DIFFERING MINDS

Considering Neurodiversity in Educational Design

G+P
GRIMM + PARKER

Emily Wright

Associate

Laura Smyles

Senior Associate

Learning Objectives

At the end of this presentation, participants will be able to:

Describe the proportion of neurodivergent students learning in a general education environment.

Discuss how school design can support educational strategies such as UDL.

Discuss large-scale and small-scale design strategies to support neurodivergent students.

Identify strategies for providing flexibility for students.

Neurodiversity refers to the **range of differences in individual brain function and behavioral traits**, regarded as part of normal variation in the human population.

(Oxford Languages)

People Experience the World Differently

Where in your body do you feel the nails on a chalk board sound?

Time for a Poll

People Need Different Levels of Stimulation

Do you find it easier or harder to focus on an auditory presentation when doodling or sketching?

A. Easier to focus on the presentation

B. More difficult to focus on the presentation

C. I don't notice a difference

D. Don't know

Time for a Poll

People Learn Differently

You are in an unfamiliar city with no cell signal. How would you like a stranger to give you directions to your destination?

A. Describe it to me using street names and landmarks
B. Sketch it for me on a scrap of paper
C. Take my hand and lead me there

Time for a Poll

People Thrive in Different Environments

People Thrive in Different Environments

How do you feel about working in a busy coffee shop as shown?

A. Looks fun to me!

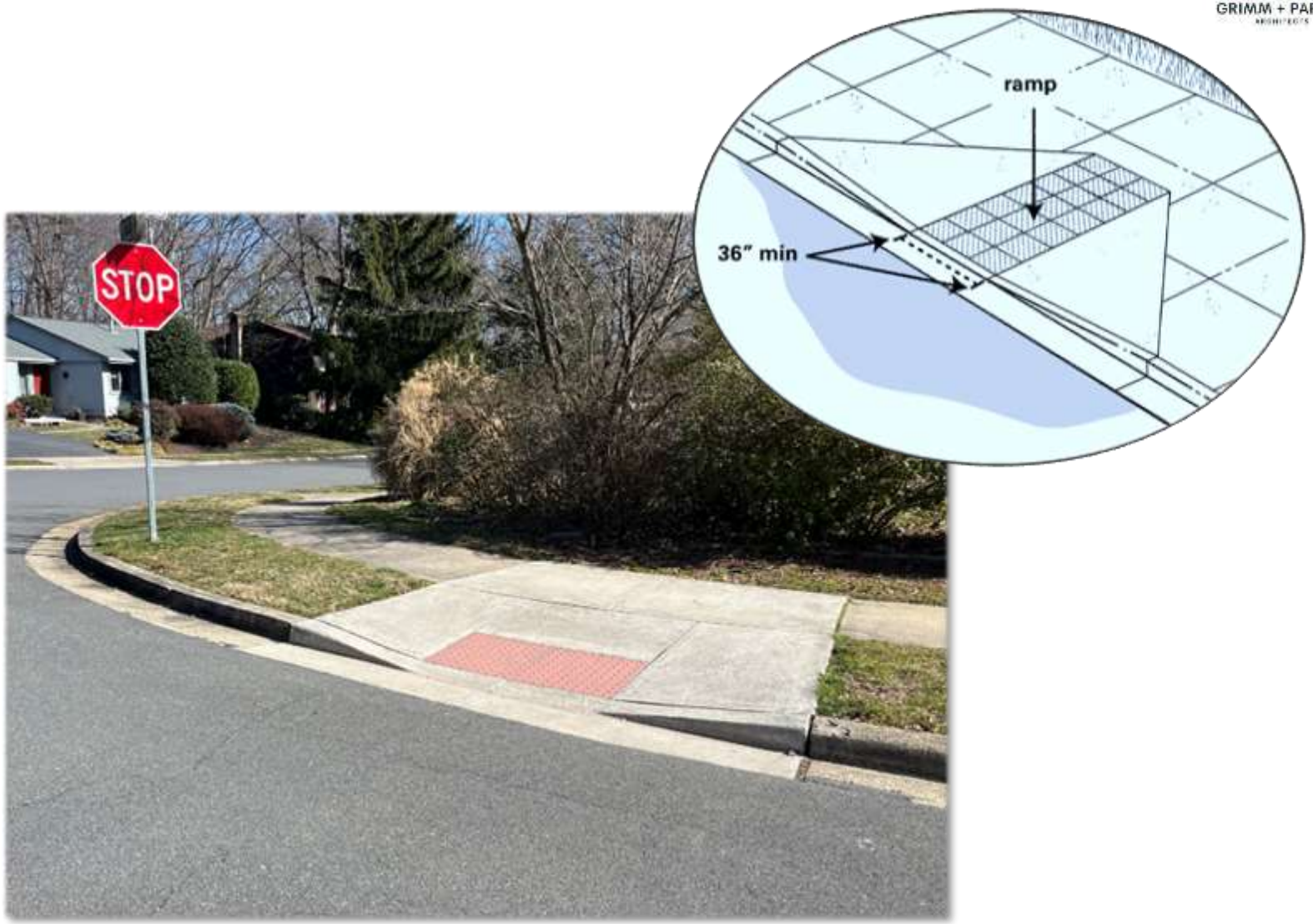
B.Wouldn't be my choice but I could tolerate it.

C.Get me far, far away from this place.

