

Schedule

Class Rules

How does our Classroom help us learn?
How does natural light help us focus + feel calm?
How do shapes + patterns in nature help us relax + pay attention?
How do natural textures + materials make us feel safe
How do colors + images from nature inspire us?
How do our nature spaces make you feel different from the rest of the room?

Learning without Limits +

How Biophilic Design Supports Students with Special Needs.

CRAIG
GAULDEN
DAVIS **PKX**

 GREENVIEW LE COUNTY
SCHOOLS

THE UNIVERSITY OF
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+ The People Behind the Work



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+ The Impact of Biophilic Learning Spaces on Student Success

15 EXPERIENCES OF NATURE

1. VISUAL CONNECTION W/ NATURE



2. NON-VISUAL CONNECTION W/ NATURE



3. NON-RHYTHMIC SENSORY STIMULI



4. THERMAL & AIR FLOW VARIABILITY



5. PRESENCE OF WATER



6. DYNAMIC & DIFFUSE LIGHT



7. CONNECTION W/ NATURAL SYSTEMS



8. BIOMORPHIC FORMS & PATTERNS



9. MATERIAL CONNECTION W/ NATURE



10. COMPLEXITY & ORDER



11. PROSPECT



12. REFUGE



13. MYSTERY



14. RISK/PERIL



15. AWE



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The Impact of Biophilic Design;
What the Evidence Reveals

**Bethel-Hanberry
Elementary School**

[Findings to be included]

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The Impact of Biophilic Design;
What the Evidence Reveals

Baltimore School

[Findings to be included]

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The Impact of Biophilic Design;
What the Evidence Reveals

Bookman Road School

[Findings to be included]

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+ Why this Matters

The Gap is Real

Existing educational research focuses primarily on general education; benefits for students with Emotional and Behavioral Disorders (EBD) remain largely unexplored.

A First of Its Kind

The first empirical study to investigate research-based biophilic classroom design for students with EBD in self-contained education settings.

Design as Intervention

Can the built environment serve as a tool for regulation, re-engagement, and well-being for these learners?

+ First Empirical Test of Biophilic Design



The Problem Statement



For students with emotional, behavioral, and sensory needs, resilience is a daily process. Compliance-driven facilities rarely offer a place to recover without leaving the room and losing instruction.



The Central Question



Can the physical environment become an active classroom resource offering regulation, movement, privacy, nature, and varied participation rather than a neutral container?



What Intervention Changed



Redesigned rooms added natural light and views, biomorphic forms, sensory-rich materials, calming refuge spaces, movement-supportive furnishings, and structured student choice.



What we Expected to Learn



Not that design prevents every difficult moment. The question was whether it helps students manage those moments while staying connected to teachers, instruction, and school.

+ Year-Long Comparative Study

[photo]

[photo]

Two redesigned, self-contained EBD classrooms compared with two control EBD classrooms

ONE

Mixed Methods

- + Year-long observations, surveys, and interviews.

TWO

External Measures

- + State and district referral, suspension-hour, absence, and academic growth data.

THREE

The Intervention

- + Complete biophilic renovation with views and access to nature, dynamic and diffuse light, biomorphic shapes and patterns, material connections with nature, prospect, refuge, and complexity and order.

+ The Spaces Students Named



Nature Retreat

- + Gardens, wood and forest imagery; peaceful and home-like.



The Lookout

- + Quiet elevated perch: away from noise without leaving the room.



The Shelter

- + Refuge for rocking, resting, brief resets.

+ Four Devices, Four Pathways

Each Element Targets a Different Mechanism:		
Element Biophilic Device	Proposed effect In Short	Pathway How It May Work
 View to nature Evergreen, deciduous garden	 Calming	☒ Mental breaks and attention restoration
 Dynamic light Tree-shadow print shades	 Comfort	☒ Daylight access, changing natural conditions
 Biomorphic pattern Grass carpet, wave ceiling	 Focus	☒ Easier visual processing, relaxed focus
 Reduced clutter Fewer teaching aids on walls	 Relief	☒ Visual relief, fewer extraneous stimuli

[Additional findings and formatting to be finalized]

