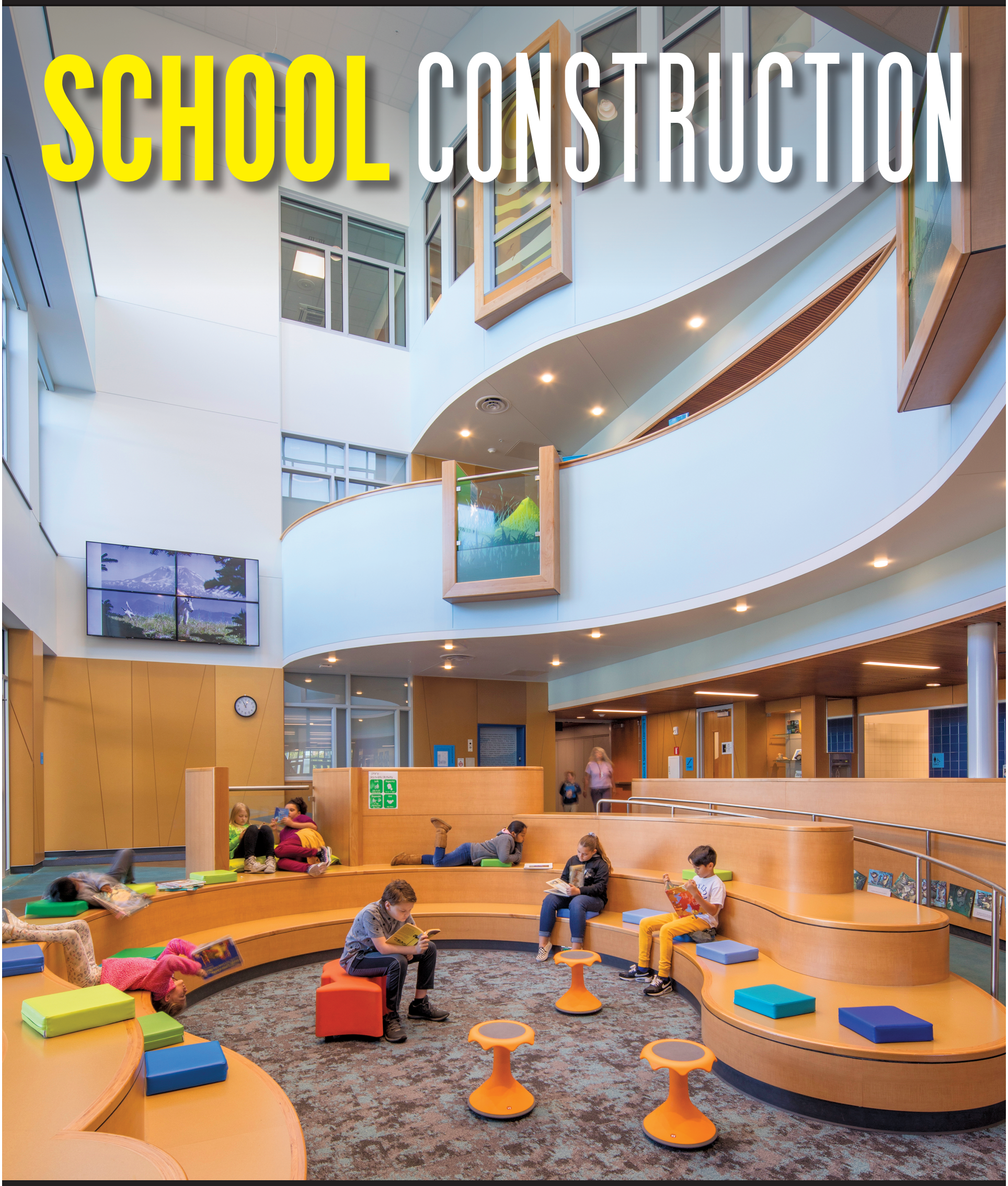
Seattle Daily Journal of Commerce

SCHOOL CONSTRUCTION



August 27, 2020

FIRST U.S. NET ZERO SCHOOL HAS 10-YEAR CHECKUP

Teams set goals for creating a building that was net zero in both water and energy use.

The LEED platinum Hood River Middle School Music and Science Wing was the first certified net zero energy public school in the country.

The school houses the FACS — Food and Conservation Science curriculum — that connects all disciplines and all the school's students through a three-year program in sustainable systems.

BY ALEC HOLSER
OPSIS ARCHITECTURE

The client envisioned a building that could act as a "teaching tool" illustrating sustainable ideas in practice and allowing students to interact directly with those systems to learn about their interdependency. Opsis began the process with an eco-charrette that included teachers, students, designers and engineers. Together, we set goals for creating a building that was net zero in both water and energy use. While constrained by a modest budget, we also wanted to use sustainable design techniques to help building users understand how the systems work and how students' actions are a critical component in the building's use of resources.

Now, 10 years later, the project continues to perform exceptionally both technically in balancing energy use and production, but almost more importantly, as a real-life teaching tool for middle school students to easily understand their own direct effect on the consumption of energy and ultimately their impact to the larger environment and forces creating climate change.

The food science program involves every student in the school and connects engineering, social science, math and biology with a goal of opening students' minds to the inter-relationships of all things in nature. A focal point of the project is the large greenhouse that connects the inside science lab to the outside learning garden. The linear flow back and forth between these spaces is modeled on a curriculum that encourages an iterative process of creation, prototyping, testing and building.

Keys to this project's long-term success has been the continued deep involvement and commitment of the original primary project sponsor, science teacher Michael Becker, combined with the dedication of the school's students from year to year. Beck-

At Hood River Middle School, solar panels and the greenhouse are integrated into a new building architecture fitting the National Historic Register school campus.

PHOTO COURTESY OF OPSIS ARCHITECTURE

PROJECT TEAM

Architect, interior designer, green consultant:
Opsis Architecture

Mechanical engineer, electrical engineer, lighting designer:
Interface Engineering

Structural and civil engineer:
KPFF Consulting Engineers

Geotechnical engineer:
PSI

General contractor:
Kirby Nagelhout Construction Co.

Landscape architect:
Greenworks PC

Acoustical and A/V consultant:
Listen Acoustics

Signage and graphics consultant:
Anderson/Krygier (now Knot)

er was instrumental in the initial planning, design, teaching in and monitoring the building from day one. He has adjusted many aspects of the systems over the years, even how students use the building, with the goal of maintaining the delicate balance of the energy cycle.

Since its opening, students have designed and constructed numerous additions to the building systems and grounds, including a living machine that uses waste from fish tanks to fertilize the greenhouse garden, a solar battery that modulates the greenhouse temperature through a thermal rock tank and many edible garden projects that tie directly to the food science program.

One thing we learned through this project, our first net zero facility, is that all systems in nature are interconnected and reliant on each other in very complex ways. Interestingly, the foundation of the school's permaculture science curriculum is similarly centered on whole-systems thinking and resiliency.

For our project, the challenge was to integrate many different technologies into one operationally complete system. Technologies included the 35-kilowatt PV array, geothermal loops under the adjacent school field, triple-glazed windows, natural ventilation, high-mass wall construction, radiant floor heating and the solar panel fresh air pre-heat plenum. The result is often quite beautiful, like the many ways we modulated the daylight through windows, skylights and clerestories to find just the right balance of light for learning, maximizing winter heat gain and minimizing summer gain.

While the project was not able to fully reach net zero water, its systems include a complex rainwater and adjacent stream water collection system and 20,000-gallon tank that not only supplies the building's toilets and sinks, but is a major source for the very large school garden.

Thinking holistically before the common use of the words "zero carbon," the team developed an extensive program of recycle and reuse that included the full dismantling of the existing 70-year-old bus barn on the site. The old-growth floor joists were carefully removed, structurally graded, and reused to form the dramatic exposed wood trusses over the science lab and music room. Every nail was recycled, and every board reused for the wall framing.

With all the technology inherent in a net zero building we were also guided by the fact that the project was part of 1927 National Historic Register campus and review by the local historic committee. We wanted to demonstrate that even using traditional building forms and details that these ecosystems could be integrated successfully.

Over the years we have heard comments about how amazing it was that we could "renovate" what they thought was a historic building to be net zero. In a nod to teaching students that "old school" is often foolproof, we designed a sundial over the main entry to remind us all about the constants of our planet circling the sun through the seasons.

Another lesson learned was that this type of building is, and should be, always a work in progress. We were asked to hold out the budget for landscaping and irrigation for the first few years so students could use their creation of the gardens to provide food for a school culinary kitchen program, a farmers market school-run vegetable stand and school-wide events.

More than 4,000 students have experienced the FACS program and net zero building, taking that knowledge forward in their lives. From this aspect, the building has far exceeded our expectations and was one of the first demonstrating that this idea was not a dream of architects and engineers, but in reality a practical and even affordable goal for any community to realize.

Every year, the school graduates a new class of students and has dozens from around the country and the world visiting the unique educational program and the building that houses it — spreading the word about our vital interconnection to nature. That alone gives us hope for the future.

Alec Holser is a founding partner of Opsis architecture, with more than 38 years of experience leading the design of a wide range of projects.

Students move freely from lab to greenhouse to garden to engage in a whole-systems iterative learning curriculum.

PHOTO BY M. MATHERS

INSIDE

ON THE COVER

Mary Lyon Elementary School in Tacoma was designed to engage the community, with a three-floor atrium library as the building's central hub. Learn more about the project on page 22.

PHOTO BY LARA SWIMMER PHOTOGRAPHY

2020 SCHOOL CONSTRUCTION

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LEARNING INSIDE AND OUTSIDE THE BOX

Outdoor spaces in educational environments can be more than just spaces to pass through.

BY SARAH BARTOSH & JAMES STUART SR.
AHBL

Arlington Elementary School in Tacoma offers both natural spaces on-campus and a partnership with nearby Oak Tree Park.

IMAGES COURTESY OF AHBL

Outdoor learning spaces may be a critical tool in response to COVID-19. We've learned from lockdowns and quarantines that the outdoors offers a refuge from the rigors of isolation.

Additionally, disease — especially respiratory disease — is less able to be transferred outside than in confined spaces where air is recycled and recirculated. The flexibility of outdoor learning allows for physical distancing. Schools need to use every tool at their disposal — including outdoor learning — to limit the spread of disease and keep children safe until vaccines and treatment are developed.

With this in mind, it is worth considering the advantages of outdoor learning and environmental experiences beyond this challenging time:

- An increased connection with the natural world.
- A better understanding of seasons, flora and fauna.
- Better health and wellness, fueled by fresh air, natural light and access to exercise.

These are the goals to which landscape architects, school districts, educators and parents must aspire.

Outdoor spaces in educational environments can be more than just spaces to pass through. They can be opportunities to foster unique learning experiences. Connecting students to nature is essential. While schools all over the country have been incorporating innovative landscapes, these features tend to be the first to be cut. Considering COVID-19, perhaps that will change.

When visualizing outdoor spaces at schools, most envision asphalt basketball courts and plastic play equipment. Rarely does one think of vibrant natural environments that teach about the ecosystems and are intertwined with our everyday

lives. Many schools lack any kind of natural environment, despite the impact environments have on student's development and understanding of the world around them. Landscape architects and schools are making great strides to change the way we design and utilize our outdoor learning environments to capitalize on the innate benefits of outdoor learning.

Outdoor learning environments can take vastly different forms, from wide-open fields and wooded areas to nearby open spaces and public parks. At the Annie Wright School in Tacoma, outdoor learning was identified as a primary goal of a recent playground upgrade. In order to accommodate the school's International Baccalaureate program and its emphasis on outdoor learning, AHBL landscape architects created a natural area to invite exploration, curiosity and creativity.

Large, old-growth stumps anchor the edges of the space and create opportunities for outdoor classroom teaching and a large wooden table and benches provides additional seating and flexible learning space nestled under an existing tree and enclosed by soft, low plantings. Framed within the beautiful brick walls of the school on three sides, the new natural area was carved out of existing spaces and has become an immediate asset.

Fife School District is undertaking just such an endeavor at Elementary School No. 4, where an outdoor learning courtyard was selected by the school district and Integrus Architects as a primary project goal. A key element in this effort is the inclusion of natural berms, created from repurposed topsoil which would have otherwise been trucked offsite during construction.

These sculpted landforms are designed for students to engage in creative and unstructured play and can accommodate classes in a socially distant, open air environment. In addition to providing a venue for play and learning, the berms are visible from three stories of classrooms, reducing stress among students and standing as a tangible reminder of nature. The use of fill material and existing space ties directly into the cost efficiency school projects demand.

