Influences from the Outside

FSB Education Design Studio
University of Oklahoma / College of Architecture
Edmond Public Schools
RTA Architects

October 24, 2015

Health / Safety / Welfare

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Course Description

How School Planning can Benefit When Advisory Boards, Research Universities and Government Funding Agencies Together Discuss Points-of-View

Learning Objectives

Learning Objective 1

Learn the processes involved to create research relationships between government research funding agencies, research universities, investigators and planners familiar with the design and construction of schools.

Learning Objective 2

Learn the benefits that are available to school district officials and school boards who seek to make building design decisions for new schools or school renovations.

Learning Objective 3

Learn why parents, teachers, students and school district officials have ongoing discussions about healthy and highly performing schools and what they want them to be as a viable part of their communities

Learning Objective 4

Learn how to gain a stronger definition of the trade-off concerning sustainability and environmental quality for students.

Session Description

- Introduction
- State of the Grant
- Building Features List
- Community Advisory Board (CAB)
- Next Steps

Introductions

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Balancing Sustainability, Clean Air, Healthy Learning Interiors and Structural Safety when Designing and Building Schools

- Determine impact on student performance.
- Determine how healthy school strategies affect one another.

State of the Grant

How the Grant Works

How the grant works

- Grant is funded by the EPA
- Peer review for the EPA determines which projects to fund.
- University of Oklahoma College of Architecture is the primary lead for the research team

State of the Grant

EPA Requirements

Structural Hardening

Increase the strength of materials by adding, building or replacing structural components; Structural safety

- ✓ *Building Inspection*
- ✓ *Floor Plan Review*

Sustainability

Reduce environmental impact of buildings; Reduce energy consumption; Efficient use of low carbon materials; Protects, preserves and improves water and air quality.

- ✓ *LEED Criteria – Rating system for Building Design and Construction*

Healthy Interiors

Interior spatial conditions that affect: Thermal Comfort, Lighting, Acoustics, Ventilation, Aesthetics, and Visual Harmony

- ✓ *In-situ testing + case modeling*
- ✓ *Building Inspections*

Air Quality

The degree to which the ambient air is pollution-free. Indoor air quality (IAQ) can be affected by a number of contaminants including mold, gases, particulates and any stressor that can be considered harmful to health conditions.

