JAMES D. MACCONNELL AWARD

2016 SUBMISSION

A Design Research Planning
Approach to K-5 Learning Environments

Carter G. Woodson Education Complex
Buckingham County Public Schools
Dillwyn, VA

Catering to Every Type of Learner

The Carter G. Woodson Education Complex was named for the great African-American scholar, historian and public education advocate Carter Godwin Woodson, PhD who was born in Buckingham County, VA in 1875. Comprised of both Primary and Elementary Schools, the Education Complex was planned to serve 1,000 K-5 students from across Buckingham County as a vibrant campus community of learners. When the community embraced the proposal to re-design a 40-acre existing school site, they also prioritized HEALTH and WELLBEING as a precursor for better learning and set out to create a new paradigm for school architecture, educational theory and human performance. In conjunction with public health researchers and social scientists, the design and planning process aimed to cater to every type of learner in support of every child's lifelong healthy habits and ability to deeply engage in their learning journey. The Buckingham County School District, facing the opportunity to renovate and expand two mid-century schools, wanted to ensure the project exemplified their pedagogical vision to cultivate health and "make learning visible" for all learners, teachers, families and visitors for decades to come.

Building Research Partnerships

The strategic planning group, led by the District Superintendent, sought to develop a set of design principles to link teaching practices with learning spaces for every member of the learning community. In addition to developing a set of educational specifications to revolutionize collaborative and interdisciplinary school practices, the team also sought to embed health-promoting design strategies that, by default, shift school culture toward better health and deeper learning. The Design Guidelines were developed through multidisciplinary collaboration with a research team of public health researchers, international childhood obesity scientists, a kinesiologist and an anthropologist to develop 20 evidence-based domains of the school food and physical activity environment (e.g., cafeteria, kitchen, garden, active classrooms, etc.) around 10 core healthy design principles. By prioritizing health and wellness as a design driver, the learning experience is fused with inspiring learning spaces for Buckingham County's youngest learners in support of the fundamental elements of joyful learning: sparking curiosity, prompting discovery, and engaging exploration.

A strong sense of community brought a diverse group of advocates and experts together to re-imagine what the learning journey could be for young children when architecture serves a pivotal role in the educational and health landscape. The approach began by focusing on the child's experience and prioritizing design strategies to promote innovations in health, learning and teaching. Careful research attention to wider academic and sustainability goals were paired with a commitment to crafting architecture finely tuned to the spirit of a child by:

DESIGNING FOR CONNECTION & COLLABORATION.
Familiar with the needs of young children to feel a sense of belonging in their learning community, the design-research team thought deeply about forging connections between the children and their learning spaces by integrating the natural and social world the moment they enter the campus rendered with ample glass and natural daylight.

DESIGNING FOR HUMAN & ENVIRONMENTAL HEALTH.
As children are most vulnerable to the health impacts of the built environment, the design-research team worked hard to ensure the design was holistic and comprehensive, integrating both human and environmental health design strategies around healthy eating and physical activity/movement to better link awareness with behaviors toward a culture of health for future generations.

DESIGNING FOR ALL THE SENSES.
As children are most engaged in their learning environments when they signal a sense of ownership, autonomy and inquiry; the design-research team translated existing research in several disciplines to benefit the multisensory intelligences of all children. The natural curiosities of children as discoverers, seekers and wonderers are best expressed through kinetic and tactile expression, yielding a kid-centric learning landscape rich in texture, color and natural materials.

"I HAVE COME TO BELIEVE THAT WE CAN CHANGE LIVES THROUGH PREVENTION AND PARTNERSHIPS. TEACHERS ARE ENCOURAGING STUDENTS TO PRESENT IDEAS ABOUT MOVEMENT, NUTRITION, AND OUR OWN HISTORY

EDUCATOR : MS. PENNIE ALLEN, PRINCIPAL, PRIMARY SCHOOL

01

COMMUNITY ENGAGEMENT PROCESS

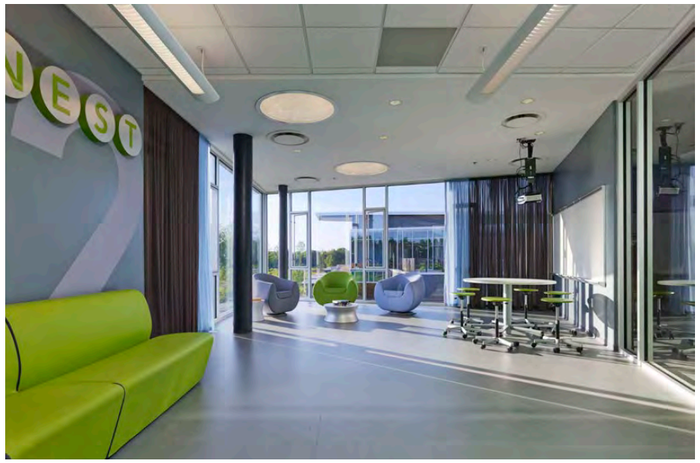
CROSSING DISCIPLINES TO SPARK INNOVATION

The Collaborative Context for
Design Thinking & Decision Making

Designing for Connection & Collaboration

The Piazza sets the stage as a social space, a gathering place and a gateway to the world of doing, seeing, making, discovering and enjoying the vibrancy of life and learning. As a centerpoint, the Piazza reinforces a sense of ownership and social connectedness for children.