As Sharon Gamson Danks notes in her article, "The Green Schoolyard Movement" (The New Nature Movement: guest columns, Feb. 6, 2014), interaction with nature reduces cortisol levels, leaving a person feeling renewed and revived for days after their nature experience. Additionally, outdoor learning can enhance student enthusiasm and engagement in learning. Hands-on experiences promote deep learning and imaginative play by providing variety and diversity in children's social and play environments. The result is an increased ability to focus, reduction in boredom, shifts in social leadership structure, and fewer disciplinary problems such as playground bullying.

Even before COVID-19, AHBL's landscape architects were embracing the challenge of bringing outdoor learning to K-12 clients around Washington state.

Currently, there are several barriers that can prevent schools from being able to implement these types of spaces. Funding, time demand and maintenance are three of the most prominent, but with the right approach, solutions are available.

In Tacoma, the outdoor learning environment at Arlington Elementary School benefits from using natural elements and takes advantage of nearby Oak Tree Park to enhance science curriculums. This is a great example of school districts partnering with local parks districts to capitalize on nearby open spaces while maintaining budget and programming space.

In the case of Arlington Elementary, AHBL also provided landscape architecture services for the restoration of Oak Tree

OUTSIDE THE BOX — PAGE 7

The natural learning and play area at Annie Wright School is an adaptable space which offers students an area of refuge, interaction with natural elements and the ability to spread out and learn in outdoor classes.

STUDENTS GET A BOOST FROM OUTDOOR CONNECTIONS

Designers and educators need to consider the potential of nature integration as a resource for learning.

BY BRENDAN CONNOLLY
MITHUN

Do experiences with nature promote learning? Until recently, claims and anecdotal observations exceeded evidence. But the field has advanced with hundreds of studies that offer converging evidence of the cause-and-effect relationship between nature and learning.

Research by educators, psychologists and social scientists alike demonstrates that experiences of nature boost academic learning, environmental stewardship and child development. Additional benefits range from physical fitness to stress reduction and emotional resilience, making outdoor connections an important design consideration for schools and families during the unique challenges presented by the COVID-19 pandemic.

"In academic contexts, nature-based instruction outperforms traditional instruction," said Ming Kuo, Ph.D. of University of Illinois at Urbana-Champaign's Landscape and Human Health Laboratory and lead researcher for multiple studies on the impact of nature on learning.

Nature helps children in key areas driving academic performance: restoring attention, relieving stress, developing self-discipline and fostering creativity. Quantitative metrics include higher standardized test scores and graduation rates within experiments spanning a wide range of instructional approaches.

The average American child spends more time watching screens (1,200 hours per year) than in school (900 hours per year). With many Puget Sound area schools opening in a distance learning model this fall, the need to balance expanded on-screen time with outdoor exploration is of heightened importance, and these outdoor resources add programmatic and operational resilience as future re-occupation of learning facilities occurs.

How can we strengthen outdoor learning opportunities and bring natural relationships into the built environment? Three case studies offer replicable strategies for schools from pre-kindergarten through 12th grade.

The library at Blakely Elementary School features views into the adjacent forest, as well as biophilic design elements like tree columns and a timber reading "nest" that activate children's imagination and provide a break from classroom learning.

PHOTO BY BENJAMIN BENSCHNEIDER

Integration of the upper school expansion on The Bush School's urban campus amplifies the connection between students and larger ecological systems of the city.

IMAGE COURTESY OF MITHUN

Engaging senses

Located on a wooded site on Bainbridge Island, Blakely Elementary School is designed to bring nature into the learning experience through diverse outdoor environments and biophilic strategies. Completed in fall 2019, the replacement pre-K-4 school maximizes views from classrooms and the library toward an outdoor learning courtyard and forest beyond to reinforce connection to nature throughout the daily experience. Significant open area is restored to a native forest condition with stormwater management to protect wetlands on the site and the adjacent IslandWood environmental education campus.

The courtyard is designed to support STEAM curriculum and features activity zones that immerse students in nature, hands-on learning and quiet study. Outdoor play areas encourage exploratory play with natural materials and forms. Research suggests that kids are more engaged in learning not only during outdoor activities but also upon returning to their classroom afterward — even if the subject they return to is not nature-related.

Biophilic design elements are infused within the indoor experience to extend connectivity with the site. Stair guardrails are inspired by tree rings, digitally abstracted and modified to ensure structural integrity once the pattern is laser-cut from steel panels. Tree columns provide structural support along the primary circulation spine of the school, from the exterior front entry to the library at the rear.

"When we think of our school as inspired by the forest, the library is certainly at the top with a full view of learning going on all around us while we curl up in 'The Nest' to share a story," explained Blakely library media specialist Kathleen Pool. "It is a very natural place to listen, to use the imagination and to wonder. It is as if the room says 'come and read…' and the children do."

Building environmental stewards

Not all schools have immediate access to forests and wetlands, but even the most urban settings afford opportunities to connect with the natural world.

Located in Seattle's First Hill neighborhood, the densely programmed Northwest School 401 E. Pike building features a rooftop sports field, learning garden, solar thermal collection panels and "sky lab" with views across downtown, changing weather patterns and the urban tree canopy. These settings extend hands-on science exploration beyond the classroom, and invite students in grades 6-12 to engage with the school's energy performance and the city fabric beyond.

Another urban campus, the Bush School is aiming to foster stewardship through the integration of natural materials and elements in its upper school expansion. Observation and teaching porches provide opportunities for meaningful connection with the natural and urban environment as part of the learning process. Integrated stormwater strategies on display serve as keen reminders of the watershed location of this campus and its role in habitat protection.

Bush School will be the first Salmon Safe certified school in this region. Through this program, students and staff will play an active role in protecting water quality and salmon habitat, reinforcing connections between classroom learning and community ecological health.

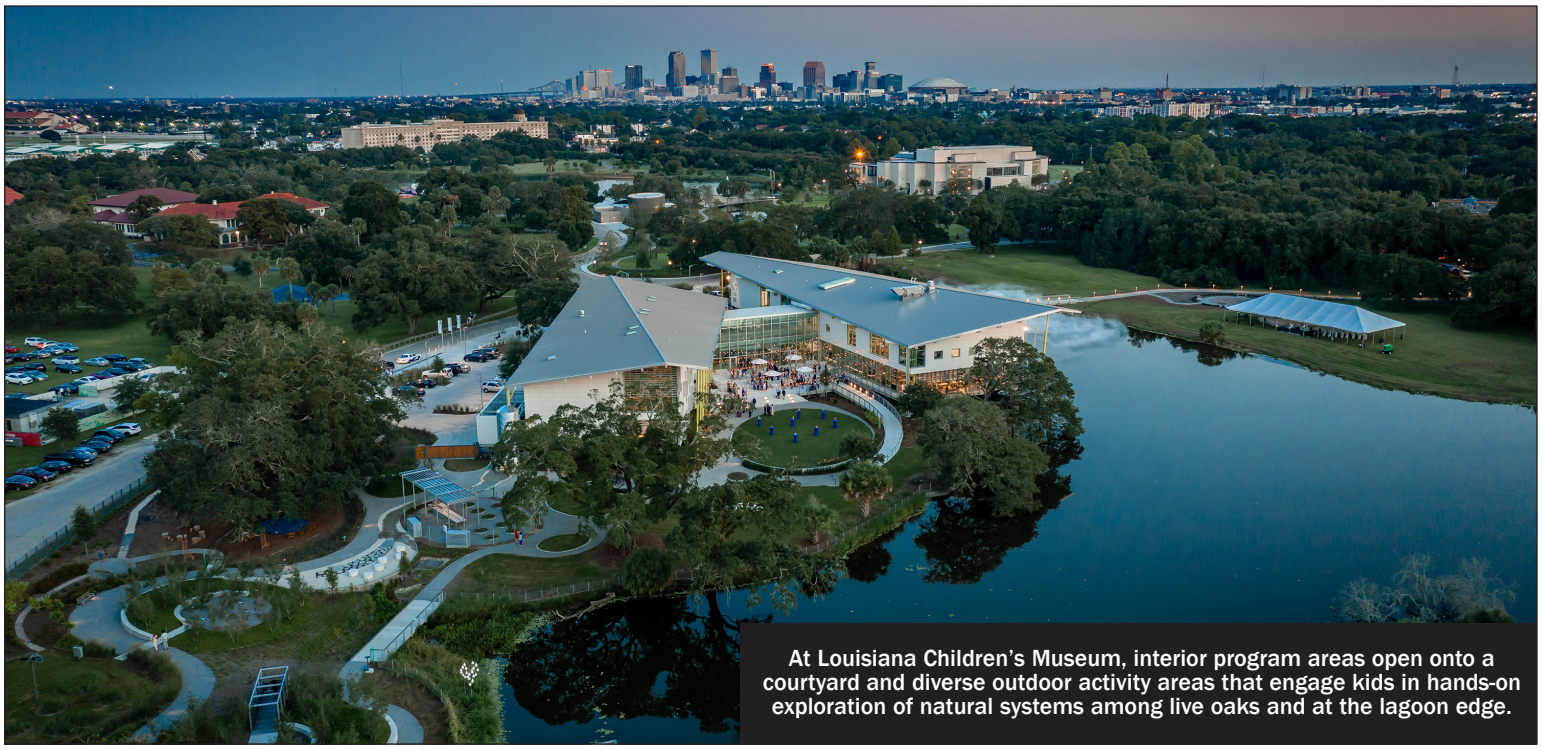
Through environmental education and stewardship programs like this, schools are able to leverage their immediate natural surroundings as learning tools, and also to bridge to larger regional ecological systems.

Accelerating child development

After Hurricane Katrina in 2005, Louisiana Children's Museum re-envisioned its mission to holistically address the health and development of children in a state that consistently ranked among the worst in the nation for education outcomes. The health and development benefits of intentionally connecting children with nature led the museum to relocate from an indoor-focused experience in New Orleans' Warehouse District to a new campus encircling a lagoon in the 1,300-acre City Park.

The new campus presents a transformative model for children's museums, one that weaves together indoor and outdoor learning opportunities along with literacy, parenting, early childhood research and environmental education activities to create a holistic and supportive environment for children and their families.

A favorite among new interactive exhibits is the mighty Mississippi, which follows the river's journey from its headwaters in Minnesota all the way to the Port of New Orleans and Gulf of Mexico. Reinforcing connections between indoor and outdoor play experiences, Mithun's integrated design team extended the experience outside with a child-operable sluice gate that releases water flow into a shallow scrim and ends where kids can jump between small mounds surrounded by marsh plantings. Hands-on learning continues in edible and sensory gardens, music exhibits and a floating classroom.



At Louisiana Children's Museum, interior program areas open onto a courtyard and diverse outdoor activity areas that engage kids in hands-on exploration of natural systems among live oaks and at the lagoon edge.

PHOTO BY KEVIN BARRACO

By providing multi-sensory environments that empower children to make their own choices, and enable and reflect children's work and ideas, the museum encourages children and families to engage more deeply. As a result, staff have noted that interaction across multi-generational families has increased. Children remain engaged longer in the experiences — honing skills like perseverance, self-efficacy, resilience and collaboration that are essential to 21st century learning and life.

The groundbreaking project has accelerated new investments in early childhood development in New Orleans and statewide, an exciting change from Louisiana's historical ranking among the lowest in childhood development benchmarks. Continued momentum is anticipated. The Louisiana Department of Education initiated discussions with Louisiana Children's Museum about two meaningful possibilities: a water management curriculum tied to the new science curriculum being shared by four states, and an early learning/school readiness initiative.

Resilient schools

Educational institutions that emphasize nature connections, even in the tightest of urban conditions, amplify the learning potential of their curricula and cultivate resilient learners with a greater capacity to meet challenges and thrive in adverse situations. Given the myriad cognitive, leadership and developmental benefits of nature experiences, it's imperative that designers and educators consider the full potential of nature integration as a resource for learning. Amidst the realities of current online learning models and societal stressors, access to nature is a vital element in fulfilling the educational promise to current and future generations of learners.

Brendan Connolly is a partner and education practice leader at Mithun.

OUTSIDE THE BOX

CONTINUED FROM PAGE 5

Park, in which major improvements were made for accessibility and natural habitat. This project is a testament to creative problem solving and resource management. The school district has partnered with Metro Parks Tacoma and Wildlife Champions to bring the students immersive nature experiences. Partnerships with local agencies and utilizing existing open spaces are low-cost strategies to bring students closer to nature.