- ✓ *Air Quality Test*

State of the Grant

Partnerships

FSB
Architects Engineers Planners

COLLEGE OF ARCHITECTURE
The UNIVERSITY of OKLAHOMA

Colorado State University

The UNIVERSITY of OKLAHOMA
Health Sciences Center

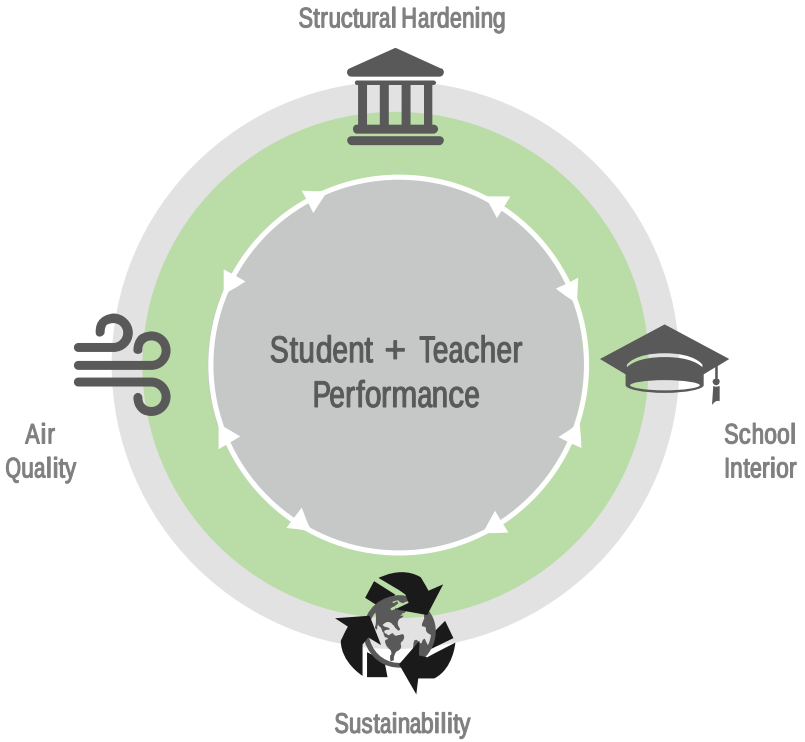
Edmond Public Schools

OKLAHOMA CITY
Public Schools

education design studio

State of the Grant

Research Grant Objective

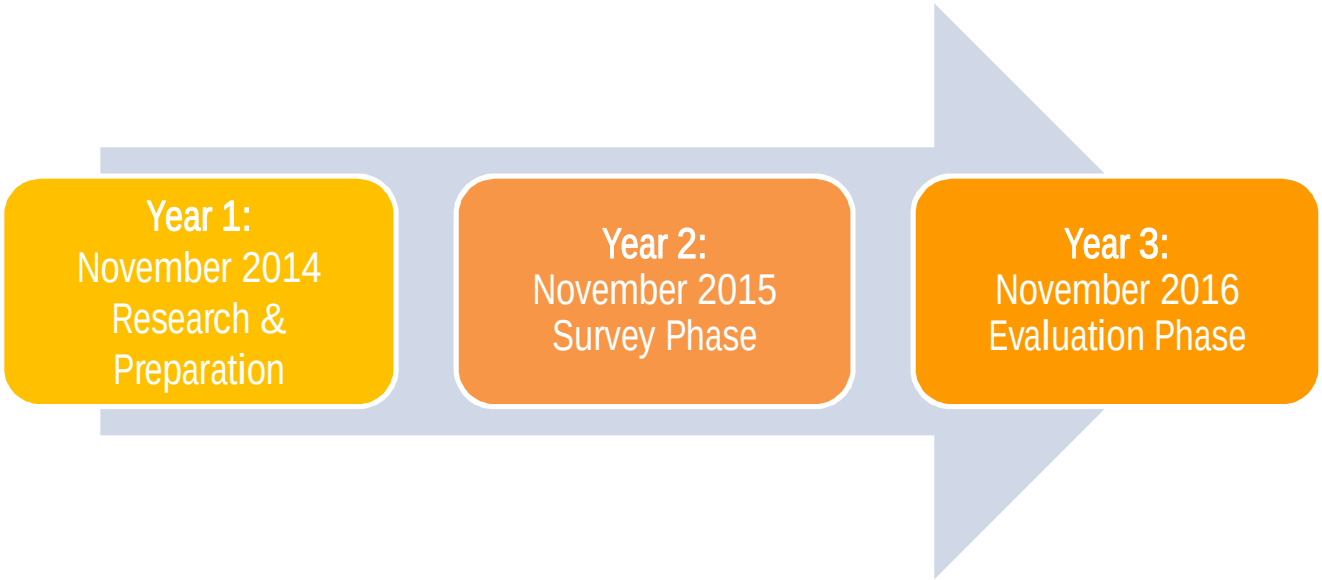


Determine the extent to which factors related to school building design affect:

- Student achievement
- Teacher achievement
- Occupant health
- Impact one has on another

State of the Grant

Grant Research Timeline



A final report will be create to help stakeholders make better informed decisions.

State of the Grant
Building on 2014

What has transpired since last year?

- Developed the Community Advisory Board
- Gathered and sorted Building Features List
- Assigned Learning Relativity Category based on feature's impact on student learning (1, 2 or 3), 1 being highest.
- About 150 items are still on the list after it was sorted.

State of the Grant
Building on 2014

What has transpired since last year?

- Defined items on list in laymen's terms
- Assigned a scale or metric to each item
- Started measurements in schools with a Beta run to create the field survey
- Field measurements estimated to be complete Summer 2016

Building Features List

The value of research

The purpose of this research is to:

- Give decision makers tools.
- Prioritize building features that affect student and teacher performance.

Building Features List

How it was developed

How the building features list was developed:

- Polling at conference presentations
- Literature review
- Subject Matter Experts (SME) Opinions
- Community Advisory Board input

Building Features List

How it was developed

The research team found that the items could be grouped into six categories:

- Lighting
- Acoustics
- Thermal Comfort
- Interior Design
- Aesthetics
- School Campus

Building Features List

Learning Relativity Categories

Hierarchy of Building Feature Items:

- Items evaluated by Community Advisory Board and research team
- Categorized by direct impact on student learning
- Learning Relativity Categories
  1. Highest impact
  2. Some impact
  3. Less impact

Natural light

Window orientation

Depth of light penetration

Building Features List

Focus on Lighting

MAIN DEFINITION

Combination of natural and artificial light that creates specific conditions in a space or room. Lighting for specific uses requires levels of illumination based on recommended standards and also in ideal conditions it should incorporate daylight (day-lit school design) with uniform light distribution.