+ Convergence Across Data Sources

Nature and
connection to
nature

Regulation in
the Room

Spatial Choice,
Taught Use,
and Agency

Well-Being

Engagement and
Re-engagement

[Additional findings and formatting to be finalized]

+ Nature and Connection to Nature

2.25 to 3.88

Student-rated connection to nature, a 1.63-point gain

+1.38

Points above comparison classrooms: 3.88 versus 2.50

22 of 46

Purpose-and-outcome events in the Nature Retreat

11 of 15

Chose window views as calming, happy, or focusing

[Quote from Research]

[Additional findings and formatting to be finalized]

+ Staying in the Room, Staying in Class

Regulation in the Room

Prior Year

Dysregulation Meant Leaving



+ Returning students had 1–2 elopements per month.



+ Students left the room when dysregulated.



+ Leaving the room interrupted their instruction.



+ Teachers left the room to accompany students.



Study Year

Resets Without Removal



+ No elopement attempts were reported.



+ Students used in-room spaces to reset.



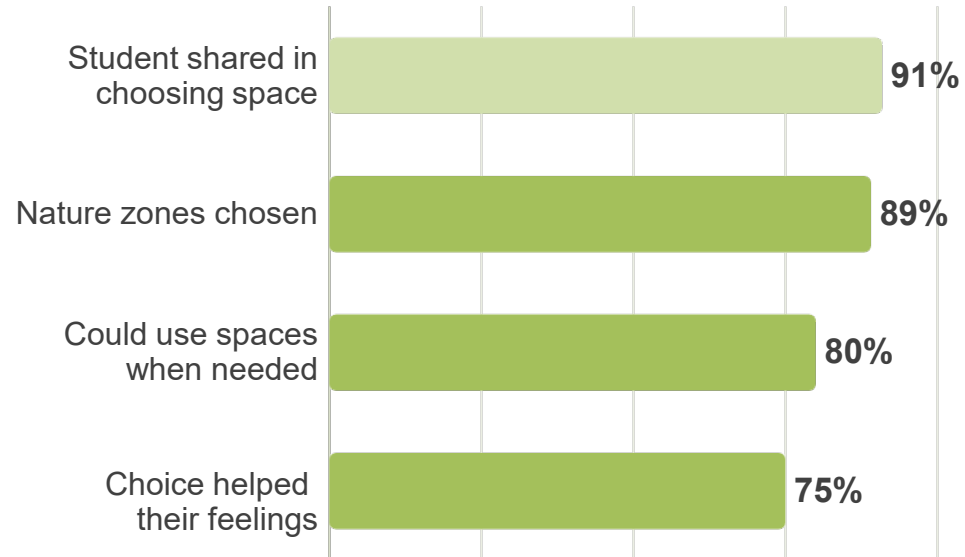
+ Students could still hear classroom instruction.



+ Teachers stayed for more face-to-face time.

Regulation inside the room keeps students connected to teachers and instruction

+ Spatial Choice, Taught Use, Agency



9/10

Students named a favorite or frequent place

2-5

Teacher rating for choice of regulating spaces

[Quote from Research]

[Additional findings and formatting to be finalized]

+ Well-Being

Students described the rooms as safe, cozy, peaceful, happy, and home-like.

8 of 11 well-being indicators increased following the redesign.

Feeling safe and secure rated higher in comparison rooms: 4.08 versus 3.72.

Teacher rating for the room supporting safety rose from 4 to 5.

Teachers valued natural light, outdoor views, the garden, and added instructional places.

10 of 11

Shared indicators higher

Spring comparison: redesigned classrooms outscored comparison classrooms on 10 of 11 shared indicators.

[Quote from Research]

[Additional findings and formatting to be finalized]

+ Engagement and Re-engagement

Regulation led to work

12 of 15 emotional-regulation events also resulted in engagement with classwork during observation visits.

Focus in the zones

9 of 16 students chose 'focused for learning' for the Nature Retreat; 6 of 17 for the Lookout and 7 of 17 for the Shelter.

Learning in place

Students completed work in the Lookout, took part in instruction from the Nature Retreat, and worked from the carpet after breaks.

