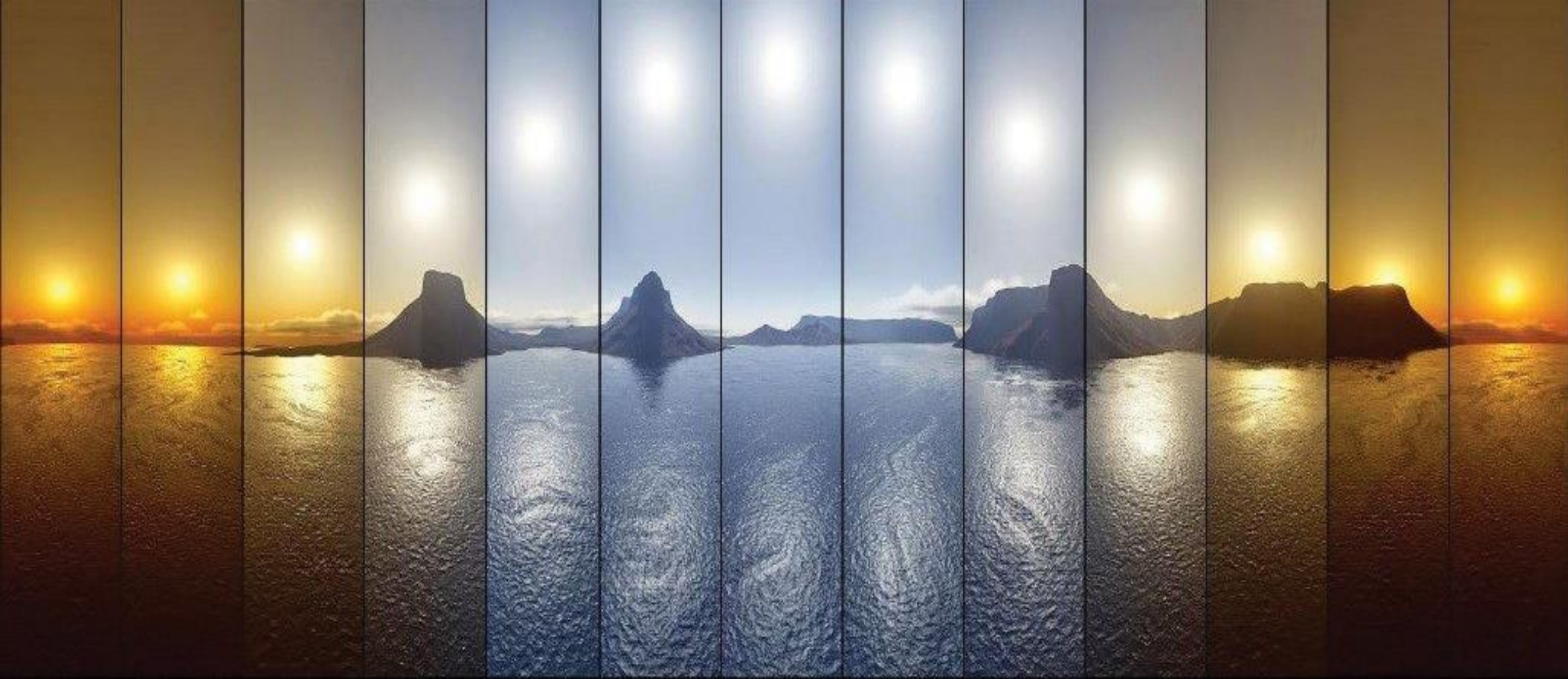
# We have evolved under natural light





# Circadian Rhythm

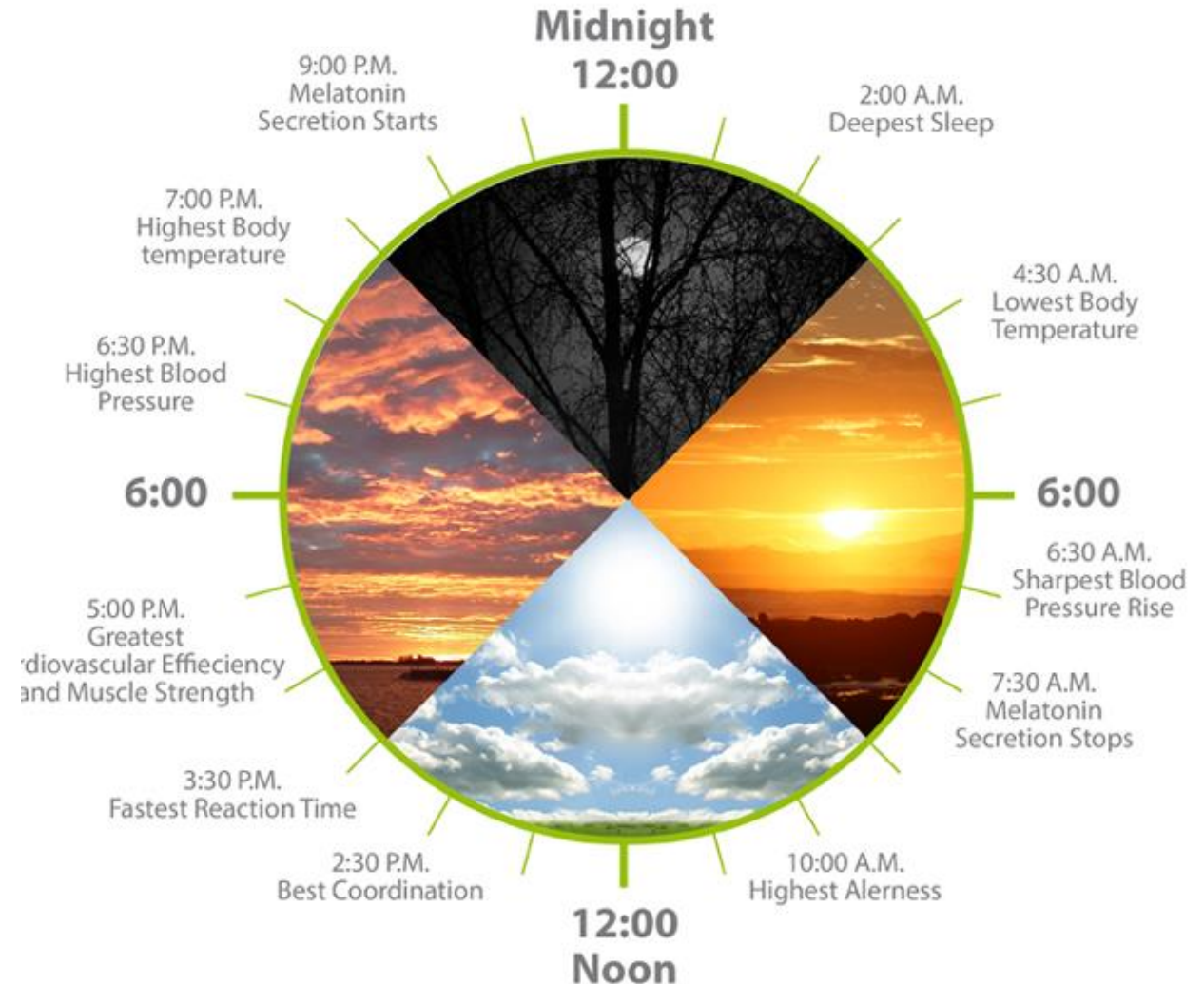
As the day progresses daylight changes in color angle and intensity