	FEATURES	DEFINITION	12	3	HOW TO MEASURE
1	Type and Source of Light :				
1.1	✓ Orientation of the Windows	Direction windows face in a room		√	s ✓ Review Plans
1.2	✓ Lighting sources				
1.2a	✓ Natural light	Amount of natural light in the room	xe		✓ Digital light meter
1.2b	✓ Lighting fixtures	Any source other than natural light	√		s ✓ Identify type of bulbs
			xe		✓ Digital light meter
1.2c	✓ Task lighting	Amount of light over selected reading area in the classroom	xe		✓ Digital light meter
1.2d	✓ Glare	Areas of concentrated light that are uncomfortable for the occupant	√		v ✓ Visual Inspection
1.2e	✓ Distribution of light	How light is distributed within the room	xe		✓ Digital light meter

Building Features List

Focus on Lighting

SPECIFICATIONS	SCALE / REFERENCE			
Specify the location of windows (N / W / E / S - combination?)		Nominal Variable ***		S
Sample 3-5 different spots (center and corners) in the room,measure amount of light in foot-candle find the mean value. Lighting fixtures must be OFF	<50f c or >100 fc	• • •	50 - 100 fc	S
Identify type of lighting bulb	Incandescent	• • •	fluorescent / LED	S
Sample 3-5 different spots (center and corners) in the room, measure amount of light in foot-candles and find the mean value. Lighting fixtures must be ON	<50f c or >100 fc	• • •	50 - 100 fc	m
Sample 4 spots (teacher + 3 students desks) on a task surface, measure amount of foot candles and find the mean value				m
Existence of problematic light concentrations in the room	No	• • •	Yesm	
Take 5 samples (highest and lowest lighting areas) in foot-candles. Then, determine range between highest and lowest values	Highly variable >50%	• • •	Consistent (0%-10%)	m

(1.1) **Orientation of the building**
Direction windows face in a room

(1.2a) **Natural light**
Amount of natural light in the room

(1.2b) **Lighting fixtures**
Any source other than natural light

(1.2c) **Task lighting**
Amount of light over selected reading area in the classroom

(1.2d) **Glare**
Areas of concentrated light that are uncomfortable for the occupant

(1.2e) **Distribution of light**
How light is distributed within the room

(2.1) **Amount of walls with windows**
Number of walls which have windows in the room

(2.2) **Dimension of windows**
Ratio of total window area to total floor area.

- (2.2a) **Windows blocked**
  Elements which block natural lighting in the room not including louvers, baffles and shades
- (2.2b) **Depth of light penetration**
  Distance of light penetration to the opposite walls from the windows

(2.3) **Glass and window system**
Type of window glass and layers. Ex: Double glazed window with low e-glass

(2.4) **Skylights**
Natural lighting originating from the roof

(2.5) **Louvers, baffles and shades**
All window adjustable elements designed to control penetration of direct sunlight

(3.1) **Adjustable lighting**
Occupants are able to control the systems to increase or reduce amount of artificial light in the room

(4.1)
Configuration of room in elevation and floor plan

(4.2)
Occupant installed objects which block lighting fixtures, not including intentional shading devices (lamp-shade)

(4.3) **Exterior wall depth**
Depth of the exterior walls of the building

(4.4) **Interior partitions or large objects**
All objects and movable partitions that divide the space temporarily and affect lighting (when you change the configuration of the room, how it affects lighting)

(4.5)
Plants and trees that blocks sunlight

(4.6)
Exterior site features which may cover, protect or block penetration of natural lighting into the space

(5.1) **Light reflectance value**
Reflection of floors, ceilings and walls

Lighting Case Study

Lighting Case Study

General definition

Systems, spaces and/or functional elements that produce background noise in the room

(1.1) HVAC Systems

(1.2) Computers, projectors, others

(1.3) Noises adjacent to classroom

- ✓ *Walkway, hallway, others*
- ✓ *Parking, streets*
- ✓ *Service Rooms*
- ✓ *Playground*
- ✓ *Gym, cafeteria and Recreational spaces*

(1.4) Bell system

(2.1) Form/shape variation

Irregular configuration that affects acoustics

(2.2) Glass and Windows system

- **(2.2a) Windows blocked**
  Ratio of total windows area to total wall area
- **(2.2b) Depth of light penetration**
  Configuration of the glass as part of the windows in the rooms

(2.3) Interior partitions or large objects

All objects and movable partitions that divide the space temporarily and affect acoustics

(2.4) Vegetation

Plants and trees that block noise

(3.1) Room activity

Use of the space based on activities

(3.2) Population-density

Average number of people using the space

(4.1) Flooring materials

Top flooring material in the room

(4.2) Ceiling materials

Bottom ceiling material in the room

(4.3) Wall materials

Wall materials in the room

(4.4) Furniture

Soft and hard materials

Acoustics Case Study

Acoustics Case Study

(1.1) **Passive systems**

(1.1a) **Crossed ventilation**
The desired circulation or flow of air through openings, such as doors, windows or vents, that are on opposite sides of the room

(1.1b) **Stack effect**
Vertical movement of air in and out the building. E.g: Warm air rises and produces a chimney effect