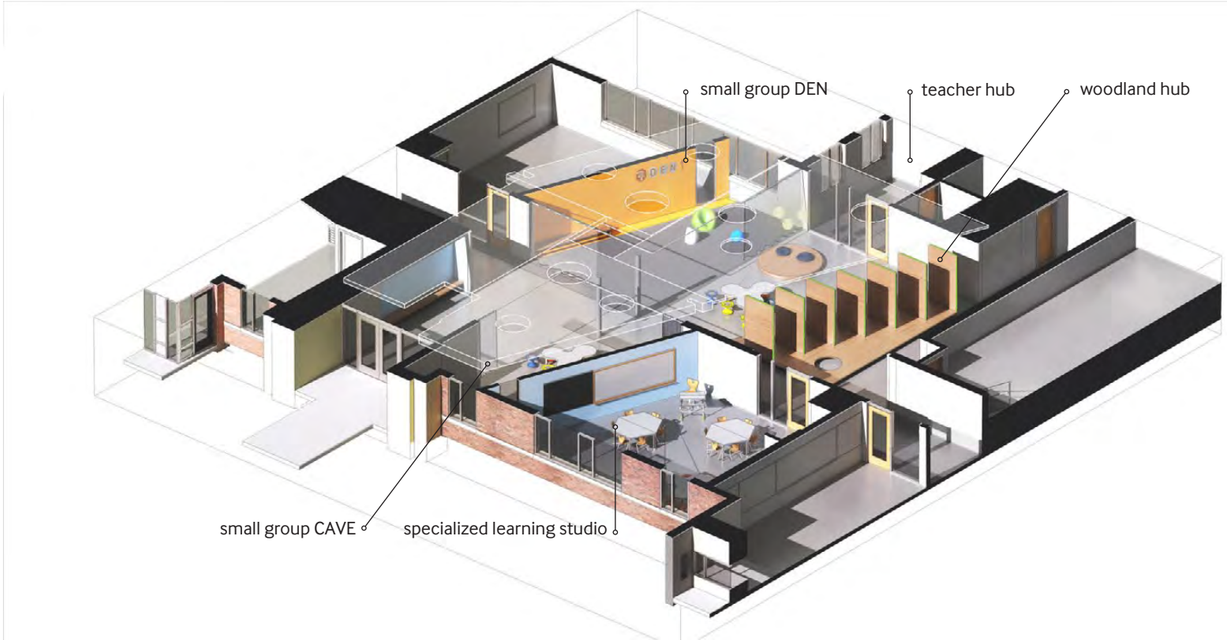
Future-proofing the School



DESIGNING FOR CONNECTION & COLLABORATION

'Home away from home' was a metaphor the team used to plan for open activity-based learning spaces and innovation hubs. 'Neighborhoods and transparency' were key to meeting short-term goals for a variety of different 'marketplaces' for learning as well as future-proofing the school for transformative teaching in years to come. To bring this metaphor to life, open learning hubs were situated along learning streets and identified by the use of color, amenities and well-integrated graphic brand elements. Connecting different neighborhoods with active, collaborative spaces furthered the sense sharing beyond the walls of each home room. To match the District's vision for the future of learning, open spaces were designed to support different uses, adapt to technology, and promote creativity with four planning objectives;

OPENNESS & TRANSPARENCY: to make collaboration and creativity visible to the whole community
DIVERSITY & BIODIVERSITY: to deepen learning and inquiry across subject areas indoors and outdoors
IDENTITY & WAYFINDING: to demarcate space by use with emotionally appealing design elements
ACTIVITY & PROCESS: To bring many choices for activity-based work to each learning neighborhood



'Home away from home' translated to habitat-themed open labs identified by color and amenities, around flexible architectural centers like the Woodland Hub in the Primary School.

Q: What are some unique characteristics of a rural school in a small school district vs. an urban school in a large school district?

A: Transportation is an issue. There is also a scarcity of opportunities for students to be physically active. We have a youth league program with soccer, baseball, football and cheerleading, but this is not an option for many families who struggle with vehicle problems or don't have money for gas. Our younger generation of parents do not plant gardens and find less healthy food cheaper and more convenient. [Ms. Pennie Allen, Principal, Primary School]

DESIGNING FOR CONNECTION & COLLABORATION

Identifying a cultural network for the rural school was a need the District worked to address in order to strengthen community ties to existing programs and to further goals for environmental education. Hosting and facilitating several engagement workshops, the team tapped into community and national partnerships to plan spaces for on-going activities with organizations such as Buckingham 4-H Youth Development, summer school garden research initiatives with the University of Nebraska, Peter Francisco Soil & Water Conservation District and master gardeners throughout the region. A major milestone in the collaborative planning process, a Garden Workshop brought together a diverse group of experts from the fields of landscape architecture, public health, education, non-profit youth organizations, design, anthropology and facilities operations to map out the future of learning in outdoor settings throughout the year. By discussing the opportunities and challenges of building, maintaining and utilizing outdoor amenities for community use, the team was able to design native habitats, outdoor classrooms and play terraces to empower the community with healthy choices and initiatives.