# Circadian Rhythm

The benefits of human-centric circadian lighting design

- Increased alertness in the morning
- Productivity and concentration improvements
- Improved mood
- Reduced hyperactivity
- Reduction in errors and accidents
- Faster cognitive processing
- Improved sleep





# Why Daylighting Matters

## Well-Being

- Promotes a vitamin D generation and circadian regulation
- Decreases depression and stress, improves sleep, and can help treat Seasonal Affective Disorder
- Lower absenteeism

## Productivity

- Enhances mental performance
- Students with the most daylight progressed 20% faster on math tests and 26% on reading tests- Department of Education

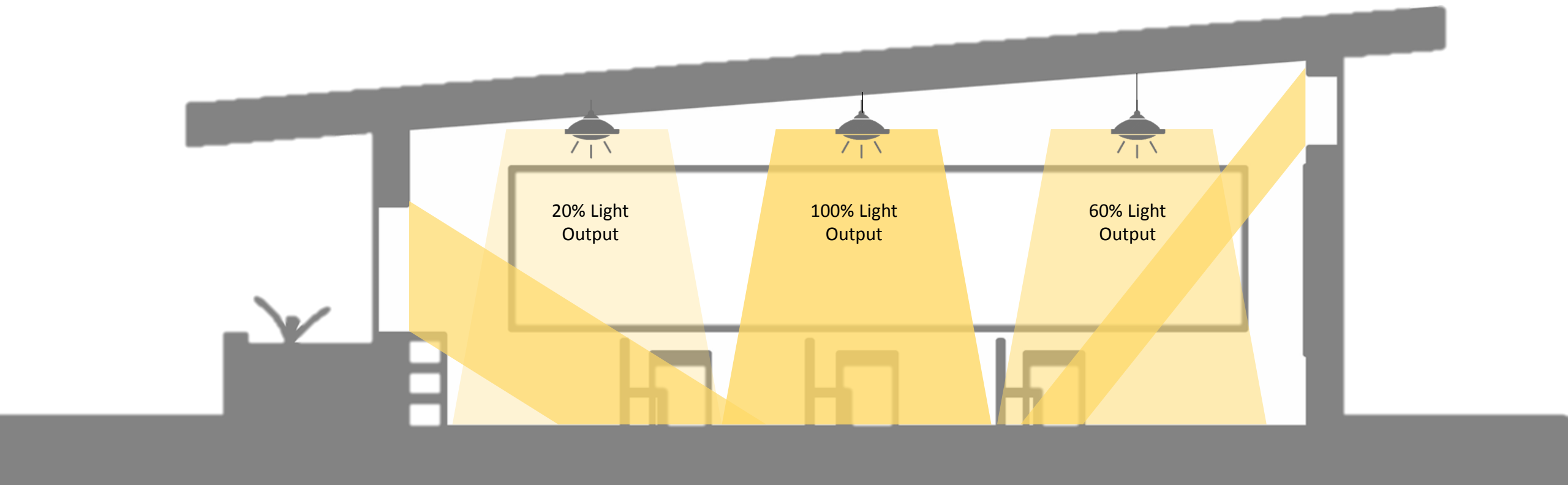
## Energy Efficiency

- 26% of electricity consumed by a typical school is just for lighting alone



# What Daylighting Harvesting is

Daylight Harvesting means using daylight as the primary light source for illuminating human activities to reduce energy consumption