(1.2) **Form/shape variation**
Shape of the room in elevation and floor plan

(1.2a) **Height of spaces**
Distance from floor to ceiling in the room

(1.3) **Vegetation**
Plants and trees that serve to reduce heat and block wind and natural light

(1.4) **Topography and landscape structures**
Sunken or burned structures

(2.1) **HVAC Systems**
Type of heating, ventilation and air conditioning in the room

(2.1a) **Thermostat Control**
Users have the ability to control the thermostat in the room

(2.2) **Lighting Fixtures**
Any lighting source other than natural light that releases heat

(2.3) **Appliances and equipment**
Equipment that releases heat

(4.1) **Interior color and material**
Color and materials of floors, walls and ceilings and any other elements with relevant area that could absord and/or reflect light

(3.1) **Orientation of windows**
Direction windows face in a room

(3.2) **Windows**
Ratio between total window area and total wall area

(3.2a) **Operable windows**
Occupant can open windows

(3.3) **Lighting control systems**

(3.3a) **Glass and window system**
Type of window glass

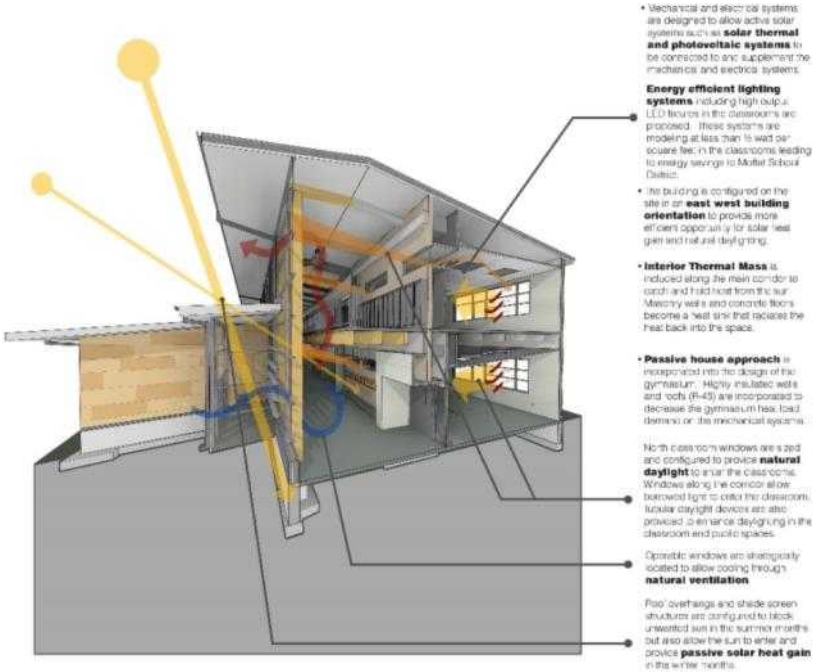
(3.3b) **Shading devices**
Physical elements (interior or exterior) that control direct sunlight affecting room temperature

(3.3c) **Skylights**
Natural lighting originating from the roof

(3.3d) **Blocking elements**
Elements which block direct sunlight in the room not including shading devices (louvers, baffles and shades)

Thermal Comfort Case Study

Thermal Comfort Case Study



(1.2) **Interior materials**

(1.2b) **Long-term usability**
Lifecycle and usability of materials

(1.2c) **Texture or surface of materials**
The texture or surface of the material effectively supports the intended activity

(1.3) **Interior Color**
Color of interior surfaces

(1.4) **Ergonomics of furniture and equipment**
Fit of occupants to furnishings and equipment

(1.5) **Size of classroomms**
Total area of the room

(1.6) **Personal and Social Space**
Distance between seated students

(1.7) **Communal spaces**
Area available for group activities in the classroom

(1.3) **Interior Color**
Secured space for media, tools, supplies, teacher and student belongings.

(1.10) **Water fountains**
Ability to vary the configuration of the room thourgh movable walls

(4.1) **Visibility**
Visibility of safe areas and the interior of classrooms from main hallways

(4.2) **Adjancency with emergency spaces**
Paths to emergency space is efficient

(4.3) **Secured entry**
Secure and operable entry process

(4.4) **Secutiry systems**
Existing and operable security system

(3.1) **Circulations**

(3.1a) **Walkways and Pathways**
A path or route that connects the main exterior areas of the building with the interior areas

(3.1b) **Interior corridors**
A narrow hallway or corridor that opens to different rooms in the interior the building

(3.2) **Hierarchy of spaces**
Obvious entrance areas and gathering spaces to which paths in the building connect

