Perkins&Will

Road Map for K-12 Education

This is not a healthy schools' moment, but a healthy schools' movement.

April, 2021

This is not a healthy schools' moment, but a healthy schools' movement.

Introduction
The World Health Organization states that "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." In 2020, the pandemic illuminated that K-12 schools have a tremendous influence on all aspects of both individual and community health, whether this involves disease transmission or accessing regular meals.

Schools act as a central health resource that can support community resilience, spirit both in "normal" times and when unexpected challenges and crises arise. We know that climate change and pandemics are inherently linked and the **United Nations** expects an increase in the number of animal-borne viruses in the future. However, pandemics are not the only threat our schools have faced. In the last several years, learning communities have lived through measles outbreaks, asthma exacerbations, wildfires, and extreme weather to name a few.

Yet, crisis often sparks transformative change and what has been born from recent events may in fact be one of the largest explosions of future thinking that has occurred over the course of human history and has led us to take a hard look at how we design schools resilient enough to respond to any change. In light of this, we have developed and gathered relevant research and innovative strategies to support future-focused schools. With thoughtful planning and integration, these strategies will help our schools be prepared and adapt quickly to whatever lies ahead.

Equity
Additionally, the pandemic has underscored the need for an equity-focused educational agenda. To that end, if we are to support healthy schools now and, in the future, we must confront and respond to the vulnerable students and communities. For example, there is both indoor and outdoor environmental justice concerns influencing the overall health of a school that reflect inadequate siting, maintenance, and operations. Recent reports have shown that these schools are disproportionately attended by Black and Hispanic students and low-income students eligible for free and reduced lunch. Also, students with pre-existing conditions including physical, cognitive, and mobility impairments may rely on schools for the support and stability that cannot be replicated in a virtual learning environment.

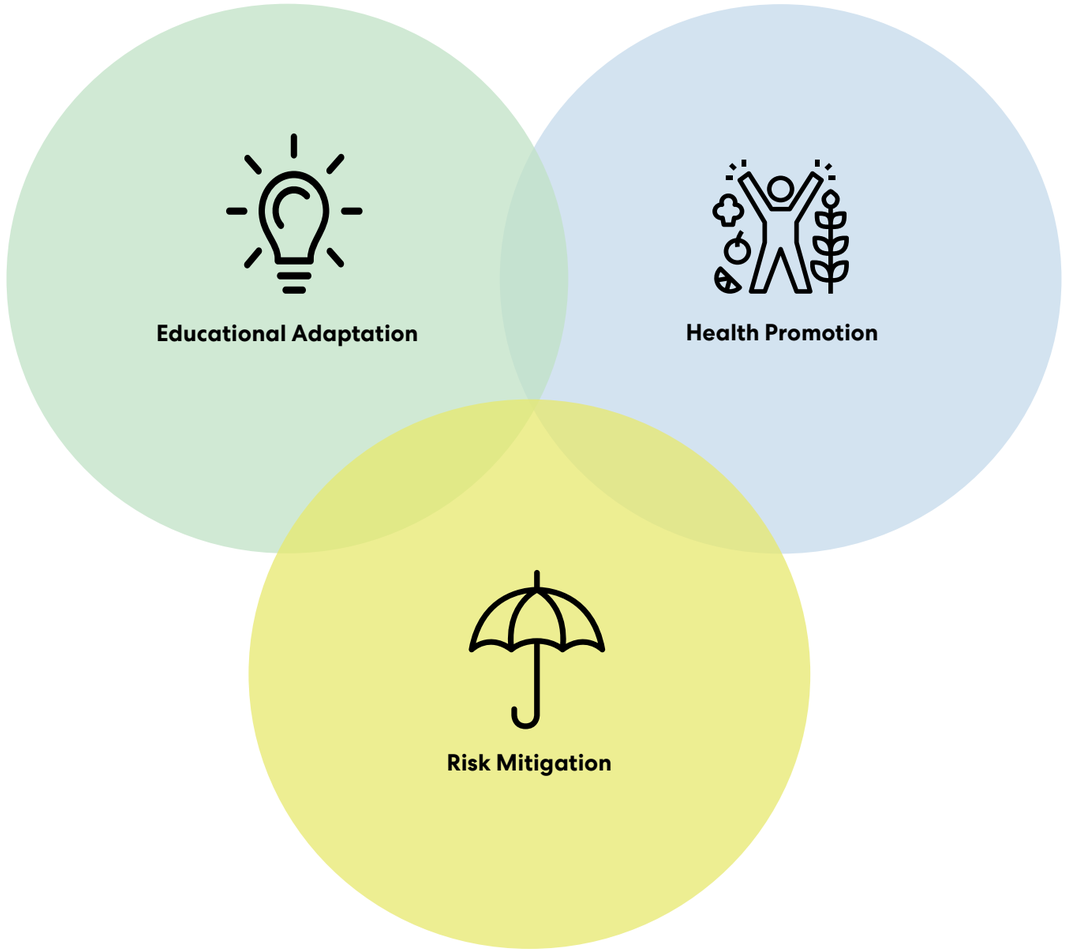
Understanding the 'Wicked Problems'
The challenges facing our K-12 schools and education systems in the future are examples of what in planning and policy are referred to as 'wicked problems'. What is a wicked problem? These are problems that are complex and difficult to solve because of incomplete, contradictory, and changing requirements. These crises come in a variety of forms and are often hard to recognize. Some are global, such as the recent pandemic and others are localized such as extreme weather. No matter the threat, future disruptions to our school communities are inescapable.

We understand that planning for problems that are constantly changing and hard to recognize is a challenge. However, we believe that thoughtful planning and design can help schools prepare for a future where the only certainty is change.

- **Extreme Storm Events**: As we build new schools, we must account for school siting and local infrastructure that can be influenced by damage, food and water contamination, displacement, injury, mental health.
- **Allergic and Nonallergic Disease from Air Pollution and Allergens**: Already, asthma is the leading cause for student absenteeism in the U.S., accounting for local sources and seasonal changes in air pollution can help or hinder good air quality.
- **Infectious Diseases**: Climate change is leading to emerging airborne, tick-borne, and waterborne diseases. Ensuring healthy environments, systems and healthcare opportunities are a part of fighting this.
- **Increased Extreme Heat**: Child physiology and development make them more susceptible to high temperatures, which may result in dehydration, renal disorders. Creating cooling environments for indoors and outdoors can protect students during these events.
- **Sea Level Rise**: Flooding and rising sea level can have lasting impacts on child mental health, lead to unplanned migration, and potentially perpetuate cycles of poverty.
- **Wildfires**: A source of air pollution such as particulate matter, hydrocarbons, carbon dioxide and carbon monoxide, wildfires are fueled by drought conditions and can lead to school closures, displacement, and smoke-related respiratory conditions.

Our holistic framework promotes health and safety without compromising students' learning potential.

This report will encompass lessons learned during COVID-19, best practices, and design strategies for both existing and new facilities. We will continue to use the holistic approach, originally developed for our **Road Map for Return**, to help communities create thriving ecosystems of learning that put well-being at the center without compromising learning potential.



Risk Mitigation

Strategies for reducing adverse environmental exposures that influence school occupant health and performance.

Educational Adaptation

Strategies that support behavioral, logistical, and technology flexibility during shifting teaching needs.

Health Promotion

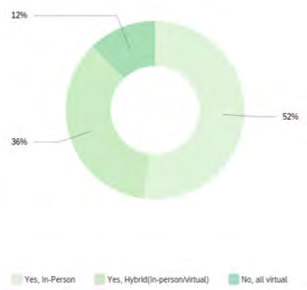
Strategies that promote physical and mental health, social cohesion, and a sense of belonging and safety.

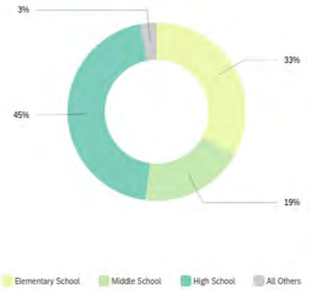
Survey Findings

In March 2021, we asked a random sample of 100 K-12 teachers, administrators, facility managers & school nurses across the United States about the lessons learned from COVID-19 including healthy practices, teaching and learning technologies.

Basic Stats

74% Public Schools
86% In-person or hybrid
50% Teachers
40% Administrators
9% Facility Managers
1% School Nurses

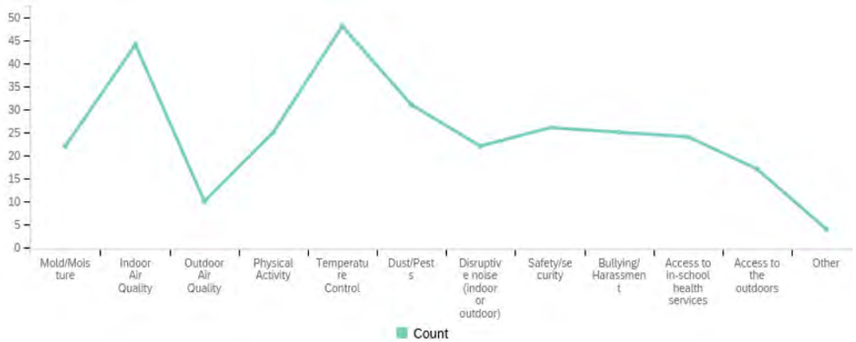




What were environmental or health concerns affecting your school before COVID-19?

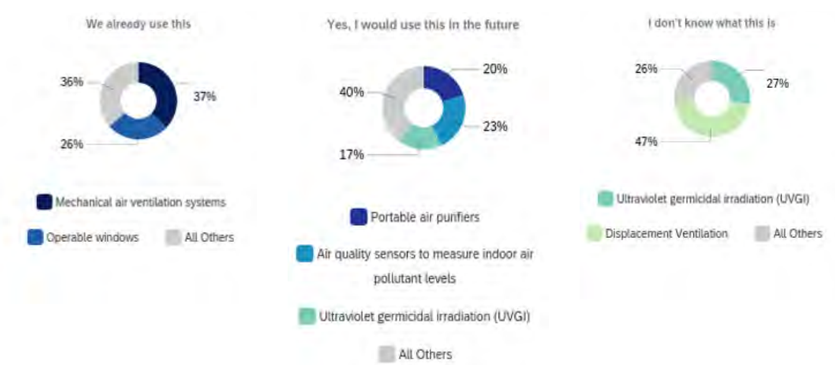
Air quality and thermal comfort are not new concerns in our schools. Now is the time to address these longstanding issues.

Top Concerns:
Temperature Control
Indoor Air Quality
Dust&Pets

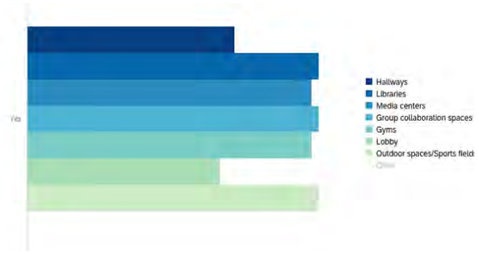


If given the opportunity to build or redesign your school in the future, which indoor air quality strategies would you like to use?

When we discuss indoor air quality, school stakeholders are starting from different ability and capacity to address their concerns. In the future, the strategies used will like change and expand.

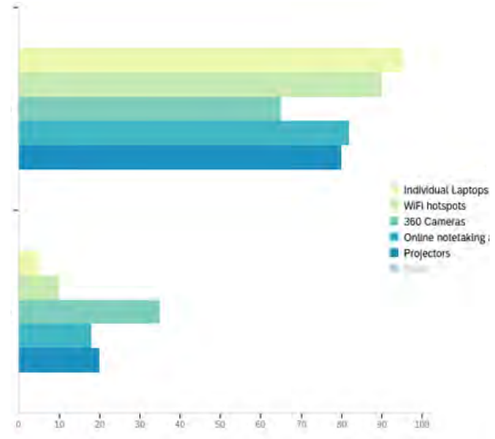


Did you use or adapt any of these locations for teaching and learning over the last year?