# Daylighting Characteristics

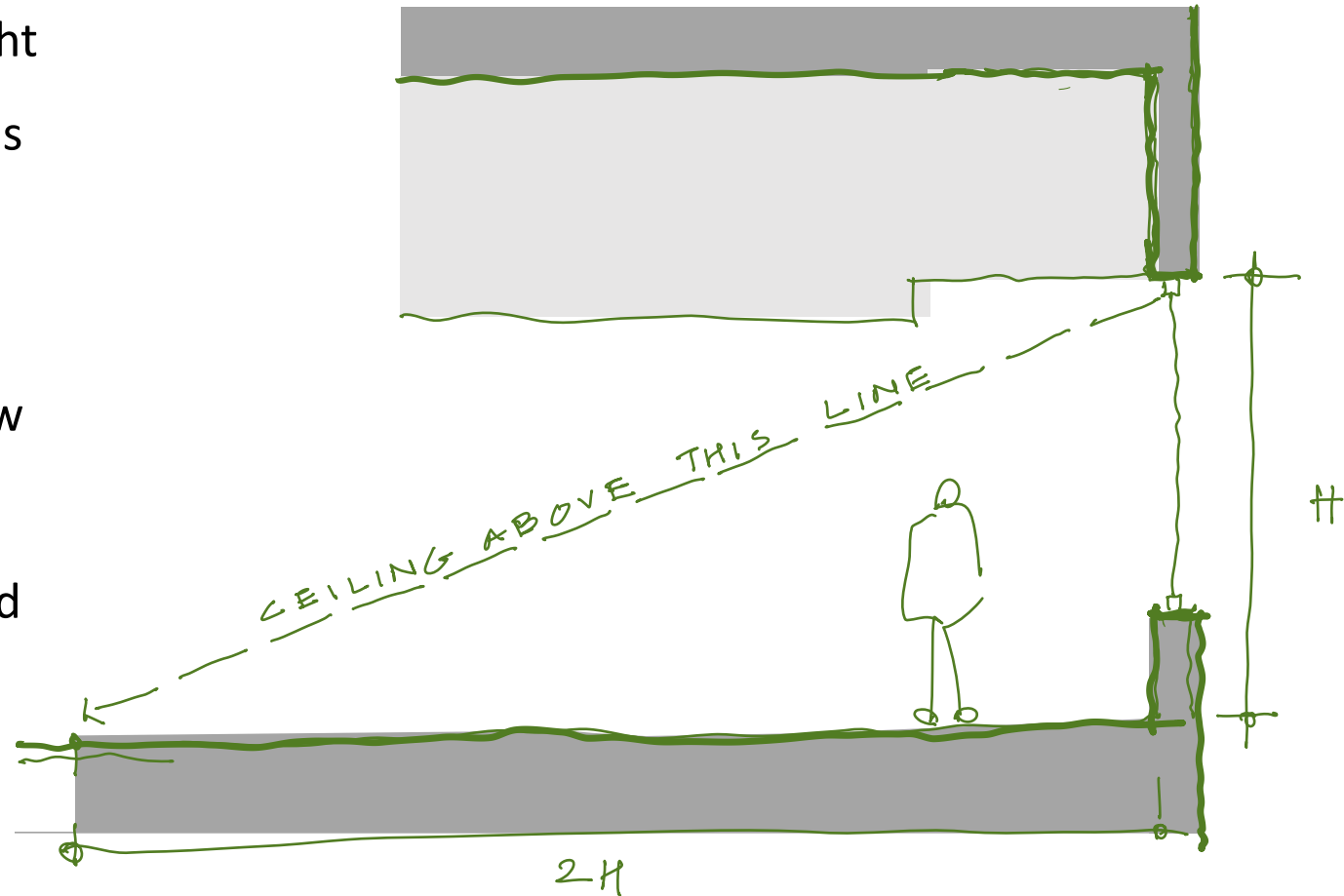
Successful daylighting is the product of many decisions from many stakeholders

- Location/ Climate/ Orientation
- Window area and location
- Shading and glare control devices
- Glazing system
- Interior finish selections
- Use of space and types of tasks performed
- Depth of space
- Occupant controls
- Integration with electric lighting controls
- Furniture layout