Outdoor learning spaces can be accommodated by almost any budget. Low maintenance options and collaboration with facilities staff ensures these assets do not become a burden to school districts. Thoughtful design can account for inclement weather and regional conditions. And while student safety remains of paramount importance, outdoor spaces can be made safe for all through thoughtful design. These are compelling solutions considering the dangers of COVID-19, made all the more attractive because of its ability to stand the test of time and bring value to students for decades to come.

For all the challenges and struggle it has created, perhaps we can make a return to nature one of the defining legacies of COVID-19.

Sarah Bartosh is a landscape designer for AHBL and James Stuart Sr. Is marketing coordinator at AHBL.

IDAHO SCHOOL MASTER PLAN TAKES ON LIVING BUILDING CHALLENGE

The Sage School's mission is to create a curriculum based on human ecology, community and sense of place.

BY JOHN MACKAY & CHRIS HELLSTERN
THE MILLER HULL PARTNERSHIP

For any educational institution, embarking on a master plan journey is a big step. For those taking on the Living Building Challenge (LBC) for a school master plan, it may seem overwhelming, but it need not be. The values and framework of LBC can help institutions and stakeholders to think through critical questions early as the vision and program elements align.

With an even greater focus on social equity, the Living Building Challenge imperatives, or requirements, can help provide a meaningful way to address the master plan's fundamentals. From equal access to organizational transparency and educational development, there are a variety of ways to help envision our built environment to better represent an inclusive and just community.

The Miller Hull Partnership had the opportunity to work with The Sage School in Hailey, Idaho, where the seamless alignment of the school's mission to create a curriculum based on human ecology, community and sense of place with the ideals of the Living Building Challenge was clear from the beginning. It was a natural fit. The goal, like every successful master plan, was to provide the school with a roadmap to inform decision making going forward, to align funding, and to inspire the community stakeholders as their shared vision takes shape.

The preferred campus concept responds to the three guiding tenets identified by The Sage School: its mission and vision, the adolescent journey and human ecology.

IMAGES BY THE MILLER HULL PARTNERSHIP

"The master plan is just that — the guiding document. It is the time, the space, the place to get as many key stakeholders together as possible," said Harry Weekes, head of The Sage School. "And it's wonderfully generative — that time when you are asking and looking at 'What the school can be?' It brings up ideas about vision, and mission, and purpose, and values, and then starts to crystallize those in physical space. You learn to

LIVING BUILDING — PAGE 10

LIVING BUILDING

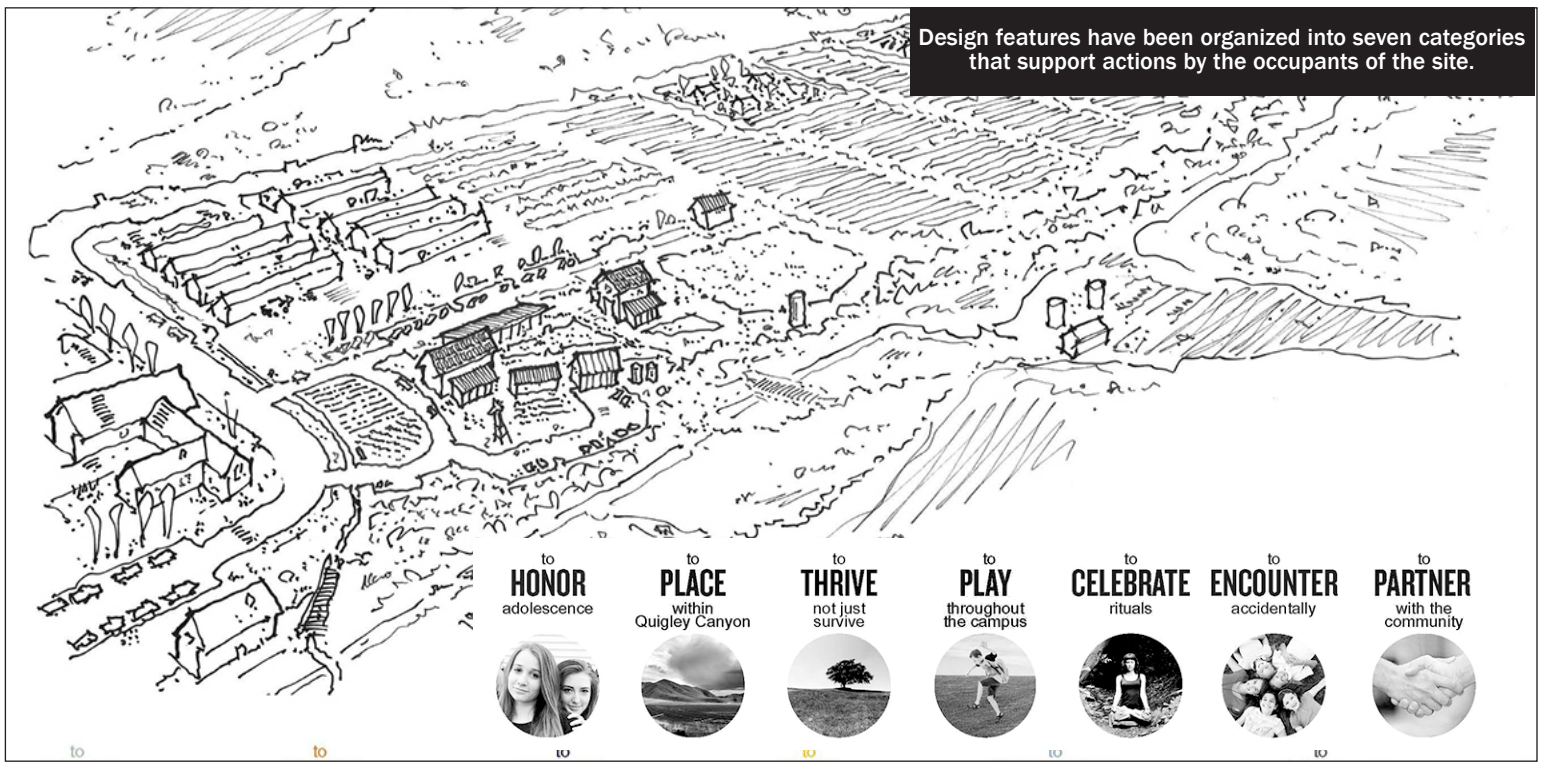
CONTINUED FROM PAGE 9

better articulate what you are thinking, to get rid of some of the things you don't really like, and to really articulate the ideas you hold dear."

The Sage School is founded on the belief that the way students are educated determines the fate of our world, and in order to change our relationship with the natural environment, students need to be guided toward developing a sense of self that includes deeply understanding the natural, built and social environments in which we live. Key themes emerged through interviews and workshops with parents, teachers, administrators and friends of the school.

Architecturally, the buildings and grounds should not be too precious, but moments or elements should be precious enough to be special. Honor adolescence and keep the love of learning alive. Design the campus to integrate the latest in ecological design — borrow from the characteristic of emergence that develops from a relationship. Community connections are a must — educate the community and build a more humane reality for kids.

As the most stringent sustainability building rating system in the world, the focus of the LBC is to set a framework to encourage regenerative buildings that emulate nature and give back to their environments, a powerful foundation for developing global citizens to both protect nature and build community.



Design features have been organized into seven categories that support actions by the occupants of the site.

IMAGES BY THE MILLER HULL PARTNERSHIP

The LBC requires each project to operate within the natural carrying capacity of the site. Understanding how much solar energy strikes the site and how much rain falls on the property informs the carrying capacity, which was estimated at this very early planning stage by determining the extreme minimum and maximum carrying capacities and then identifying a middle ground target. For example, normal school hours and use throughout a calendar year constitutes the minimum capacity.

The school's goal is to optimize the use of the physical campus resources to function as a community asset beyond the school day and year. Therefore, the total waking hours with extended uses account for the maximum capacity.

Miller Hull's team — which included PAE, Biohabitats and The Berger Partnership — test-fit a path to realize each of the challenge's seven petals, or performance areas, for inclusion in the final master plan document. The new Sage School campus will provide a home for students to mature in a positive and supportive environment during their formative years.

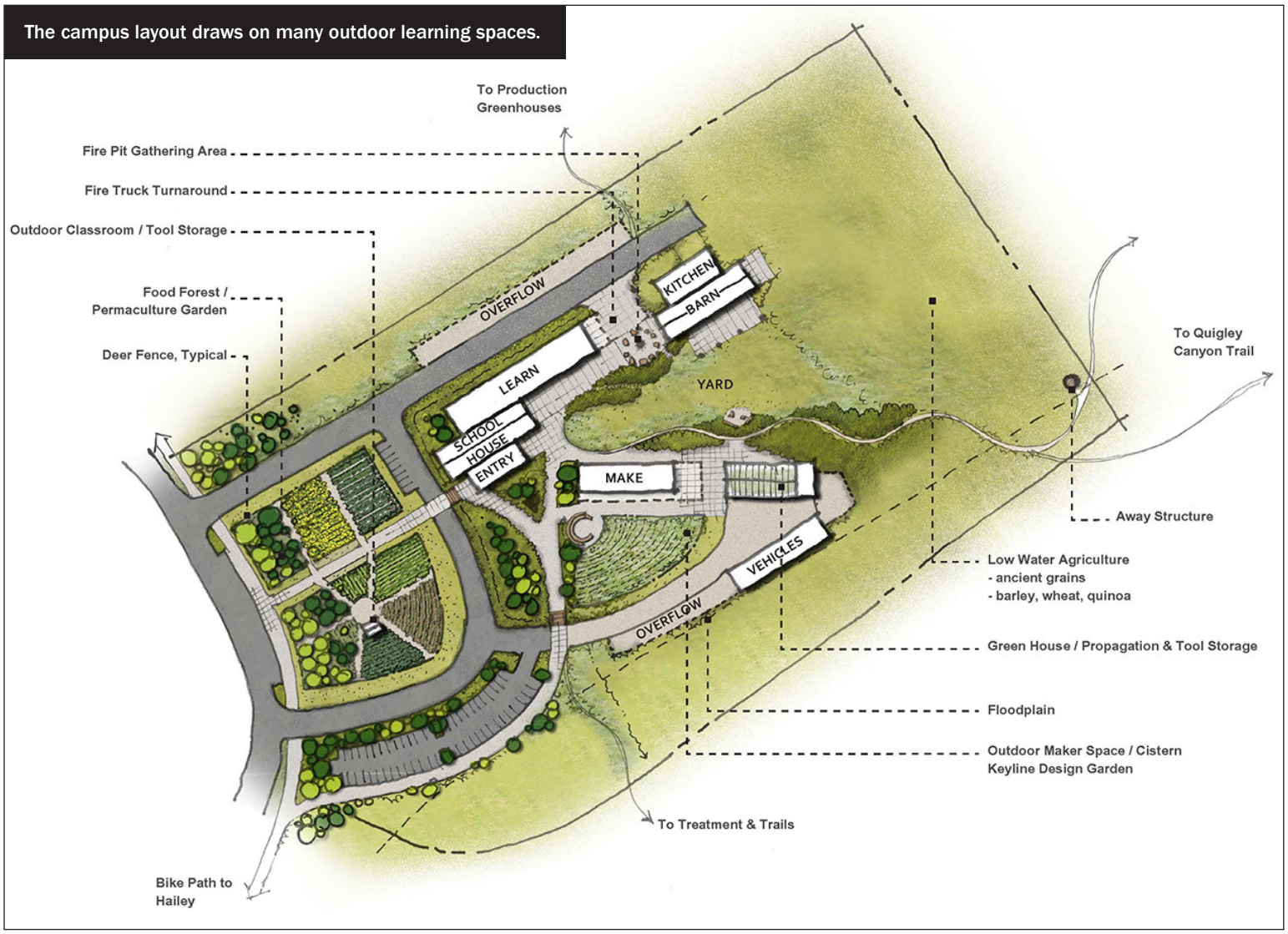
The Sage School is currently fundraising and working through COVID-19-related challenges. This pandemic pause should encourage all of us to plan and design our next buildings in the light of nature.

This pandemic gives us an even greater reason to focus on making our buildings healthier for their occupants. It provides stronger opportunities to address socioeconomically disadvantaged populations, which are harmed more by both climate change and disease outbreaks.

It gives us an even greater purpose to holistically and systemically address sustainability in all our work. And, it reinforces the need for all of us to take swift and effective action to solve these challenges together, one master plan at a time.