D. Don't care, I can work anywhere.

Time for a Poll

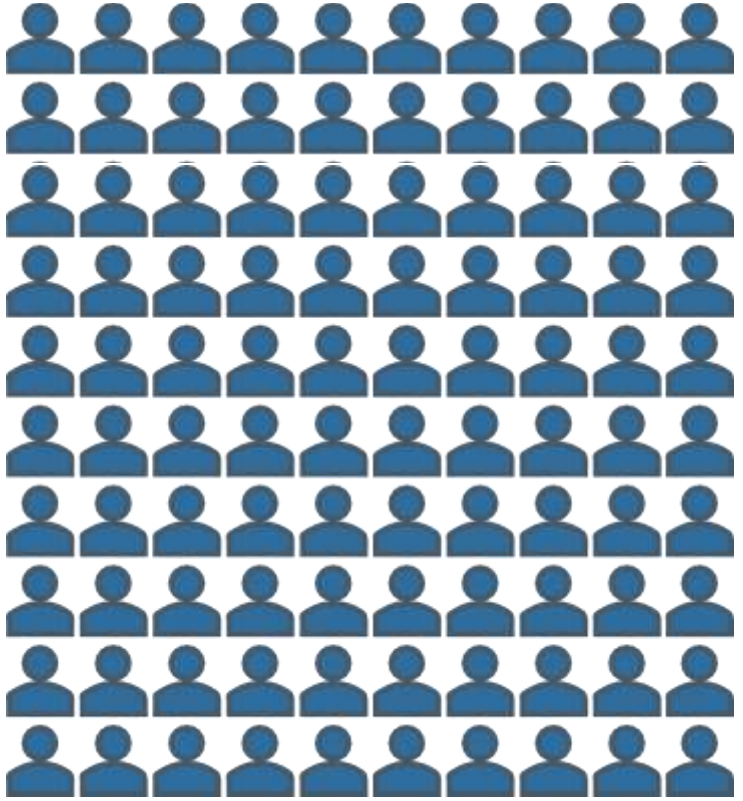
What is the curb cut effect?



Where in school buildings are our students spending their time?

Where are our students spending their time?

For every 100 K-12 students in the United States:

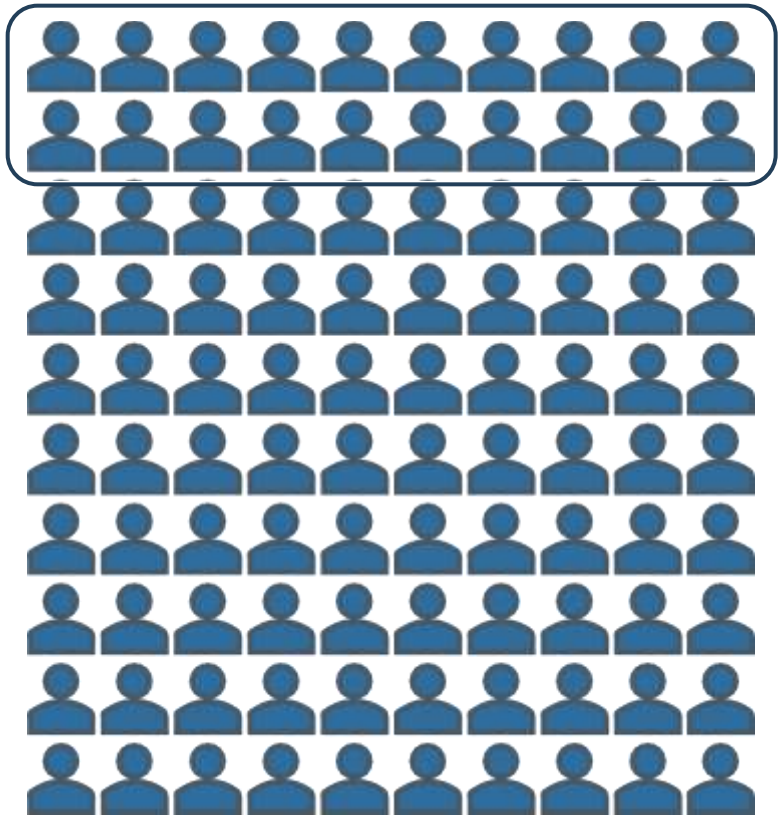


Where are our students spending their time?

For every 100 K-12 students in the United States:

20%

have learning or attention issues



Where are our students spending their time?

For every 100 K-12 students in the United States:

20% have learning or attention issues.

2% receive classroom accommodations in a general education setting.

6% receive special education services (Individualized Education Plan) in both the special education setting and the general classroom.

1 in 3 receive special education services full time in a special education setting.

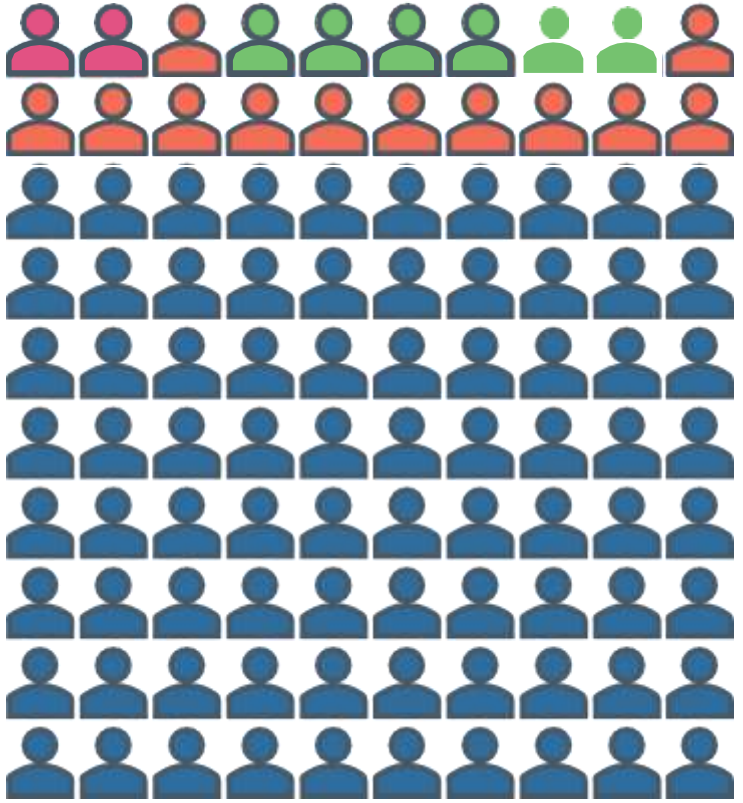
12% have learning or attention issues, but receive no special services.

Where are our students spending their time?

For every 100 K-12 students in the United States:

98%

of students spend the majority of their day in the **general education environment**.



How can learning environments support how all students learn?

Supporting UDL

But, what about when individual students gravitate toward quite different environments?

Design Approach

- Focus on spatial solutions that support a wide range of learners without causing disruption to any individual learner's educational experience.