Bridging Building & Landscape

DESIGNING FOR CONNECTION & COLLABORATION

Critical to the success of defining 'connection' for the Buckingham story, was the use of local building materials, specifically Buckingham slate from the local quarry in Arvonia, VA. In concert with stone craftsman and quarry experts, the client and design team worked together to integrate Buckingham slate in ten different ways; from its presence as a rainscreen building envelope to its atmosphere as an interior stone tile, the naturally black slate provides an emotional intelligence to place-making that is visible and palpable to the children.

Natural, local, durable and resilient; the choice to feature Buckingham slate also reinforced local economies and creative craftsmanship in true collaboration with builders. As the children encounter their local resource in new ways, they begin to visualize what a sustainable future can become when creativity, craft and economy all come together. By using local stone in novel ways in and outside of the building, conversations can spark among children and educators as they look around to see, touch and feel how each slate environment is producing a micro-climate – thus providing a real-world habitat for what is possible in nature as a learning lab.

Designing for Connection & Collaboration

Designing for Human & Environmental Health

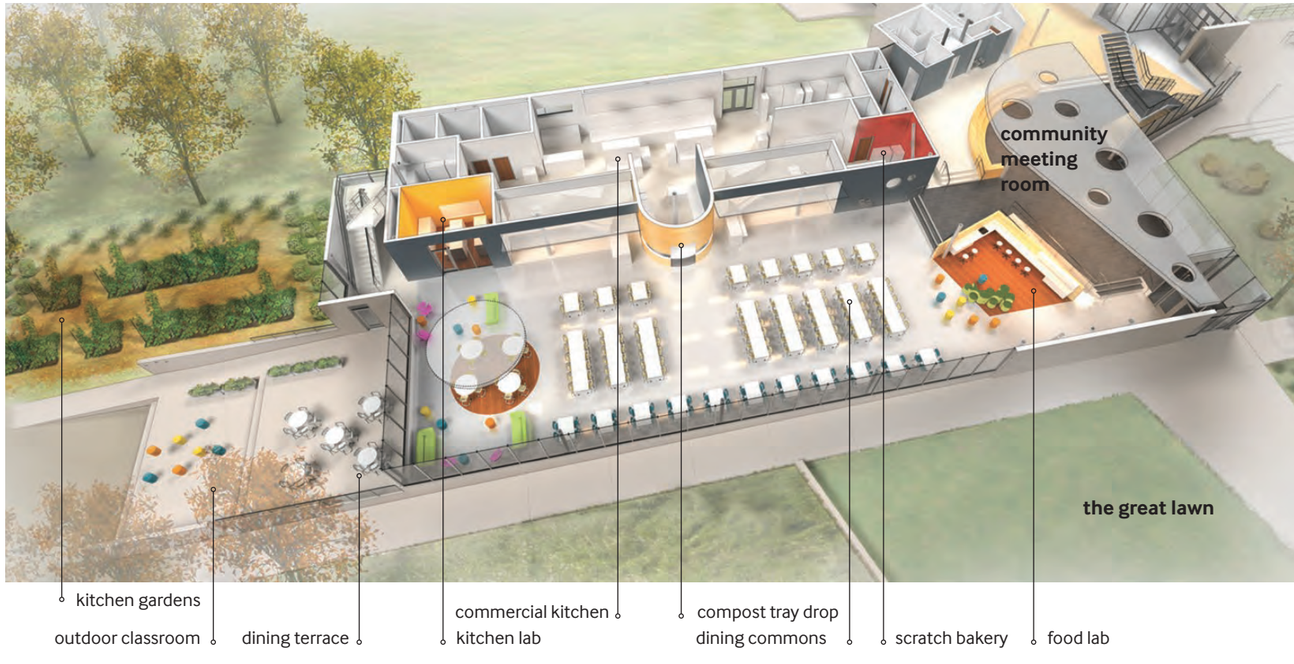
The close proximity of the Outdoor Dining Terrace to the kitchen gardens, lab & play terraces promotes a programmatic overlap for an increase in healthy eating and physical activity initiatives as a routine part of the school day as well as after hours programs.