John MacKay is an associate at Miller Hull and Chris Hellstern is the firm's Living Building Challenge Services director.

The campus layout draws on many outdoor learning spaces.



EASTSIDE SCHOOL'S HVAC SYSTEM ZAPS THE BAD STUFF

StudieshaveshowntheNPBItechnologyselectedforForestRidgehasbeenabletoreducetheCOVIDvirusloadby99.4%.

BY JACOB BESAGNO
HERMANSON CO.

While teachers, parents and students struggle with the question of returning to school campuses this fall, one school in Bellevue is preparing to welcome students back, when it is safe to do so, confident in the steps they have taken to help mitigate exposure to COVID-19.

As COVID cases continued well into the summer months, administration at Forest Ridge School of the Sacred Heart, an independent Catholic day and boarding school for middle and high school girls, contacted their mechanical preventative maintenance contractor for help in determining ways to reduce pathogen exposure in classrooms and dormitories.

Hermanson Co.'s Brad Sharp, testing, controls and commissioning manager, had begun researching the efficacy of both ventilation and surface-based therapies months earlier. Sharp, who has over 20 years in indoor air quality training and remedy implementation, had determined the combination of HVAC-based needlepoint bipolarity ionization (NPBI) and increased filtration to be the most effective option available. Sharp and his team had already installed functioning systems in a large corporate complex and medical clinic with promising results.

Needlepoint bipolarity ionization creates negatively charged ions (also known as anions) as air passes through a high-voltage electrical charge inside a cartridge strategically installed in HVAC ductwork. The ions clump molecules together, making them easier to capture by denser ventilation filters. The ions also rob virus, bacteria, allergen, mold and odor molecules of their hydrogen and render them inactive without creating harmful ozone!

The NPBI technology is an example of biomimicry. The negative ions created in NPBI are the same phenomenon that occurs in nature around rapidly moving water. The force of water creates negative ions. Anyone who has been hiking and came upon a waterfall or stood on the seashore near crashing waves recalls the fresh air surrounding those natural spaces. This is also one of the reasons a morning shower is so refreshing.

Based on Hermanson's research and the manufacturer's recommendations, Sharp sent a team of technicians to Forest Ridge to begin an HVAC system analysis. They gathered information on the system's tonnage and cfm capacity. Once the information was gathered, technicians Kelsey Ayer and Chris Cruz confirmed the HVAC system's true airflow by taking readings and performing spot pressure tests.

According to Sharp, proper air flow is key to creating the required level of ions needed to inactivate pathogens, dust and odor molecules. "Over the course of installing multiple NPBI units, we have developed an expertise in identifying airflow obstacles that would impact ion levels," notes Sharp. In addition to ensuring proper airflow, strategic placement of the NPBI unit within the ductwork is also key to optimizing ion levels.

Once baseline airflow readings were established, installation of 100 NPBI units across nine buildings in the school's air handler unit, fan coil unit, VAV and dormitory VRF ductwork began in early July. In addition to installing the NPBI units, Ayers and Cruz will be increasing HVAC filtration to MERV 13 as a first line defense against the COVID virus.

Forest Ridge's decision to invest in NPBI technology was based on several factors.

"Brad Sharp met with us and did an amazing job explaining in layman's terms the science behind why bipolarity ionization works," recalls Kelly Cruden, Forest Ridge facility manager. "We have some functioning but aging HVAC components. Since the NPBI units are fully portable, they can be re-installed in future upgraded equipment, making this a sound investment for the long term."

Studies have shown the NPBI technology selected for Forest Ridge has been able to reduce the COVID virus load by 99.4% within 30 minutes at consistent levels of concentrated ions. Additionally, NPBI is a continuously active preventative measure that does not, like mandatory mask wearing and recommended hand washing and social distancing, rely on human compliance. If the HVAC system is running, this preventative measure is working. Also, knowing this is the same method used in hospital and medical settings and does not create harmful ozone is reassuring to both staff and parents.

Already the indoor air quality at Forest Ridge has improved. Ayers and Cruz report entering the school's chapel to a distinct stagnant smell, but after install-

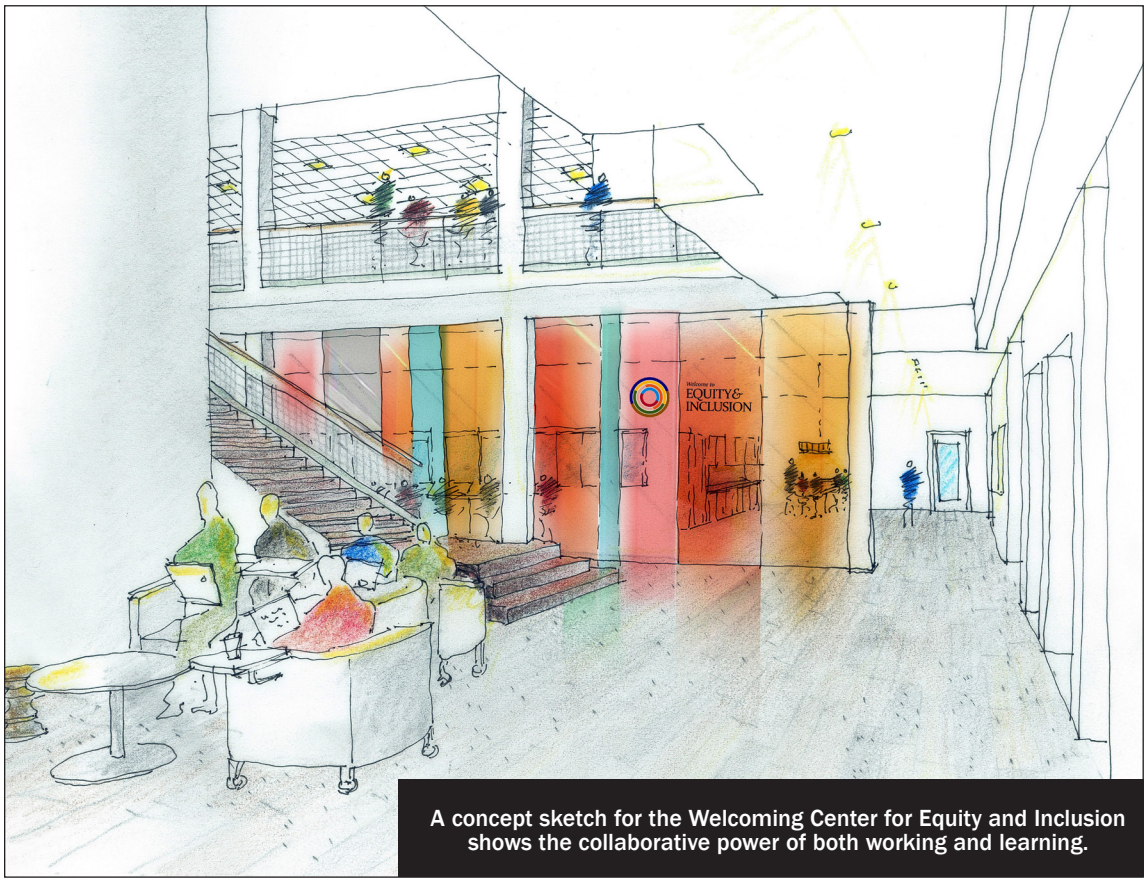
HVAC — PAGE 15

Hermanson's TCC manager Brad Sharp and TAB technician Kelsey Ayer with NPBI units to be installed at Forest Ridge School in Bellevue.

PHOTO COURTESY OF HERMANSON

UWT PROJECT FOCUSES ON EQUITY, JUSTICE AND DESIGN

The school's Welcoming Center for Equity and Inclusion will be a gathering spot for students of all backgrounds.



A concept sketch for the Welcoming Center for Equity and Inclusion shows the collaborative power of both working and learning.

IMAGES COURTESY OF MCGRANAHAN ARCHITECTS

BY SHONA BOSE & SEONG SHIN
MCGRANAHAN ARCHITECTS

This year has brought renewed attention to inequities deeply rooted in our society. These inequities cut through all aspects of our lives, including architecture and equal access to shared spaces. Architectural design and the design process have a unique opportunity to respond to and help promote change towards a more equitable and just society.

The University of Washington Tacoma (UWT) is bringing together four units on the downtown campus with the intention of being an agent of such change. These four units are the Center for Equity and Inclusion (CEI), the Teaching and Learning Center (TLC), the University Library, and a new technology hub. This new Learning Commons focuses on inclusion, integrated learning, knowledge and technology in equal parts to infuse the university's core values into the buildings at the heart of campus.

Bringing together these diverse program types and designing purposefully democratic educational spaces for today requires an inclusive design process, with curiosity for the diverse lived experiences of students and an awareness of the historical cultural context of the place.

Inclusion in the design process

Throughout the planning and design phases, McGranahan sought to engage the people we are designing for, to hear and understand their interaction with the university.

In these in-person and online meetings, it was not about the questions that we-as-the-architect asked, but that we-as-the-whole-team developed a sense of trust and belonging. We had to create a psychologically safe environment by setting some ground rules for all our meetings in order to be this vulnerable with each other.

From the beginning, our intent was to include as many voices in the process as possible and give them equal weight. All opinions and perspectives were respected, and every conversation was approached with curiosity. We would conclude each meeting with "Wows and Wonders" (a quick roundtable method of recalling highlights from the meeting) to make sure everyone's voice was heard. These meeting practices require time, discipline and sometimes a bit of awkwardness to establish in a group, but it is worth the effort for projects of all sizes/scales. For a project as complex as the Learning Commons, with so many unique units coming together, it was essential to slow down the process and truly hear everyone's point of view.

The relationships that were formed through this process not only informed the design but have shaped connections between the units. As the narrative and floor plans developed, the mindset of the group shifted towards one of partnership and collaboration, which will inevitably flow into the spaces created from the drawings.

Connecting people and place

As with any project, we heard about the many services offered by each program and the current challenges they face; however, with this project, we also heard about the cultural and historical connections that run throughout campus and the surrounding community. These connections enforce the feeling of belonging, so it was essential to understand and create space for them.

Most students commute to this campus, so the Learning Commons is one of the few shared spaces where all students find a common university experience. The UWT student population is diverse in ethnic and family backgrounds, age, interests and experience levels. First generation college students make up more than half the student population. There is a kaleidoscope of perspectives and needs on the UWT campus.

UW Tacoma is an urban university that opened in 1997, located in the heart of the city's historic warehouse district. It is physically tied to the Tacoma's 19th century emergence as the terminus of the Northern Pacific Railroad. This railroad was built by Chinese migrant laborers who were not allowed to make their homes in Tacoma. Many of the buildings that UWT inhabits today were originally used as commercial business buildings because of their proximity to the terminus, including a vibrant community of Japanese-owned businesses

that were lost to the internment of Japanese people during WWII.

In the larger context of Tacoma, UWT resides within and acknowledges the territory where the Puyallup people lived for thousands of years. It also must grapple with the redlined neighborhoods that have a lasting mark on Tacoma to this day.

Design response — access for all

This is a small project, rich with design opportunities and challenges, but the inclusive and engaging process has allowed us to listen to all stakeholders, see through their lenses, and give birth to a UWT HUB — a Learning Commons with efficient solutions including these three design moves:

- Relocation of CEI and technology lab/maker space on to the first floor of the main entry.
- Navigation "spine" connecting all four units with a "one-stop-shop" main desk and other resource-specific check-in desks.
- Variety of active learning, flexible and open spaces for all.

Relocating the CEI to the first floor of the new Learning Commons will complete the university's vision of creating a welcoming campus for all students. At the beginning of the design process, the Center for Equity and Inclusion asked the design-build team, the university leadership, and the other units to trust that they could anchor the whole program by placing them prominently on the first-floor near the main entry to the Learning Commons. This was a highly coveted location, which evolved through many conversations and design iterations. As we arrived at the iteration where the CEI and the new technology hub hold the first floor, the whole project started to come into focus.