What this asks of design

Regulating spaces work when they are taught, structured, nature-rich, and kept inside the room rather than outside it.

[Quote from Research]

[Additional findings and formatting to be finalized]

+ A Building People Feel Welcome In



98%

Of teacher's believe
design promotes
learning and new
teaching methods

100%

Of parents feel
welcome in the
building

100%

Of parents say
their children are
happy there

88%

Of students like
collaborating outside
the classroom

+ Additional Research Findings

Research Findings & Emerging Themes

- Data Slides to be developed after analysis completed in Oct

Focus:

- Emerging observations
- Student and teacher feedback
- Behavioral and engagement themes
- Environmental patterns observed
- Transferable implications
- Include one brief discussion around adjustments, surprises, or lessons learned to increase authenticity and credibility.

[Quote from Research]

[Additional findings and formatting to be finalized]

Dysregulation Ends in Removal from Instruction

When a student dysregulates, leadership often removes them from the room. That means missed instruction, exposing environments never designed to hold students who cannot manage within them.

“Removal solves the disruption but not the student's need to learn.”

Removal as Default

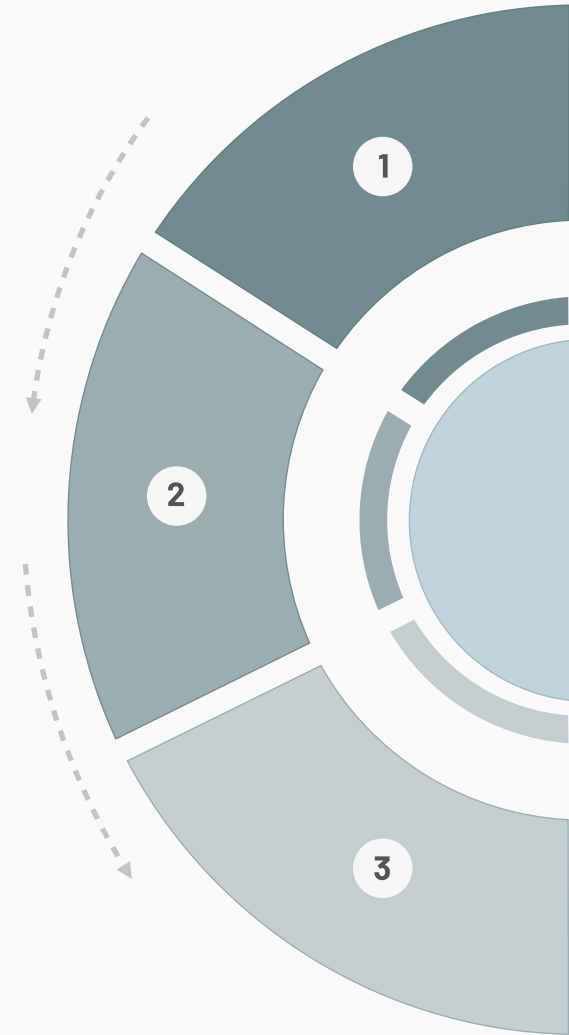
Dysregulation is most often met with exclusion from the room.

Instruction is Lost

Time away from the classroom means missed learning, not just missed behavior.

A Design Mismatch

Traditional environments were not built for students who cannot self-manage within them.



+ Everyday Resilience, Defined



Resilience Is a Daily Process

- + For students with emotional, behavioral, and sensory needs, it is lived moment to moment



The Room as Active Resource

- + Places for regulation, movement, privacy, nature connection, and varied participation.



Stay Connected, Not Removed

- + Design helps students manage hard moments while staying with teachers and instruction.



Choice Must Be Taught

- + Options alone do not build agency; adults must teach how and when to use each space.

+ Students Calmed Down Inside the Room



A Clear Reset Sequence

Students described a clear sequence: upset, use a space, feel better, return to work.



Varied Regulation Tools

Regulation tools varied: rocking, spinning, swinging, resting, quiet, outdoor views.



The Value of Brief Resets

Brief resets mattered. "I cooled down like five minutes." "It rocks me calm."



Regulation in the Classroom

Adults confirmed students often regulated without leaving the instructional environment.