Designing for Foodsmart Kids

DESIGNING FOR HUMAN & ENVIRONMENTAL HEALTH

The interdisciplinary team developed a new tool, Healthy Eating Design Guidelines for School Architecture, to provide practitioners in architecture, education and public health with a practical set of spatially organized and theory-based strategies for making school environments more conducive to learning about and practicing healthy eating. By optimizing physical resources and learning spaces, this measurable tool aimed to improve the ability to adopt a healthy nutrition curriculum and promote healthy eating. The planning guidelines emphasize programmatic connectivity between indoor / outdoor eating and food preparation spaces to promote flexibility in using spaces for various functions. The social science behind this new paradigm in healthy eating environments that encourage healthy decisions follows four key planning themes:

CHOICE ARCHITECTURE to feature healthy choice as a tool to empower kids.
BEHAVIORAL ECONOMICS to make the healthy choice the easy choice for kids.
HEALTHY FOODSCAPE to encourage nutrition & whole food education.
ACTIVE INTERIORS to create joyful, beautiful spaces dedicated to mealtime.

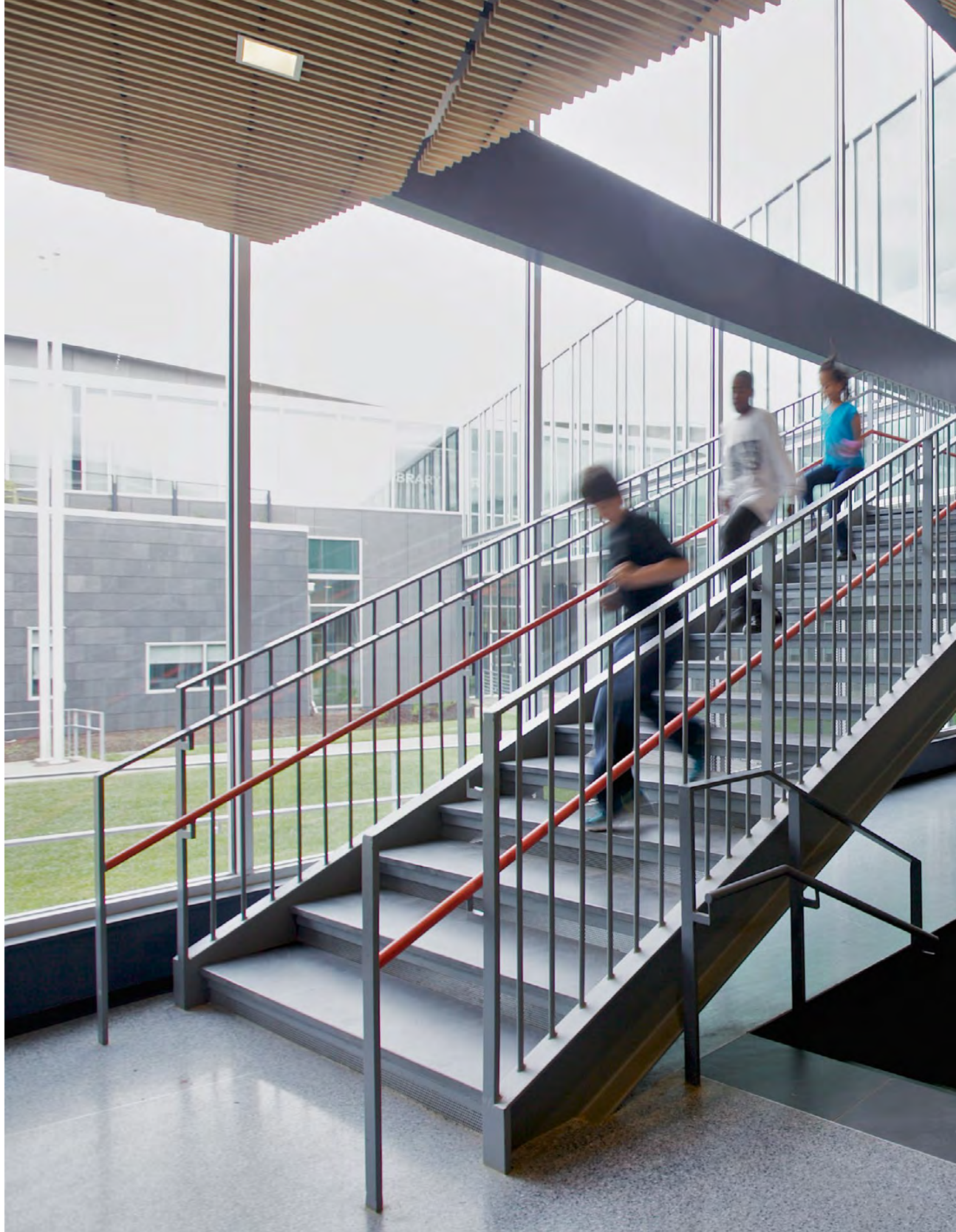


Q: As a member of a committee that helped Michelle Obama shape her agenda on childhood obesity, you were trying to come up with solutions for the obesity epidemic that can be implemented within one generation. What are the priority areas?