Gathering spaces as a result of architectural and spatial conditions

(3.3) **Adjancency with spaces**

(2.1) **Interior Flexibility**

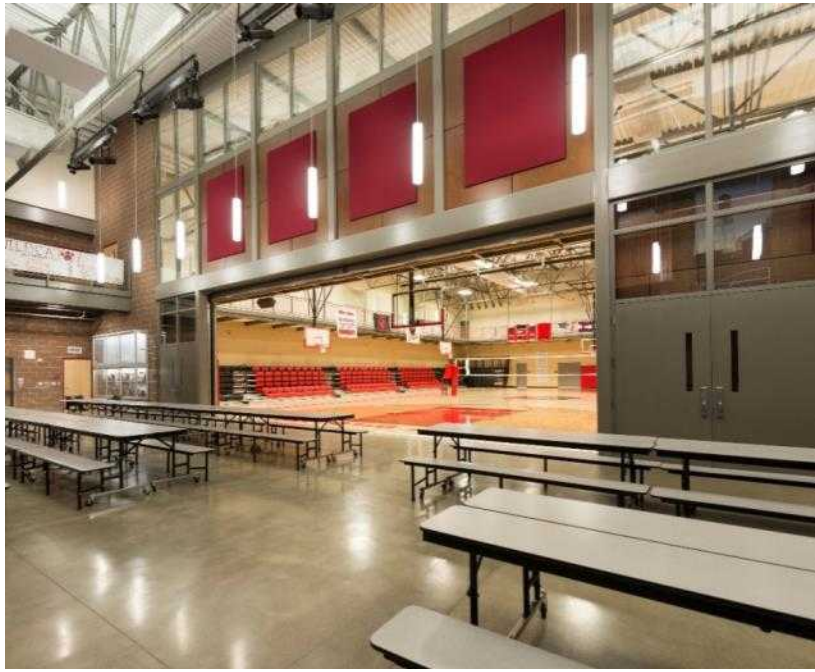
(2.1a) **Moveable Partitions & Furniture**
Ability to vary the configuration of the room thourgh movable walls

(2.2) **Space Adaptability**

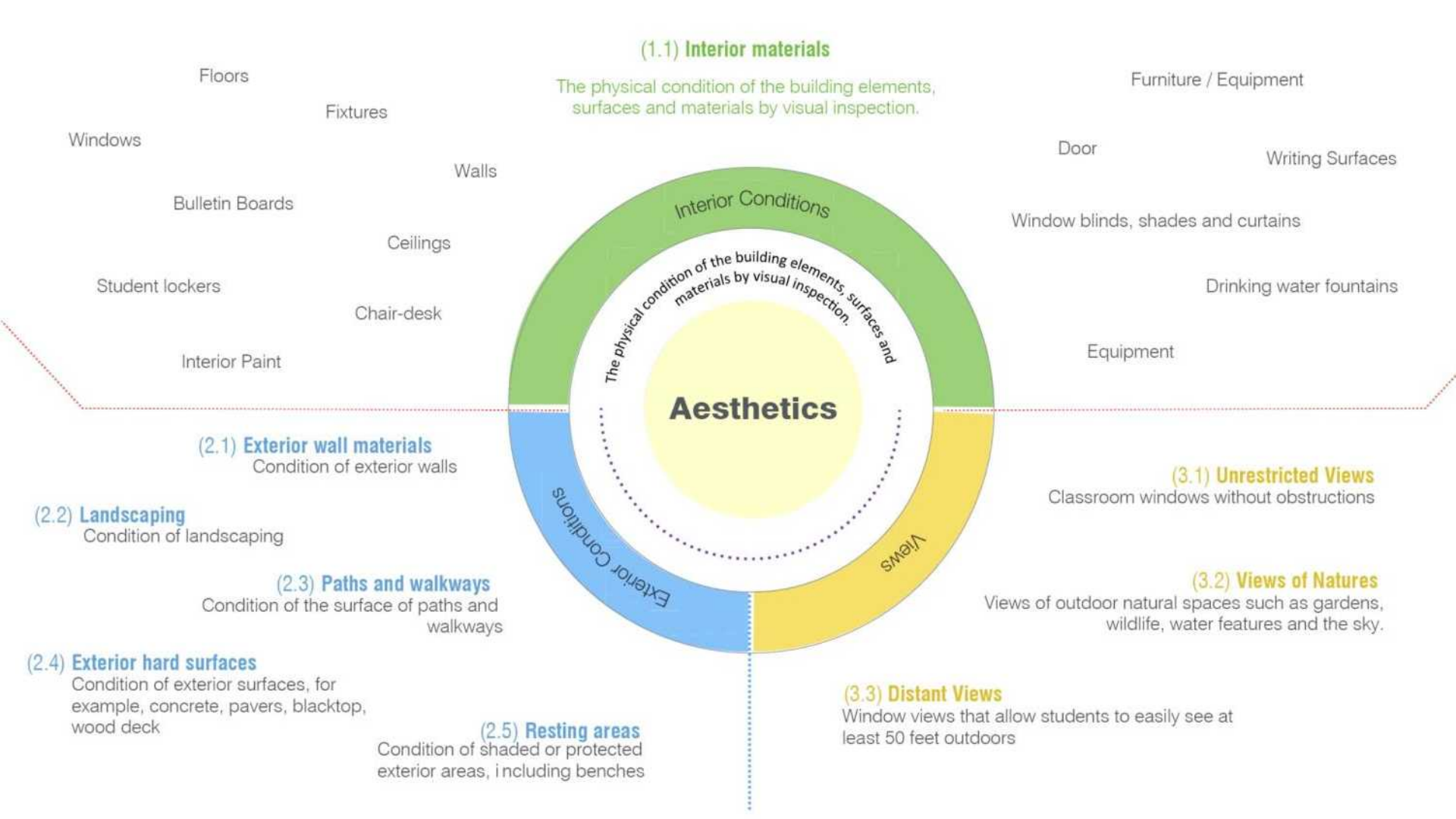
(2.2a) **Display surfaces**
The room provides designated areas for displaying student work