- Provide individual choice and customization where practical.

How can we design learning environments that respond to **all students**?

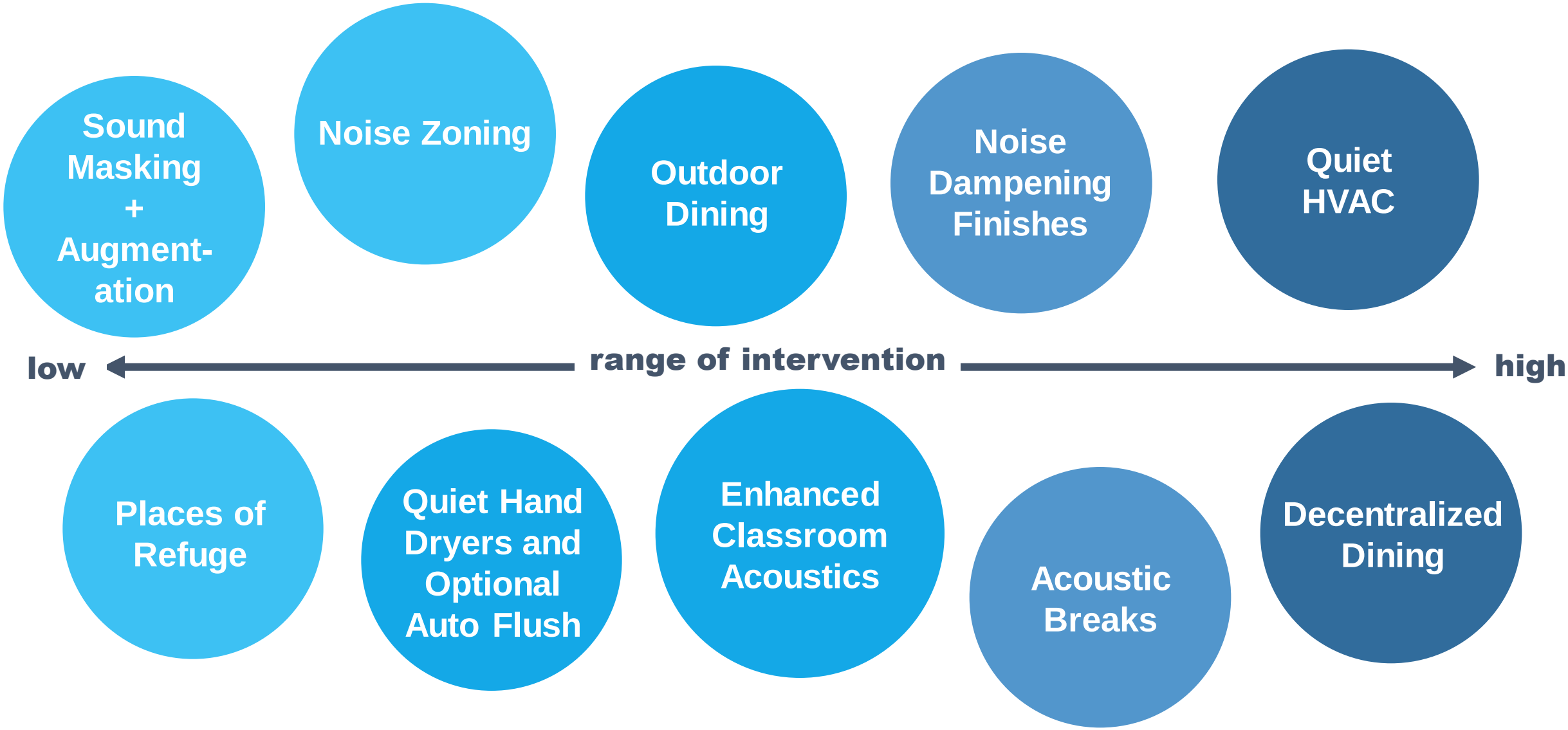
Acoustic	Visual	Kinesthetic + Tactile	Biophilic

Acoustics

- The design of a building/space crafts the acoustic environment.
- When general noise levels are too high, or the volume level of the speaker is too low, all children must strain to hear and devote greater mental resources to processing auditory information.
- High noise levels required building users to raise voices in order to be heard, leading to vocal fatigue and further increasing noise levels.
- For some students, increased noise levels are especially disturbing as their brains cannot filter as well as neurotypical people.
- Students with auditory processing delays or hearing impairments are at a further disadvantage.

The excessive noise observed in the school environment can cause damages or losses to the learning process as well as risks to the health of teachers and students, such as physical, mental and social impairments, including, among them, hearing loss.