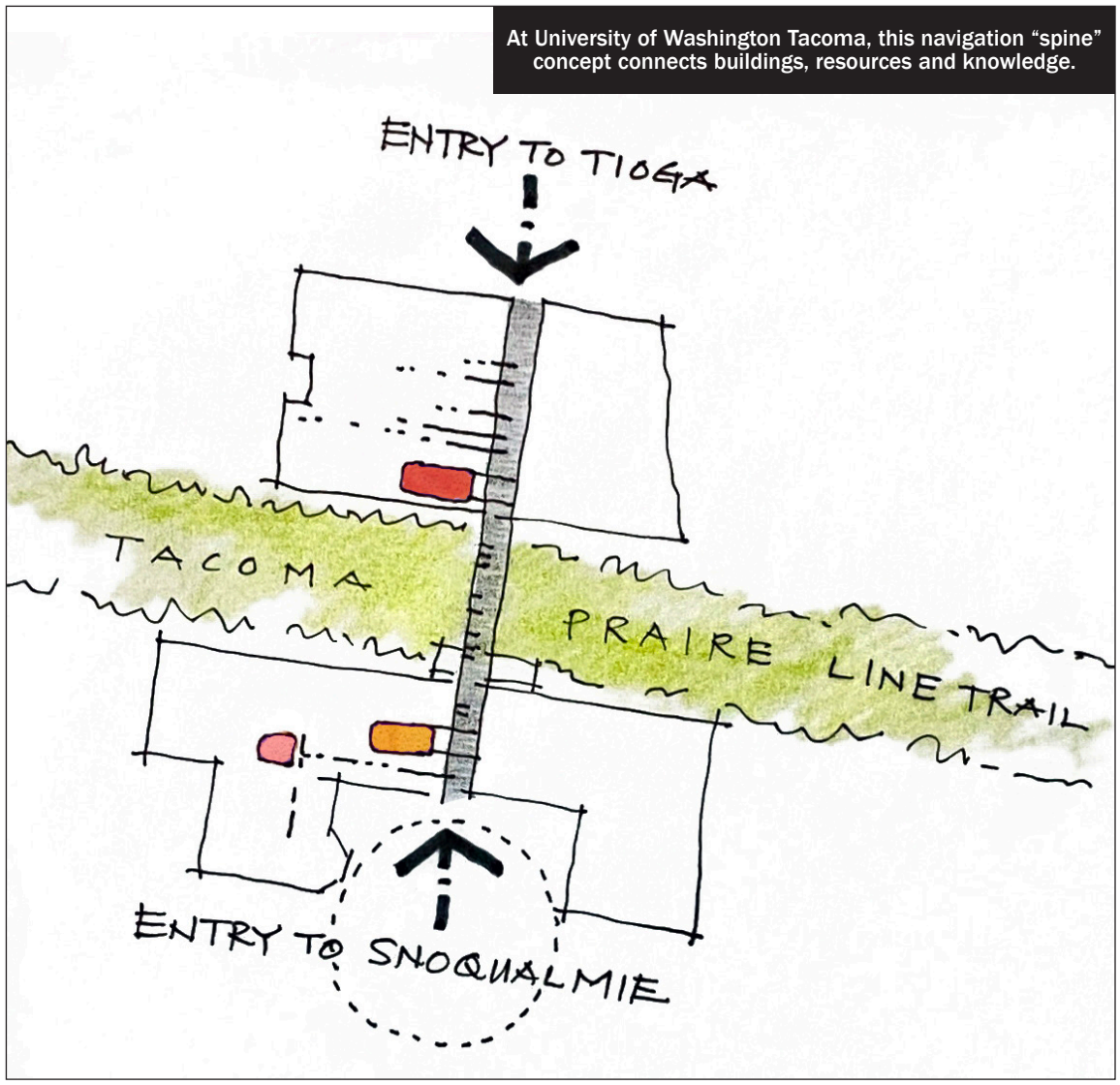
The CEI is a natural connector already creating joint programming with other units. They give space where historically marginalized communities can be in closer proximity to one another while maintaining a sense of their own space. They celebrate belonging and culture where everyone can participate. In addition to this, co-locating the technology lab/maker space with the CEI creates a 21st century Learning Commons where equal access is a priority.

Enhancing the navigation experience was one of the clients' primary goals. The new "spine" — connecting the buildings and the service points of all four units — provides logical wayfinding, clear sightlines and a welcoming experience. The spine also functions as a curated gallery space to showcase local histories, diverse community stories and UWT-focused projects.

It was important to students, staff and faculty to reflect on and consciously transform the way they want to learn, study and engage in this new space. The environment will be open, connecting to both natural light and campus views. A variety of furniture types, reservable study rooms and active learning spaces addresses the community's diverse and unique learning styles. There will be a prayer and meditation space with an ablution sink for ritual washing. This space was designed with the help of the Muslim Student Association and can be reserved by any group needing a place to express their personal beliefs.

Bringing together unique services and resources, while also honoring history and lived experiences, has allowed us to create a welcoming hub for diverse learners to navigate integrated services, technology-rich resources and safe physical spaces. As a result of these new conversations and partnerships, the Learning Commons as a built environment will embody UWT values and place knowledge, learning and inclusion at the heart of this historic campus.

Seong Shin is a director of interior design and Shona Bose is a project designer, both with McGranahan Architects.



At University of Washington Tacoma, this navigation "spine" concept connects buildings, resources and knowledge.


© Benjamin Benschneider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© Janette Ryan

HOW THE PANDEMIC CAN CHANGE EDUCATION FOR THE BETTER

The re-creation of authentic learning experiences is both a hurdle and an opportunity.

Earlier this year, the immediate shift to remote emergency learning as a result of COVID-19 forced school districts to think differently about the delivery of education. In many cases, a culture of lecture-based instruction fell flat as it was pushed online.

BY EMILY S. FROESE
DLR GROUP

To find out more about how the pandemic is changing learning among K-12 communities, DLR Group conducted personal surveys with school districts across the country, representing more than 2.6 million learners. The data collected supports what we are now seeing going into the fall semester — to one degree or another, virtual learning is here to stay.

The pivot in instructional delivery with this pandemic has shifted the mindset exponentially out of absolute necessity. The re-creation of authentic learning experiences is both a hurdle and an opportunity and has paved the way for an inquiry-based learning model for student engagement and authentic learning.

Transferringresponsibility

Inquiry-based education offers a methodology that does not rely solely on the educator being the lead in all learning. It is an active form of learning that begins with inquiry, problems and scenarios. Learners identify, investigate and research issues and respond to challenges or complex problems. In addition, this mode of learning can support a broader variety of learning styles, allowing students to select their modes of discovery; and for those learning virtually, maximize tools available in their own homes.

By moving through the three levels of inquiry — structured, guided and personalized — learners acquire the skills for personalized and individualized learning and are prepared for future success:

- **Structured:** In a structured environment, the learner follows the lead of the educator and the entire class engages in one structured lesson together.
- **Guided:** In a guided approach, the educator chooses the topic and essential question, while the learner has autonomy to design the product or solution.
- **Personalized:** In this case, the learner creates her own essential question with support from the educator, researches needed resources, orchestrates her learning evidence, and designs how she will demonstrate her learning.

Inquiry-basedlearning

The educator facilitates the development of an essential question focused on the inquiry-based question based on the state standards and determines the formative assessment to ensure those criteria are being met. A typical inquiry-based cycle starts with an essential question, that can diverge or follow a single area of study such as math or English.

Schools such as Discovery High School in Camas include components of inquiry-based learning, including exhibition space for presentations and collaboration.

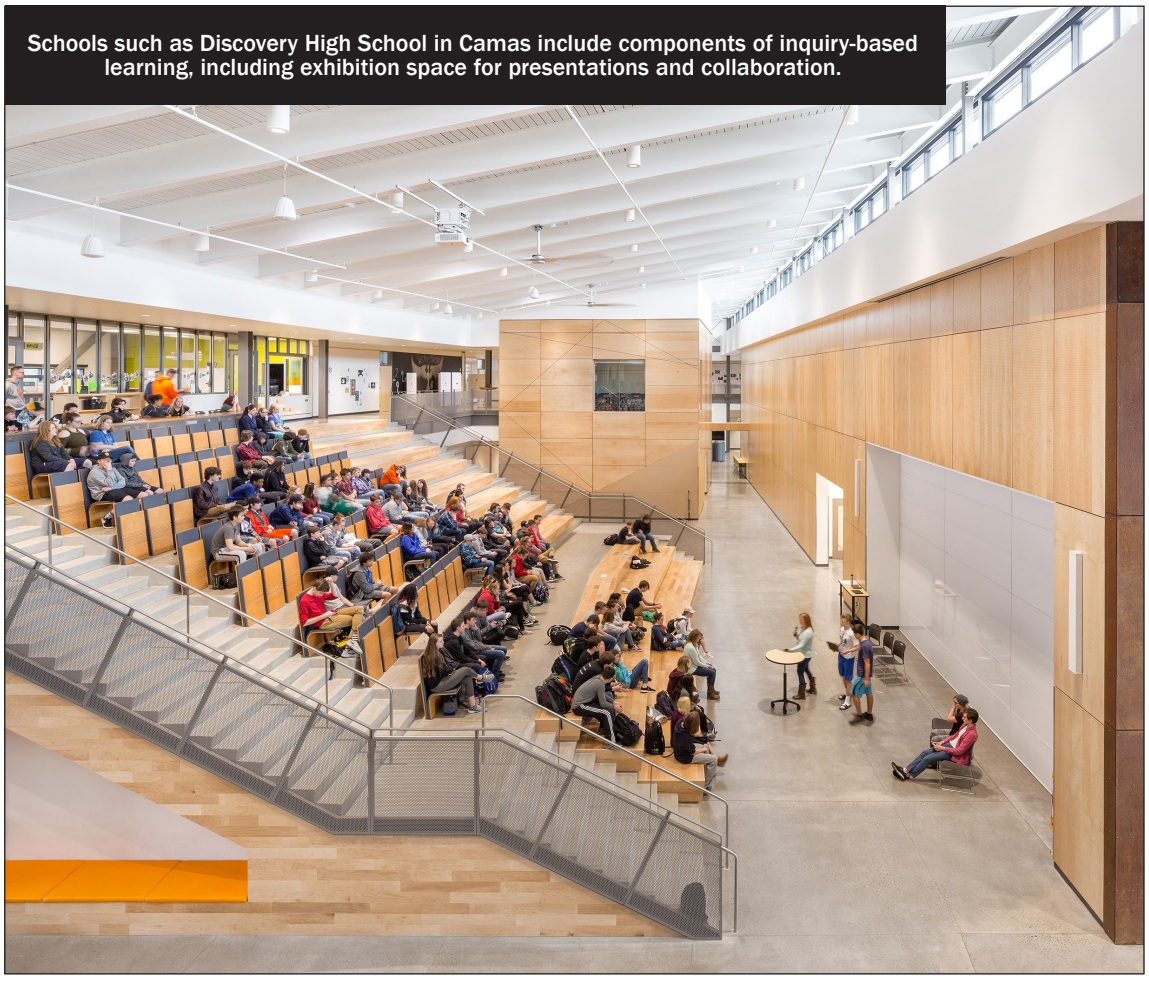

PHOTO BY JOSH PARTEE

Much like the basis of inquiry-based learning, Discovery High focuses on real-world learning application through self-directed passion projects and small group projects.

