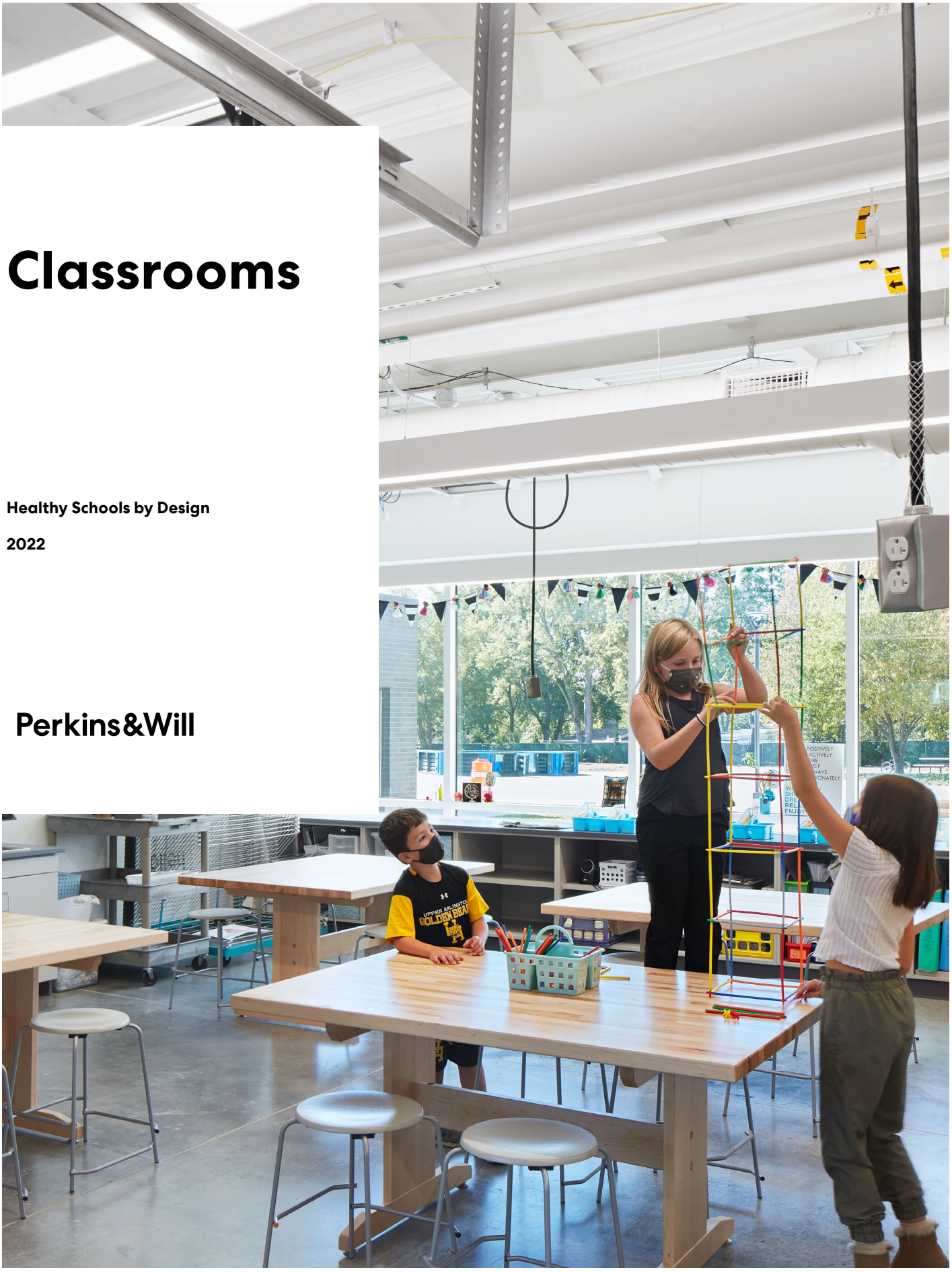