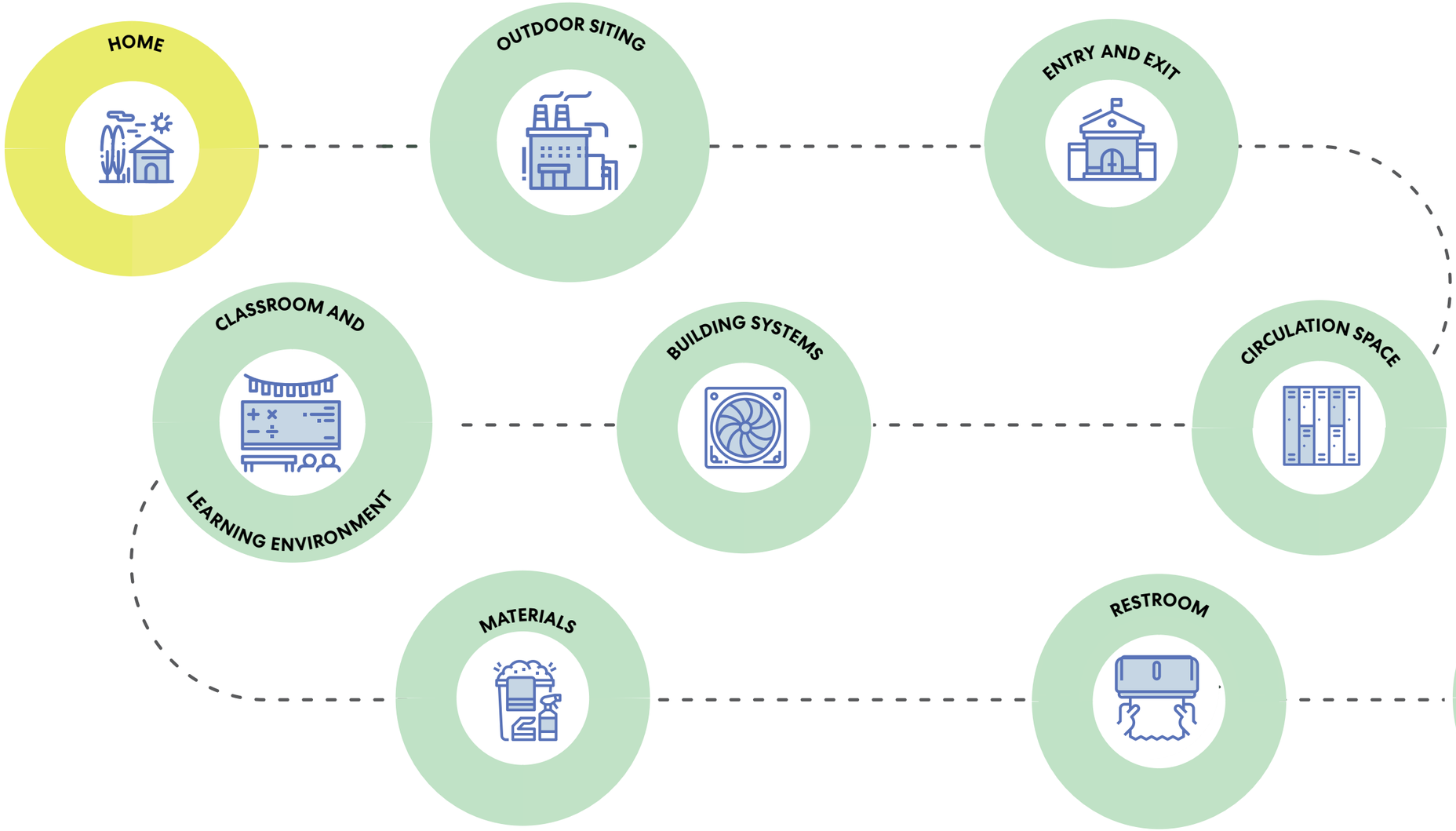
In this last school year, we had to get creative about where students learned, but what is surprising is that respondents would like to continue to use these spaces in the future.

What specific technology would you like to use in the future?



95% said they would like personalized technology and 90% would like WiFi hotspots. These findings tell us that learning can happen anywhere with these tools - a park, home, healthcare facility and potentially reduce academic challenges like chronic absenteeism in the future.

If given the opportunity to build or redesign your school in the future, how likely are you to include the following features?



Contents

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. Like many students, Riley relies on school for more than just their education. It's also where they eat breakfast and lunch, socialize with friends, and receive their most reliable Internet connection. We owe it to students like Riley to make school buildings as inviting, safe, and healthy as they can be.

Outdoors and Siting

The pandemic has underscored the critical importance of outdoor learning environments. Studies have shown that students with greater access to these spaces had better mental health, higher test scores, and lower chronic absenteeism (Kweon et al., 2017; MacNaughton et al., 2017).

More Information

Did you know? *Research shows that nature can support learning through improvements in student attention, stress, self-discipline, and learning enjoyment as well as health and safety benefits including, physical activity, fitness, and collaboration (Kuo et al., 2019).*

What we're reading: *EPA's School Siting Guidelines provide site screening information to assist in holistically evaluate future sites.*

What we're reading: *Green Schoolyards American offers research, examples and guidance on ways to optimize outdoor learning environments - no matter how small.*

↑
Dena'ina Elementary School

Outdoors and Siting

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
O.1	Create **accessible outdoor learning spaces** with WiFi, power outlets, durable furniture and areas of various sizes.	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
O.2	Reduce **urban heat islands** by promoting the use of green or cool roofs, shade trees, landscaping, and reducing impervious surfaces (**National Park Service,2021**).	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
O.3	Plan for post-Construction **stormwater management** (**Collaborative for High Performance Schools, 2020**).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
O.4	If possible, special attention should be paid to **site selection** to account for the proximity to industrial sites, major roadways, and oil and gas wells to avoid outdoor air pollution concerns (Grineski et al., 2020, Grineski et al., 2018, Mohai et al., 2020).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	Easy Moderate **Hard**
O.5	Enforce **anti-idling measures** to prevent exposure to diesel exhaust that may lead to indoor air quality concerns, asthma exacerbations, and the unnecessary burning of fossil fuels (**Collaborative for High Performance Schools, 2020**). Avoid intake louvers near drop off and pick up sequences.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.6	Incorporate **wildfire mitigation strategies** that work for your local area: when appropriate, include wider roads surrounding the school, create gravel buffers between buildings, include nearby irrigation sources, have steel framing, and biodegradable flame retardants.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
O.7	Use a **land berm** to protect the school site from sea level rise and flooding events.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
O.8	Strategically place trees to **reduce indoor thermal gains**, provide views of nature, and maximize daylight during the day as well as during power outages.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.9	Provide **rooftop PV arrays or PV canopies over parking** to generate electricity on site.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**
O.10	**Elevate the building, roads, and critical infrastructure** above the floodplain, to prevent the school from becoming an island during extreme weather events.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**
O.11	Include opportunities for **nature-based curriculum** (Kuo et al., 2019)	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
O.12	Use **structural soil in urban landscapes** that contains larger solid particles to promote larger tree canopy and optimize greenspace (MacNaughton et al., 2017).	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.13	**Account and mitigate sources of outdoor noise** to reduce disruptions to class by physical placement of the building on the site, and the inclusion of acoustical buffers indoors and outdoors (Mohai et al., 2020). Locate sensitive program spaces away from exterior noise and consider acoustically insulated windows.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy Moderate **Hard**
O.14	Employ **rain gardens and other "soft" storm water strategies** before or in addition to engineered solutions such as, underground storage and leeching tanks.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
O.15	Use **permeable pavement** where possible to reduce storm water runoff and increase infiltration (not all permeable pavement is created equal, some like crushed stone are low-maintenance while others such as permeable asphalt need to be "vacuumed" to maintain optimal permeability).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.16	Select play equipment that encourages open-ended and imaginative play also known as **"Natural Playgrounds".**	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.17	Include **movable/flexible furniture** that can be reconfigured to varying educational needs.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.18	**Specify native, drought-tolerant species** that provide habitat for local fauna. Include identification markers on plantings to create additional learning opportunities.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.19	Provide **wheelchair accessible** outdoor learning and play space to ensure an equitable natural environment.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
O.20	**Extend WiFi** to school grounds including fields and parking areas.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
O.21	Account for **solar orientation** to optimize daylight.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard

Check out our resources and citations at the end for more information!

Outdoors and Siting

Strategies in Action

O.9
Provide Rooftop PV Arrays

O.4
Pay Special Attention to Site Selection

O.20
Extend WiFi to School Grounds Including Fields and Parking Areas

O.12
Use Structural Soil

O.1
Create Accessible Outdoor Learning Spaces

O.21
Account for Solar Orientation

Lisle Elementary School, Lisle, Illinois

O.18 Specify Native, Drought-Tolerant Species

Clockwise from Left: *Lisle elementary School, Dena'ina Elementary School, Dena'ina Elementary School*

"Perhaps the time has come to cease calling it the 'environmentalist' view, as though it were a lobbying effort outside the mainstream of human activity, and to start calling it the real-world view."

—E. O. Wilson

O.19

Provide Wheelchair Accessible Play Space

Check it out!

Resources:

To understand more about resilient design, check out **RELi Resilience Action List** for strategies to support your community and school.

Our modular classroom, **Sprout Space**™ can reduce overcrowding and support greater social distancing year round with modular classrooms designed with green building strategies.

What we're reading: Dr. Sara Grineski from the University of Utah has been helping to quantify the greatest risks to school siting. From air pollution to traffic noise, her research shows that these environmental exposures have lasting impact on student health and performance and are not equally distributed.

O.8 Strategically Place Trees to Reduce Indoor Thermal Gains

Project: The Willows Community School

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Project: Rodriguez Elementary School

Entry - Exit

Every day, around 25% of Americans enter a school as teachers, students, staff or adminstrators. By proactively designing learning environments with features can stem the spread of infection and promote overall wellness, the results would be exponential. A schools first line of defense is its entrance. This communal space can assist in preventing the spread of disease, inspire the community, and help to keep students safe.

More Information

Did you know? *According to the OECD , students in the U.S. attend school for a total of 8,884 hours over nine years to complete primary and lower secondary education (OECD, 2019).*

What we're reading: Green Schoolyards American offers research, examples and guidance on ways to optimize outdoor learning environments - no matter how small.

"Let us remember: One book. one pen, one child and one teacher can change the world."

-Malala Yousafzai

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Lisle Elementary School, Lisle, Illinois

Exit-Entry

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
E.1	Install **track pad at every entrance** to reduce outdoor contaminants from soil (lead, heavy metals) that contribute to indoor dust. This can be surface installed or part of a recessed system.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
E.2	Modify entry sequences so that they can serve as **both a safety and health screening area**.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.3	**Install touchless hardware technology** (motion-activated, foot-activated, voice-activated, etc.). Prioritize bathrooms, nurses areas, special education and therapy spaces, and shared spaces.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.4	Include **hand washing/sanitizing stations** at entrances and exits (Hobbs et al., 2015).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
E.5	Include **mobile and fixed announcement** and wayfinding signage and graphics (Kashima et al., 2017).	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
E.6	Include **signage and graphics** that advises students and staff how touchless technology is operated.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
E.7	Integrate **natural ventilation strategies** to improve air flushing (Qian et al., 2010).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.8	Use signage to designate **entry and exit doors to reduce bottlenecks** in doorways and provide one-way traffic.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
E.9	Provide **storage** at main entrances and egress points for students.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.10	Include a **single point of entry and a vestibule** to control access.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.11	Employ **Crime Prevention through Environmental Design** strategies and maximize visibility (CPTED).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.12	Make sure **entrances and exits are fully accessible**.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.13	Incorporate **clear, easy to find access to stairs** to promote physical activity.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
E.14	Include the **Universal Design for Learning framework** when addressing entry and exit strategies (UDL).	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard

"Studies show that If indoor air is not regularly exchanged, it can contain greater levels of pollutants than outside air (EPA). "

Check out our resources and citations at the end for more information!

Exit-Entry

Strategies in Action

E.7
Integrate Natural Ventilation Strategies

E.3
Install Touchless Hardware Technology

E.4
Include Hand Washing/Sanitizing Stations at Entrances and Exits

E.1
Install Track Pad at Every Entrance

SAGE Center- North Kansas City Schools, Kansas City MO

E.10 Include a single point of entry and a vestibule to control access.

Check it out!

Did you know?