A: Michelle Obama's Let's Move campaign embraces the following key areas: empowering families, starting health early in childhood, creating access to healthy foods, increasing physical activity, and improving the school environment for health. These are not necessarily mutually exclusive domains." [Dr. Terry Huang, MPH, CPH]

DESIGNING FOR HUMAN & ENVIRONMENTAL HEALTH

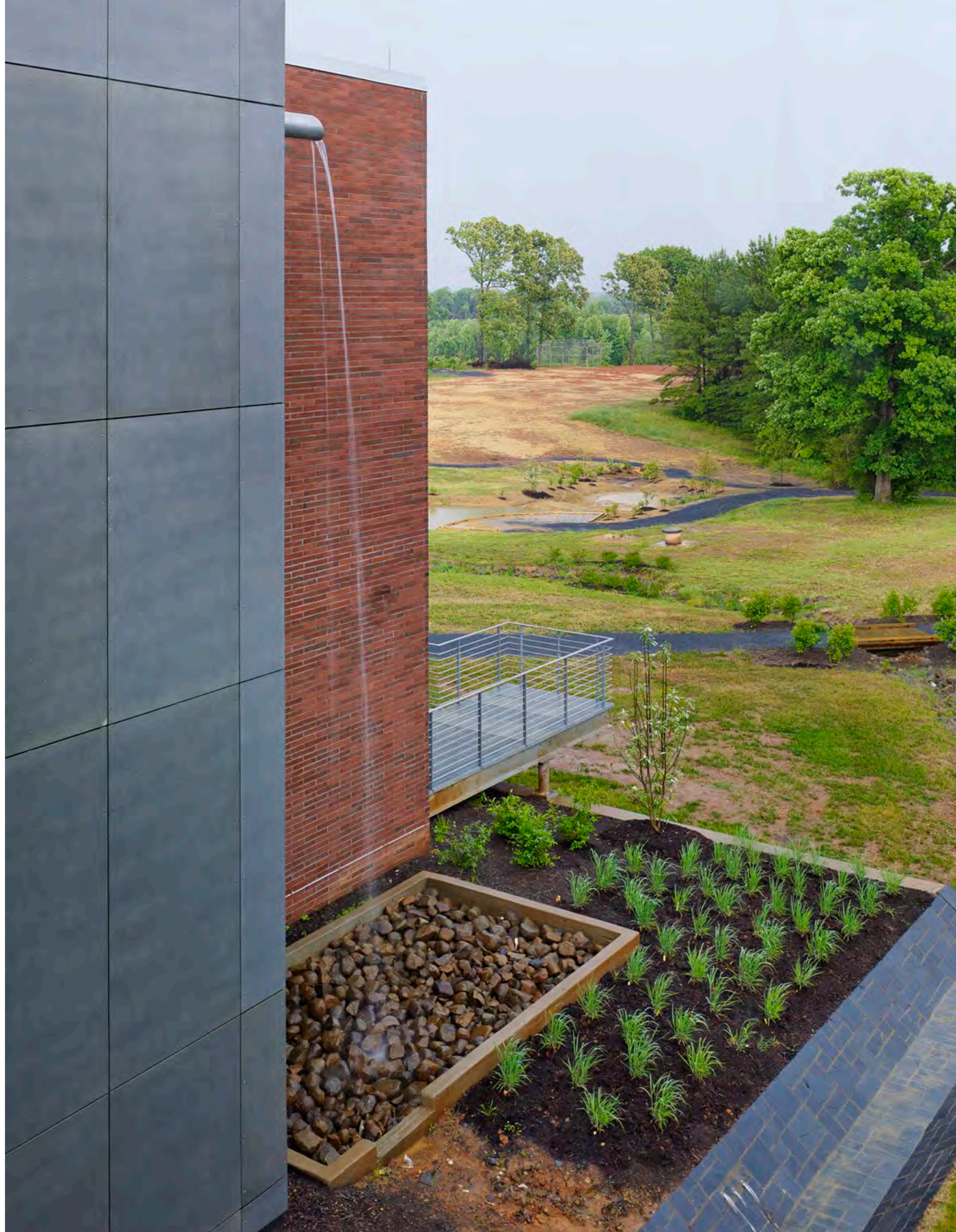
"The Buckingham project is a prime example of improving the school environment for health, by increasing access to healthy foods and physical activity. The community outreach and coordination work that support the construction of the new school will also go a long way in empowering families and mobilizing the community to create a larger scale change beyond the school itself" (Huang). As a core team member, Dr. Huang and the research team addressed the challenge of increasing physical activity and movement through the built environment. Blending existing research with Active Design Strategies resulted in a complementary tool to the Healthy Eating Design Guidelines: the Physical Activity Design Guidelines for School Architecture. These guidelines aim to provide architects and designers, school planners, educators and public health professionals with strategies to make K-12 school environments conducive to healthy physical activities and to engage scientists in transdisciplinary perspectives toward improved knowledge of the school environment's impact.