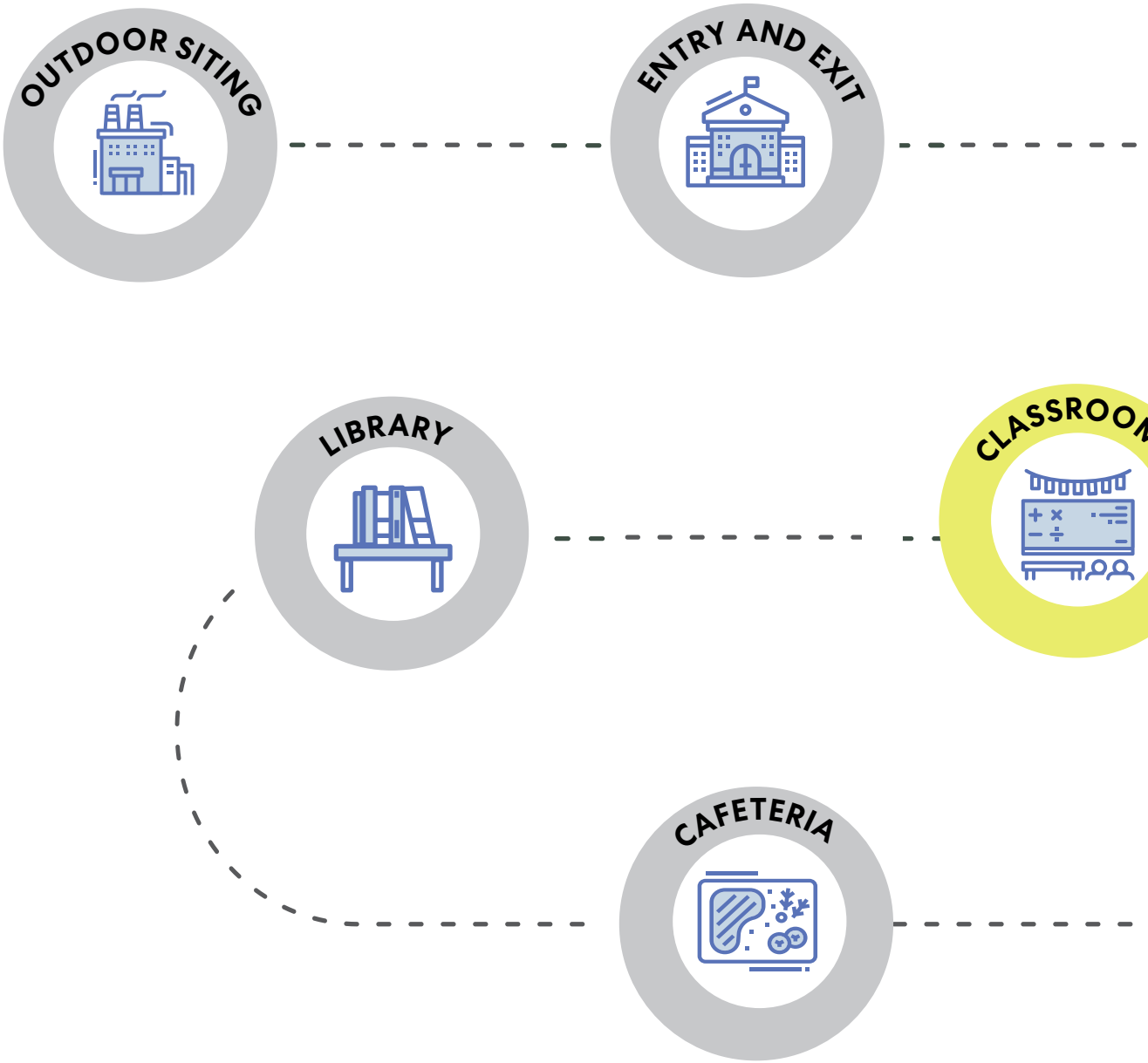
Classrooms