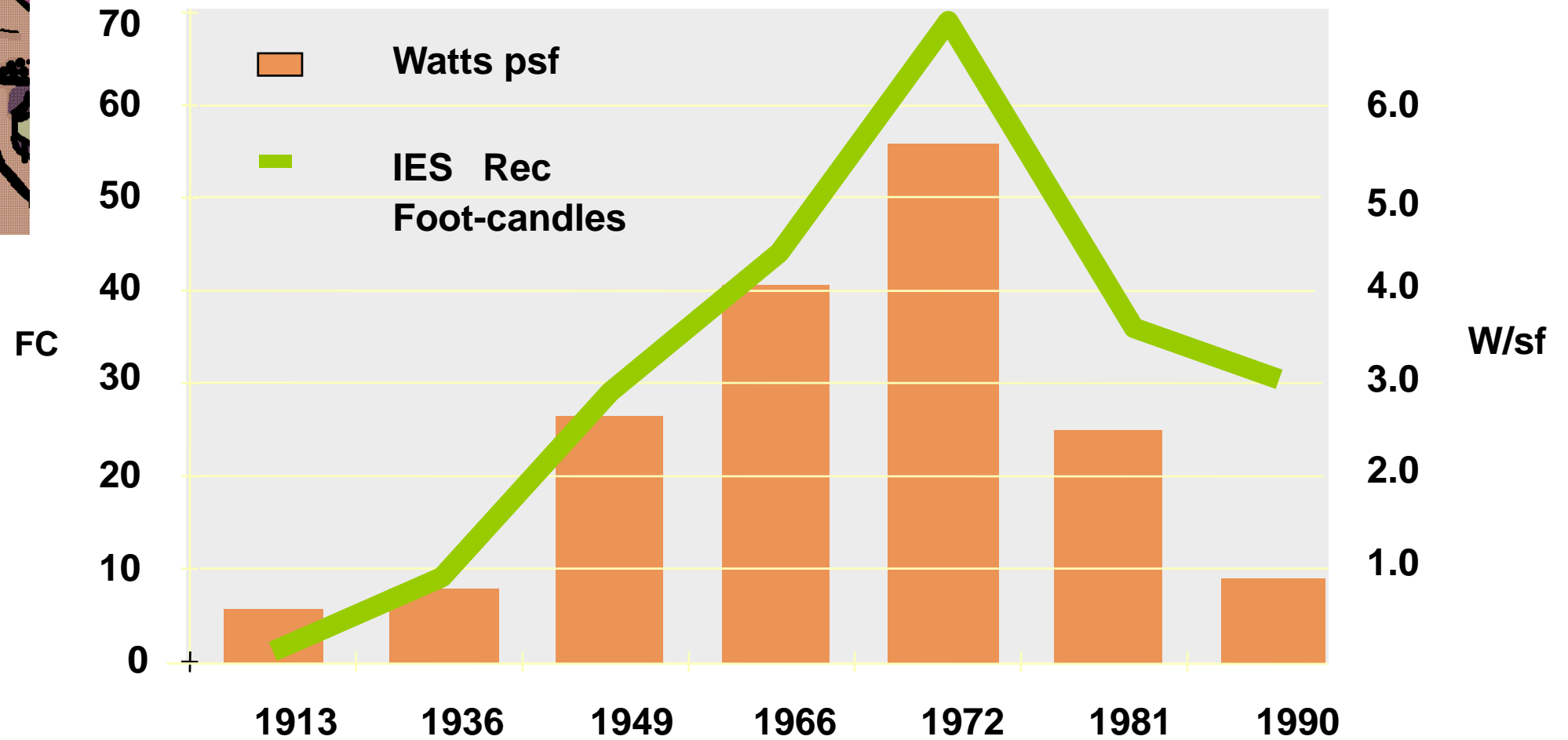


# Optimizing Daylight Access

- Window to Floor Area Ratio → **20-25%** goal
  - Don't count window below task height
- Elongate the building along East/West axis
- Avoid glazing on East/West face
- Add clerestories on the South face
- Penetration into the space 2 x the window head height
- Perform analysis to optimize windows and minimize glare



# How Much Light We Need



# Interior Finishes





# Advancements in Classroom Design





# Why Daylight is So Good

- It's free and happens every day!
  - Sometimes more and sometimes less, but daylight happens every day
- Our eyes have been adapting to Daylight for a long, long time
- It is a familiar light source
- Because we are so familiar with it, we seem to be more productive when we have it as a light source



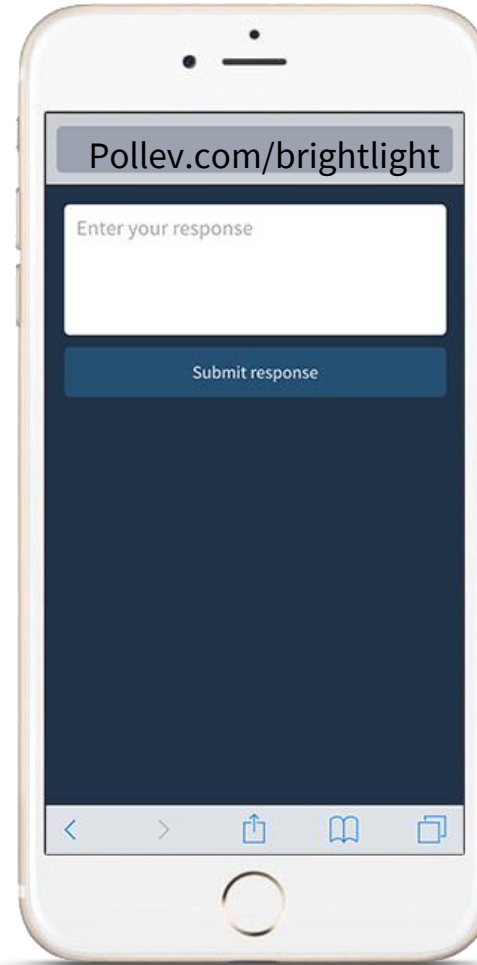
# Synergies and Tradeoffs

# Smartphone Polling

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School security

# Is Daylighting a Synergy or Tradeoff with SECURITY?

Tradeoff

Synergy



# Security

- Well lit areas reduce likelihood of an intruder going unnoticed
- Daylighting provides a positive environment implicitly encouraging the wellbeing of building occupants
- Interior and exterior glazing can provide lines of sight to corridors and entrances





Energy efficiency



# Is Daylighting a Synergy or Tradeoff with ENERGY EFFICIENCY?

Tradeoff

Synergy

# Energy efficiency

- Windows are less efficient than walls but we build for people
- Newer LEDs are more efficient but have even more capabilities.





Lighting controls





# Is Daylighting a Synergy or Tradeoff with LIGHTING CONTROLS

Tradeoff **A**

Synergy **B**

# Lighting controls

- Lighting controls are becoming smarter and more integrated
- Lighting controls and daylighting sensors can be complimentary
- Cost and complexity





# What is the biggest reason why you might not use lighting controls in your facilities?

Start the presentation to see live content. Still no live content? Install the app or get help at [PollEv.com/app](https://PollEv.com/app)