Building Healthy Ecologies

DESIGNING FOR HUMAN & ENVIRONMENTAL HEALTH

Building complex ecological habitats across school grounds – from wetlands and rain gardens to successional meadows-to-school kitchen gardens – was collaborative and hands-on from the start. Rallying the community for the first Garden Build Day successfully launched the school Kitchen Gardens. The team prioritized long-term environmental health with a native, sustainable landscape and energy conservation strategies. A combination of stormwater strategies serve to cleanse water before entry into local rivers, streams, oak-pine forests and edible gardens. Making site hydrology visible with a waterfall scupper, garden cisterns, rain gardens, a constructed wetland "Frog Bog" and a permeable paver parking lot elevates ecologies and serves as a teaching tool for children across related disciplines.



Designing for Human & Environmental Health

Designing for All the Senses

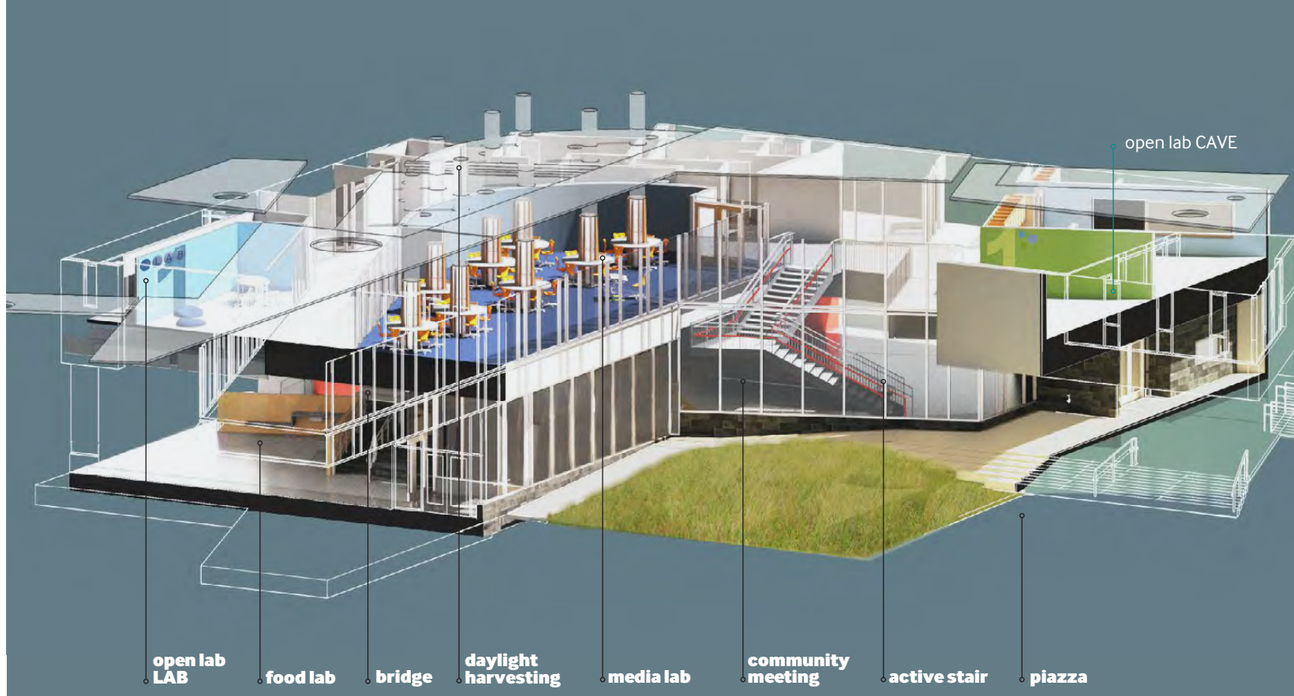
Media Lab technology 'tree' kiosks house 2-story daylight harvesting tubes while also providing an ergonomically tuned 'gather round' zone for active, dynamic sitting. Adjacent to the Media Lab, the Library is richly appointed with healthy materials, comfortable swivel chairs and 'grab-go-cushions' for mobility.

Sparking Wonder & Delight

DESIGNING FOR ALL THE SENSES

By utilizing an interdisciplinary scientific approach, the team tapped into child-centric subjective experiences related to the realm of the senses to promote engaged learning through visual and tactile communication systems. Creating key learning space adjacencies along pathways gives children and adults opportunities for both planned and serendipitous discovery of their gifts and intelligences. As teaching methods change over time, intentionally planned open spaces are anchored by wayfinding elements to reinforce spatial touchpoints with a combination of reflective, absorptive and translucent material qualities that children personalize over time by sparking:

INQUIRY that begins with curiosity and is sustained by wonder.
AUTONOMY that brings social meaning and freedom to navigate learning.
COMMUNICATION for meaningful links between sensory and literary cues.
CREATIVITY PATHWAYS to enrich the learning ecology.



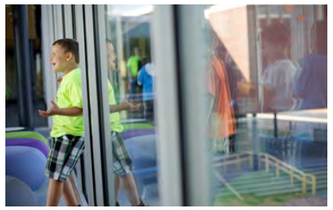
Multi-sensorial design includes all the touchpoints and experiences a child has throughout the day and throughout their learning journey. Choreographing movement for meaningful encounters enhances multi-sensory perception while boosting cognitive and physical development.