Still Limits of Intervention

Not a cure: some afternoon resets still took about 30 minutes to complete.



8/10 Students Described:

Certain spaces that helped them calm down in the redesigned classrooms.

+ The Experience is the Outcome

"I'm allowed to change location depending on what I need."

Student at Greenville County Schools District



"I feel safe in here. I feel like I'm at home, because I'm very comfy in here."

Student at Greenville County Schools District



"Since it's more relaxing in here and I could think" (his math benchmark) "went up 18 points from last year."

Student at Greenville County Schools District



"Usually when I'm like not calm, I get very stressed and then I start yelling. But like since I'm calm in this classroom, I like to like talk to people."

Student at Greenville County Schools District



+ Quotes from Teachers

[Quote]

Teacher

”

[Quote]

Teacher

”

[Quote]

Teacher

”

[Quote]

Teacher

”

+ Quotes from Administrators

[Quote]

Administrator

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[Quote]

Administrator

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[Quote]

Administrator

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[Quote]

Administrator

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Choice Becomes Agency when Taught

The room supports self-advocacy before students have words for what they need.

1 Structured Choice

"It promotes agency once you teach them how to use the spaces."

2 Chosen for a Reason

Chose spots by task, mood, sensory need, or routine, desks stayed valuable.

2 Support for Everyone

9 out of 10 students were about to name a favorite reset spot in the redesigned rooms.

“

I can refocus and calm down.
With less stress, I can get
back to what I'm doing.

- Sixth-grade student, Green Street Academy

”