Healthy Schools by Design

2022

Perkins&Will





A DAY IN THE LIFE

Meet Riley

In the pages that follow, we invite you to imagine how these design interventions will impact Riley, an imaginary—but very real—student. We owe it to students like Riley to make school buildings as inviting, safe, and healthy as they can be.

Follow Riley's journey through school at
healthyk12.perkinswill.com/

CIRCULATION

MATERIALS

RESTROOM

NURSE

GYMNASIUM

Why you should read this!

- Of the 15,000 hours spent in school by the time they graduate 12th grade, **children spend most of that time in their classrooms.** This exposure to classroom environments can impact both academic and biological growth.
- According to a **National Center for Education Statistics Survey**, on average teachers have 14 years of experience and work approximately 53 hours a week. Therefore, teachers are susceptible to classroom conditions as well.
- **Older school buildings may contain harmful substances and features that are not optimized for student health and performance** including, windowless classrooms, high levels of background noise, lead in paint and drinking fountains, and asbestos.

Our Goal

This series is focused on translating research into practical design solutions that promote health in our K-12 schools. The guidance provided is based on the available information as of the date of publication and does not replace federal, state, or local public health recommendations. It aggregates best practices and innovative solutions at the intersection of buildings and school health. We encourage schools to reach out and seek expert advice on their unique circumstances.

Project: *Drew Charter Junior and Senior Academy*
Location: *Atlanta, Georgia*

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— Classrooms

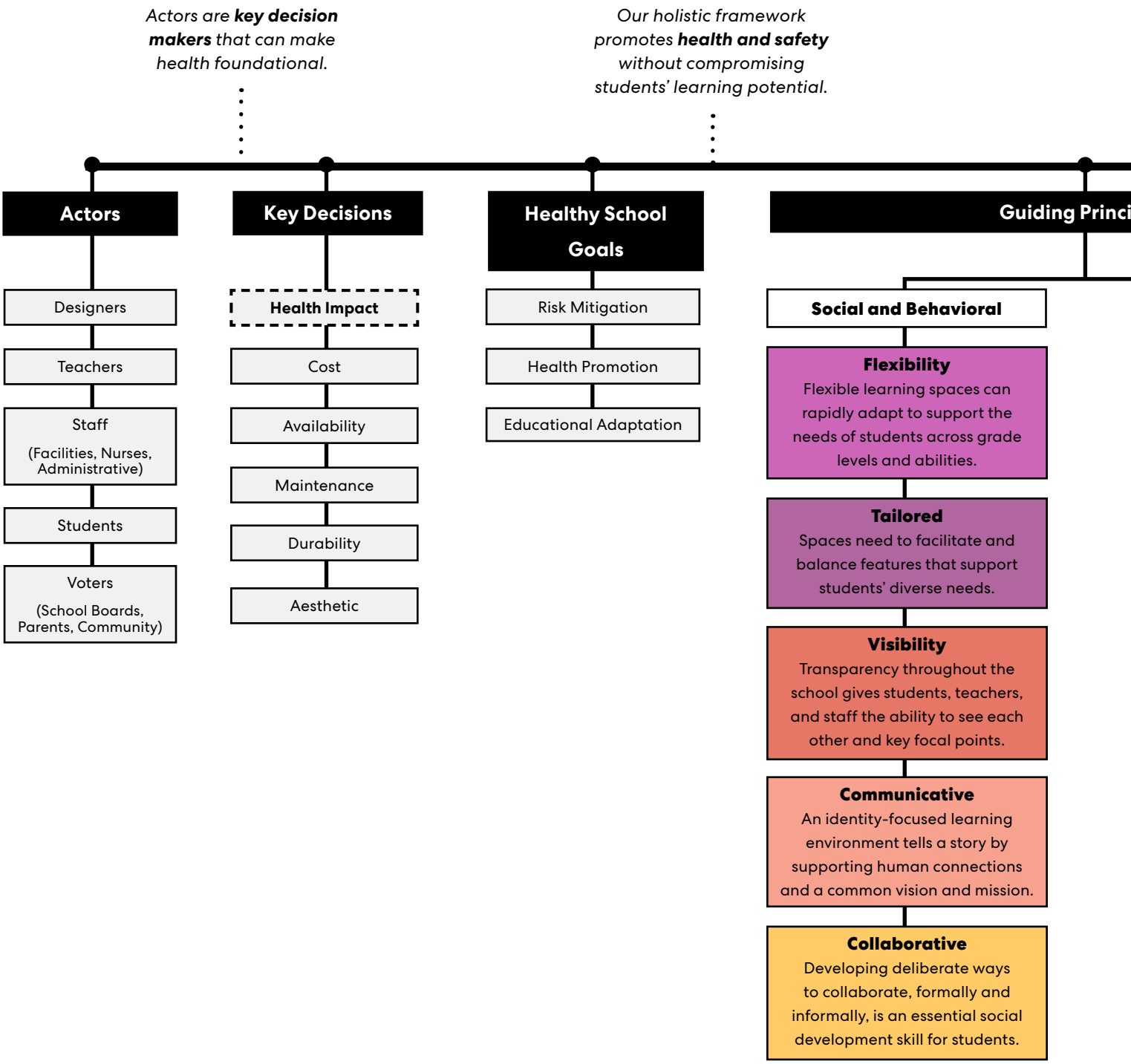
Each classroom is a community that supports students, staff, and the surrounding neighborhood. This can be achieved by giving special attention to teaching styles, student age and ability, social and environmental climate, building age, and design.