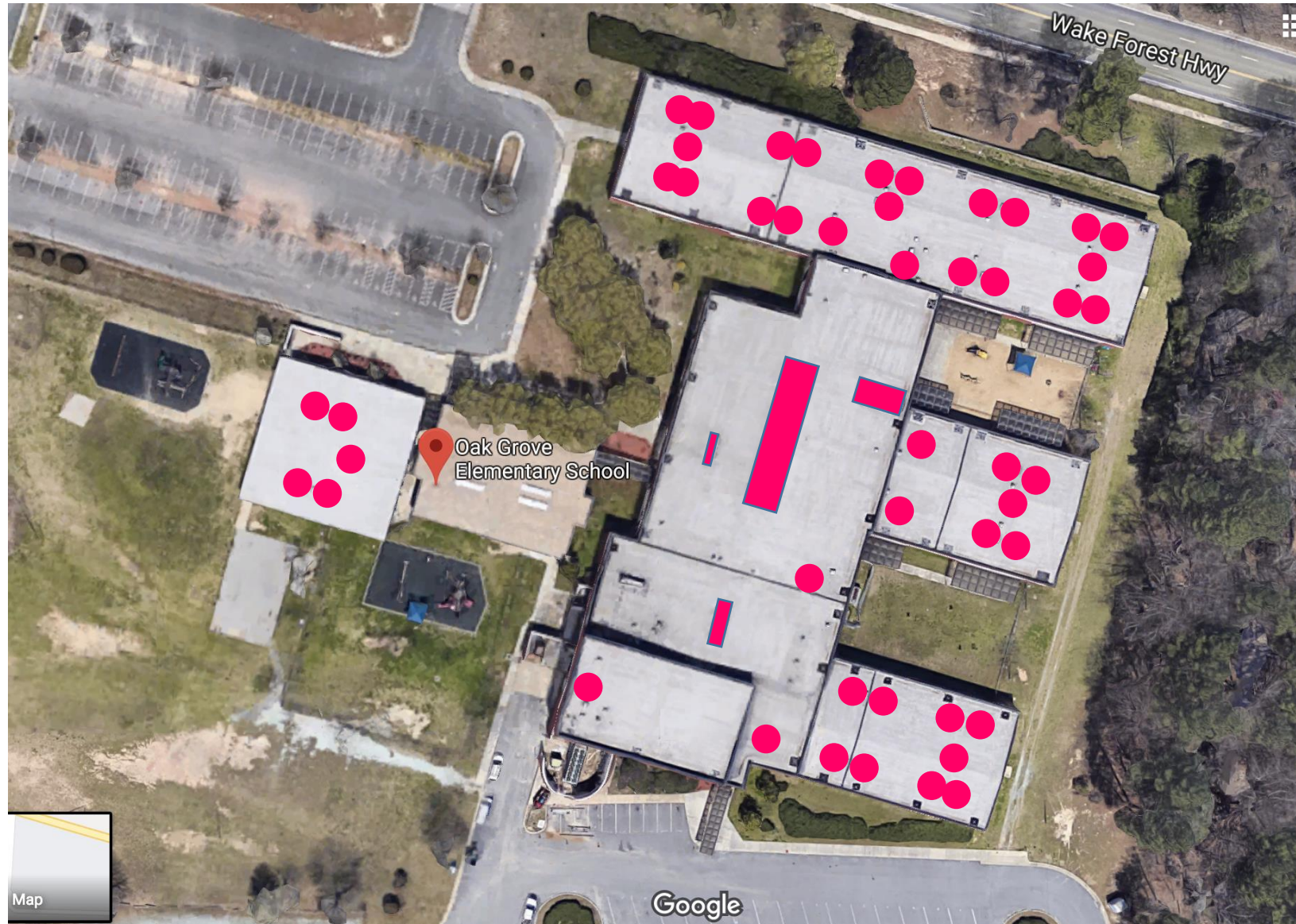
# Reasons for Lack of Implementation

- Decided not to invest at this time
- Seemed too complicated to do, so skipped it
- Some rooms were left out... *who knows why*
- Wrong control equipment installed
- Incorrect location for sensor
- Lights wired incorrectly
- Controls not calibrated
- Users want control, disable system



# Experiences from the Classroom

# Evolution of Design

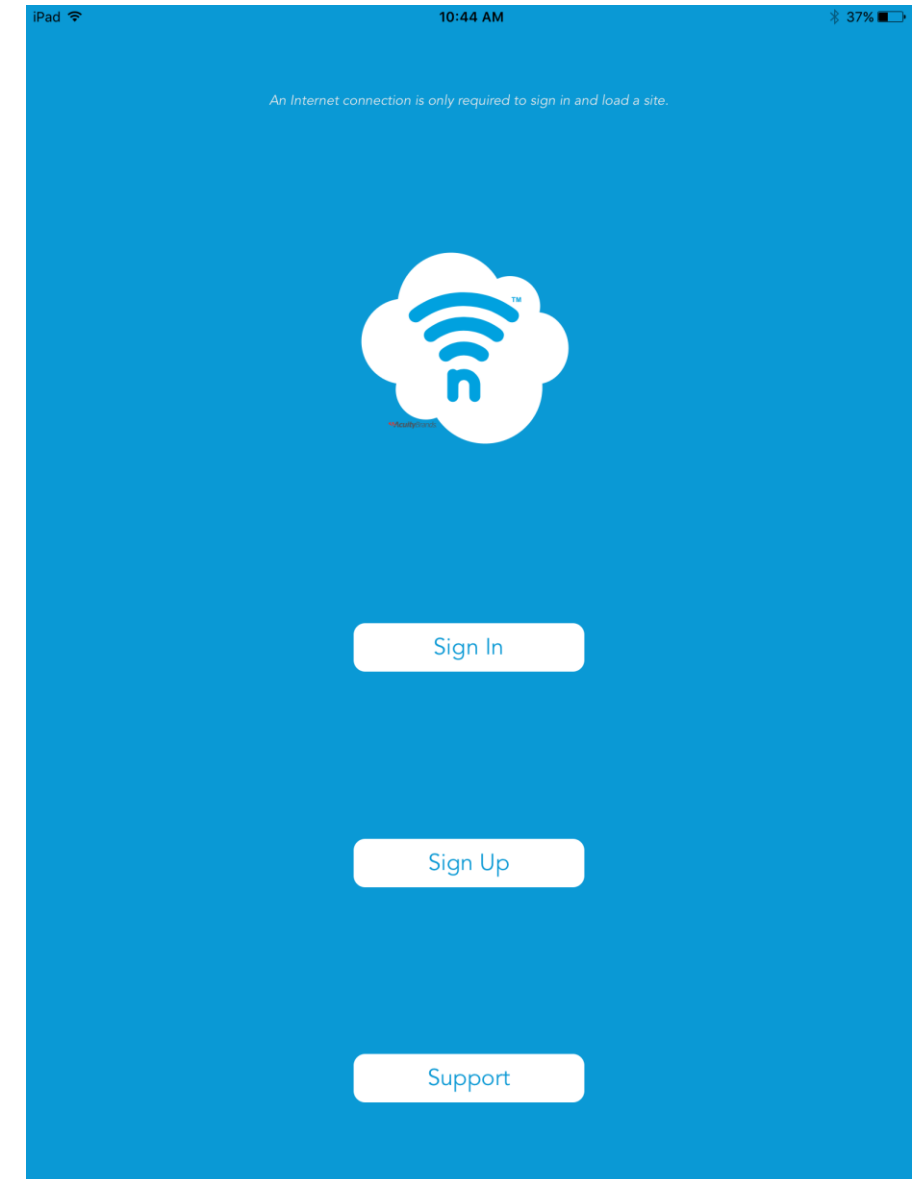




# Evolution of Light Fixtures



# Evolution of Light Fixtures





# On-Board Sensing





# Individual Fixture Daylight Harvesting



# Individual Fixture Daylight Harvesting

iPad 85%

10:44 AM  
204 Classroom  
Behaviors

Save

Zone 1

20 outputs, 1 switch pole

Switch Control

On/off and dimming by switch:  
Keep dim level after turned off/on

Delete

Occupancy/Vacancy

On by Switch (manual-on)