Allergens

Did you know that for people who do not have a pet at home, school can be the largest exposure to animal allergens. For example, cat allergens can transfer from your homes to my classmates clothing and disperse into the air. So, you bring more than your backpack when you enter a school.

Check out **this paper** for more information.

Clockwise from left: Barrington Early Learning Center, *SAGE Center-North Kansas City Schools, Katherine Johnson Tech Magnet Academy*

E.14- What is Universal Design (UDL) in our entry-exits?

UDL provides multiple means of engagement, representation, and expression. This provides opportunities who may have different auditory, visual, or mobility abilities. Therefore, to promote individual's health and sense of safety, every entrance and exit can include signage with both symbols, colors, and words that can direct people to the entrance and exit during an emergency. Schools are extending their operational hours to support the community including English Language classes, food service, and more. Ensuring the languages spoken in the community are represented at the entrance are critical to create inclusive welcoming invites.

E.5 Wayfinding signage and graphics

Exit-Entry

Project: Dena'ina Elementary School

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Classrooms

In order to navigate what comes next, we need to create multi-faceted classrooms that offer increased control and full access to technology. As education continues to evolve - accelerated by the pandemic - we are leveraging research to better understand how learning environments can support students holistically.

More Information

Did you know? *A paper published in the journal Building and Environment found that classroom design could be attributed to a 25% impact, positive or negative, on a student's progress over the course of a year. (Barrett et al., 2015)*

What we're watching: **NOVA's School of the Future** - How can the science of learning help us rethink the future of education for all children?

Did you know? *A student spends 75% of the school day engaged in listening activities. Therefore, making sure the acoustics and background noise are properly addressed are important to a healthy, successful classroom.*

↑
Benjamin E. Mayes High School, Atlanta, Georgia

Classrooms

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
C.1	Continue to **provide technology to make classrooms virtual using**: 360 degree cameras, multiple screens, and amplified acoustics so students can continue to participate if sick.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** Existing Building	Easy **Moderate** Hard
C.2	Provide **multiple (fixed or portable) screens** available in the front and on the side of the classroom to support virtual student learning and virtual student inclusion.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
C.3	Provide **adequate in-class storage** to reduce clutter, increase ease of cleaning, remove visual clutter and promote focus.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
C.4	**Enhance acoustical performance** - especially for the younger students who are learning language (CHPS).	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.5	**Optimize daylight for student alertness.** Maximize sunlight by siting the building on an East-West axis, while optimizing thermal and lighting needs.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy Moderate **Hard**
C.6	**Support daylighting without introducing glare.** Use light shelves and highly reflective surfaces to bounce sunlight into the room, preventing direct beam radiation and increasing illuminance.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.7	**Provide environmental control** for teachers and staff (e.g daylighting, temperature, etc.) by including dimmable lights, window blinds, and classroom-specific thermostats (Mendell et al., 2005).	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.8	**Offer direct access to the outdoors** for nature-based learning opportunities (Kuo et al., 2019).	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.9	**Use transparent solutions** strategically to optimize learning and enhance collaboration (Laal et al., 2012).	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** Existing Building	Easy **Moderate** Hard
C.10	Include large and small **collaborative areas** adjacent to classrooms.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.11	Incorporate **operable windows** for greater thermal control and increased natural ventilation (Mendell et al., 2005), and **educate teachers** about mechanical air filtration systems so they use the systems effectively.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.12	Promote **diversity of teaching methods** by offering teachers and students flexibility by including features such as garage doors, movable furniture, and variety of space types (Attai et al., 2020).	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
C.13	**Include quiet areas** (nooks, pods, caves, etc.) for heads-down work.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** Existing Building	Easy **Moderate** Hard
C.14	**Extend technology and Internet** to allow for maximum flexibility, including the roof for HVAC management.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.15	Provide **options for adjustable desk height** or standing desks, some studies show improvements in physical activity & attention for elementary students.	Risk Mitigation **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
C.16	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**	Easy **Moderate** Hard
C.17	Provide **touchless entry option** for students, including motion-activated, foot opener or can be easily propped open	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
C.18	Special attention should be paid to the classroom's **acoustics, lighting, tactility, and smell** to support multisensory learning (Baines, 2008)	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard

ty

According to the study, factors such as lighting, air quality and students' sense of ownership of their classroom all affected the students' ability to learn.

Check out our resources and citations at the end for more information!

Classrooms

Strategies in Action

C.5

Optimize Daylight for Student Alertness

C.10

Include Large and Small Collaborative Areas Adjacent to Classrooms

C.11

Incorporate Operable Windows for Greater Thermal Control and Increased Natural Ventilation

C.12

Include Easy to Move Furniture to Increase Flexibility and Diverse Teaching Methods

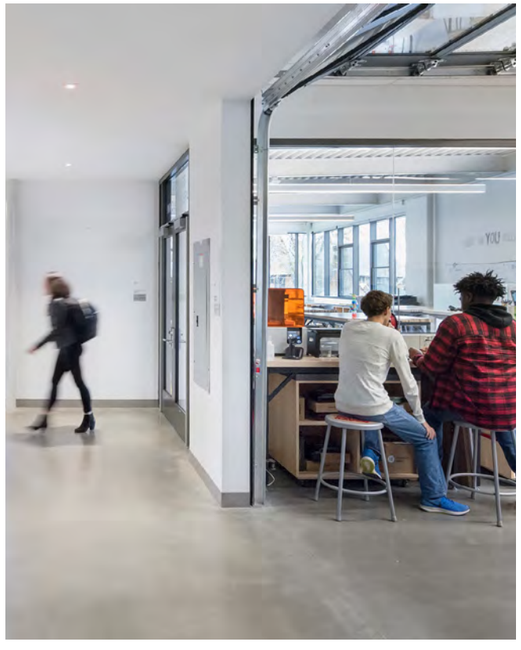
Lisle Elementary School, Lisle, Illinois

C.12

Promote Diversity of Teaching Methods by Providing Flexible Spaces

C.1

Continue to Provide Technology to Support Virtual Learning



Clockwise from left: *Bishop Lynch High School, Dallas, Texas; Billerica Memorial High School, Billerica Massachusetts; Brimmer and May School, Chestnut Hill, Massachusetts*

Check it out!

Check it out!

Collaborative learning requires flexibility, which can be achieved by including a variety of furniture. Yet, the COVID-19 pandemic required many schools to enforce socially distancing and many schools introduced traditional desks — placing group tables in storage. As we look to the future, flexibility will be a top priority in order to support collaboration and personalized learning.

Post-pandemic, the focus will be on designing schools that students and communities need and not on reopening and building new schools as they were.

Clockwise from left: *Rodriguez Elementary School, San Marcos, Texas;Ewing Marion Kauffman School, Kansas City, Missouri*

C.8

Offer Direct Access to the Outdoors

Clockwise from left: *Willows Community School, Culver City California; Hollis Academy, Greenville, South Carolina*

C.13

Include Quiet Areas

C.3

Provide Adequate in-class Storage to Reduce Clutter, Increase Ease of Cleaning, and Promote Focus

Project: *Dena-ina Elementary School*
Location: *Chicago, Illinois*

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Building Systems

Research shows that schools have a fundamental impact on student health, thinking, and performance (Mendell & Heath, 2005; Eitland et al. 2017), which makes K-12 school building systems a public health intervention. When designed properly, building systems provide benefits to the whole community as they support indoor air quality, thermal comfort, acoustics, and visual acuity.

More Information

Did you know? *According to the CDC, Nearly 14 million school days were missed due to asthma in 2013.*

Did you know? *Daylight is the most effective way to provide health benefits of circadian lighting.*

What we're reading: Ten questions concerning well-being in the built environment.

What we're reading: Residential Air Cleaners: A Technical Summary by the U.S. EPA provides useful tips and information on determining what air cleaner works best for you.

Did you know? *Kids breathe 50% more air than adults do, and their lungs grow until the age of 18.*

↑
North Kansas City School District, Students in Academically Gifted Education, Kansas City, Missouri

Building Systems

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
B.1	**Increase electrical outlets** to support teaching and learning throughout schools. Consider overhead electrical outlets to avoid tripping hazards and charging ports for personal devices.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** Existing Building	**Easy** Moderate Hard
B.2	**Maximize ventilation and outside air supply**	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
B.3	Invest in **mechanical air filtration systems** and/or supplement with portable air cleaners to lower levels of indoor air pollutants.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
B.4	**Educate staff** on the specific of the mechanical ventilation because open windows can result in increased levels of fine particulate air pollution from traffic and outdoor allergens, and limit the effectiveness of mechanical and portable air purifier systems (Pacitto et al., 2020).	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
B.5	Include **operable windows** for passive ventilation during potential power outages (Stabile et al., 2017).	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
B.6	**Increase Filtration.** Include High Efficiency Particulate Air (HEPA) filtration to remove airborne particles or high-rated air filters with the ability to upgrade filters to higher efficiencies (+MERV-13).	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
B.7	Use **upper room ultraviolet germicidal irradiation (UVGI)** strategically in high use spaces such as nurses areas or places with sensitive occupants. (CDC, 2021)	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**
B.8	Use **real-time sensors to track air quality** (carbon dioxide, particulate matter) or measure IAQ with a flow meter.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
B.9	Raise school **infrastructure above expected sea level** by 2070 and locate critical systems above flood levels.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
B.10	Appoint a person on school staff to be the **IAQ manager** to identify, address, and document indoor air concerns in a timely manner.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
B.11	**Facility staff & occupant training** on how to use and maintain building systems in their space, creating an ecosystem of healthy maintenance and operations.	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
B.12	**Include on-site power generation** which can be used during extreme events.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
B.13	Provide **HVAC or humidification/ dehumidification systems** able to increase relative humidity (40-60%) in winter months to reduce communicable disease transmission (Koep et al., 2013).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
B.14	**Optimize daylight and add lighting control** through blinds, dimmers, zoned and/or tuneable lighting systems.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
B.15	Supply easy to use, low-maintenance blinds to **minimize glare and reduce direct beam radiation**.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
B.16	**Limit sources of background noise.** (e.g. place HVAC systems away from instruction areas, siting considerations) especially for younger students.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
B.17	Provide **enhanced temperature control** per classroom, including classroom-specific thermostats, fans, heaters that are easy to understand and adjust (Altomonte et al., 2020) .	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
B.18	Track **Global Temperature Rise and Local Ambient Outdoor Changes** for impacts on Building Envelope and Systems Service Life Expectations for the Next 30 Years. Plan for the time period between 2050 and 2080 for visible and experiential climate change impacts.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**

In our Future of Schools Survey, the top three priorities for our teacher, administrator, and facility staff respondents were advanced ventilation and air filtration, universal internet connectivity, more windows with daylight access in the classroom.

Check out our resources and citations at the end for more information!

Building Systems

Strategies in Action

B.2
Maximize Ventilation and Outdoor Air Supply

B.5
Include Operable Windows for Passive Ventilation

B.7
Use Upper Room Ultraviolet Germicidal Irradiation (UVGI)

B.10
Appoint a Person on School Staff to be the IAQ Manager to Identify Concerns in Timely Manner

B.14
Optimize Daylight and Add Lighting Control

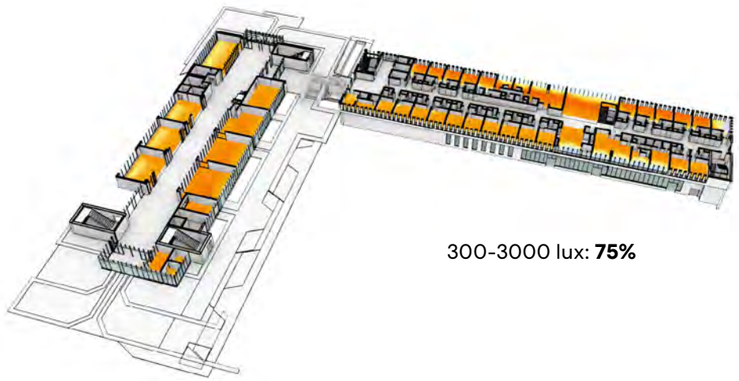
Billerica Memorial High School, Billerica, Massachusetts

Process Lab: Case Study

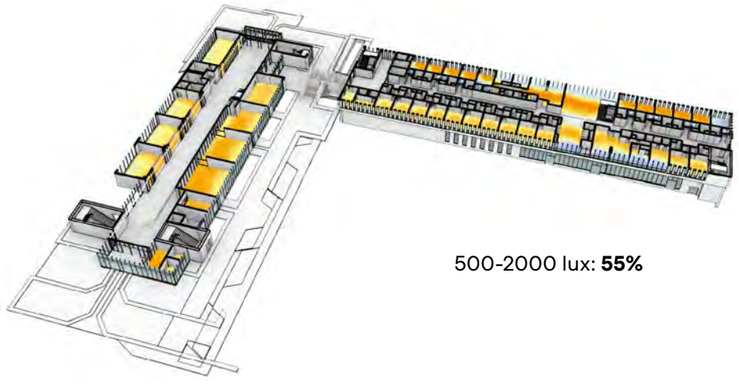
Using public health literature, Perkins&Will's Process lab modeled the percentage of time where there was useful daylight luminance in this high school.