(2.ba) **Display surfaces**
Any interior element and/or structural element which interferes with line of sight for instruction

Interior Design Case Study

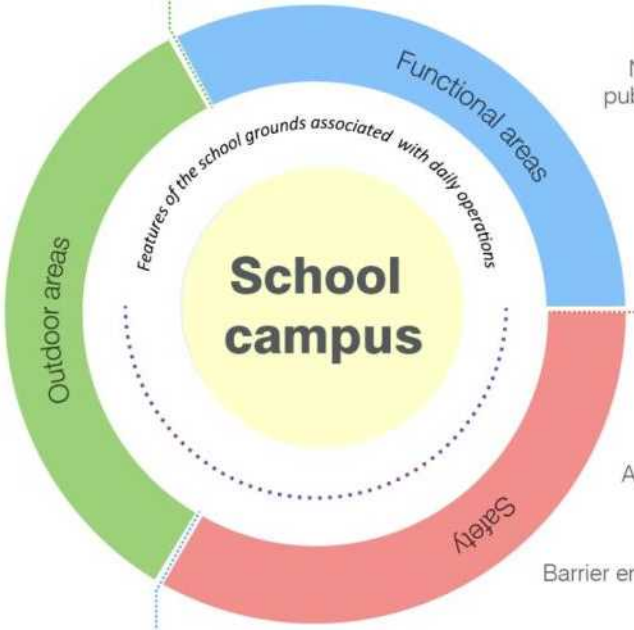


Interior Design Case Study


(1.1) Interior materials
The physical condition of the building elements, surfaces and materials by visual inspection.
Floors
Fixtures
Windows
Walls
Bulletin Boards
Ceilings
Student lockers
Chair-desk
Interior Paint
Furniture / Equipment
Door
Writing Surfaces
Window blinds, shades and curtains
Drinking water fountains
Equipment
Interior Conditions
The physical condition of the building elements, surfaces and materials by visual inspection.
Aesthetics
Exterior Conditions
Views
(2.1) Exterior wall materials
Condition of exterior walls
(2.2) Landscaping
Condition of landscaping
(2.3) Paths and walkways
Condition of the surface of paths and walkways
(2.4) Exterior hard surfaces
Condition of exterior surfaces, for example, concrete, pavers, blacktop, wood deck
(2.5) Resting areas
Condition of shaded or protected exterior areas, including benches
(3.1) Unrestricted Views
Classroom windows without obstructions
(3.2) Views of Natures
Views of outdoor natural spaces such as gardens, wildlife, water features and the sky.
(3.3) Distant Views
Window views that allow students to easily see at least 50 feet outdoors

Aesthetics Case Study

Aesthetics Case Study



(2.1) **Playground and outdoor activity areas**
Outdoor area provided for students to play on and exercise

(2.2) **Outdoor learning spaces**
Active designated outdoor space designed for formal learning

(2.3) **Common spaces**
Gathering areas controlled by school staff and used by students and staff

(2.4) **Courtyard**
Areas between buildings and enclosed by at least 3 exterior walls with sufficient space to accommodate a group of students

(2.5) **Green spaces**
Open space with undeveloped landscaping within the site

(2.6) **Landscaping**
Open space with intended plants within the site

(2.7) **Unprotected resting areas**
Outdoor areas for students with furniture to sit that are not sheltered from weather

(2.8) **Protected resting areas**
Outdoor areas for students with furniture to sit that are sheltered from weather

(1.1) **Drop-off area(s)**
Area(s) to drop-off or pick-up students + School bus loading areas are separate from parent drop-off areas

(1.2) **Drop-off area(s)**
Bus traffic and private drop-off drives are not connected and independent

(1.3) **Parking**
Number of spaces for public and private parking

(3.1) **Closest street**
Type of closest public street

(3.1) **Secured separation**
Physical barrier between students and public street

(3.1) **Safe rooms**
The school provides a safe room or storm shelter area.