Acoustic Strategies



Acoustic Strategies

Sound Masking + Augment-ation

Noise Zoning

Outdoor Dining

Noise Dampening Finishes

Quiet HVAC

low ← range of intervention → high

Places of Refuge

Quiet Hand Dryers and Optional Auto Flush

Enhanced Classroom Acoustics

Acoustic Breaks

Decentralized Dining

Acoustic Strategies

Sound Masking + Augment-ation

Noise Zoning

Outdoor Dining

Noise Dampening Finishes

Quiet HVAC

low ← range of intervention → high

Places of Refuge

Hand Dryers & Auto Flush

Enhanced Classroom Acoustics

Acoustic Breaks

Decentralized Dining

Acoustic Strategies

Outdoor Dining

Sound Masking + Augment-ation

Noise Zoning

Noise Dampening Finishes

Quiet HVAC

low ← range of intervention → high

Places of Refuge

Quiet Hand Dryers and Optional Auto Flush

Enhanced Classroom Acoustics

Acoustic Breaks

Decentralized Dining

Acoustic Strategies

Sound Masking + Augment-ation

Noise Zoning

Outdoor Dining

Noise Dampening Finishes

Quiet HVAC

low ← range of intervention → high

Places of Refuge

Quiet Hand Dryers and Optional Auto Flush

Enhanced Classroom Acoustics

Acoustic Breaks

Decentralized Dining

Acoustic Strategies

Sound Masking + Augment-ation

Noise Zoning

Outdoor Dining

Noise Dampening Finishes

Quiet HVAC

low ← range of intervention → high

Places of Refuge

Quiet Hand Dryers and Optional Auto Flush

Enhanced Classroom Acoustics

Acoustic Breaks

Decentralized Dining

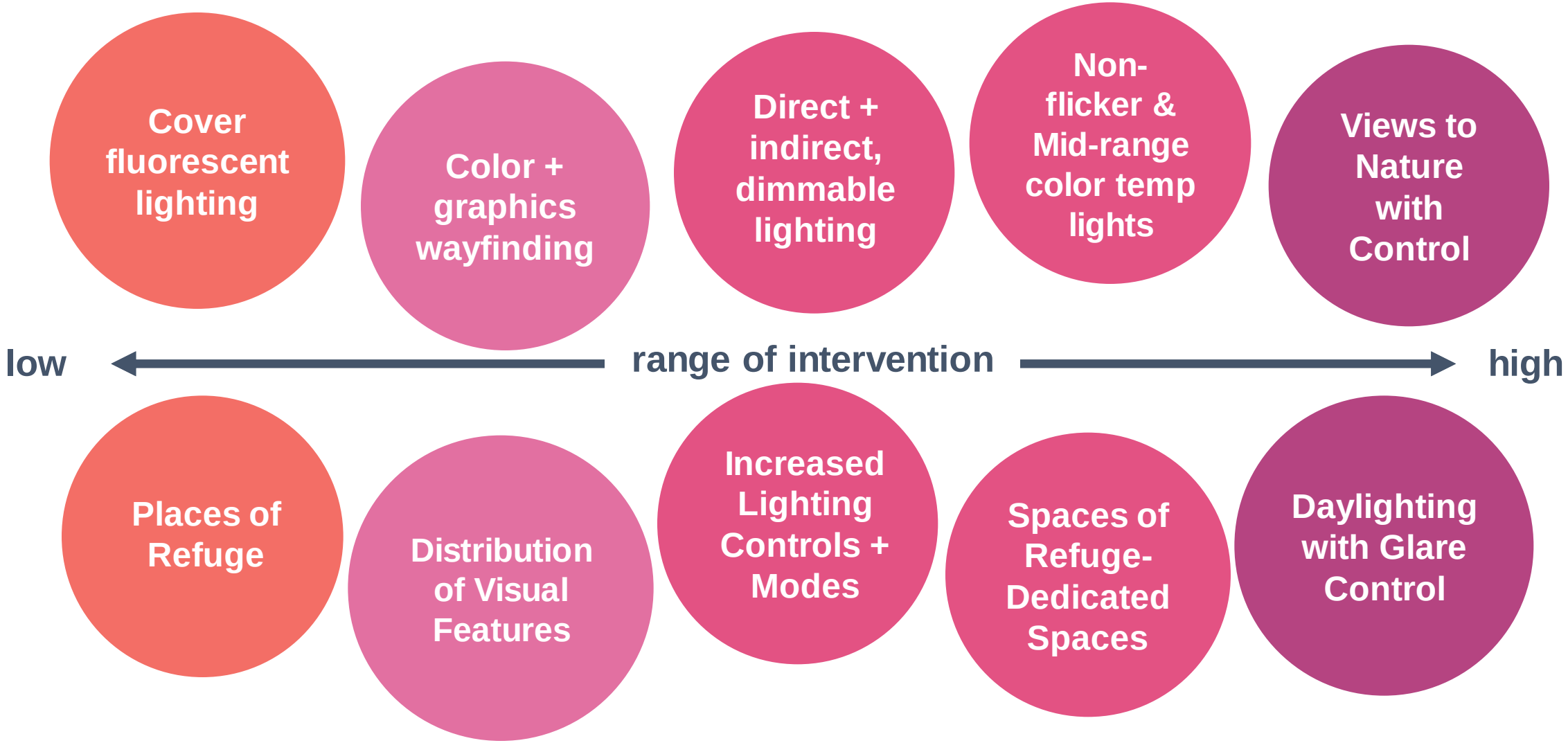
Visual

Overstimulating visual elements distract and make processing target information more difficult and can cause distress

- Flicker of fluorescent or LED lights
- Dense classroom and corridor visuals
- Harsh or strong light and glare
- Light that cannot be controlled by building users
- Wayfinding: School buildings can be difficult to navigate, causing stress and anxiety in students

In seeking students' voices regarding their personal interpretations of 'visual clutter' in classrooms, light was shed on four themes: color palette, feature congestion, affordances, and spatial size, which were each shown to elicit negative emotional responses from the students.