Turn on to 100% when occupied

Dim to 10% after 7.5min of no activity

Turn off 2.5 min after dimming

Individual photosensors ✓

Common photosensor

Daylight harvesting strategy  
Individual photosensors

Delete

Zone 2

4 outputs, 1 switch pole

Switch Control

On/off and dimming by switch:  
Keep dim level after turned off/on

Delete



# Durham Public Schools

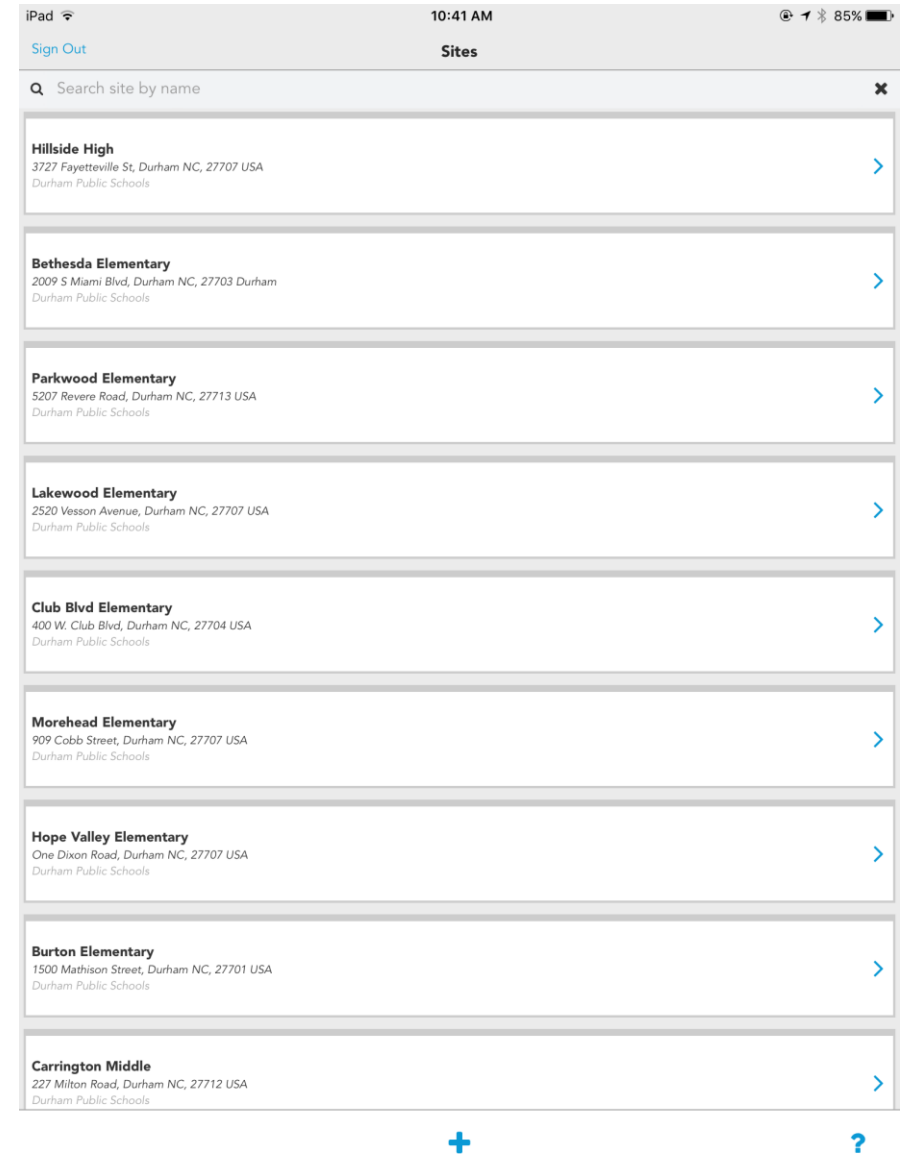
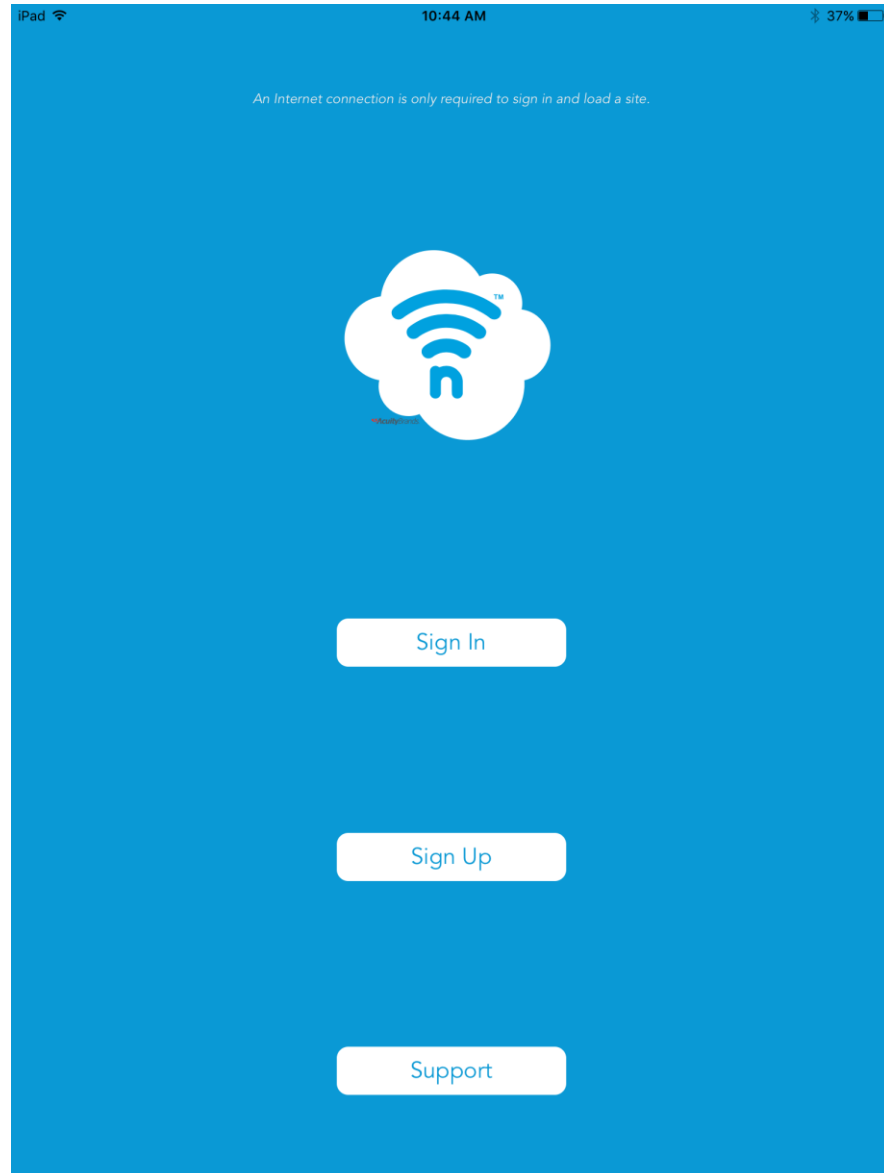
- Roughly 1.5-million sqft “Smart LED Lighting” systems installed at DPS
- Multiple systems deployed:
  - Cree SmartCast (1 full site, 2 half schools, spots)
  - Philips SpaceWise (1 full school, 3 add’l spots)
  - Lithonia/Acuity nLight Air (14 sites)