Typical classrooms are designed to meet 300-3000 lux thresholds, but to promote student alertness and concentration research suggest 500-2000 lux is better.

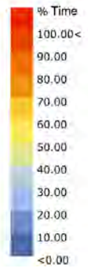
When we restrict our acceptable daylighting thresholds, we learned that only 55% of the building was meeting the proper lighting standards for children. We were able to optimize this space with supplementing with artificial light and considering orientation of the building. For more information about this work, check out **Process Lab.**



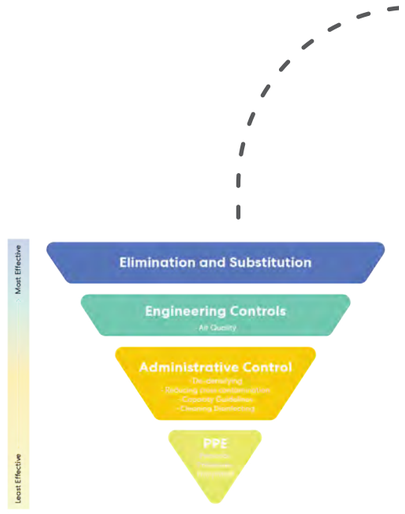
300-3000 lux: **75%**



500-2000 lux: **55%**



B.1 Increase Electrical Outlets to Support Teaching and Learning



Did you know?

The CDC estimated fans at a cost of $100 each; $500 each for portable HEPA filters; and $1,500 for ultraviolet germicidal irradiation to counter the coronavirus in ducts above rooms with limited ventilation.

Bipolar ionization – we do not yet have peer-reviewed literature to support the inclusion of this technology. Schools should keep in mind that there can be secondary pollutants and oxidative stress as a result of this technology.

If **layered risk mitigation strategies** are used, school closures do not need to be the first line of defense. Building systems act as engineering controls within the hierarchy of control, which can effectively reduce disease transmission and indirectly reduce other respiratory ailments (allergies, asthma).

Check it out!

Project: *Billerica Memorial High School*
Location: *Billerica, Massachusetts*

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Circulation Space

Thoughtfully planned circulation areas increase opportunities to extend learning environments. With smart design and strategic signage, corridors and stairwells offer schools additional space to support both learning and health. Variety and flexibility give students agency, support collaboration, and can reduce density when needed.

More Information

Did you know? A study from the National Center for Education Statistics showed that students between the ages of 12 and 18 reported nearly twice as many bullying incidents in hallways and stairwells.

Did you know? Research shows that educational experiences that are active, social, contextual, engaging, and student-owned lead to deeper learning (Cornell University Center for Teaching Innovation).

What we are reading: The Collaborative Classroom: Teaching Students How to Work Together Now and for the Rest of Their Lives - Trevor Muir

↑
Lisle Elementary School

Did you know?

According to a study published in the American Journal of Public Health, a child's social and emotional skills in kindergarten might be the biggest predictor of success in adulthood (Jones et al., 2015).

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
CS.1	**Increase the size of corridors** to allow additional space for movement and to **increase the amount of breakout areas**. Flexible breakout areas can increase collaboration and offer additional square footage when needed.	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CS.2	**Increase the area within stairwells** to offer additional space and to support one-way movement.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
CS.3	**Reduce the number of lockers** to less than 1 locker per student. Students can sign up at the beginning of the year for a locker. Less lockers means more room for circulation.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** Existing Building	**Easy** Moderate Hard
CS.4	Offer a **variety of space types** within circulation zones - individual nooks as well as areas that support medium and large groups of students.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CS.5	**Include daylight** in corridors and stairwells if possible as it may inhibit the survival and transmission of infection and support overall health.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
CS.6	Include **intermediate handrails** at stairs **for safety** and as a way to promote **one-way traffic**. Encourage the practice of good hand hygiene.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
CS.7	Place **handwashing or sanitizing stations** at the top and bottom of each stairwell.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
CS.8	**Display signage** with **easy-to-understand language and symbols**, positive messaging, and minimal text to promote healthy actions and support wayfinding.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
CS.9	**Include transparent design that emphasizes windows and clear lines of sight** to reduces bullying opportunities in corridors and stairwells.	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CS.10	**Promote the use of stairs** to support physical activity and overall wellness by limiting capacity and central location of elevators.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
CS.11	Provide **separate storage options** for student outside of circulation areas.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard

Circulation Space

Strategies in Action

CS.3

Reduce the Number of Lockers

CS.4

Offer a Variety of Space Types within Circulation Zones

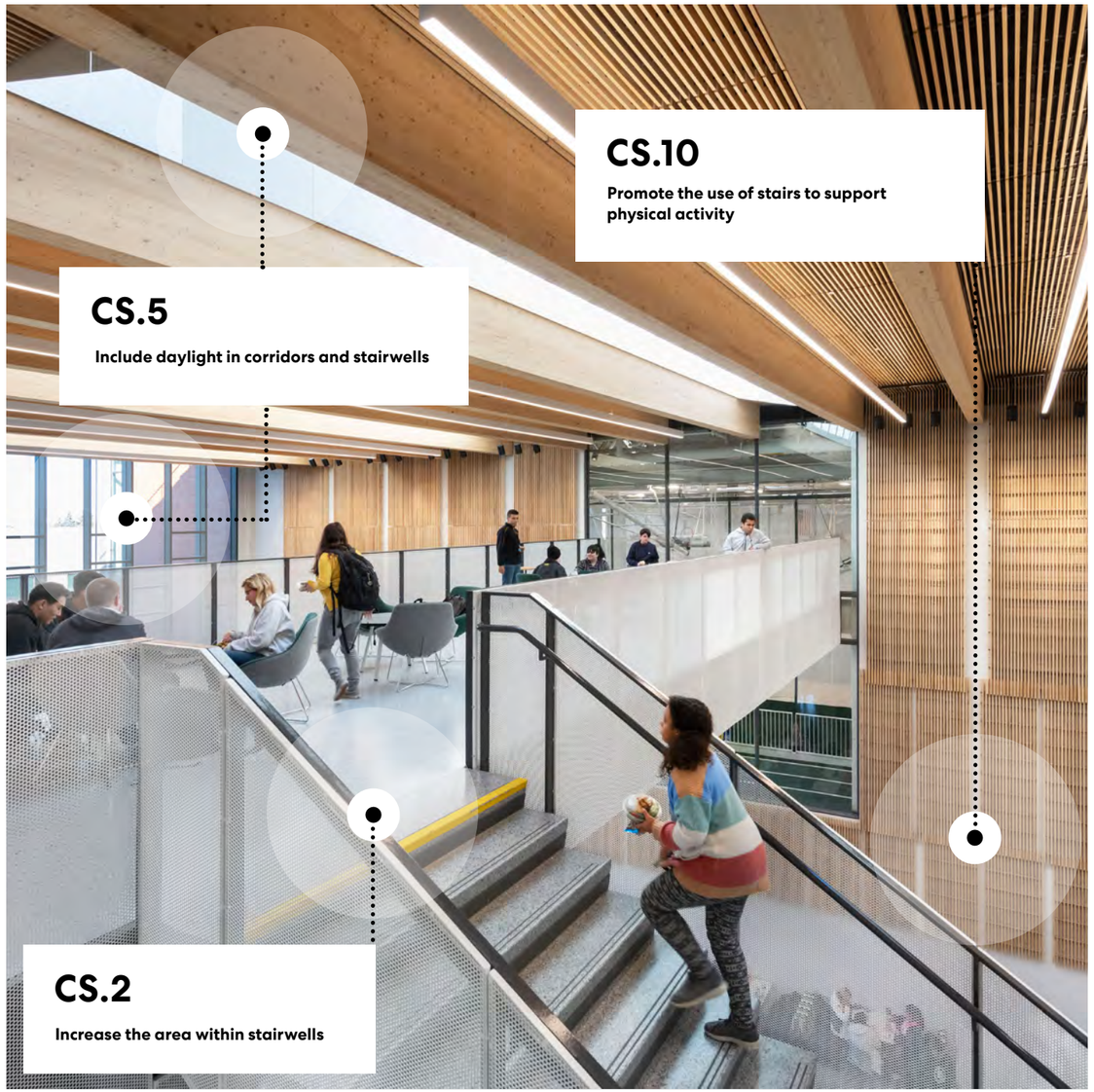
CS.11

Include Transparent Design that Emphasizes Windows and Clear Lines of Sight

CS.1

Increase the Size of Corridors to Allow Additional Space for Movement and to Increase Breakout Areas.

Lisle Elementary School, Lisle Illinois

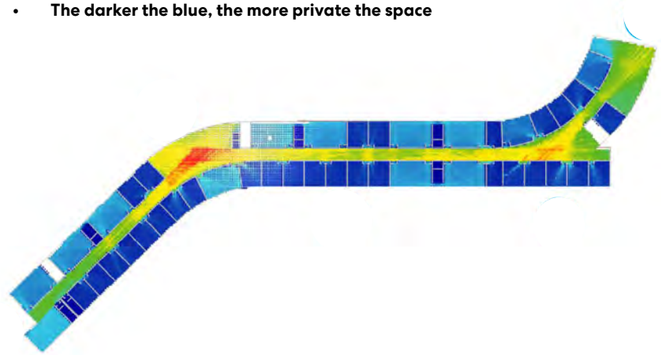


Top: *Billerica Memorial High School,*

Process Lab: Case Study

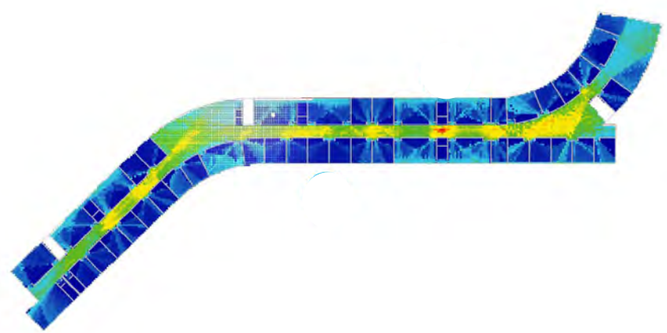
LEVEL 02 - Visibility Area

- **Measures how much areas are visually connected.**
- **Areas in Red a the most visually connected and have the most visual control over circulation**
- **The darker the blue, the more private the space**



LEVEL 02 - Visibility Occlusivity

- **Represents obstacles and potential line of sight from the corridor**
- **Dark blues represent blind spots from the corridor.**



Case Study

CS.11 Transparent Design

Morrow High School:
Visibility Study
Location: Morrow, Georgia

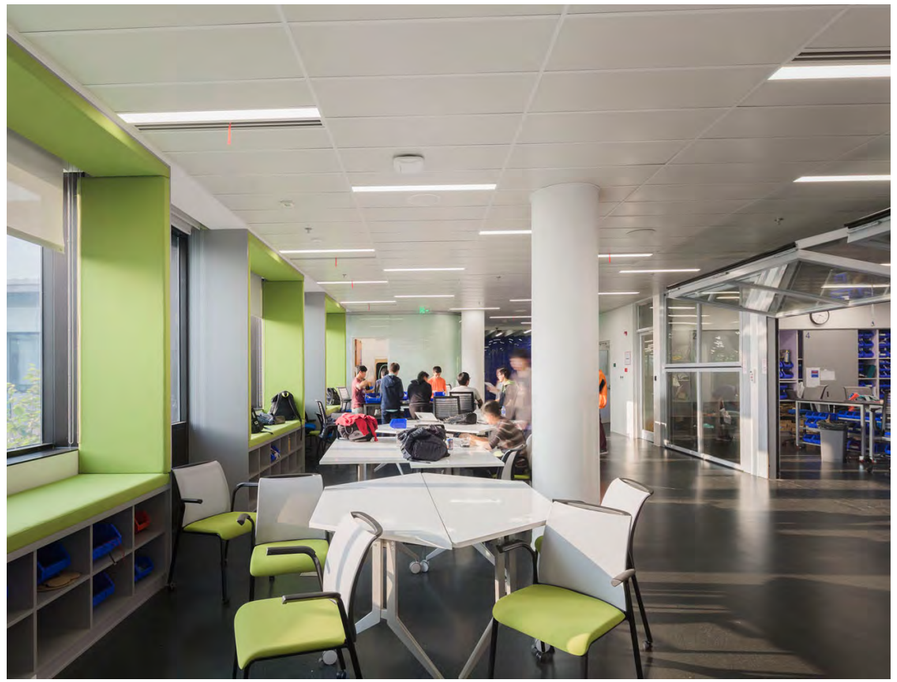
The Morrow High School team performed a study which analyses the **Visibility Area** and **Visibility Occlusion** of each floor. Below are two studies from one of the floor plates. Studies like this help inform what the desired level of transparency should be for different spaces.