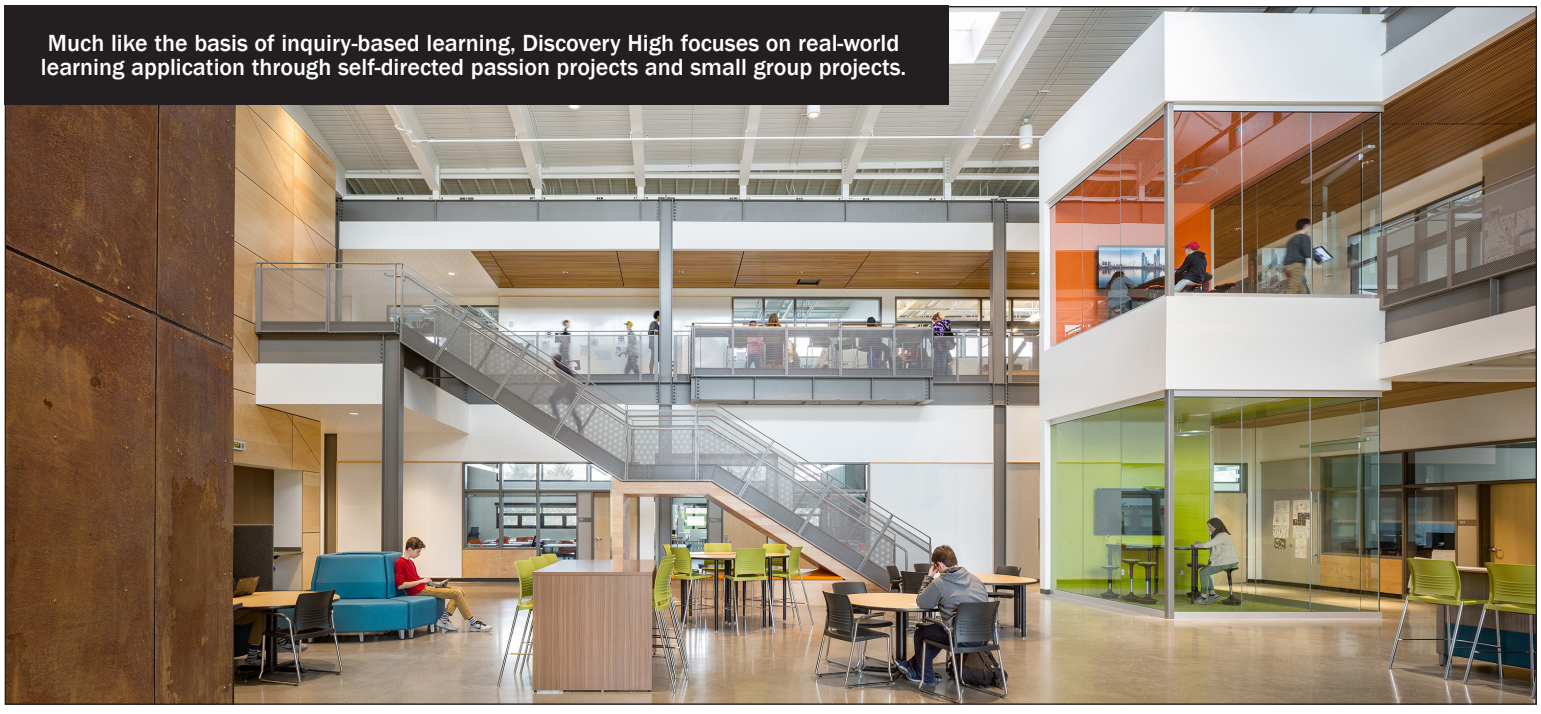

PHOTO BY JOSH PARTEE

Students find real-life experiences from different mediums to then complete their assignment (e.g. reading an article, conducting an interview, listening to a podcast, watching a video). Working from home, they can work at their own pace with regular check-ins with their teacher. Additionally, the instructor can offer before and after school "office hours" to provide parents and caregivers the opportunity to ask questions and monitor their student's progress.

The final stage of the inquiry-based learning cycle is reporting out, reflection and carrying the lessons forward. By designing the lessons to be attainable for all, this approach maximizes personal interests of the student, and uses resources they have available at home.

Adaptingthelearningenvironment

This mode of learning offers varied levels of autonomy and independence and can be implemented anywhere — from brick-and-mortar settings to remote locations. Rather than imposing a strict linear progression

through phases, inquiry-based learning supports learners as they weave through the facets of exploration.

The actual environment where inquiry-based learning occurs is a key element in the success of the learner and must be one that motivates, inspires and challenges individuals to achieve excellence. This environment can be divided in to four respective parts, including academic, physical, social and emotional, and community:

- **Academic.** Establishes high expectations and prepares learners for their future.
- **Physical.** Encourages engagement through flexible spaces, adaptable furniture and current technology.
- **Social and emotional.** Provides a foundation for safe and positive learning, and the development of positive relationships.
- **Community.** Affords the opportunity to interact with other individuals who share common interests throughout the school, the surrounding community and across the world.

Catalyst for change

While many people believe this pandemic to be a negative experience for academia, our survey data and ongoing conversations with our clients tell us otherwise. COVID-19 can be the catalyst to change an entire K-12 education system through a transformational shift in the delivery of education. Never have we had the opportunity or reason to push teaching and learning to the degree it has already been impacted.

School districts should be bold in their educational thinking post-pandemic. Inquiry-based learning may be a relatively new concept to many communities across the country, which is why school districts that opt to make the transition to inquiry-based learning in 2020 and beyond must invest in professional development to provide educators with the tools to authentically teach in a hybrid environment. Without a clear change process, teaching and learning behaviors may slip back to a pre-COVID-19 mindset.

Looking backwards at where we've been, not where we are heading, will never do justice for our young learners and future leaders. We must take this opportunity to change and adapt for the better.

Emily Froese is an educational planner who helps school districts and communities holistically respond to changes in the world that impact the overall experience for every learner.

Participants at this workshop collaborate to design innovative learning spaces that align with the instructional and learner needs.

PHOTO BY NICOLE MLAKAR

HVAC

CONTINUED FROM PAGE 11

ing the NPBI unit, the air is noticeably fresher. As with other installations, once all the units are in place Ayers and Cruz will take ion counts to ensure the ions are accumulating at the proper level.

"We rely on peer-reviewed metrics to know the ions are doing the job of neutralizing COVID. We like to tell our clients that what their eyes cannot see, their nose knows," said Sharp.

Once the NPBI units are installed and proper ion levels are achieved, the technology is virtually maintenance free. Unlike other technologies that require bulb changes or increased energy costs, the operational costs for NPBI are non-existent. Extended warranty programs can be tied into preventative maintenance agreements for additional peace of mind.

Long after a COVID vaccine becomes widely available, NPBI will continue to play a part in creating a healthy learning environment for the students at Forest Ridge. Studies show multiple benefits of exposure to negative ions including increased serotonin, reduced stress and depression, and boosts in daytime energy levels. Likewise, negative ions help counteract harmful exposure to positive ions generated by electromagnetic fields from computers that build up in confined classroom spaces. By removing allergens, molds and common bacteria and viruses, NPBI could also reduce staff and student absences.

Hermanson is in talks with area school districts, private schools, facility managers and school administrators about following the example set by Forest Ridge to employ a technology that mimics nature, mitigates exposures to harmful pathogens, improves indoor air quality, and most importantly helps relieve the concerns of students, staff and parents about returning to school.

As head of Hermanson's owner direct solutions team, Jacob Besagno oversees the coordination of service, owner direct projects and TAB, controls and commissioning departments.

BUILDING SCHOOLS IS ABOUT BUILDING COMMUNITIES

Theschoolsbuilttodayaredesignedforthestudentsoftomorrowandneedtofunctioninawaywhereeducationisparamount.

BY ROB ROBINSON
SKANSKA USA BUILDING

Schools are big investments for local communities, and that investment goes well beyond the dollars it takes to fund new construction.

Schools are a commitment to our students; a pledge to our teachers, staff and administrators; a proud declaration to our broader communities; and a promise to our future, even when our immediate future inside of school buildings this fall seems a little uncertain as our communities and school districts focus on distance learning, hybrid models and other challenges.

The first day at a new school — whether newly constructed and open for the first time, new to a student progressing from elementary to middle or middle to high school, or newly returned to when school districts have moved beyond distance learning — is a special time, full of wonder and potential.

Rendering of the new Highline High School, under construction in Burien. The school has a planned opening in fall 2022.

IMAGE COURTESY OF BASSETTI ARCHITECTS

For students, it's about seeing old friends, meeting new teachers, finding their way around and, when it comes to brand new schools, exploring the buildings and campus to learn all about this place that each of them will spend roughly 180 days of the year. For teachers, it's about having the tools and facilities to help them inspire, educate and make lifelong learners of their charges.

Working in strong partnership with architects and school districts throughout the process, our job at Skanska USA Building is to ensure that from the moment everyone arrives on campus and steps foot into a new school, they can rely on a safe, distraction-free environment in which to learn, teach and come together. We help turn the larger team's vision into reality and we take that job very seriously.

We know we've done our job and executed the architect and school district's vision when we hear excitement from students about being in a school they can learn in, when teachers tell us that it's a building they love to teach in, when parents say how proud they are to send their kids there, and when the broader community takes pride in the results of their collective investment.

COMMUNITIES — PAGE 18

COMMUNITIES

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The schools we build today are designed for the students of tomorrow, and need to function in a way where education is paramount. To do so, project teams (architects, builders and districts) focus intently on providing high-performing learning environments, and reducing long-term operational costs by choosing innovative, efficient and easy-to-maintain building systems and materials, allowing school districts to spend more of their precious budget on education and less on costs to build and run their facilities.

That focus not only extends to things like natural lighting (which has been shown to have a positive impact on student learning and test performance), but also the inclusion of breakout spaces and flexible learning environments, and even how the exterior of the schools can be used in learning. For example, some schools have used their stormwater bio-filtration systems as a way to engage students about ecology, sustainability and the environment. Helping bring our architect partners' vision for these elements to life is something about which we're very passionate.

Since most new school construction happens adjacent to an existing facility that's in use while our work continues, our early involvement with parents, teachers, students and the community is essential to helping them understand — and learn from — the process.

At Skanska, we make a concerted effort to partner with schools and school districts to transform the concept of "construction" into a true learning opportunity for those seeing it happen on a daily basis. We work with teachers and staff to develop age-appropriate curriculum to help everyone learn what's happening next door and how it may relate to what the student is currently learning. As construction progresses, excitement grows.

During construction, we also work to support educational programs at the existing facilities. When working on Browns Point Elementary in Tacoma, our staff came in once a week to read to students. When we built Vashon Island and Central Kitsap high schools, our team went into math classes to help show the direct application of geometry to real world projects and to the new schools we were building. For older students, we've developed and taught extracurricular courses on construction technology, and have been a part of helping school districts with career development and skills needed for careers in the construction trades.

Good schools also help make strong communities, and Skanska understands that. As much as possible, we employ local subcontractors and labor to keep valuable bond money within the community each school serves. A central part of that commitment is working to engage a diverse and inclusive team of individuals and subcontractors. We try to develop work packages that increase the amount we spend with disadvantaged, minority and women business enterprises and regularly mentor small and micro-businesses within the communities we serve.

As school construction continues, we use innovative reporting technology to keep communities informed about the project. Whether it's working with school districts to erect site cameras so people can see real-time progress or publishing major milestones and pictures to community blogs, we want communities to understand and feel good about the work every step of the way.

Just like good schools help make strong communities, strong communities help us make great schools. The importance of true partnership between and trust developed within communities, school districts, architects and builders cannot be overstated. When these groups are all working in sync to ensure successful projects, our educators benefit and our students flourish.

Over the past three years, Skanska has been involved in 23 K-12 projects in the Pacific Northwest, and we're currently building schools in the Auburn, Evergreen, Highline, Issaquah and Vancouver school districts in Washington; and Astoria, Lake Oswego, North Clackamas, Portland, Reynolds, Sherwood and Warrenton school districts in Oregon.

Building a school doesn't end when the heavy equipment is gone and all the women and men who worked to bring the architect's vision to life have gone home and moved on to the next project. It doesn't end on the day when students come back, either. For us, a commitment to building a new school means supporting the communities in which we operate, leaving a positive and lasting legacy.

The work that we do places us at the heart of many different communities. We are committed to being a responsible member of these communities and to being a good neighbor. Through our structured Community Investment framework, we provide our time, skills and gifts in kind to leave a positive legacy wherever we work. Our focus is on strengthening local economies and championing education. We believe this is where we can have the greatest influence, and it directly supports Skanska's core purpose to build for a better society.

One of our favorite activities is helping celebrate the communities where we build. From hosting back-to-school backpack and school supply drives and supporting school district summer lunch programs, to developing and contributing to coats-for-kids programs and career days, our people actively seek out opportunities to become involved at a deeper level.

With the new school year almost upon us here in the Northwest, we at Skanska are excited about the future and to continue building great schools and great communities, and are especially looking forward to the day when our kids, educators and everyone who makes this industry so special are back in these wonderful buildings, safe, healthy and ready to learn.

Rob Robinson is vice president of Skanska USA Building.

Backpack drive for Rainier Beach High School.

PHOTO COURTESY OF SKANSKA USA BUILDING

Opening windows to increase outside airflow is an easy tactic to dilute the concentration of airborne viruses.

IMAGES COURTESY OF BCE ENGINEERS

MODIFIED MECHANICAL SYSTEMS FOR HEALTHIER SCHOOLS

A thoughtful mechanical design can go a long way in helping reduce the transmission of airborne illnesses.

In the current climate, it's no secret that the transmission of respiratory illnesses has become a primary concern in every facet of life. School districts, bound by a finite academic year compounded by grade-level standards, are chief among those grappling with how to safely reopen.

BY CHRIS CAFFEE
BCE ENGINEERS

The good news is that mechanical systems in new schools are already being designed using proven techniques to combat the threat of airborne transmission. Best practices like utilizing outside air ventilation and not recirculating air while the building is occupied are key factors employed on every project to keep the air within the building fresh and clean.