To ensure optimal health and learning potential, we have identified strategies to support overall wellbeing and achievement within the classroom. This requires examining two equally important parts:

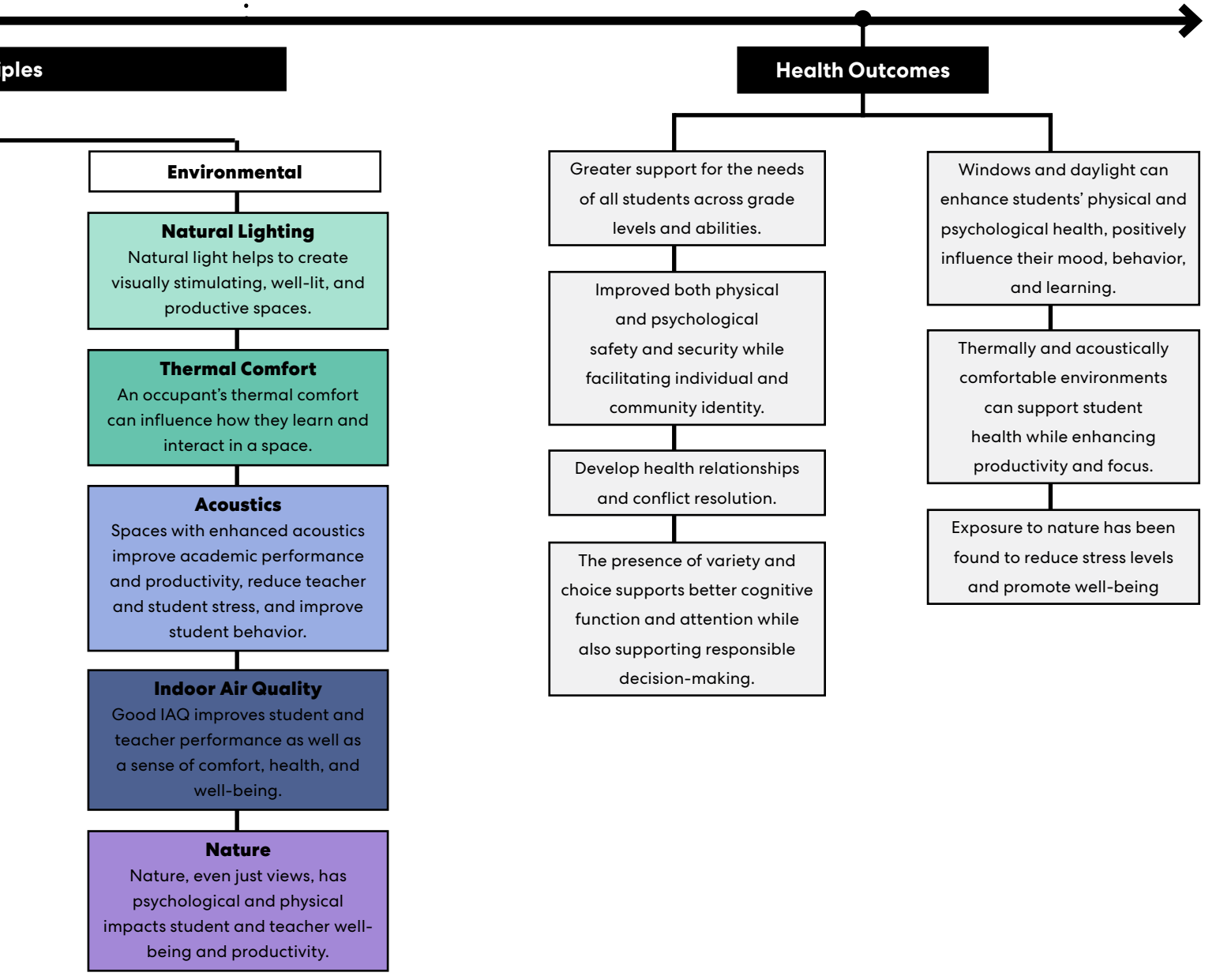
1. **Social and behavioral factors**
2. **Indoor environmental factors**

Here, we will explore both.