Did you know?

"Knowing where the blindspots are in a building can make sure we are using additional security measures only as we need them and makes sure we are keeping an eye on bullying and harassment"

Check it out!

Circulation Space



CS.6 Include daylight in corridors and stairwells

CS.7 Include intermediate handrails to promote one way traffic

Top: *Shanghai American School, Center for Inquiry and Design*
Bottom: *Drew Charter School*

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Did you know?

A study published in the International Encyclopedia of the Social & Behavioral Sciences indicates that childhood friendships are good for kids' mental health (Borner et al., 2015). adulthood (Jones et al., 2015).

Materials

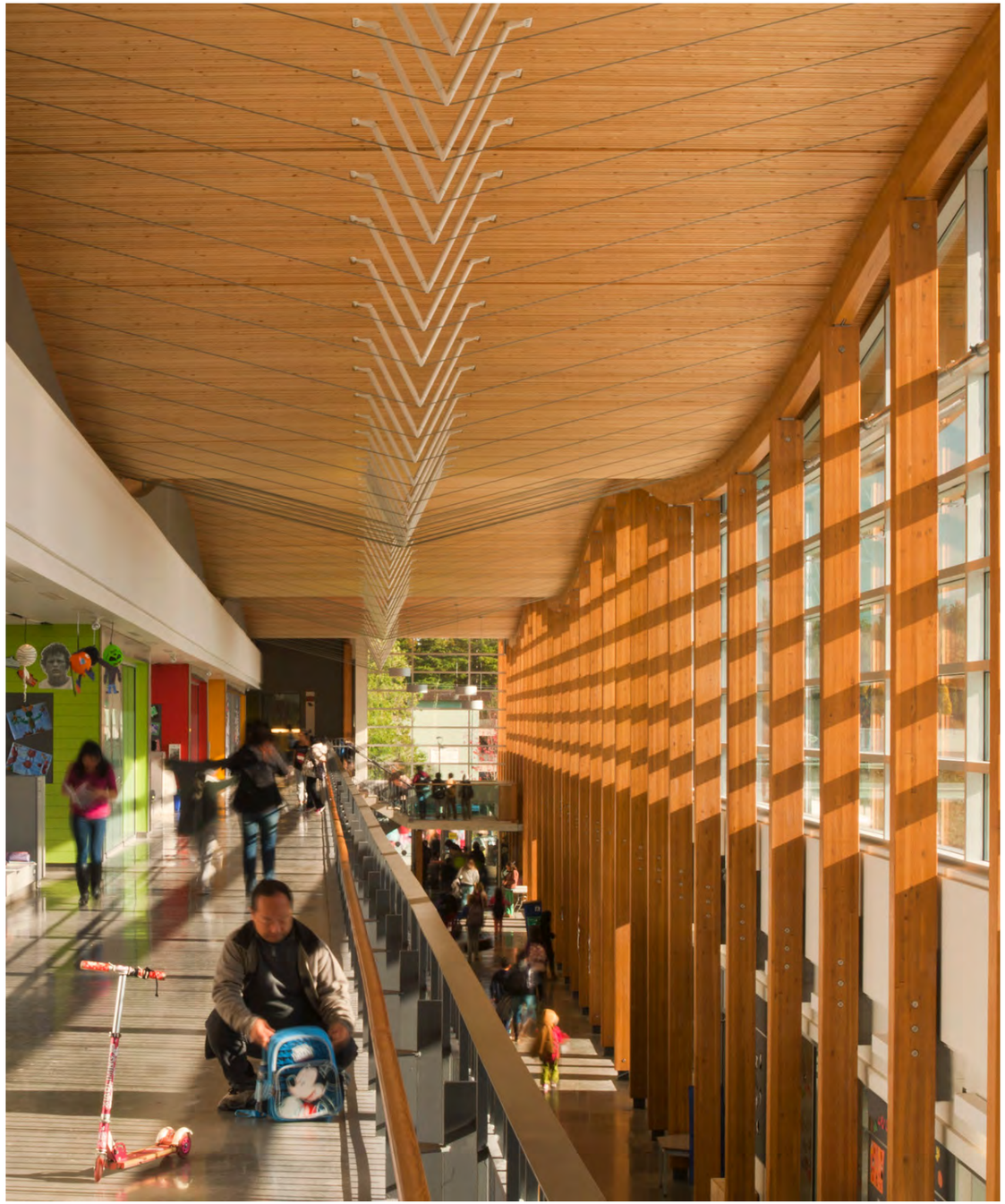
From the cells in your body to a sense of belonging, building materials and furniture can influence health and the well-being. These strategies call attention to the fact that school furniture can include harmful chemical additives that migrate out into the dust and air we breath. Additionally, furniture can help or hinder student inclusion. Our micro to macro approach allows us to optimize our framework and balance risk mitigation, health promotion, and educational adaptation.

More Information

What we're reading: *From the Center for Green Schools at U.S. Green Building Council: Healthy Green Purchasing for Asthma Prevention that helps schools select environmentally-friendly products.*

Did you know? *Allergens from pets and furry animals can attach to clothing, walls, furniture and other upholstered surfaces. This can lead to asthma exacerbations and allergic reactions. These small allergen particles can also be airborne and removed using air filtration approaches. (Naja et al., 2019)*

Did you know? Schools should only use well-researched materials and finishes. During the pandemic, many products were released to the public that have not been adequately tested. Follow the evidence, not the hype.



↑
Samuel Brighouse Elementary School

Did you know?

When thinking about future proofing your school against wildfires, flame retardants are not the answer. They have been linked to a variety of negative health effects, including hormone disruption, impaired brain development, liver damage and cancer. Flame retardants are not covalently bonded to fabrics and foam and can migrate into the air our children breathe (NIEHS, 2016). Check out our Outdoor and Building Systems strategies for other ways to mitigate risk from wildfires.

Check out our resources and citations at the end for more information!

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
M.1	Use a **multi-faceted integrated pest management** approach to reduce routine exposure to chemical cleaners. (Brenner et al, 2003; NIOSH, 2007; U.S. EPA, 2021).	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
M.2	Select **hard, non-porous furnishings** that will respond well to green cleaning products such as, **Green Seal™**, the EPA's Design for the Environment, Environmental Choice's EcoLogo and the European Union's Ecolabel. (Regional Asthma Management & Prevention)	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
M.3	Use **EPA-approved cleaners and disinfectants** that are effective on bacterial, viral, and fungal infections. (U.S. EPA, 2021)	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
M.4	Select **low-emitting VOC** furniture, building materials, adhesives, and paints to limit impact on indoor air quality and health (U.S. EPA, 2021)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
M.5	**Minimize surface clutter** by creating adequate storage that can be easily contained to make cleaning easier for custodial staff.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
M.6	Include **flexible, stackable, easy to move furniture**.	Risk Mitigation **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
M.7	**Buy chemicals in bulk and do not mix cleaners** to prevent the creation of harmful secondary pollutants (American Lung Association, 2020)	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
M.8	Select or replace furniture and building materials to ensure they are **without chemical additives** (flame retardants, stain repellents, phthalates). (Eitland et al. 2017)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
M.9	Account for the **chemical sensitivities** of students and staff when considering cleaning products (e.g. avoid scented cleaners), (Bradshaw & Robinson, 2010).	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
M.10	Select **natural patterns** in flooring, wall, acoustical paneling to create biophilic spaces that lower student stress and higher student enjoyment. (Determan et al., 2019)	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
M.11	**Consider the age and ability of the students when selecting furniture and finishes.** Avoid sharp edges, limit seating and desks that can not be adjusted for different sizes and heights, and be mindful of flooring for younger students). Provide enough width to move around - at least 3 feet.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard

Materials

Strategies in Action

M.2
Select Hard, Non-porous Furnishings

M.4
Select Low-emitting VOC Materials

M.10
Select Natural Patterns

M.5
Minimize Surface Clutter by Creating Adequate Storage

M.11
Consider the Age and Ability of Students

M.6
Select Flexible, Easy to Move Furniture

Rodriguez Elementary School, San Marcos, Texas

Clockwise from left: *Rodriguez Elementary School, Haskins Library Renovation, Lisle Elementary School*

Check it out!

Check it out!

Our Transparency Tool to learn more about what is in your products. Treat this as the nutritional label for your furniture.

Did you know?

Integrated and Clean

Integrated pest management and green cleaning products reduce toxic exposures, reduce asthma exacerbations, increase safety for staff and students, and save money for the district.

VOCs

The immediate symptoms of being exposed to volatile organic compounds (VOCs) include, eye and respiratory tract irritation, headaches, dizziness, visual disorders and memory impairment.

Inclusive and Flexible

The inclusion of flexible, stackable, and easy to move furniture provides opportunities for diverse learning pedagogies, easy cleaning for custodial staff, and customizable spaces for teachers.

Maintenance

Include finishes and materials that can be easily cleaned and maintained (non-porous) to improve longevity, prevent the need for harsh chemical cleaners, and lower costs of maintenance and replacement

Materials

Project: Lisle Elementary School

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What We're Reading

From the Children's Environmental Health Network (CEHN), we recommend checking out the fact sheet about Furniture & Carpets, which is also available in Spanish.

Restrooms and Sanitation

Used countless times throughout the day, school restroom design should not be an afterthought. As schools work to future-proof learning environments - now is the time to holistically rethink their design. A collaborative approach and simple solutions, such as direction of travel, thoughtful signage, and touchless technology can provide communities healthy and inclusive restrooms facilities.

More Information

Did you know? *57% of students are more likely to wash their hands when reminder signs are posted—only 34% of schools post reminder signs (Bradley Corporation, 2021).*

"Well maintained restrooms promote orderly behavior by demonstrating respect for and ownership of property."