Summer 2017 via local bond funds:

- Total construction area: 1.31 million sqft
- Total Net Costs: \$1,539,518
- Total Duke Energy incentives: \$1,992,478
- Estimated annual avoided energy costs: \$440,173
- Impact on our students and staff: Priceless



# Digitalization of Lighting



# Digitalization of Lighting


iPad 10:43 AM 85%

[< Groups](#)

Group Overview

[Done](#)

The behaviors and zones for this group may not match what's on the group's devices. You can use the **Troubleshoot Group** button to get the latest details for the group.



Name

204 Classroom

Group Components

1. Devices (21) >

2. Zones (2) >

3. Behaviors (3) >

Device Settings >

Edge Device Selector >

Utility

Firmware Updates >

Commissioned Devices (21) >

Troubleshoot Group >


Delete

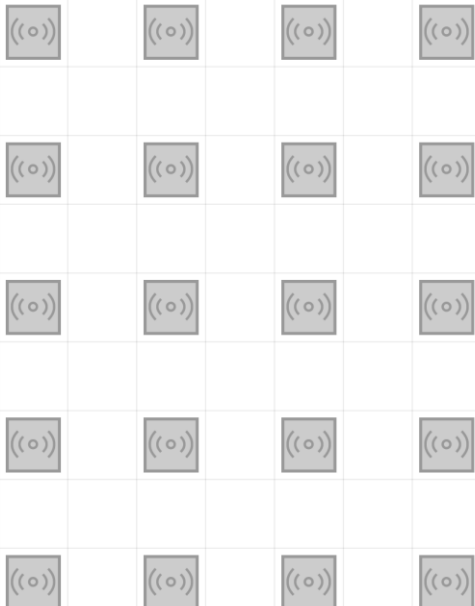
iPad 10:47 AM 84%


[< Group](#)




Device Layout

[Done](#)