The Health Impacts of Classroom Design



*These strategies recognize a time of rapid academic and biological development and growth by addressing **universal conditions** that can be optimized for any age group.*



Strategies —— Guiding Principles Legend:

Flexibility *Tailored* *Visibility* *Communicative* *Collaborative*

Natural Lighting *Thermal Comfort* *Acoustics* *Indoor Air Quality* *Nature*

	STRATEGY	CATEGORY	NEW/EXISTING	IN YOUR SCHOOL?
C.1	**Zone classrooms** to include quiet areas or zones (nooks, pods, coves, etc.) for heads-down work and larger spaces for collaboration and group learning.	Risk Mitigation **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.2	Include large and small **collaborative areas** adjacent to classrooms that create opportunities for interactions between classes for community building.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.3	**Increase visibility by using transparent solutions** including strategic glazing and adjacencies to optimize learning and enhance collaboration.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** Existing Building	**O Yes** **O No** **O Not Applicable**
C.4	Promote **diversity of teaching methods** by offering teachers and students flexibility by including features such as garage doors, moveable furniture, dual purpose walls (writable/projectable), and modular walls that create a variety of space types.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.5	**Provide classroom technology to increase continual learning opportunities:** 360-degree cameras, microphones, multiple fixed and portable screens, and amplified acoustical systems so students can participate in-person or remotely.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.6	**Extend technology and internet** to allow for maximum flexibility, including outdoor learning spaces.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.7	Provide **desks, storage cubbies, or lockers with charging ports or include additional outlets**, as individualized technology increases the need for power for each student.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.8	Provide **flexible, mobile, in-class storage** to reduce physical and visual clutter, increase ease of cleaning, and promote focus.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.9	Provide **alternative furniture** (such as adjustable height desks and rocking chairs/ottomans). Studies show improvements in physical activity and attention for elementary students when a variety of options are provided.	Risk Mitigation **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**
C.10	**Cohesive and strategically located wayfinding graphics** and colors foster a welcoming, accessible learning environment.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**O Yes** **O No** **O Not Applicable**

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	STRATEGY	CATEGORY	NEW/EXISTING	IN YOUR SCHOOL?
C.11	**Offer direct and indirect access to the outdoors** through windows with views of nature and access to outdoors for nature-based learning opportunities.	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.12	**Optimize daylight for student alertness and to help regulate circadian rhythm**. Orient the building on an Easy-West axis to maximize sunlight while optimizing thermal and lighting needs.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	O **Yes** O **No** O **Not Applicable**
C.13	**Incorporate operable windows** for greater thermal control, psychological comfort, and increased natural ventilation during power outages.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	O **Yes** O **No** O **Not Applicable**
C.14	**Use enhanced daylighting strategies** (including light shelves, high reflective surfaces, skylights, etc.) to bring sunlight deeper into the space, while preventing increased solar radiation and glare.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.15	**Place main return and supply mechanical systems in the corridor** to serve each classroom independently to limit sound transfer from one room to another.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	O **Yes** O **No** O **Not Applicable**
C.16	**Design and/or provide classroom temperatures between 68F - 74°F** to support student performance and comfort.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.17	**Provide environmental control for teachers and staff** (e.g daylighting, temperature, etc.) by including dimmable lights, occupancy sensors, daylight and air quality sensors, window blinds, and classroom-specific thermostats.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.18	**Enhance acoustical performance** by increasing ceiling absorption (> .90 NRC), selecting flooring materials that dampen noise, and using sound absorption on strategic walls and at specific heights.	Risk Mitigation **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.19	**Educate teachers** about lighting and mechanical air filtration systems so they use the systems efficiently and effectively.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.20	**Replace dust-generating chalkboards** with whiteboards or screens to reduce damage to technology and improve indoor air quality.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**
C.21	Special attention should be paid to the classroom's **acoustics, lighting, tactility, and off-gassing odors** to support multisensory learning.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	O **Yes** O **No** O **Not Applicable**

Our aim is to support holistically healthy buildings, but we understand that each learning community is unique and has their own health priorities. Use these strategies as a starting point!

— Classrooms

Social and Behavioral Considerations

Schools are uniquely positioned to identify and mitigate daily mental health issues and offer support.