But will this make a difference when schools reopen? What about older schools that haven't been updated in decades?

While we are not virus dispersion experts, using information known at this time about the spread of viruses, and in particular COVID-19, we can make recommendations to help reduce transmission possibilities.

In general, the job of the HVAC system is to fully mix the air in a room to provide an even comfort level for the occupants. Unfortunately, while mixing the air, airborne and near airborne viruses are also mixed within the room. This means a good HVAC system is also a good viral transmitter. COVID-19, in particular, seems to be locally transmitted. This means that it is less likely to get into the ductwork than true airborne viruses, but is more effectively spread within the space that the infected person is located. Fortunately, there are measures that can be taken to minimize the transmission potential.

Whether a school has a new HVAC system or is looking to retrofit an existing system, the following ideas may help reduce the spread of viruses and can lead to healthier schools. Of course, there are many different HVAC systems in which to apply different technologies and all of those systems will have individual idiosyncrasies that will need to be addressed with each option.

- **Global Plasma Solutions:** Global Plasma Solutions (GPS) can be added to the return air stream of a recirculating HVAC unit. GPS ionizes particles to cause them to stick to each other. This makes bigger particles that are easier to filter. Better filtration leads to better air quality. While the particles are collecting together, viruses may also be bound to the particle clusters and filter out of the airstream with greater effectiveness. GPS systems can easily be retrofitted into existing equipment, as well as new design.
- **Powered filters:** Powered filters can be added to ducted HVAC systems. Powered filters operate by statically charging filter media to attract particles and have the ability to filter better at lower pressure drops. Powered filters work well with the GPS systems to better filter the air while reducing filter maintenance. They are convenient for retrofits and new designs.
- **Humidification:** Keeping humidification between 40% and 60% relative humidity (RH) allows the human body to have optimum resistance for airborne and semi-airborne viruses. In the Northwest, the indoor RH is normally in this range except in the wintertime. In the winter, humidity indoors typically drops to around 25% RH. At that level of humidity, viruses penetrate the lung tissue more deeply and increase the potential infection and severity of the infection. Humidity levels work for traditional viruses. However, it is not clear if it works for COVID-19 because currently that virus is quite active in the summer in the southern U.S. where the humidity is high. Humidification is relatively easy to retrofit on existing central systems and very difficult to retrofit on decentralized systems.
- **Increasing outside airflow:** Increasing outside airflow dilutes viruses in the air and reduces the potential for infection by a large concentration of virus. However, there are many constraints on just increasing outside airflow. Systems with economizers can easily increase the outside air during mild days (not the coldest or hottest design days) without sacrificing room comfort. Systems without economizers will need to have their capacity checked to see if they are

MECHANICAL SYSTEMS — PAGE 20

MECHANICAL SYSTEMS

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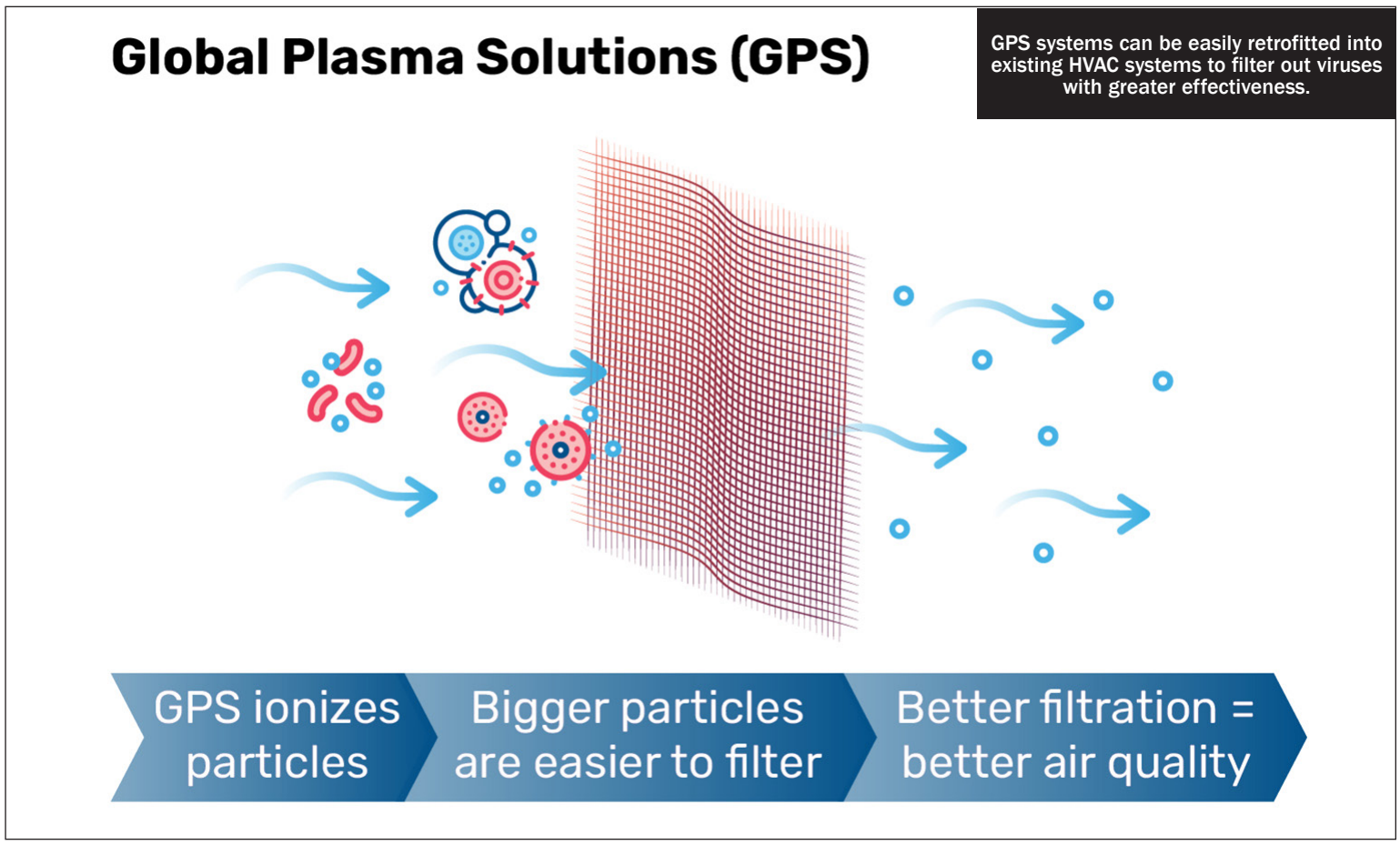
capable of adding extra ventilation quantities. However, in both cases, energy use will increase and thus operational costs.

- **Effective ventilation:** Effective ventilation is supplying high and returning low or supplying low and returning high. There is still a complete mixing of the air, but the ventilation quantities are more effective. This can allow for lower outside air quantities to comply with code or allows for code maximum quantities to better dilute room contaminates. Effective ventilation can be used to reduce the density of the virus within the room. Effective ventilation is difficult to add to an existing system, but is easy to design into a new system.
- **Displacement ventilation:** Displacement ventilation is supplying ventilation air low at laminar airflow speeds and slowly lifting the air to high returns. The difference between displacement ventilation and effective ventilation is that effective ventilation is still meant to fully mix the air in the room and displacement ventilation is meant just to treat the breathing zone. Displacement ventilation allows the air around the person to lift directly upwards and attempts to not mix the room. This will limit the spread of contaminates and viruses to just around a particular infected person. Displacement systems cannot be retrofitted into existing systems.
- **Ultraviolet treatment:** UV light is an effective virus sanitizer. It takes very little time for direct UV light to destroy a virus. UV lights can be put into the supply air stream (after heat exchangers and coils) to destroy viruses. UV lights are best with recirculating systems and less effective with 100% outside air systems. They work best in new design.
- **Electric hand dryers:** Electric hand driers use recirculated, heated bathroom air to dry previously washed hands. Since the air does not get hot enough to sanitize the virus, this is a potential spot for reinfection. Touchless paper towel dispensers can be a safer alternative.

Chris Caffee is a principal and mechanical engineer at BCE Engineers.



MODULAR CLASSROOMS ARE A QUICK STUDY IN FILLING VITAL NEEDS

The classrooms are relocatable and come in many sizes.

In the fall of 2019, about 56.6 million students attended elementary, middle and high schools in the United States. The need for efficient, modern and safe teaching spaces is growing at a staggering rate.

To cater to the yearly increase in student strength, some schools have constructed new buildings and classrooms, but even making minor changes to traditionally built classrooms is a tedious and time-consuming task. A construction site is no safe space for children, and schools cannot pause classes in the middle of the school year to construct the classrooms and facilities students require.

BY AMANDA WILSON
SPECIAL TO THE JOURNAL

Modular classrooms are an effective solution to this pressing matter; they are flexible, budget-friendly, and can be constructed quickly. They might just be the one-fits-all solution that schools can adopt to provide students with an environment that makes learning easy.

Whyportableclassrooms?

Regardless of public, private or charter schools, portable classrooms are a cost-effective way to accommodate long-term and temporary classroom overcrowding problems. Schools can rent or purchase state-of-the-art prefab classrooms, depending on their requirements.

Private schools can smartly maneuver tight budgets and preserve working capital for other investments by opting for modular classrooms. For those few private schools that aren't bogged down by tight budgets, portable classrooms can be equipped with endless upgrades that are affordable and of high quality.

For charter schools that are growing quickly or require large capital expenditure, temporary modular buildings are the ideal solution. They are relocatable and come in many different sizes so that charter schools can get exactly what they need and are not tied down by limitations on the amount of classroom or office space.

Portable classrooms are a cost-effective way to accommodate long-term and temporary classroom overcrowding problems.

PHOTO COURTESY OF MOBILE MODULAR

Overcrowding

Portable classrooms can solve these school problems:

- Due to shifting demographics and other factors, predicting the number of enrollments has become difficult for schools. The fluctuating enrollment demands for flexible classroom sizes and modular classrooms provide this flexibility. Renting modular classrooms is a quick fix for an unexpected intake of students to preventing overcrowding. To solve the immediate school needs, an alternative cost-effective and time-saving solution is to buy portable classrooms. Various modular construction companies, such as Mobile Modular, provide a list of classrooms on sale to choose from.
- Summer vacation is the only time schools can carry out any heavy renovation or construction. This limited renovation time is often not enough for schools to get prepared for the next academic year. By going modular, schools don't have to wait until summer and can renovate while simultaneously running classes.
- Schools don't have the financial firepower to invest in traditional construction practices due to tight budgets. Schools can get fully equipped classrooms without having to pay the full price by leasing or buying portable classrooms.

Schools in Palm Beach

The School District of Palm Beach County in Florida is a great example of how modular classrooms have saved the day. Palm Beach County is the 10th largest district in America and the fifth largest in Florida. It successfully serves a student population of 193,000 along with 12,800 teachers. To keep its promise for a well-rounded education, the district had to completely modernize the outdated Verde and Addison Mizner elementary schools. These schools were relocated to a temporary campus for two years to prevent the disruption of education. In the meantime, the existing facilities were demolished and replaced.

Mobile Modular delivered and installed all 78 buildings in six months and created a learning environment that aligns with student empowerment and growth. Mobile Modular's temporary classrooms helped the schools of Palm Beach County deal with the following problems:

- **Interruption of classes.**

MODULAR — PAGE 23

COMMUNITY ENGAGEMENT DRIVES DESIGN FOR TACOMA SCHOOL

Mary Lyon Elementary School is a unique building that serves its community in a refreshing way.

Mary Lyon is located within the tight fabric of a residential neighborhood. Its street-front presentation provides a welcoming community presence while sheltering student play areas.