Visual Strategies



Visual Strategies

Cover fluorescent lighting

Color + graphics wayfinding

Direct + indirect, dimmable lighting

Non-flicker & Mid-range color temp lights

Views to Nature with Control

low ← range of intervention → high

Places of Refuge

Distribution of Visual Features

Increased Lighting Controls + Modes

Spaces of Refuge-Dedicated Spaces

Daylighting with Glare Control

Visual Strategies

Color + graphics wayfinding

Cover fluorescent lighting

Direct + indirect, dimmable lighting

Non-flicker & Mid-range color temp lights

Views to Nature with Control

low ← range of intervention → high

Places of Refuge

Distribution of Visual Features

Increased Lighting Controls + Modes

Spaces of Refuge-Dedicated Spaces

Daylighting with Glare Control

Visual Strategies

Cover fluorescent lighting

Color + graphics wayfinding

Direct + indirect, dimmable lighting

Non-flicker & Mid-range color temp lights

Views to Nature with Control

low ← range of intervention → high

Places of Refuge

Increased Lighting Controls + Modes

Spaces of Refuge-Dedicated Spaces

Daylighting with Glare Control

Distribution of Visual Features

Visual Strategies

Cover fluorescent lighting

Color + graphics wayfinding

Direct + indirect, dimmable lighting

Non-flicker & Mid-range color temp lights

Views to Nature with Control

low ← range of intervention → high

Places of Refuge

Distribution of Visual Features

Increased Lighting Controls + Modes

Daylighting with Glare Control

Spaces of Refuge

Visual Strategies

Non-flicker Lighting w/ mid-range color temp

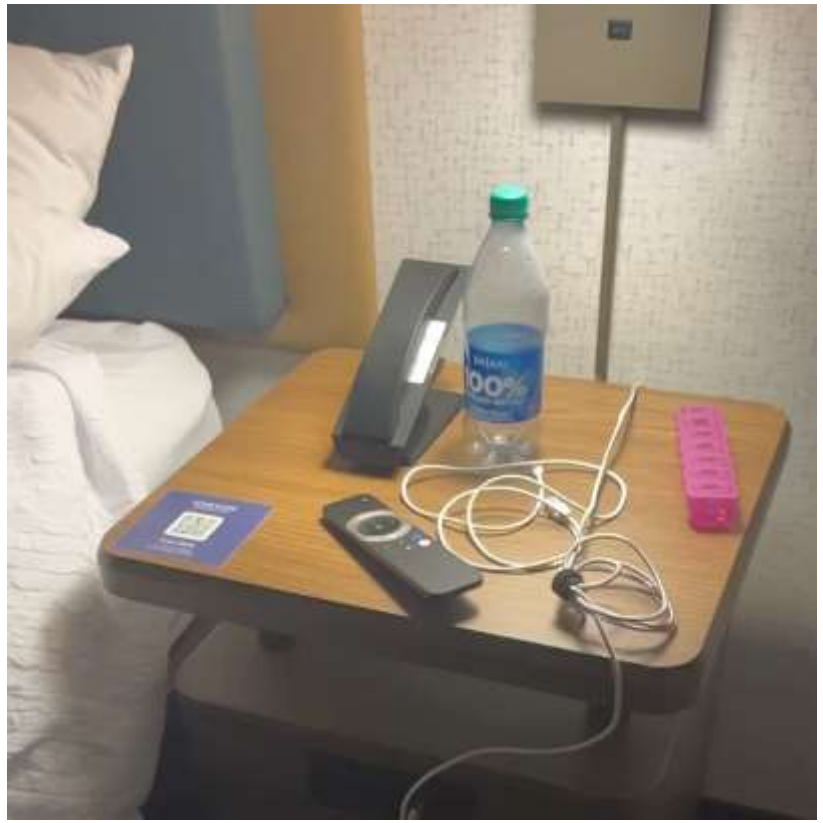
- Cover fluorescent lighting
- Color + graphics wayfinding
- Direct + indirect, dimmable lighting
- Views to Nature with Control

low ← range of intervention → high

- Places of Refuge
- Distribution of Visual Features
- Increased Lighting Controls + Modes
- Spaces of Refuge-Dedicated Spaces
- Daylighting with Glare Control

Visual

Taking a slo-mo video with your phone can show which lights are flickering.



Kinesthetic + Tactile

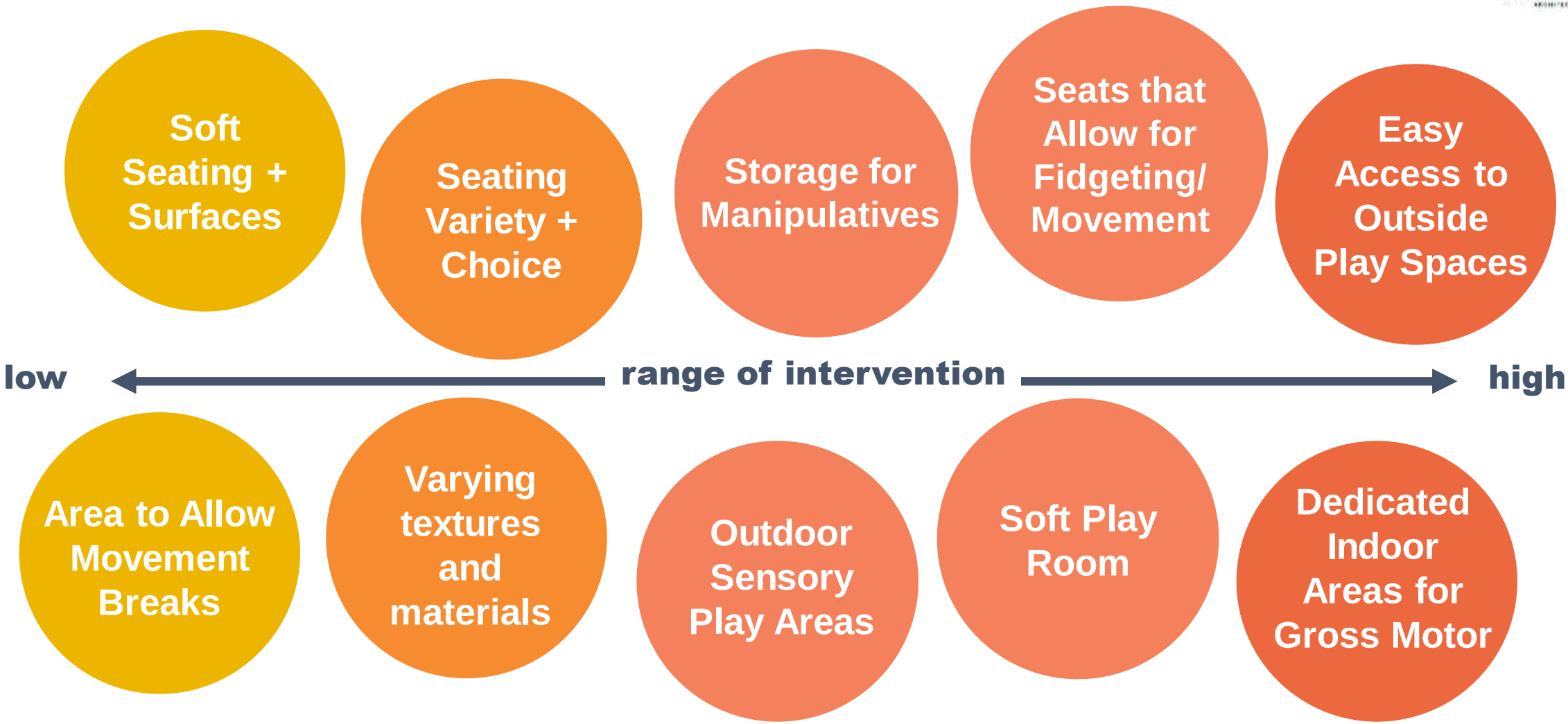
Movement and Touch can increase attentiveness and content retention

- Sensory seekers (especially those with ADHD) find wiggling increases concentration
- Different positions can be helpful for different learners, ex: feet flat on the floor for dyspraxia/dysgraphia
- Variety of seating and option for choice is beneficial

Dyslexia and Learning Disabilities Are Impacted by the Haptic System

There is evidence that children with moderate learning disorders often have poorly functioning visual, auditory, or vestibular (balance) systems which can contribute to their lack of attention, task avoidance, behavior issues, and self-regulation.