-National Clearinghouse for Educational Facilities, 2008

↑
Spaulding Rehabilitation Hospital, Boston, Massachusetts

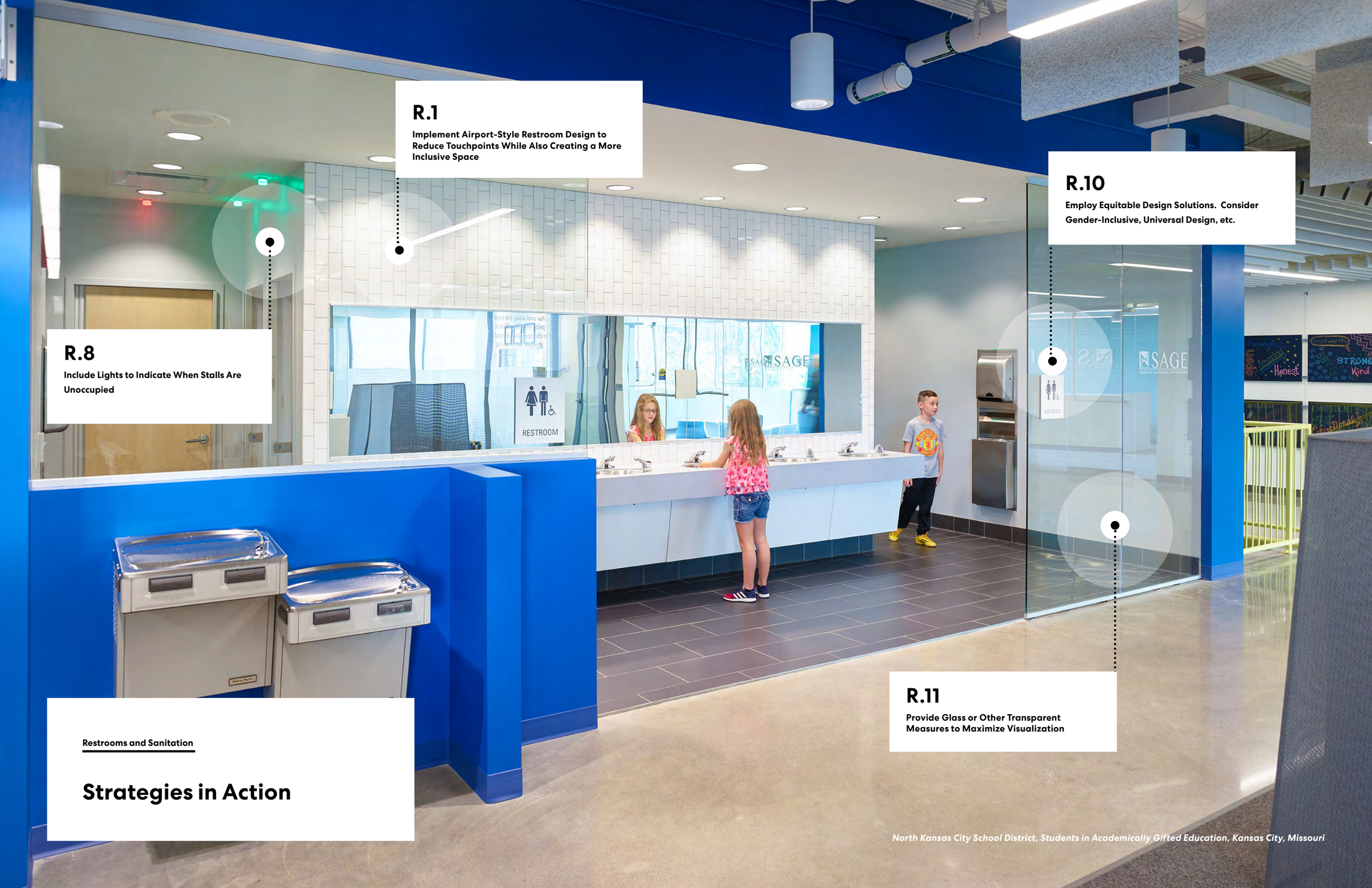
“Design for Human Dignity and the Health, Safety, and Welfare of the Public: Members should employ their professional knowledge and skill to design buildings and spaces that will enhance and facilitate human dignity and the health, safety, and welfare of the individual and the public.”

- AIA: Office of General Counsel 2017

Check out our resources and citations at the end for more information!

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
R.1	Implement **airport-style restroom designs** to reduce touchpoints while also creating a more inclusive space. This design includes open and visible hand washing stations, individual stalls, and one-way traffic flow	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy Moderate **Hard**
R.2	Provide permanent areas for **hand sanitizing stations** that are numerous and strategically placed throughout the school. Include hand sanitizer that is effective, but that does not include potentially harmful chemicals	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
R.3	Remove **restroom doors** to reduce touchpoints if existing walls provide adequate privacy	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
R.4	Consider **touchless technology** for doors and fixtures - doors, faucets, toilets, etc.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
R.5	Consider including **restroom groupings** strategically placed throughout the school or in academic neighborhoods.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**
R.6	Special attention should be paid to the quality and frequency of **cleaning and disinfecting restroom surface** (Curtis et al., 2013)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
R.7	Modify **drinking fountains into bottle fillers**. Include hand washing and sanitizing stations next to bottle filler stations	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
R.8	When possible, **include lights** to indicate when stalls are unoccupied	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
R.9	Include **sanitation stations** near bathroom entrances	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
R.10	Employ **equitable design solutions**. Consider gender-inclusive, universal design, etc.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**
R.11	Provide glass or other **transparent measures to maximize visualization** (National Clearinghouse for Educational Facilities, 2013)	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
R.12	**Educate students on the reason for and importance of good hand hygiene (Younie et al., 2020)**	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**



R.1

Implement Airport-Style Restroom Design to Reduce Touchpoints While Also Creating a More Inclusive Space

R.8

Include Lights to Indicate When Stalls Are Unoccupied

R.10

Employ Equitable Design Solutions. Consider Gender-Inclusive, Universal Design, etc.

R.11

Provide Glass or Other Transparent Measures to Maximize Visualization

Restrooms and Sanitation

Strategies in Action

North Kansas City School District, Students in Academically Gifted Education, Kansas City, Missouri

R.3

Remove restroom doors to reduce touchpoints if existing walls provide adequate privacy

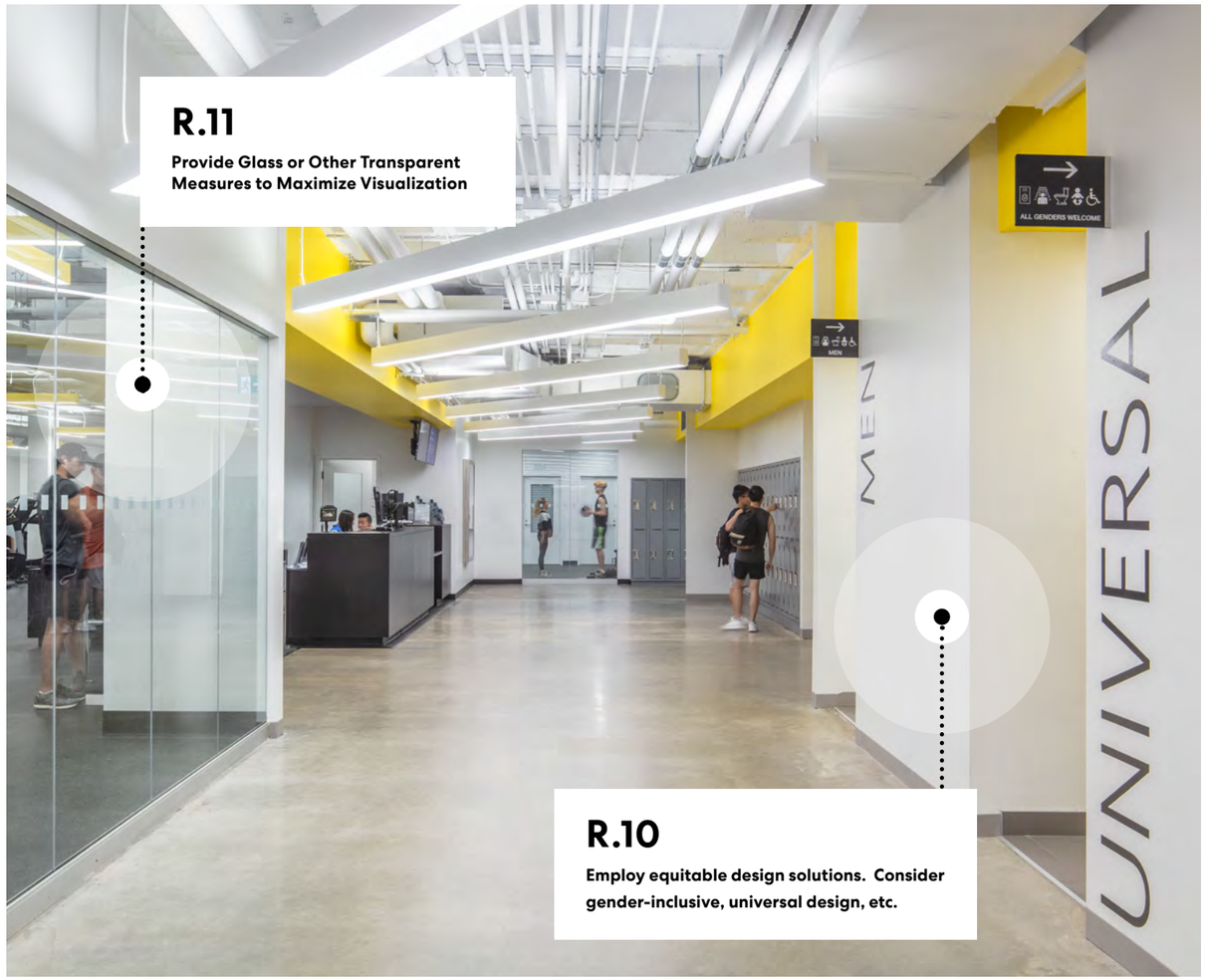
Did you know?

“Poor or Fair”

Nearly half of American high school students describe the condition of their school restrooms as “poor or fair” (Bradley Corporation).

Check it out!

Clockwise from left: *Kawartha Trades and Technology Centre*



Project: *UBC Life Building, (Photographer: Michael Elkan)*
Location: *Vancouver, British Columbia*

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Cafeteria

COVID-19 highlighted that schools do much more than teach children. They provide countless services each day, one of which is offering many children a reliable source of food. With this in mind, cafeterias in the future will need to prioritize equity and health in their design.

More Information

Did you know? *For schools that were able to reopen during the pandemic, food service became a challenge. State policies, like Massachusetts, agreed to 3' distancing with masking but during breakfast, lunch or snack eaten in their classroom required 6' distancing. The options provided in this section focus on reducing congestion, distributing eaters, and providing greater choices and flexibility for students.*

Did you know? *81% of schools offered food via drive-through pick up, and 58% offer walk-up services, according to a School Nutrition Association survey. Most schools provided both lunch (99%) and breakfast (94%). (School Nutrition Association, 2020)*

Survey Findings *Student respondents to the Future of School Survey said they were 'Very Likely' to include multiple smaller cafeterias or food service options in their future schools.*

↑
Billerica Memorial High School, Billerica, Massachusetts

Imagine if school lunches were the healthiest meal a child received every day.

A 2021 study of nearly 21,000 kids found that school lunches have significantly improved since 2010 across different student population subgroups. This means that we are making meaningful progress towards healthier kids. (Liu et all., 2018)

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
CF.1	**Locate kitchens along vehicular access road** where food distribution can be easily accessed when building is closed	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CF.2	**Incorporate online ordering** and food service management software to simplify the flow of food selection and payment when either the servery is closed or when reduced congestion in the servery is required	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
CF.3	Consider several **smaller, distributed food service options** that prevent congestion and provide greater choices to students	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
CF.4	**Offer direct access to outdoor dining** opportunities so students can eat outdoors	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CF.5	**Provide hand sanitizing or handwashing options** at the entry to and exit from the cafeteria to prevent the spread of microbes between high touch items.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CF.6	Select a **variety of cafeteria seating and table options** to accommodate social distancing, different social needs, and opportunities for collaboration, individual study and classes	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
CF.7	Include **Grab and Go Carts** to avoid congestion in the servery and cafeteria	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
CF.8	Prioritize equipment in the kitchen that helps **provide fresh produce over processed food** (e.g. better refrigeration)	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
CF.9	Establish **student-run green teams** in charge of recycling and composting to create a sense of community and pride in the cafeteria	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard

Check out our resources and citations at the end for more information!