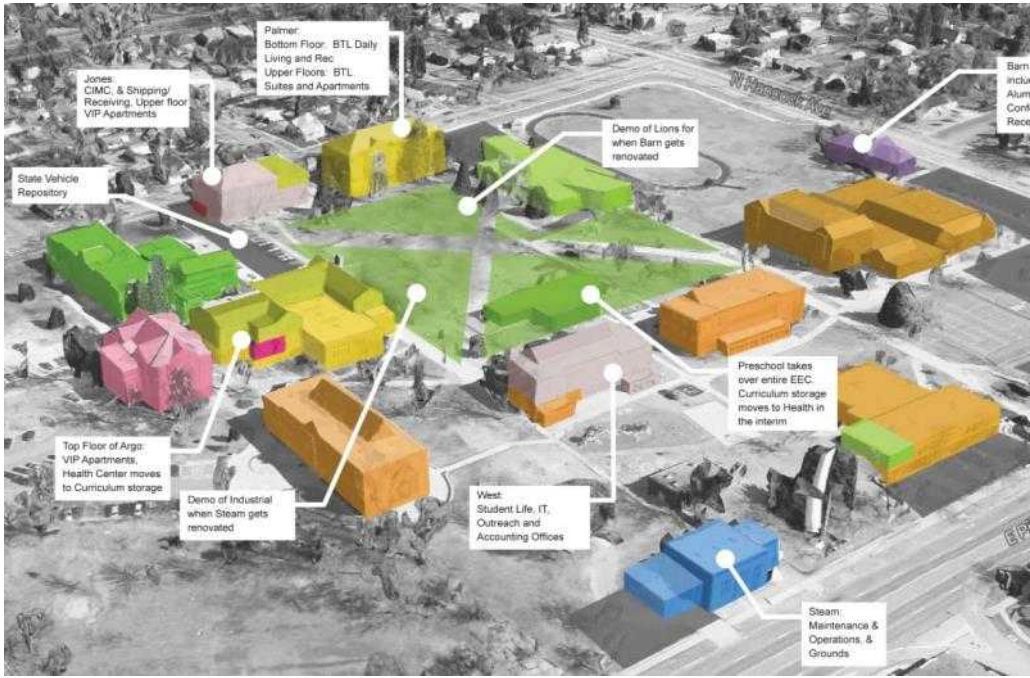
(3.1) **Unintended hidden areas**
Any outdoor or indoor area with limited visual supervision

(3.1) **Site fencing**
Barrier enclosing the campus or main facilities of the school

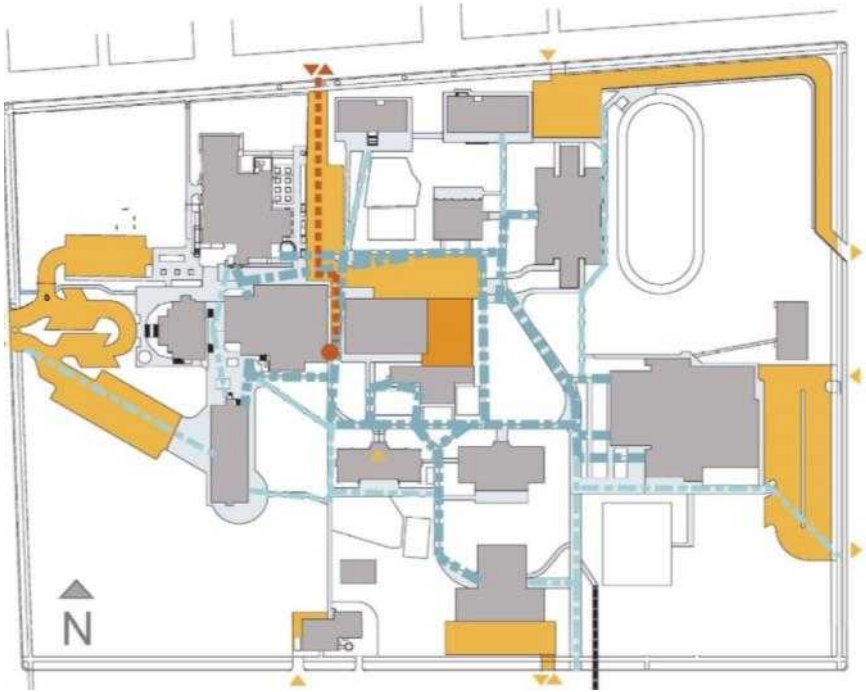
(3.1) **Secured building entry**
Controlled access for students, staff and the public

(3.1) **Closed Campus**
The school campus is secured requiring permission to enter

School Campus Case Study



School Campus Case Study



Community Advisory Board

Purpose

What is the purpose/history of the Community Advisory Board (CAB)?