←
Holy Innocents' Episicopal School, Upper School Humanities Building

FLEXIBILITY

According to research, emotional awareness, expression, and regulation differ by student demographics. With the diverse student population in today's schools, social-emotional learning programs must be adaptable for specific student needs to effectively improve social-emotional competencies. Flexible learning environments can rapidly adapt to support the needs of students across grade levels and abilities. Examples include the flexibility to rearrange the room for different activities and providing a variety of furniture options for students to define how they participate and learn.

TAILORED

Tailored learning spaces respond to students' physical, educational, cultural, and social-behavioral needs. Their design and utilization are influenced by **Universal Design for Learning**, which relies on emerging research on how students learn. Spaces need to facilitate and balance features that support visual, auditory, kinesthetic, and reading and writing learners. **Personalized learning** spaces respond to rapidly developing students as each child brings a unique personal narrative to their learning environment. This is influenced by age, gender identity, emotional state, and home environment. Needs and preferences may shift due to daily or chronic personal challenges.

VISIBILITY

Visibility can be created throughout a school's hallway network by removing turns, alcoves, and blind spots. **Research tells us** that longer hallways may allow adults to detect bullying and harassment more quickly and prevent students from participating in risky behavior. Distributing teacher and staff meeting, planning, and work spaces may foster passive supervision throughout the school, even when teachers are not actively engaging students. **Studies have shown** that people-place cues and social wayfinding can improve psychological safety, and a nearby teacher or a public space with adult supervision can indicate that an area is safe to walk in alone.

COMMUNICATIVE

An identity-focused learning environment tells a story by sparking emotional human connections and supporting a common vision and mission. Communicative spaces establish and reinforce a school's values and expectations by using stories, graphics, wayfinding, and signage. Additionally, thoughtful communicative graphics and signage can **indirectly mitigate** implicit biases, racial anxiety, stereotype threat, and hate, which **diminish student performance**. Similar to Visibility, social and graphic wayfinding **can support** safety and security for all occupants by positively reinforcing students' self-worth, facilitating ease of movement through the space without consequence, fostering inclusion of the greater school community, and supporting students of all abilities

COLLABORATIVE

At the heart of learning is collaboration, human connection, and engagement. Developing deliberate ways to collaborate is an **essential social development skill** that has implications for future job performance, building healthy relationships, and conflict resolution. Design should support deliberate, formal collaboration while also providing opportunities for spontaneous human connection. These objectives can be accomplished in nontraditional places such as hallways, breakout areas, learning pods, and co-teaching spaces, requiring an openness to nontraditional learning spaces and a different approach to adjacencies.

“No significant learning occurs without a significant relationship.”

—Dr. James P. Comer, Professor of Child Psychiatry, Yale University (Comer, J. (1995). Lecture given at Education Service Center, Region IV. Houston, TX.)

Check out our **2021 article in the Green Schools Catalyst Quarterly** on the six principles of social-emotional informed design!

Social and Behavioral Strategies in Action

Using stories, graphics, wayfinding, and signage can establish identities and direct students seamlessly within a K-12 facility. Cohesively composed and strategically located graphics and colors within and outside of the classroom can create a positive and warm environment where students feel welcome and have a sense of ownership.

In our Martin Luther King Junior Middle School, for added educational opportunities, students can look to floor-to-ceiling murals that bear the motivational words of some of history's most awe-inspiring figures.

C.10 Strategically locate graphics and color

Tailoring schools means meeting the needs of the students experiencing personal hardship such as housing instability, food insecurity, or domestic abuse. Simple amenities within or adjacent to the classroom, such as a private shower, a clothes closet, a washing machine, or a food pantry can support high-needs students without stigma. For new or renovated designs, this should be incorporated early in the process and consider sociodemographic, health, school culture, and academic data to inform which elements need to be prioritized.

←
Learn more about **The Nest**, a forward-thinking preschool designed to serve local homeless or otherwise struggling families and children.

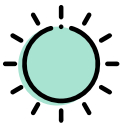
— Classrooms

Environmental Considerations

Did you know?

Air circulation can impact the amount of dust that accumulates within a classroom. Dust is not only bad for one's health but is also **bad for technology** (i.e., projectors, screens) and HVAC systems. **Dust can cause systems** to overheat, reduce speed, and increase chances of crashes.