Q: What role does the built environment play in kids' lives?

A: We know the environment shapes attitudes and behaviors. We know that community values are reinforced by the quality and care taken in our surroundings and we know that children create personal meaning from these settings. With that, we also need to consider the variety of ways children learn and express their multiple intelligences by allowing for teachers to present lessons in a wide variety of creative ways to 'light up' cognitive curiosity. [Design team member]

DESIGNING FOR ALL THE SENSES

Designing for all the senses meant designing for the broad range of intelligences and human potential in children. The team prioritized the realm of the senses through architecture, interiors and environmental graphics to forge linkages between intelligences as posited by Dr. Howard Gardner: linguistic, logical-mathematical, spatial, musical, intrapersonal, bodily-kinesthetic, interpersonal, naturalist [and additionally, through Buckingham's FoodSmart Kids platform]. Broadly extending "health" to learning created fresh insight into the necessity to design for the inherent intelligence, amazing creative capacity, natural wonder and curiosity that young learners bring to their learning opportunities inside and outside of school. Focusing on a planning process that "create[d] an environment that promotes the health and mental well-being of our students and results in better engagement and learning opportunities" was a top goal of Pennie Allen, Principal of the Primary School.



Activating Pathways for Engagement

DESIGN FOR ALL THE SENSES

To further engagement and interest-based learning, the team considered the impact of design on children's perception of school spaces. The team used an environmental approach to hone the positive influence of design by creating sensory rich pathways to enhance the use of activity-based spaces by both children and teachers. As customized learning, diverse knowledge resources, individualized assessment and distributed knowledge become the future norm, the team planned for the ultimate goal: to contribute research to the design of the District's only K-5 campus in order to support better learning and developmental outcomes. Because educational delivery models change over time, appealing to the timeless realm of the senses helped re-define Buckingham's school culture as kid-centric and tactile-friendly.

Designing for
all the Senses

02

EDUCATIONAL ENVIRONMENT

CREATING PATHWAYS FOR PARTICIPATION

The Integration of Social Learning,
Playing and a Sense of Well-Being

Kid-Centric Learning

LEARNING STREETS

The K-5 campus incorporates new and renovated spaces meant to inspire students and prompt inquiry and exploration. In academic areas, educational opportunities spill outwards from classrooms into corridors, where various reading nooks and small-group study stations transform circulation pathways into child-centric "learning streets." These spaces are intimately scaled with soft seating and fun colors that help activate thought and play throughout the school day. Ergonomic, flexible furniture supports novel arrangements by teachers and accommodates student movement to help increase concentration and engagement in the learning process. Educational spaces are available for everyone, at every scale and in any combination of grouping – in the form of reading nooks, learning streets, under-the-stair cubbies, and through various flexible, ergonomic desks, chairs, stools, tables, performance platforms, and grab-n-go cushions that can be customized to fit various pedagogical needs. Learning can take place on walls and doors (in the form of signage), on the floors (where footprints of local animals, featured in the signage, appear), and on nearly any surface of the school. Learning is made visible and celebrated, encouraging a lifelong pursuit that is transformative, positive, and exciting.

Open Lab Along
a Learning Street

Enriching Literacy & Inquiry

READING, RESEARCH & RELAXATION

Rather than a closed, centralized library containing a body of knowledge, the team envisioned the library as an open environment saturated with design features like reading nooks, an outdoor library terrace, large-scale graphic quotes and kid-centric reading prompts to enrich the daily experience and exposure to language. Building vocabulary and strengthening reading comprehension in fun, colorful and comfortable spaces throughout the school spoke to the need to bring social delight to everyday exploration through physical books, digital tools and nature. While the team acknowledged the data, rubrics, and standards that continue to measure the efficacy of teaching, equal value was placed on the socio-emotional – and related academic – development of Buckingham students.

Nurturing Creativity & Expression

CREATIVE ARTS & EXPRESSION

Central to the planning process was the need to share programmatic spaces like the Library, Media Lab and Dining Commons across grade levels K-5. To make the most of a tight budget on an existing site with a ready-made "central axis," the team was able to situate Creative Arts, a core educational component, at key intersections between new and existing buildings. With a strong drive to balance academic curriculum, creativity and musical expression, the Creative Arts became educational and architectural foci with indoor/outdoor programmatic features like music studios, an outdoor music terrace, K-2 and 3-5 Art Studios with ample natural daylight and an outdoor arts terrace adjacent to the Library and Media Lab for ease of multidisciplinary teaching and learning.