Cafeterias

Strategies in Action

CF.1

Locate Kitchens Along Vehicular Access Road Where Food Distribution Can Be Easily Accessed

CF.4

Offer Direct Access to Outdoor Dining Opportunities

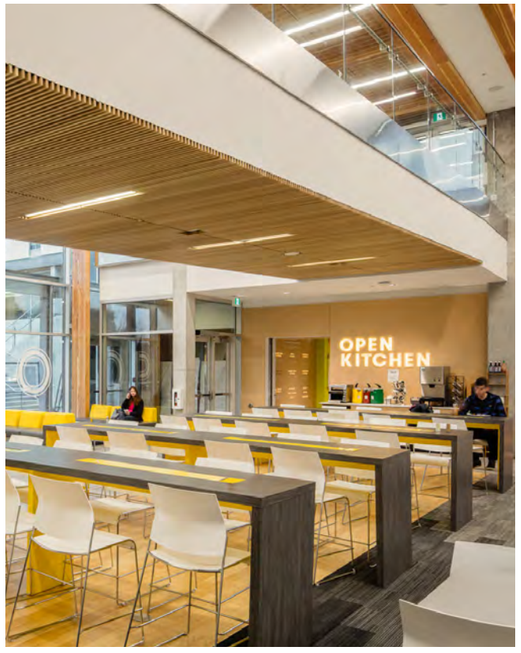
CF.5

Provide Sanitizing or Handwashing Stations at Entry / Exit

CF.6

Select a Variety of Seating and Table Options

Johnston High School, Chicago, Illinois



CF.3

Smaller, distributed food service options that prevent congestion and provide greater choices

Clockwise from left: *Thomas Jefferson Independent Day School, Joplin, Missouri; Lisle Elementary School, Lisle, Illinois; Bethany Elementary School, Plano, Texas; Orchard Commons, Univ. of British Columbia*

Did you know?

If students are regularly eating food outside of their classroom, use food grade cleaners on these surfaces (e.g. desktops). When using **EPA's N List of disinfectants,** look for products that say "Food Contact" to know which ones are safe to touch food, dishes, and utensils. Some may require a rinse after use.

During the 2019 school year, **29.4 million kids relied on the National School Lunch Program** for free and reduced-price meals. In 2011, participation peaked at 31.8 million children. As we recover from the economic impact of COVID-19, the number of students may rise again.

Two-thirds of kids eating school meals **don't have the option of bringing packed lunch from home**. (Strong, 2020)

Project: *Zan Wesley Holmes Jr. Middle School*
Location: *Dallas, Texas*

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Did you know?

Gardens can support an interdisciplinary teaching opportunities when connected to culinary, science and business classes.

Composting has the potential to reduce waste in schools by significant amounts. These include composting on a variety of scale. Vermicomposting, or composting with worms, is an easy method for teachers and students to do in the classroom.

Libraries and Media Centers

Libraries and media centers are the epicenters of knowledge in our schools. As the use of personal technology increases, media centers and libraries will be less about where we store our paper books and more about communal spaces with diverse uses. These uses include collaborative learning areas, spaces for virtual reality and innovative tools (e.g. 3D printers), as well as being flexible environments for community engagement.

More Information

Survey Findings: Our Future of Schools survey found that students would like to "access online notetaking apps" in the future. Librarians can help support students by sharing other online tools, resource portals, and study tips.

Did you know? In a Pew Research Center report, they highlighted several library innovations including the incorporation of maker or hacker spaces to translate education into creative outcomes, greater access to e-books and mobile services to bring the library to the community.

Survey Findings: All student survey respondents said they would like to use their library as a future learning space.

Fast Facts: Some 95% of elementary schools and 82% of secondary schools had a library or media center in 2016.[3]

↑
Billerica Memorial High School

Future schools will have to withstand environmental man-made challenges. Educating students on resilient strategies can assist in passively educating students and increase climate literacy. Signage discussing energy saving strategies, health promotion and building features can turn schools into a teaching tool. Including resilient information in the library is a great way to share information and strategies with students as well as the greater community.

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
L.1	Provide fully integrated technology to support virtual engagement, This can include: mobile charging stations and amplified acoustics systems so school community can engage in person & remotely	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
L.2	Provide multiple **portable** flat screens available to allow **flexible collaboration** and support librarian-led lessons.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
L.3	Provide **storage on wheels** to reduce clutter and increase ease of cleaning	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
L.4	Offer **direct access to outdoors** so students have the opportunity to read, learn, and collaborate outside (Kuo et al., 2019).	**Risk Mitigation** **Health Promotion** **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
L.5	Include **quiet areas** (nooks, pods, caves, etc.) for heads-down focused work.	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
L.6	Provide **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**	Easy **Moderate** Hard
L.7	Provide **hand sanitizing options** at the entry and exit to limit the spread of microbes between high touch items.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
L.8	Select or **replace** old furniture with **products free of antimicrobials,** flame retardants and PFAS chemicals	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard

Libraries and Media Centers

Strategies in Action

L.5

Include Quiet Areas (Nooks, Pods, Caves, etc.) for Heads-Down Focused Work.

L.4

Offer Direct Access to Outdoors

L.3

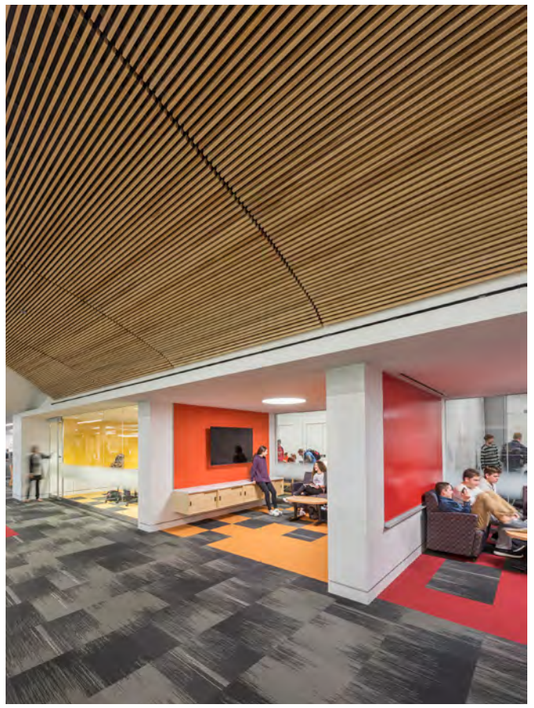
Provide Storage on Wheels to Reduce Clutter and Increase Ease of Cleaning

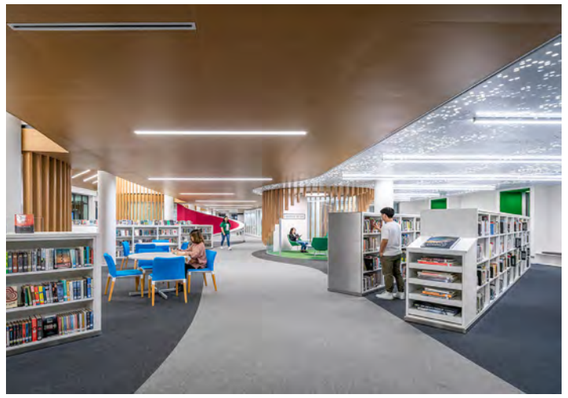
L.8

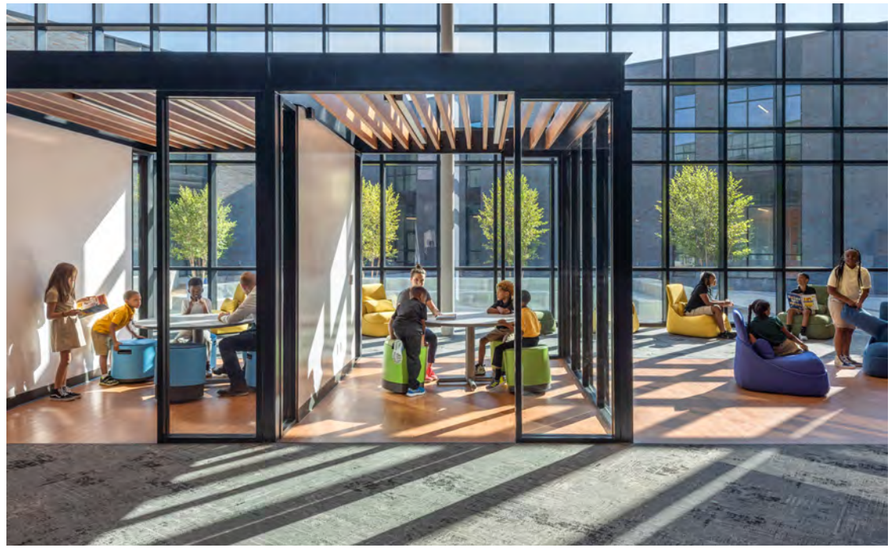
Select or Replace Old Furniture with Products Free of Antimicrobials, Flame-Retardants and PFAS Chemicals

Katherine Johnson Tech Magnet Academy, DeSoto Texas

Libraries and Media Centers







Clockwise from left: *SAGE Center- North Kansas City Schools,Bishop Lynch High School, Shanghai American School, Puxi Campus Library Renovation, Shanghai, China; Katherine Johnson Tech Magnet Academy, Deerfield Highschool*

↑
Rodriguez Elementary School, San Marcos Texas

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"The only thing that you absolutely have to know, is the location of the library."

- Albert Einstein

Gymnasiums

COVID-19 turned many pedagogies on their head. Physical Education teachers have overcome Immense challenges to help keep students healthy even while many school gymnasiums had to play double duty as educational spaces. Through all of this, the pandemic has helped to raise the value of the important role health education plays in our communities.

More Information

Did you know? A report from the American Heart Association determined that cardiorespiratory fitness is a predictor of health conditions in kids. However, only 40% of 12- to 15-year-olds in the United States are believed to have a high CRF.

What we're reading: We are learning from UC Berkley researchers on the future of physical activity. **What's Wrong with Physical Education?**

What we're reading: Let the Children Play - How More Play Will Save Our Schools and Help Children Thrive

↑
Phillips Andover Academy

“Physical fitness is not only one of the most important keys to a healthy body, it is the basis of dynamic and creative intellectual activity.”

-John F. Kennedy

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
G.1	In order to achieve **equity, flexibility and space efficiencies** place the boys and girls lockers **in front** of the changing rooms, showers and team rooms for an all gender environment	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
G.2	**Minimize glare inside the gym** through the implementation of exterior shading devices and interior light shelves.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
G.3	Provide **windows in the gym for natural light and views beyond** to enhance and support a variety of uses (community, performances, teaching, and collaboration)	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
G.4	Ensure that the gym **can be used for teaching and learning** by providing wireless technologies, hard wired data ports and ample power to support student devices and portable interactive flat screens	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	Easy **Moderate** Hard
G.5	Large gyms can serve the community in the event of an emergency or environmental concern. **Ensure adjacency to toilets, showers, and kitchen**. Provide a **storage room** for cots, medical supplies and food.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
G.6	Allow the **gym to be easily partitioned from the rest of the building** for safety and security, account for exit/entry	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
G.7	Install **roll down gym divider curtains** for flexible teaching spaces	Risk Mitigation Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
G.8	In the event of emergency the gymnasium **generator should support lighting, plumbing, power, heat, ventilation, and AC.**	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy Moderate **Hard**
G.9	**Ensure that WiFi is extended to the sports fields for** educational, recreational, and safety purposes	**Risk Mitigation** Health Promotion **Educational Adaptation**	**New Construction** **Existing Building**	**Easy** Moderate Hard
G.10	Develop **branding and messaging** in the gym that **supports inclusivity, diversity and a sense of community pride**.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
G.11	Provide **signage to promote Health+ Wellness** with messaging like “Walking helps your heart to be more efficient, bringing more oxygen and nutrients to your organs”.	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard

Gymnasiums

Strategies in Action

G.7

Install Roll-Down Gym Divider Curtains for Flexible Teaching Spaces

G.4

Fixed Flat Screens can be Used for Community Events, Performances and Teaching.