PHOTO COURTESY OF IBI GROUP

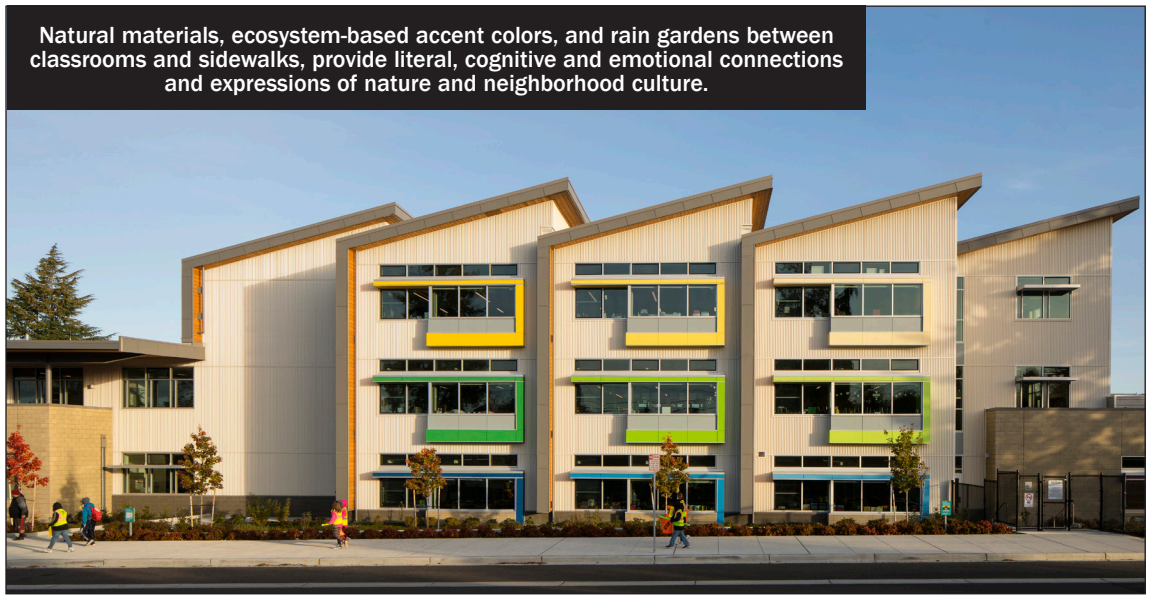
What happens when you ask a historically underserved community to "dream big" for their new school? What if you then take those big ideas and community needs and combine them, with a goal of creating an inclusive and empathetic school with strong connections to nature? If you do it right, you get the new, reimagined Mary Lyon Elementary School — a unique building which serves its community in a refreshing way.

BY ROSS PARKER
IBI GROUP

This new replacement school in southeast Tacoma is a three-story, 56,625-square-foot facility that serves 450 students in pre-K through fifth grade. Its design was driven by community outreach and extensive input from students, teachers, staff and parents from pre-design through construction. Careful study of student activities and locations was undertaken during pre-design to ensure the school would reflect where students actually spend the majority of their time — and where staff intend them to spend their time — in or adjacent to their classroom. The result was a learner-centered design for next-generation learners.

The school is embedded in a community which is long underserved by amenities like neighborhood parks, services or shopping, and is surrounded by one- and two-story houses. Both the school and community wanted to maximize outdoor play and learning spaces for students on the small 3-acre site, dictating a three-story configuration closely fronting two sidewalks. Most vehicular traffic is on-street, with separate street frontages for visitor parking, school buses, and parents' loading and drop off. Generous canopies provide shelter at both street and playground entries to offer a welcoming gesture to the community while supporting the longstanding ritual of personal hand-offs of students between parents and teachers.

At the heart of the school is an open library atrium, serving three learning neighborhoods. Each neighborhood has six classrooms and two group meeting rooms. Each neighborhood includes a central, open learning area that supports hands-on activities and where art and science can occur on display for all. Each of the spaces is interconnected with flexible and transparent glass walls to foster collaboration, inspiration and supervision.



Natural materials, ecosystem-based accent colors, and rain gardens between classrooms and sidewalks, provide literal, cognitive and emotional connections and expressions of nature and neighborhood culture.

PHOTO BY LARA SWIMMER PHOTOGRAPHY

The learner-centered design started by locating student support spaces — library, counseling, tutoring, specialized instruction and administration — near to where students spend most of their time, in the learning neighborhoods. This close adjacency, extensive transparency, and minimization of corridors help to minimize stigma of students having to leave their classroom and cohort.

Safety is embedded throughout the design with the following features:

- Student outdoor areas sheltered from the street behind the building.
- Controlled entry vestibules lead to the receptionist, who has clear visibility into each wing of the school, each of which can be isolated at the touch of a button.
- Learning neighborhoods create student populations of a size where every student is known by all in their cohort to monitor changes in behavior and academic performance.
- Secured playgrounds help to contain autism students in the event that they run away uncontrollably.

Key to the curriculum, to an inspiration for travel and creating an empathetic worldview and to instilling a sense of environmental responsibility, is the school's embedding themes and connections to the natural environment. A design theme of "Sea to Sky" incorporates elements from around the Puget Sound region (about a third of the students were reported to have never seen), including native plants, views, natural materials, colors, an outdoor learning deck with student planters, rain gardens, environmental graphics, and illustrative text in unexpected locations.

A celebration of water is used to highlight this connection, beginning with kinetic artwork that provides an interactive experience using rainwater near the main entry. From here extends a visual "watercourse," a curving sandblasted and blue-stained concrete surface that winds its way through the entry and to all main areas of the school, including the recessed "tidal pool" built-in seating area in the library. Textured wood panels with raised dowels invite occupants to climb through the stairs through the forest canopy

at the second floor. Curved ceiling forms mimic cloud formations in the daylight-filled interior. Nature-themed accent colors reinforce the progression from sea (blue), to forest (green) and to sky (sunshine yellow).

Passive sustainability is also incorporated throughout the design, including a large south-facing solar-ready roof, north- and south-oriented learning spaces for natural daylight control, vertical sunshades on the east- and west-facing windows, and daylighting of rainwater from downspouts discharging into the sidewalk-fronting rain gardens.

Personalization and flexibility of engagement of spaces is provided by extensive use of magnetic and writable wall surfaces in student collaboration areas. Individual scale is supported with small nooks in the library railings and seating areas, and window benches in each classroom with accent colors individualized to each floor and each classroom. The folding walls in each classroom support team teaching and multi-class collaboration.

On the main level, a vertically folding wall opens and closes to provide a large community space or separate the gym and lunchroom. The school requested that outdoor covered circulation be provided to connect to the lunchroom and gym so that the space saved could be used to create a community living room — a flexible, joint school-community space between the library and the gym.

The exterior's expressive form responds to the residential neighborhood with a sloping roof at the classroom wing, breaking down of vertical and horizontal scale, and providing a welcoming street-front presence with a user-friendly entry plaza. Natural materials and bright colors infuse both nature and the community's vibrant culture in a celebration of community pride.

Ross Parker is IBI Group associate principal and Seattle education practice lead.

The main entry opens into the central library with visual and tactile invitations to follow the watercourse, climb through forest canopies and explore the clouds.

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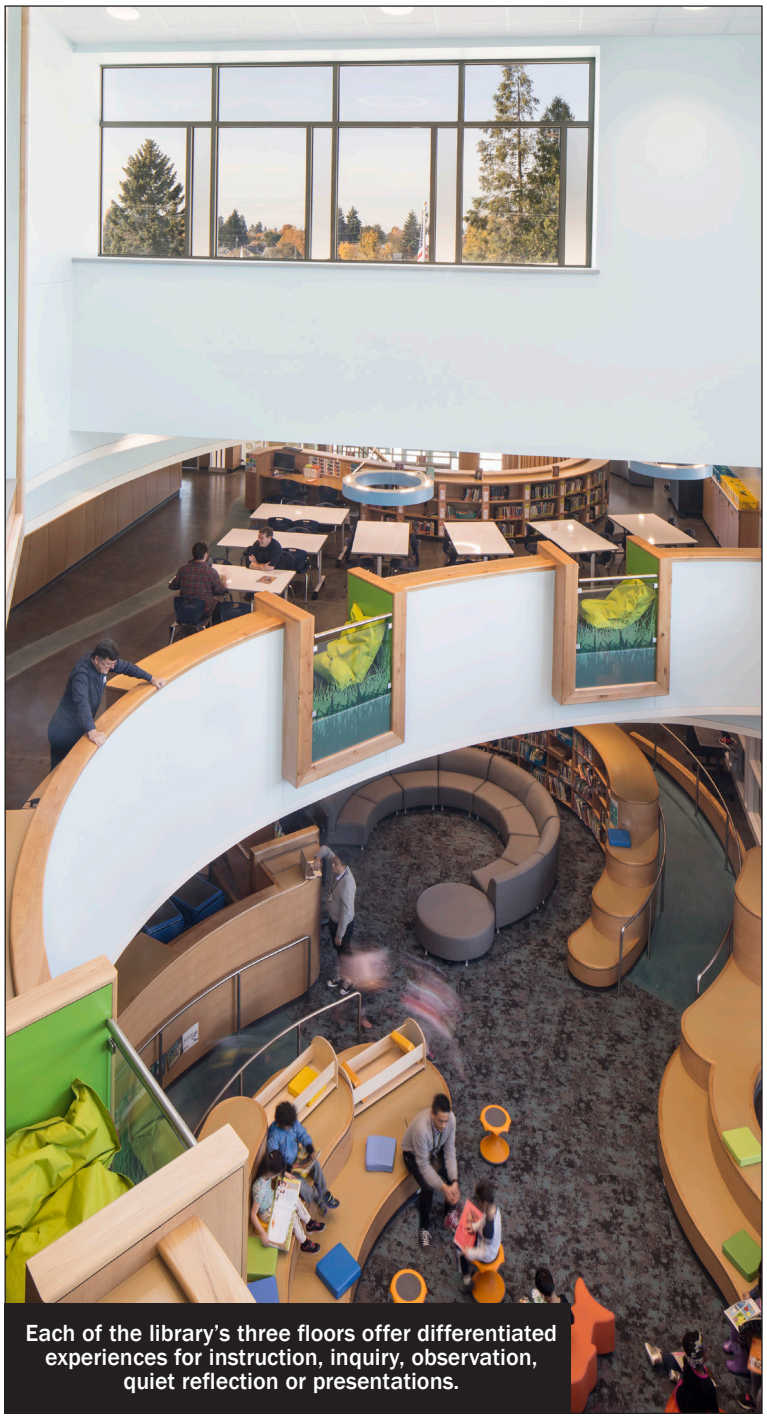

Each of the library's three floors offer differentiated experiences for instruction, inquiry, observation, quiet reflection or presentations.

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MODULAR

CONTINUED FROM PAGE 21

Since most of the modular construction work is carried out in a factory, and only the assembly happens on-site, fewer workers and machinery are required at the school premises. Hence, the schools were able to run classes even when other modular classrooms were being set up — while students and staff were not exposed to the harmful residues of a traditional construction site.

- **Budget constraints.** Modular construction is twice as quick as traditional construction; this decreased time frame means the schools were able to save significantly on labor costs, material cost and time.
- **Construction hazards.** With children running around, all construction and equipment operations need to follow certain safety standards. Modular classrooms come with built-in safety features and incorporate additional protection measures, as requested by the school. Mobile Modular provides steel-clad exterior doors, self-closers, panic hardware, and a solid core, fire-rated classroom door with a large window and locking system to ensure the safety of students. Doors can be equipped with an optional alarm and electronic entry control, and can be easily integrated with the primary security system.
- **Overcrowding of classrooms.** Temporary classrooms provided a safe learning space for thousands of students and teachers. Spaces can be expanded in no time! Portable classrooms come in a wide range of sizes and can be customized according to specific requirements. Schools also have an option to buy classrooms from the modular construction companies that fits their needs and budgets.
- **Quality issues.** Since construction takes place in a controlled environment, each component is built to a specific tolerance. As the same process is repeated for each component, the margin for error is less compared to traditional construction methods. Along with superior quality, modular classrooms are also environmentally friendly.

COVID-19 era

Social distancing has become the new normal in all aspects of life. Once schools reopen, they need to be prepared to offer students enough space to move around without breaking social distancing norms and follow other public health instructions. Temporary or permanent additional space requirements can be fulfilled by modular units that offer the flexibility to meet various health standards.

Schools can place desks at least 6 feet apart, increase administrative space, and make room for a nurse's office or on-campus triage and testing clinics by opting for a modular solution. Modular classrooms are built quickly and delivered to the campus, decreasing the time and increasing savings. This is a huge benefit for school districts that are held back by strict budgets due to COVID-19.

Modular adapts

Schools are meant to be versatile; they must adapt to accommodate the growing student population and requirements. Traditional construction practices are rigid and don't allow schools the flexibility they need to match the fast-paced changes that are taking place. By choosing to go modular, especially during a pandemic, schools can take advantage of shorter construction times, customization options, energy efficiency, less disruption, and greater flexibility to make sure students get a good learning environment.

Amanda Wilson is a freelance writer covering education and higher learning sectors.

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