Kinesthetic + Tactile Strategies



Kinesthetic + Tactile Strategies

Soft Seating + Surfaces

Seating Variety + Choice

Storage for Manipulatives

Seats that Allow for Fidgeting/ Movement

Easy Access to Outside Play Spaces

low ← range of intervention → high

Area to Allow Movement Breaks

Varying textures and materials

Outdoor Sensory Play Areas

Soft Play Room

Dedicated Indoor Areas for Gross Motor

Kinesthetic + Tactile Strategies

Soft Seating + Surfaces

- Seating Variety + Choice
- Storage for Manipulatives
- Seats that Allow for Fidgeting/ Movement
- Easy Access to Outside Play Spaces

low ← range of intervention → high

- Area to Allow Movement Breaks
- Varying textures and materials
- Outdoor Sensory Play Areas
- Soft Play Room
- Dedicated Indoor Areas for Gross Motor

Kinesthetic + Tactile Strategies

Soft Seating + Surfaces

Seating Variety + Choice

Storage for Manipulatives

Seats that Allow for Fidgeting/ Movement

Easy Access to Outside Play Spaces

low ← range of intervention → high

Area to Allow Movement Breaks

Varying Textures and Materials

Outdoor Sensory Play Areas

Soft Play Room

Dedicated Indoor Areas for Gross Motor

Kinesthetic + Tactile Strategies

Seating Variety + Choice

Soft Seating + Surfaces

Storage for Manipulatives

Seats that Allow for Fidgeting/ Movement

Easy Access to Outside Play Spaces

low ← range of intervention → high

Area to Allow Movement Breaks

Varying textures and materials

Outdoor Sensory Play Areas

Soft Play Room

Dedicated Indoor Areas for Gross Motor

Kinesthetic + Tactile Strategies

Seats that Allow for Fidgeting/ Movement

Soft Seating + Surfaces

Seating Variety + Choice

Storage for Manipulatives

Easy Access to Outside Play Spaces

low ← range of intervention → high

Area to Allow Movement Breaks

Varying textures and materials

Outdoor Sensory Play Areas

Soft Play Room

Dedicated Indoor Areas for Gross Motor

Think of a treasured, core childhood memory.

Time for a Poll

Think of a treasured, core childhood memory.
Were you outside or inside?

A. Outside
B. Inside

Time for a Poll

Biophilic

Biophilic elements in buildings have been shown to have numerous benefits to the learning environment.

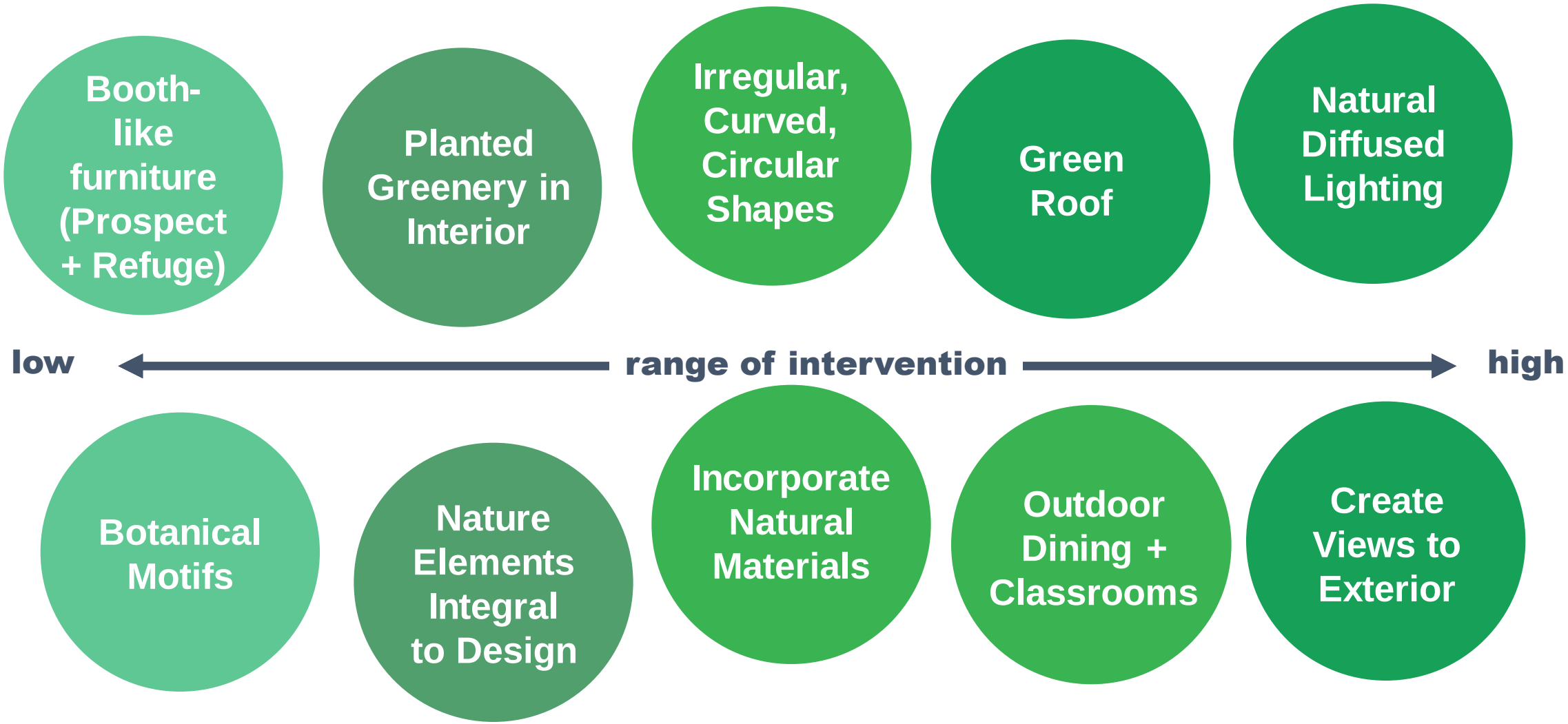
- Visual connections with nature lower blood pressure and heart rate, improve mental engagement and attentiveness
- Natural materials improve creative performance
- Prospect and refuge reduce stress, boredom, irritation and fatigue, improve concentration, attention
- Natural light positively impacts circadian system functioning

Attention Restoration Theory

suggests that mental fatigue and concentration can be improved by time spent in, or looking at, nature.