← Billerica Memorial High School



NATURAL LIGHTING

Daylight is the volume of natural light that enters a building between sunrise and sunset as direct, indirect or diffused sunlight. Natural lighting strategies allows us to create a **visually stimulating, well-lit, and productive environment**. For school designers, proper daylighting can **ensure lower artificial light energy use** and **promote school occupant health**. Children spend **up to 40 hours** in school and are more sensitive to daylight exposure than adults because **they have larger pupils** and have significantly **greater light-induced melatonin suppression**, with younger children having the greatest circadian-system sensitivity to light exposures. This biological connection means that by introducing sunlight to classrooms, students and teachers can feel more energized and have greater psychological wellbeing. **Studies show** that poor lighting is associated with eyestrain, fatigue, headaches, and reduced alertness.

THERMAL COMFORT

Thermal comfort is the perception of comfort with respect to temperature, air movement, and humidity. **Children are more sensitive** to higher temperatures than adults because of their higher core body temperature and less developed thermoregulation capabilities. Many factors impact personal comfort including **gender**, **age**, activity level, size, metabolic rate, and insulation through clothing. **Studies have found** student learning and performance are **sensitive to both** extreme **cold** and **extreme heat in the classroom**. Good thermal comfort can also apply outdoors on **school playgrounds**, when there is increased physical activity and heat exposure. **Viruses like influenza** can spread more easily in cold weather and in low humidity environments.

ACOUSTICS

Up to **60% of classroom** activities involve verbal communication between teachers and students. **Noise can have direct impact** on learning, hearing, speech development, comprehension, and collaboration. Yet, studies suggest that as many as 30% of students may have difficulty understanding their teacher's message. **Classrooms in the United States typically have speech intelligibility ratings of 75% or less, meaning every fourth spoken word is not understood**. This is especially important for younger students and language learners.

INDOOR AIR QUALITY

Indoor air quality (IAQ) is a composition of particle and gaseous indoor pollutant that can be controlled by the mechanical system or natural ventilation. **IAQ also requires regulating** humidity, indoor temperature, and moisture. **Studies** have shown that poor indoor air quality in classrooms can be associated with **headaches, dizziness**, **asthma**, and **absenteeism**, as well as poor **student attendance** and **test scores**. There are easy solutions. HVAC systems with airborne particle removal, air conditioning, and personal thermal control have been associated with **improvements in performance**.

NATURE

Direct contact with nature and **natural views** has psychological and physical impacts on student and teacher well-being and productivity. Access and views to nature **can provide** a calmer, safer context for learning. Access to **nature restores attention function**, specifically green views and biophilic design, **have been shown** to improve memory, creativity, and attention, as well as reduce stress and absenteeism. One of the biggest benefits of being outdoors is that it creates a stimulating learning environment that breaks up the day. Physical movement can allow for students to exert stored energy, thus limiting potential outbursts.