+ What Students Reported

<half

Referrals, ISS hours,
absences vs. control

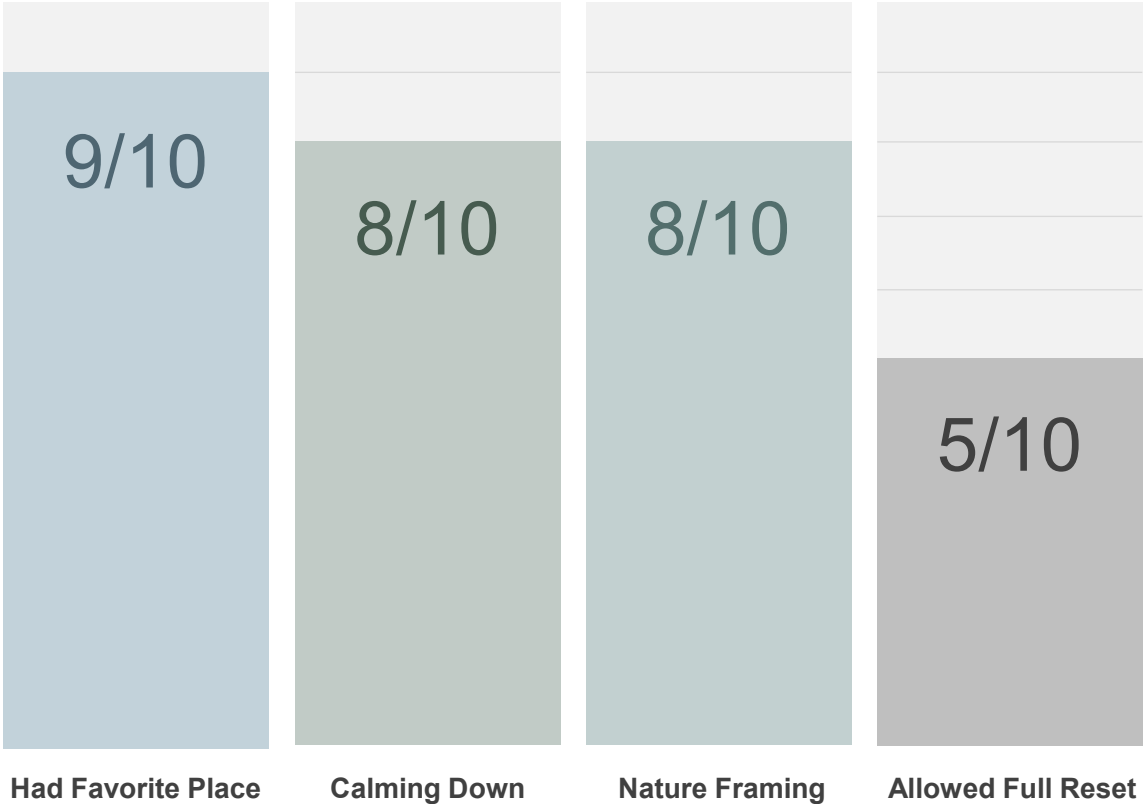
zero

Elopement incidents
during study year

18pts

One student's math
benchmark gain

*Student voice and outcome
data align; single gains
remain individual accounts.*



Interview themes across 10 students in the redesigned classrooms, with outcomes measured alongside

Tensions and Qualifications

Five findings that qualify the results and what each one asks of design practice.

Tension Observed in the study	Signal What it looked like	Qualifier Scale or condition	Implication For design practice
Resets, not cures Dysregulation still occurred	Afternoon resets	~30 minutes	Position design as a resource, not a cure
Privacy and contact Students valued each	Both desired	Both	Design for withdrawal and reconnection
Nature vs. imagery Views over patterned shades	Preference split	Direct <i>views</i>	Real nature may read differently than imagery
Choice can drift Avoidance, competing focus	Board instruction	Routines	Pair choice with clear routines and teaching
Design is not alone Maturity, peers, supports	Co-occurring factors	Multiple <i>influences</i>	Avoid attributing every change to design

[Additional findings and formatting to be finalized]

+ Five Recommendations for Practice



01

Design Beyond
Compliance



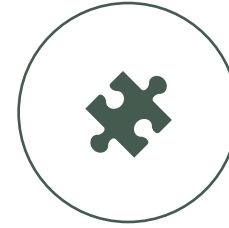
02

Keep Regulation
in the Room



03

Teach the
Spaces, Not Just
Offer Them



04

Design for
Withdrawal and
Reconnection



05

Test Intent After
Occupancy

Five moves that turn design intent into student experience.

Placeholder

Logos for all companies that donated to this project

+ Regulate without Leaving the Room

[before photo]

TRADITIONAL

Dysregulation Means Removal

- + Students removed from classroom to manage dysregulation
- + Removal causes missed instruction
- + Traditional environments don't work for all students
- + Redesigning the room, not removing the student, keeps learning intact.

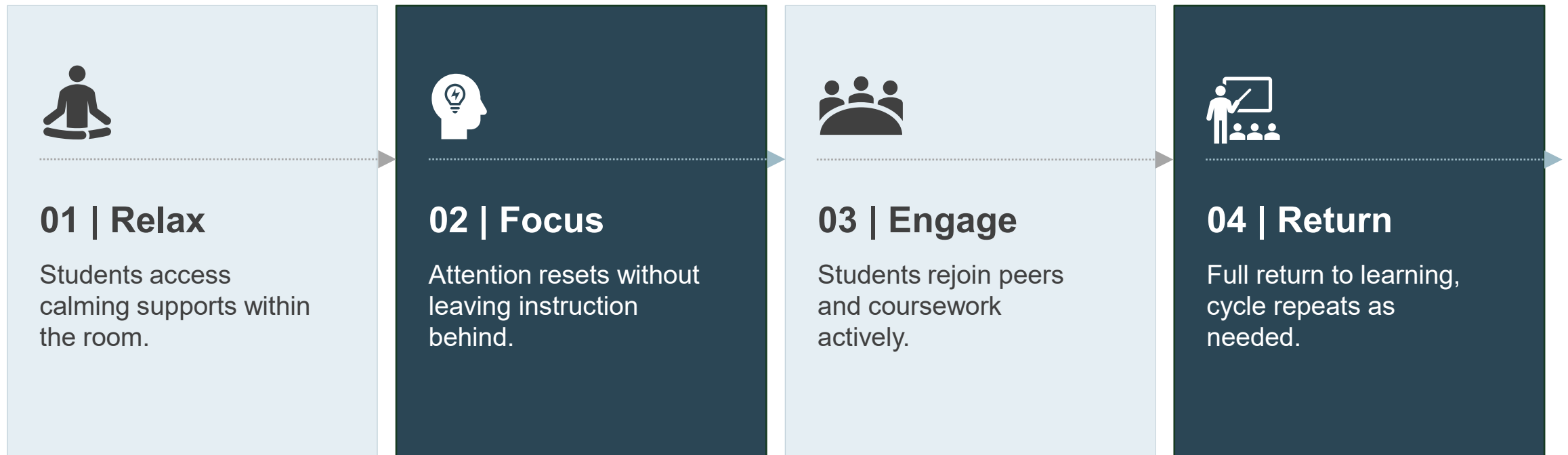
[after photo]