Exposure to natural environments encourages **more effortless brain function**, thereby allowing it to recover and replenish its directed attention capacity.

Biophilia Strategies



Biophilia Strategies

Prosect + Refuge

Planted Greenery in Interior

Irregular, Curved, Circular Shapes

Green Roof

Natural Diffused Lighting

low ← range of intervention → high

Botanical Motifs

Nature Elements Integral to Design

Incorporate Natural Materials

Outdoor Dining + Classrooms

Create Views to Exterior

Biophilia Strategies

Booth-like furniture (Prospect + Refuge)

Planted Greenery in Interior

Irregular, Curved, Circular Shapes

Green Roof

Natural Diffused Lighting

low ← range of intervention → high

Botanical Motifs

Nature Elements Integral to Design

Incorporate Natural Materials

Outdoor Dining + Classrooms

Create Views to Exterior

Biophilia Strategies

Interior Greenery

Booth-like furniture (Prospect + Refuge)

Irregular, Curved, Circular Shapes

Green Roof

Natural Diffused Lighting

low ← range of intervention → high

Botanical Motifs

Nature Elements Integral to Design

Incorporate Natural Materials

Outdoor Dining + Classrooms

Create Views to Exterior

Biophilia Strategies

Booth-like furniture (Prospect + Refuge)

Planted Greenery in Interior

Irregular, Curved, Circular Shapes

Green Roof

Natural Light

low ← range of intervention → high

Botanical Motifs

Nature Elements Integral to Design

Incorporate Natural Materials

Outdoor Dining + Classrooms

Create Views to Exterior

Biophilia Strategies

Booth-like furniture (Prospect + Refuge)