- Formed last year specifically for this research project
- Meet monthly for duration of grant
- Provide insight to the team from community perspective

Community Advisory Board

Insight

What is input/insight does the CAB provide the research team?

- “Keep us real”
- To translate the results into real world information people can and want to use.
- Ensure the final product is usable and applicable

Community Advisory Board

Members

School Nurse
Debbie Johnson

Oklahoma Education Assoc. Representative
Elise Robillard

OKC Public Schools, Executive Director, Planning, Research & Evaluation
Richard D. Weeter, Ph.D

Parent / PTA
Jacqueline Holder

University of Oklahoma
Marguerite Keesee

MAPS Foundation, Assistant Program Manager
Lance Musgrave

Regional Accreditation Officer, Oklahoma State Department of Education
Shellie Gammill

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OKC Public Schools Board
Laura Massenat

OKC Public Schools Board
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OKC Public School Principal
H. Charmaine Johnson

OKC 1st Grade Teacher
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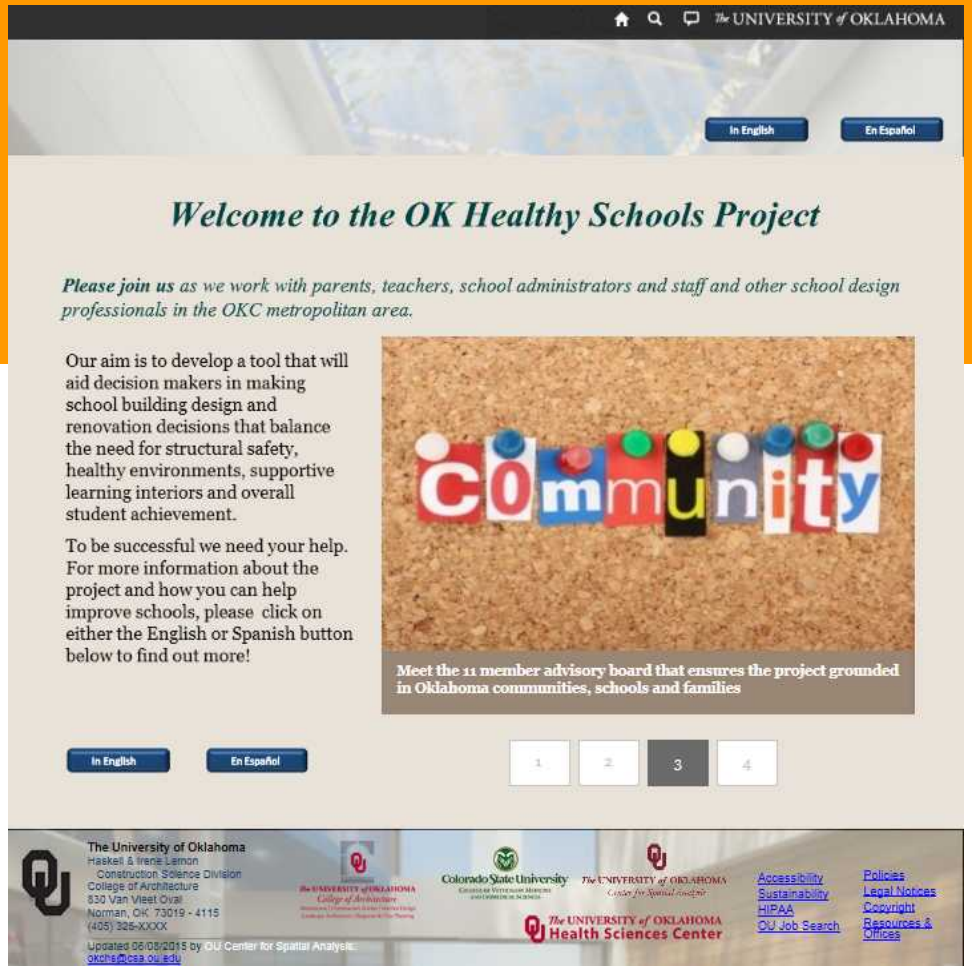
Edmond Public Schools, Chief Operations Officer
Christina Hoehn

OKC Sophomore Student
Tecumseh Cline

Thoughts & Questions

Thank you



Contact

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For presentation executive summary and downloads:

http://education-design-studio.com