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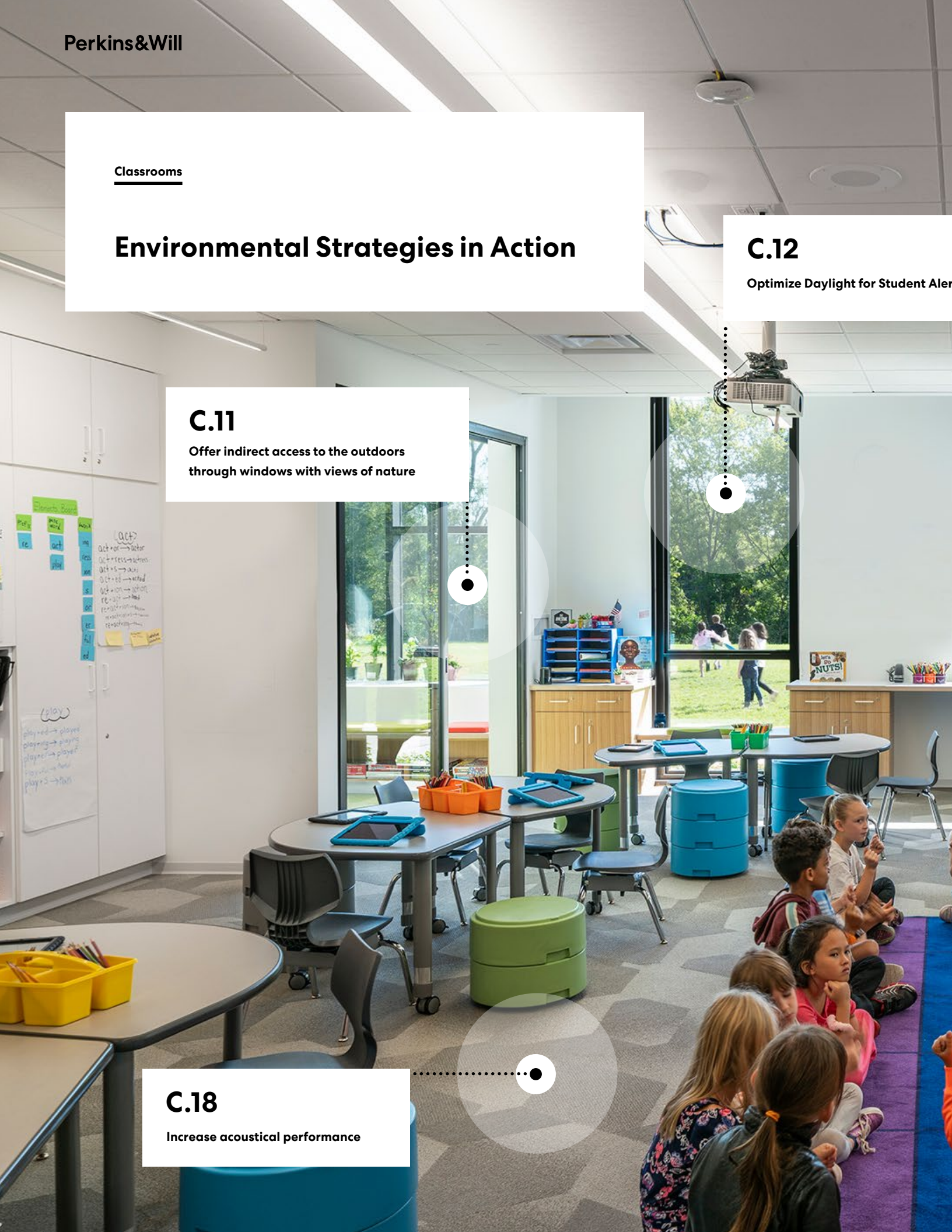
Environmental Strategies in Action

C.12

Optimize Daylight for Student Aler

C.11

Offer indirect access to the outdoors through windows with views of nature



C.18

Increase acoustical performance

rtness

C.13

Incorporate Operable Windows for Greater Thermal Control and Increased Natural Ventilation

Lisle Elementary School, Lisle, Illinois

Our team compiled a series of guidelines, assessments, websites for working experts' reference.

U.S. Environmental Protection Agency's Indoor Air Quality Tools for Schools Action Kit

The EPA's School Action Kit provides practical ways for schools to improve indoor air quality. By incorporating best practices, industry standards, and sample policies, this document offers guidance on preventing and solving most indoor air problems.

Guiding Principles:

U.S. Green Building Council IAQ Fact Sheets

USGBC's Center for Green Schools created a School IAQ Fact Sheets Series for building components and their relation to good indoor air quality. These straightforward resources provide an easy way to understand indoor air quality in the school environment.

Guiding Principles:

Harvard T.H. Chan School of Public Health's Schools for Health: Foundations of Student Success

Created by the Healthy Buildings Program, this resource focuses on how schools influence student health, thinking and performance.

Guiding Principles:

Collaborative for High Performance Schools (CHPS)

With the goal of creating the best possible learning environments for children, CHPS offers resources for schools, districts, and designers to create high performance schools.

Guiding Principles:

INHABIT: THE PODCAST

Design Is a Public Health Intervention

Our team of designers, researchers, and creatives has released a podcast about the power of design to enhance the human experience. With insights from an array of health and design experts, "Inhabit" addresses large, complex issues at the intersection of design, policy, and research. The pilot podcast aims to empower everyday people to ask critical questions and make informed decisions about the places in which they live, learn, work, play, and heal.

Listen here.

Check it out!

Guiding Principles Legend:

Flexibility *Tailored* *Visibility* *Communicative* *Collaborative*

Natural Lighting *Thermal Comfort* *Acoustics* *Indoor Air Quality* *Nature*

All spaces are learning spaces.

←

A recent ***study*** *shows makerspaces develop children's creativity, critical thinking, design thinking, and digital skills.*

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