Planted Greenery in Interior

Irregular, Curved, Circular Shapes

Green Roof

Natural Diffused Lighting

low ← range of intervention → high

Botanical Motifs

Nature Elements Integral to Design

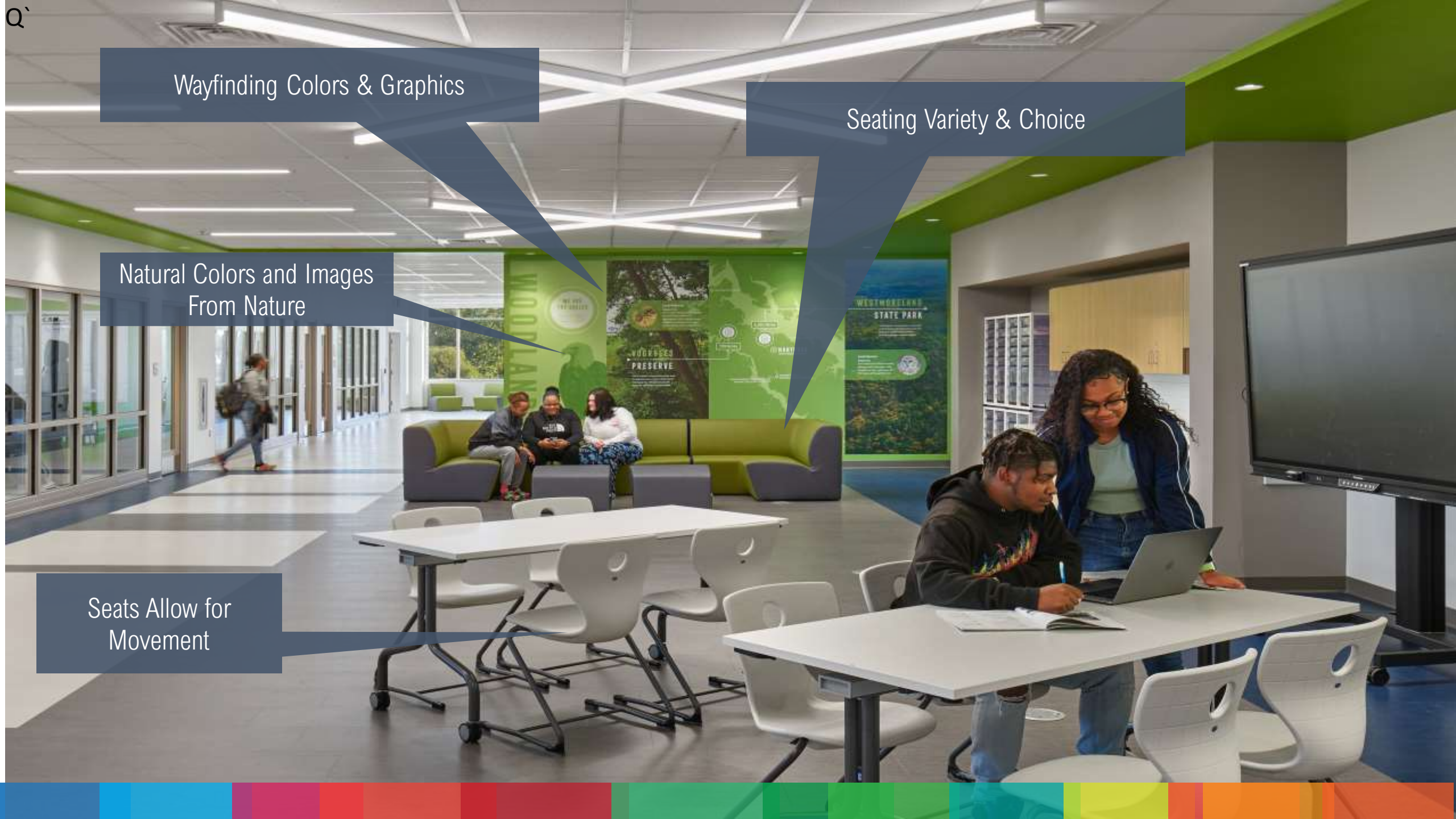
Incorporate Natural Materials

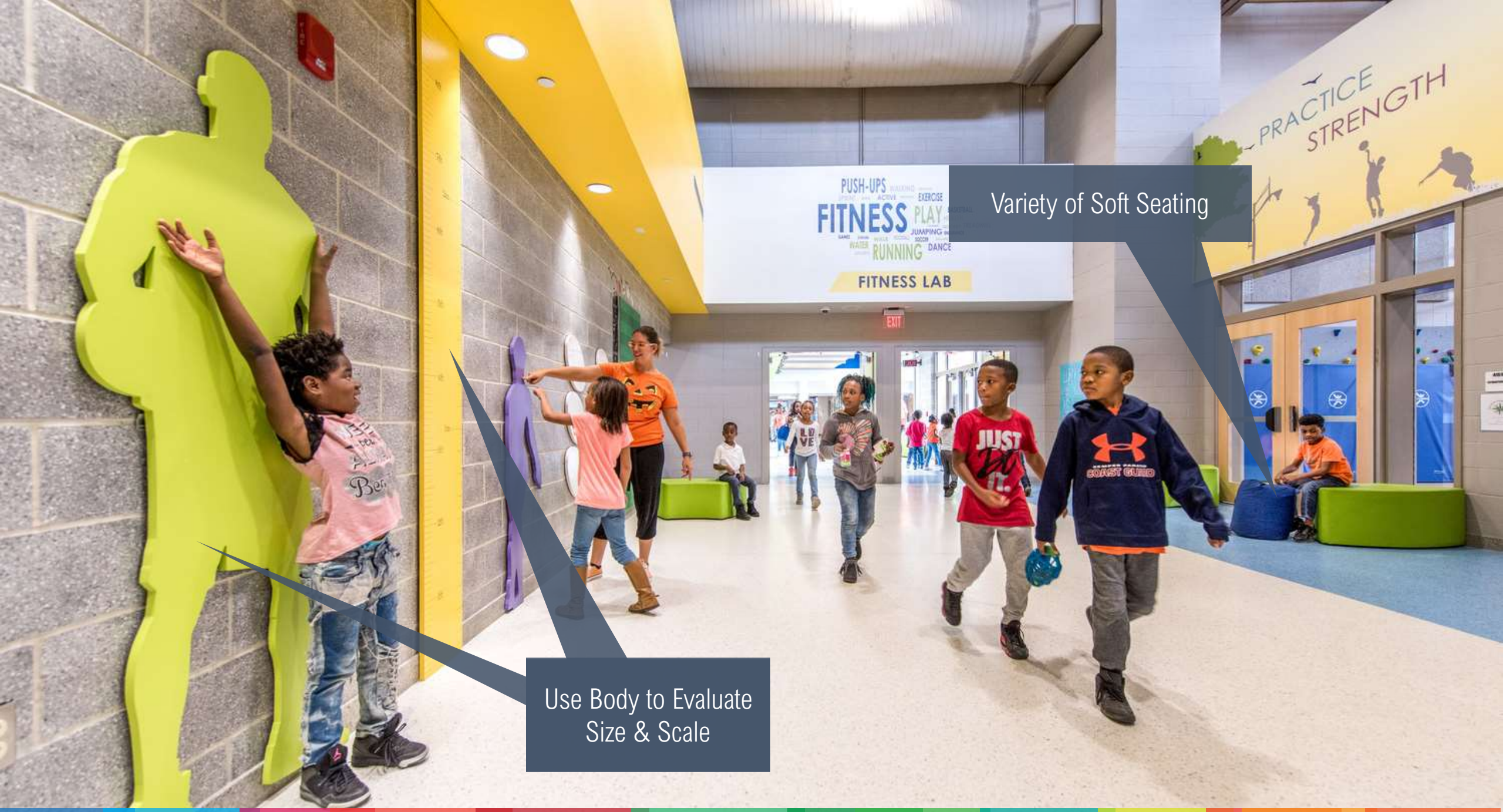
Outdoor Dining + Classrooms

Create Views to Exterior

Let’s look at some spaces.

Q`


Wayfinding Colors & Graphics
Seating Variety & Choice
Natural Colors and Images From Nature
Seats Allow for Movement
PRESERVE
STATE PARK


Variety of Soft Seating
Use Body to Evaluate Size & Scale
PUSH-UPS
FITNESS
PLAY
RUNNING
DANCE
FITNESS LAB
EXIT
PRACTICE STRENGTH


Daylight & Views to Nature
Lower Table Height
Variety of Soft Seating
Space of Refuge


Elements of Nature in Design
Daylight & Views to Nature
Natural Materials
Seating Variety

What are some potential challenges & solutions?

Challenge

Pedagogies change frequently and we expect our buildings to last at least 50 years. If we build for today's thinking, our building won't stand the test of time.

Solution

Focus on measures that provide a friendlier environment to all students and do not represent a building organization based on the latest methods of teaching term.

Examples: acoustic dampening in large spaces, dimmable lighting, classroom acoustics, and straightforward wayfinding.

Challenge

Our constituency views these types of features in schools as unnecessary and wasteful of public money.

Solution

Emphasize the link between the quality of learning environment and increased student performance and outcomes. For more information on this data, please see the reference section of this document

Challenge

This all looks great, but we have really limited resources.

Solution

- Focus on easier to implement strategies
- Implement in common areas such as a media center.
- Use these short-term interventions as momentum to build up to more significant interventions long term.

For More Information

Please see our publication, including references and further explanations of each strategy.

Thank you!

Emily J. Wright, RA, LEED AP
Associate
ewright@gparch.com

Laura Smyles, AIA, WELL AP
Senior Associate
lsmyles@gparch.com

G+P
GRIMM + PARKER
ARCHITECTS