G.3

Provide Windows for Natural Light and Views

Billerica Memorial High-school, Billerica Massachusetts

Gymnasiums

Clockwise from Top Left:
Meadowvale Community Centre and Library, Billerica Memorial High-school, Billerica Massachusetts, Johnston High School, Johnston, Iowa

G.1 Lockers in the front of the changing rooms for inclusivity

G.6 Allow the gym to be easily partitioned from the rest of the building

G.10 Encouraging Signage

References

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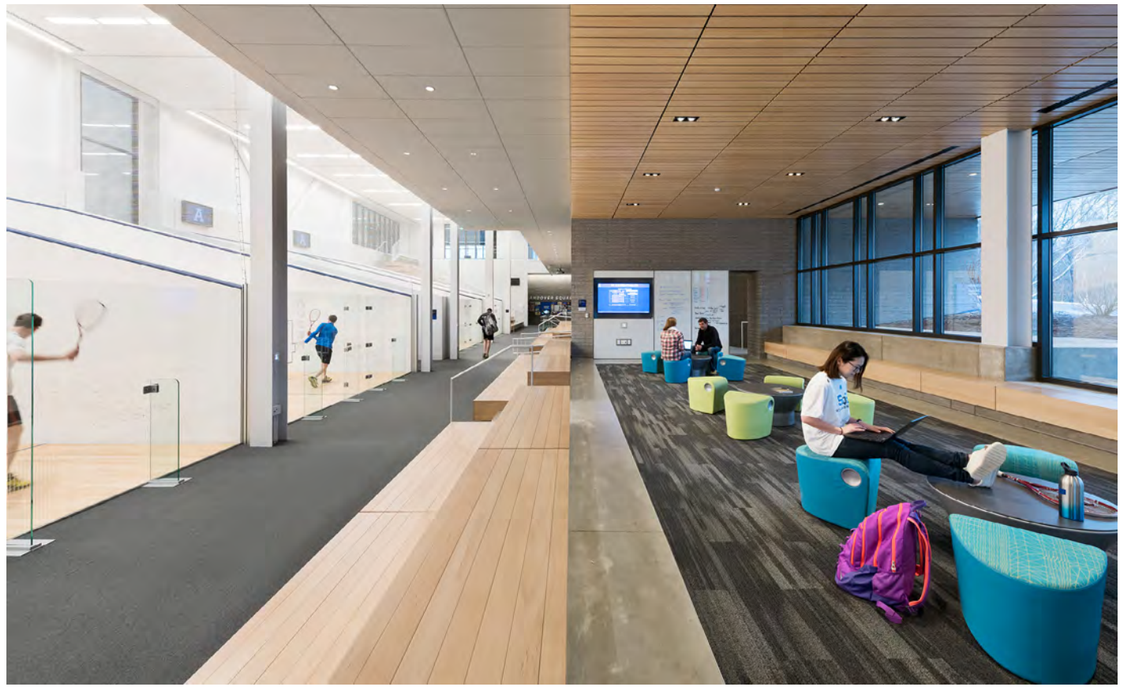
2. Pothamsetty, N., (2019) What's Wrong With Physical Education? **https://pha.berkeley.edu/2019/12/01/whats-wrong-with-physical-education/**

Phillips Andover Academy



Nurse's Area

Driven by the pandemic, inequities in our systems, community needs, and technology, the desire for holistic solutions that support student health has never been greater. As we respond to the current pandemic and future challenges, school nurses will play a critical role in helping us to design facilities that are resilient and take a holistic approach to student health. Using an evidence-based approach to planning, we can provide a student-centered health experience.

More Information

Did you know? Research shows that health is closely related to academic achievement[2]; therefore, improving a child's physical health has the potential to be a valuable protective factor in the improvement of academic performance.

What we are reading: The Institute of Education Sciences, School Nurses in U.S. Public Schools **Report** from April 2020. In 2016, 84% of traditional public schools had a least one full-time or part time nurse, but as the percentage of students who qualify for free or reduced-price lunch increases, available nurse decreased.

Did you know? According to the Centers for Disease Control and Prevention, an estimated 80 percent of infectious diseases are transmitted by touch.

↑
Lucile Packard Children's Hospital

Did you know?

According to the Bureau of Labor Statistics, only about 84,200 RNs are employed as school nurses: enough to staff just 64% of schools with a full-time nurse. However, many nurses are responsible for covering multiple schools, or they work part-time. As a result, only 40% of schools have a full-time registered nurse1 on staff. 35% have a part-time RN, and the remaining 25% do not employ one at all. (Wilgerodt & Brock, 2016)

Strategies

	STRATEGY	CATEGORY	NEW/EXISTING	IMPLEMENTATION
N.1	Identify existing spaces or create isolation areas near nurse areas for students and staff who appear symptomatic. (CDC 2021)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
N.2	Health services will require increased square footage to **provide space at the waiting area to isolate sick and well individuals**. The sick area should lead to an isolation room. In addition, handwashing/sanitation areas should be provided at entry.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
N.3	Incorporate **spaces for easy access to daily medication** (e.g. inhalers) in the nurse's area for non-communicable or well students.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
N.4	Have **nursing resources or space for each educational building.**	Risk Mitigation **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
N.5	Create a **single point of entry and exit** for students to facilitate one-way student flow to limit spread. (CDC, 2021)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	**Easy** Moderate Hard
N.6	Use **touchless entry technology** at the entrance/exit of the nurse office to reduce fomite transmission.	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	Easy **Moderate** Hard
N.7	**Provide triage areas** at the front of the nurses office to help sort well and unwell students. (ACEP, 2021)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
N.8	Include measures for **adequate ventilation** or supplement with portable air cleaners. (Qian et al., 2010)	**Risk Mitigation** Health Promotion Educational Adaptation	**New Construction** **Existing Building**	Easy **Moderate** Hard
N.9	**Ensure nursing areas are flexible and multifunctional** through the use of technology, partitions, and furniture to support the continuity of school operations, optimize privacy, and adjust to demand.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** **Existing Building**	Easy Moderate **Hard**
N.10	Provide **mother's rooms throughout the facility**, outside the nurse's area to avoid contact with sick individuals.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard
N.11	Provide **direct views to cot area** to monitor sick patients.	**Risk Mitigation** **Health Promotion** Educational Adaptation	**New Construction** Existing Building	**Easy** Moderate Hard

Nurse Areas

Strategies in Action

N.3
Create Separate Spaces For Daily Medication

N.8
Include Measures for Adequate Ventilation

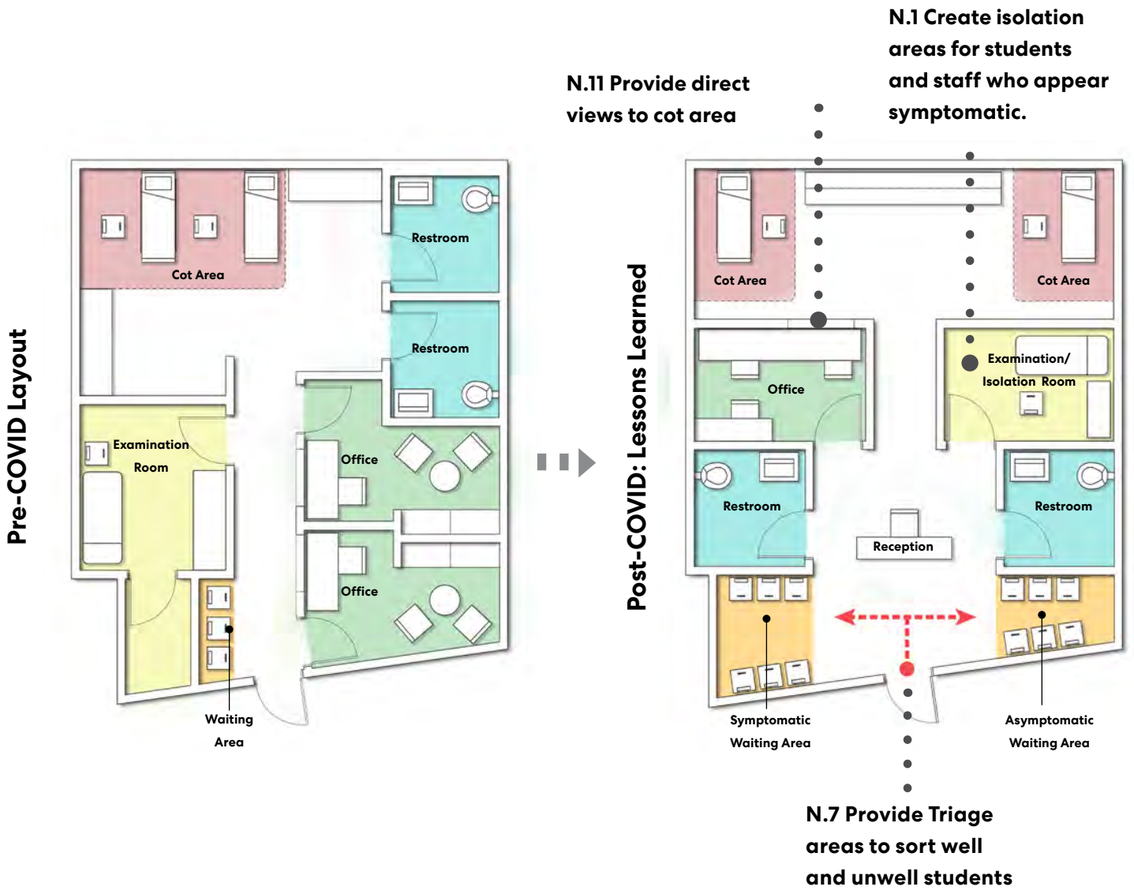
N.5
Create a Single Point of Entry and Exit

N.9
Ensure Nursing Areas are Flexible and Multifunctional

LBJ Early College High School Nursing Lab Renovation, Austin Texas

Nurse's Suite Layout - Example

Stoneham High School, Nurse's suite



N.6 Touchless entry to reduce fomite transmission

Resource:

A top priority for healthcare environments is to be nimble, flexible, and able to adapt quickly to evolving needs. Recently, we brought together multiple perspectives—from architects and interior designers to planners and registered nurses—to discuss Innovative Solutions for Healing Environments.

Above: *Medical University of South Carolina, Shawn Jenkins Children's Hospital*
Below: *Lucile Packard Children's Hospital*

Did you know?

The National Association of School Nurses has a library of available resources including everything from addressing chronic absenteeism, immunization, checklists. Check them out here!

Nurse Areas

Project: Lucile Packard Children's Hospital

References

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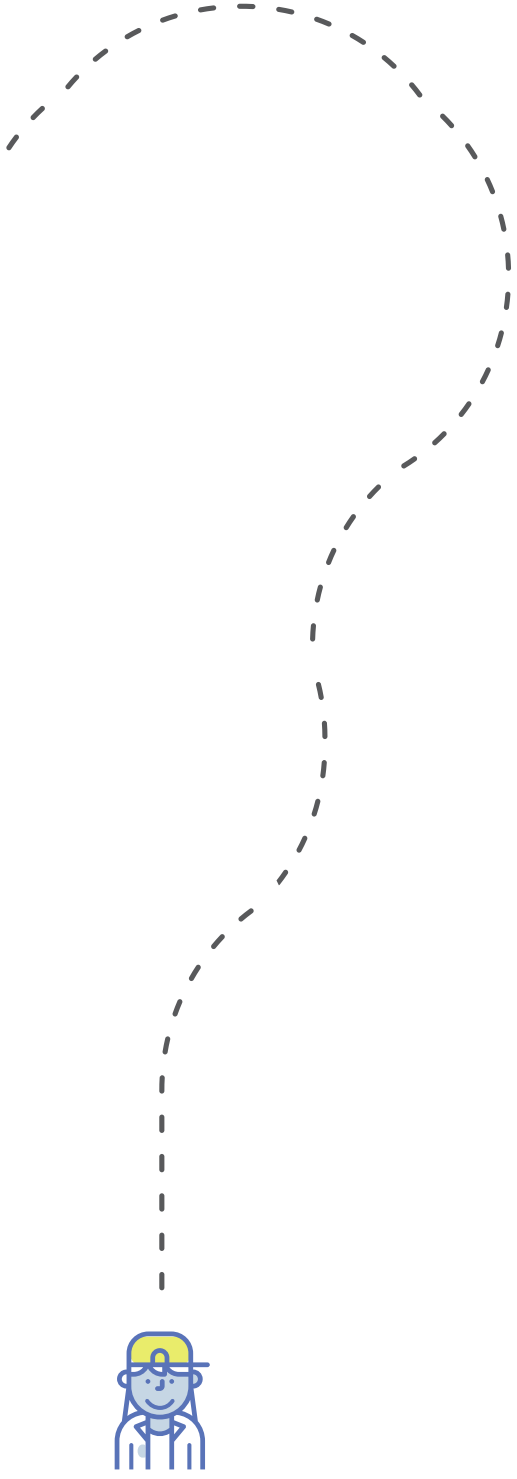
"They may forget your name, but they will never forget how you made them feel."

- Maya Angelou



Perkins&Will