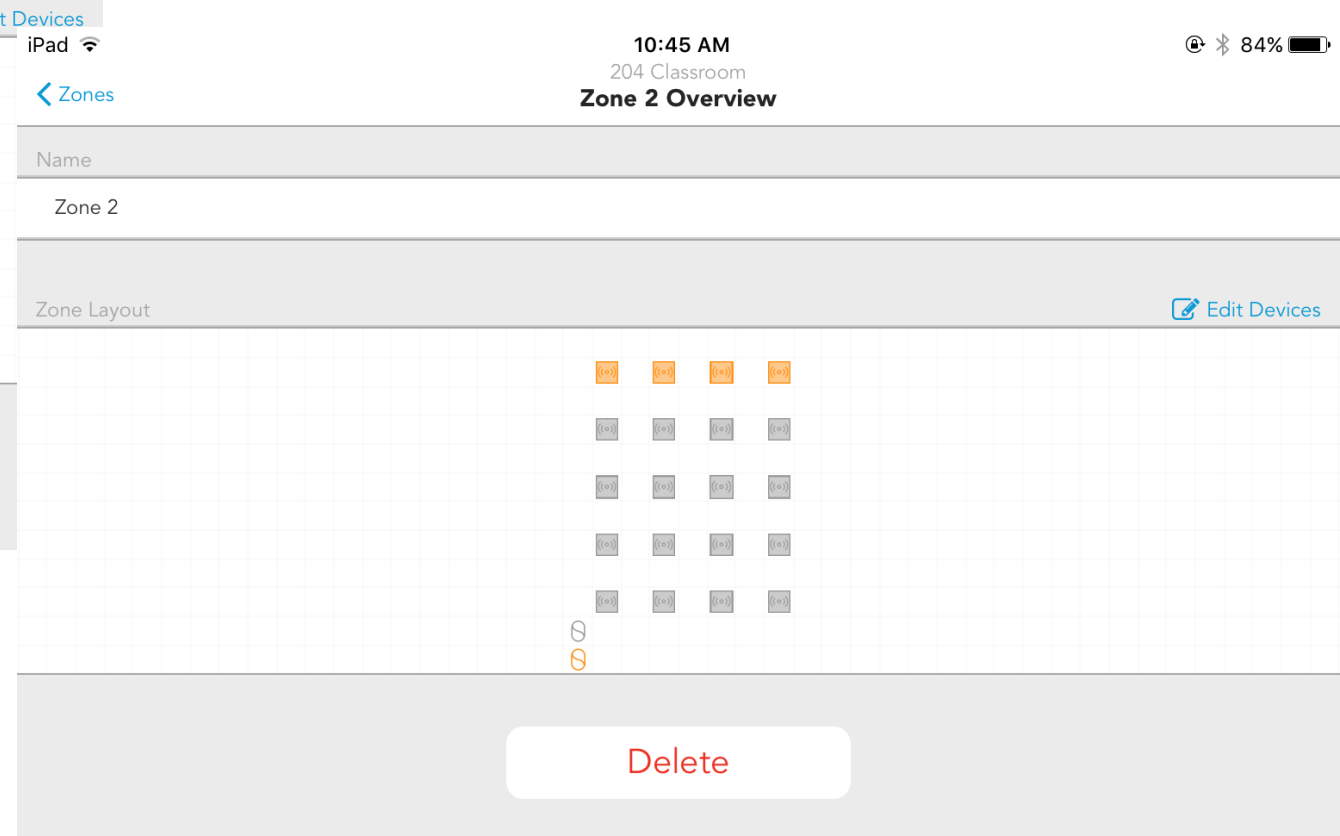
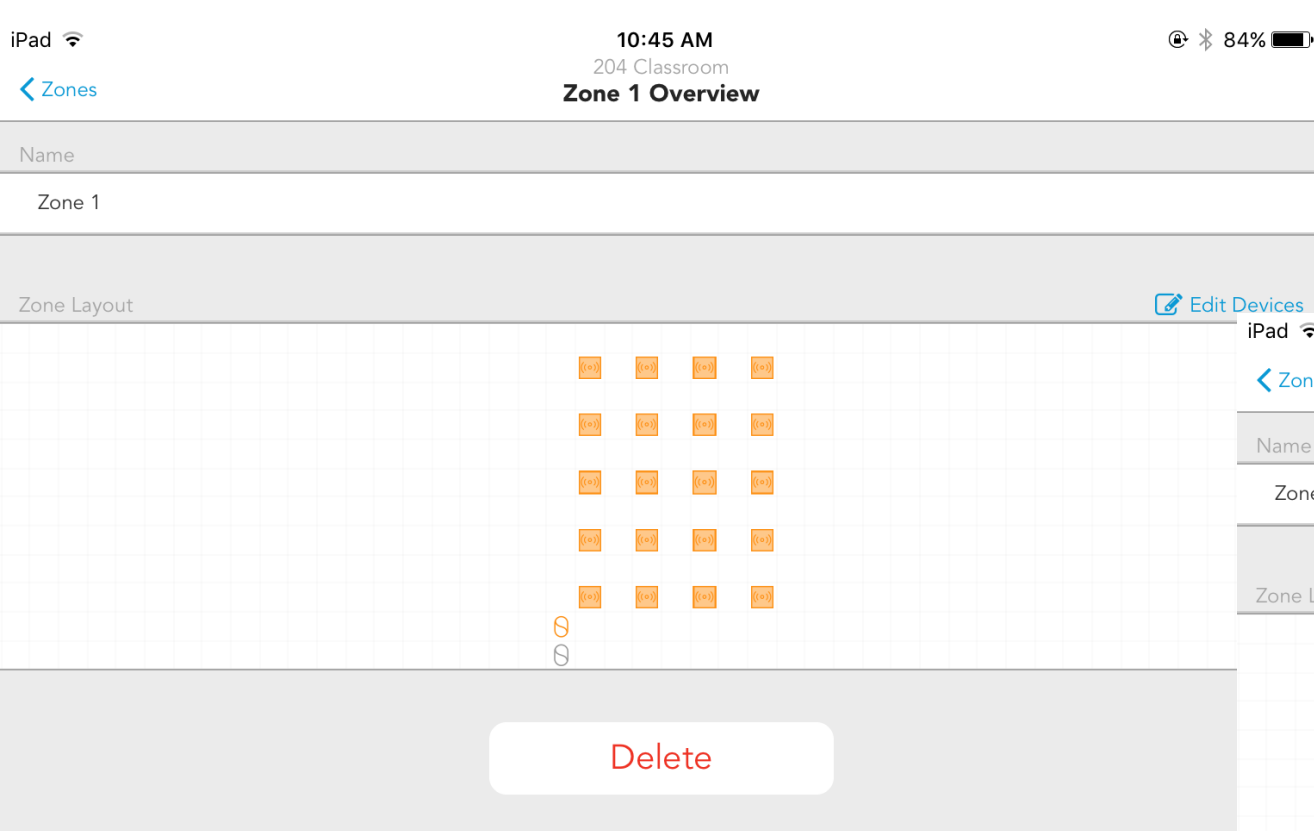


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iPad

10:44 AM

204 Classroom

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Daylight Harvesting

Daylight harvesting strategy

Individual photosensors

Delete

+

Zone 2

4 outputs, 1 switch pole

Switch Control

On/off and dimming by switch:

Keep dim level

after turned off/on

Delete

+



# Digital Lighting Controls Experiences

- Main benefits:

- Can meet energy code out of box
- Wireless dimming
- Full array of daylight harvesting settings
- Integrated occupancy/vacancy with easy to change timeout options
- Creative lighting group assignments available
- Custom setpoints available for all settings
- Integration opportunity with BAS for security + maintenance features

- Drawbacks:

- Batteries with some applications!
- Commissioning and recommissioning/updates required
- New technology piece for maintenance staff
- Learning curves for everyone

# Thank You

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