NEW DESIGN

Regulation Happens In-Room

- + Brief Bullet Point Here
- + Classroom designed to support self-regulation in place
- + Instruction and regulation support happen simultaneously
- + Goal: reduce exclusion from classroom learning

+ A Cycle Built Into the Classroom



Regulation Becomes Part of Learning, Not a Break From It.

+ From No Windows to a Garden



Before

- + Windowless room with average furniture, a source of distraction

The Resistance

- + Teachers initially did not want the window added

Now

- + Students plant a garden outside it, science happening in true form

+ Agency

[Additional findings and formatting to be finalized]

+ Student Quotes

Students hope other students could have helpful spaces like this

[Quote]

Student

”

[Quote]

Student

”

[Quote]

Student

”

[Quote]

Student

”

[Additional findings and formatting to be finalized]

+ Activity Instructions

Interactive Activity Designing for Student Support: Connecting Environment to Student Experience Lead: Facilitation + Shared Debrief

Focus:

- Applying research concepts to real classroom environments
- Connecting environmental features to student experience
- Considering regulation, engagement, comfort, and instructional access
- Translating design intent into observable student outcomes
- Encouraging practical discussion around inclusive classroom design

Activity Structure:

Participants will work in small groups using:

- Real classroom images from the intervention spaces
- A brief student persona card
- A feature-to-outcome worksheet

Groups will:

- Identify environmental features designed to support students
- Discuss how those features may support the specific student described
- Connect environmental strategies to possible student experiences and outcomes
- Consider how educators or districts might evaluate whether the strategy is effective
- Select one feature they believe may have the strongest positive impact for that student

Example Student Personas:

- Sensory-sensitive learner
- Student needing movement regulation
- Student benefiting from refuge and predictability
- Student requiring increased agency and choice

Guiding Questions:

- What design feature stands out most?
- Which feature might be most supportive for this student, and why?
- How could this strategy influence regulation, comfort, engagement, or participation?
- What might educators observe if the strategy is successful?
- How could this idea transfer to other learning environments?

Materials:

- Printed classroom images
- Student persona cards
- Sticky notes/markers
- Feature-to-outcome worksheet

Goal: Create an interactive, visually engaging discussion that helps participants connect environmental decisions to real student experiences without becoming overly theoretical or facilitation-heavy.

+ Thank You



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+ Research Informed Questions

What outcomes are we designing for?

1. What does research tell us about design elements, including biophilic and student-centered strategies, that improve student and teacher outcomes?
2. How does our design process align with academic priorities, stewardship responsibilities, and research-informed design?
3. How will the design process reflect community values and include diverse stakeholder voices?
4. How does this facility design ...
 - a. promote academic achievement?
 - b. promote engagement, belonging, calm, and emotional health and well-being?
 - c. promote teacher satisfaction, effectiveness, and retention?
 - d. promote safety?
 - e. reflect community culture?
5. What plan is in place to evaluate post-occupancy outcomes and support continuous improvement?

+ Potential District Actions to Strengthen Evidence-Based Design

ONE

Treat facilities as strategic learning investments to support district priorities.

TWO

Establish, monitor and evaluate teaching, learning, and well-being outcomes for major projects.

THREE

Involve stakeholders early in the design process and communicate learning-focused priorities and findings.

FOUR

Prioritize research/science-based design in policies, planning, and architect selection.

FIVE

Invest in post-occupancy evaluation of the design effects on student success and use findings for continuous improvement.

SIX

Support professional learning in how evidence-based design shapes teaching and learning, and effective/innovative space use.