Creative Arts
Art Studio & Outdoor Terrace

Cafeteria as a Classroom

THE NEW 21ST CENTURY DINING COMMONS

Co-created alongside researchers, the team optimized environmental health research factors such as air quality, acoustics, climate, crowding, ergonomics, and lighting because of their direct effects on occupant well-being. As these environmental factors can influence activity patterns, stress, appetite, and food choices, the team also applied environmental psychology theory to the design of the Dining Commons – recognizing the transactional relationship between this special built environment and social life as influencers of learning. The redesigned school complex incorporates a range of strategies and components, including space for school gardens and outdoor eating. The layout of the open commercial kitchen, teaching kitchen, serving area and dining areas incorporates several overlapping strategies that promote healthy food education. The open commercial and teaching kitchens are co-located for dual community use, allowing shared expertise and allowance of fresh kitchen garden produce to be utilized for school lunch or integrated in the curriculum.

Forging Connections Between Dining, Learning & Health

The recommended design strategies in the Healthy Eating Design Guidelines address 5 core principles for healthy eating design:

1. Provision of equipment and spaces that facilitate the incorporation of fresh and healthy food choices into the school and its community.

2. Provision of facilities that directly engage the school community in food production and preparation.

3. Application of evidence- and theory-based behavioral science principles to "nudge" the school community toward healthy eating behaviors and attitudes.

4. Use of building and landscape features to promote awareness of healthy and sustainable food practices.

5. Conception and articulation of school spaces as community assets to multiply the benefits of school-based healthy food initiatives.

Wayfinding as Placemaking

EDUCATIONAL SIGNAGE & WAYFINDING

The campus features an integrated interiors package – including a distinct color palette, logo brand identity, environmental graphics, and educational signage – creating a cohesive teaching and learning environment that supports the whole child.

The wayfinding techniques and related classroom/grade-level signage integrated in the campus bring the natural environment to life for students. Moving west to east, from the Primary to the Elementary School, the campus' wayfinding follows the progression of Virginia's geography (mountains to ocean) and assigns a habitat, or biome, to each grade. Classroom signage features a grade-level color, biome icon, and related native species found in that habitat of Virginia. This branding encourages grade-level identity and introduces students to elements of the natural world around them that supports the curriculum. While the Primary School is associated with warm colors and terrestrial species, the Elementary School features cool colors and aquatic species. Such colors and imagery feature prominently in the campus to encourage grade-level identity and introduce students to the natural world around them.

PRIMARY : VIRGINIA LAND ECO-REGIONS

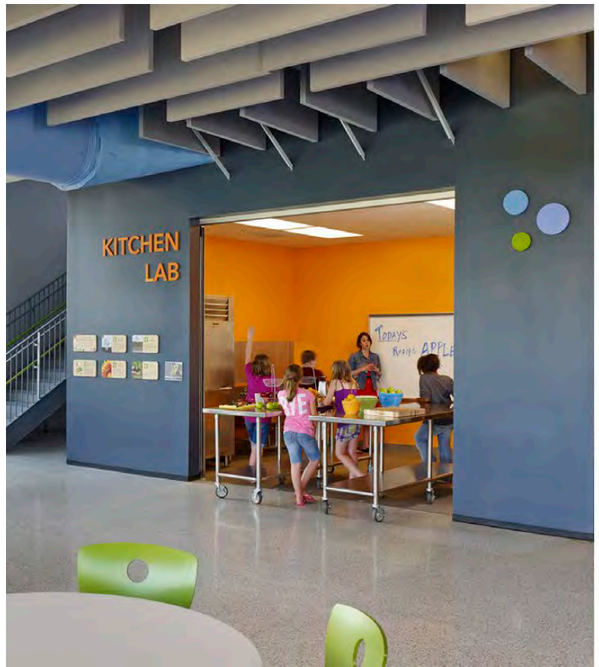
ELEMENTARY : VIRGINIA WATER ECO-REGIONS

Inquiry Based Learning

EDUCATIONAL SIGNAGE & WAYFINDING

The entire K-5 school campus is a teaching tool designed to prompt healthy decisions: it encourages healthy eating behavior, promotes activity, and inspires creative exploration of students' interior and exterior worlds. While the campus implicitly houses many healthy prompts in its design details, the signage and wayfinding package renders these prompts and learning opportunities explicit.

Broadly, the campus' graphics reinforce this branding of health by strategically scattering inquiry-based facts and health-related lessons about human and environmental systems throughout the school campus. Stairways, water fountains, healthy food options, and sustainable building materials, co-located with related facts and lessons, become design interventions prompting discussion and reflection about activity and movement, hydration, healthy eating choices, and energy conservation, among other topics.



Stewardship Through Discovery

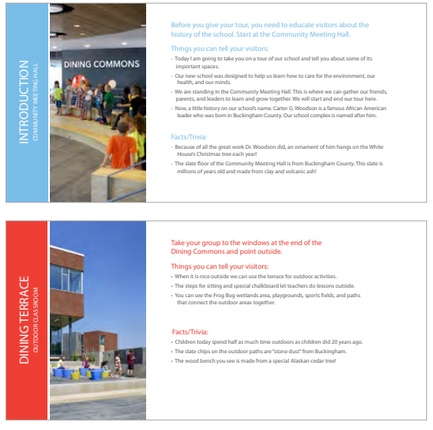
EDUCATIONAL SIGNAGE & WAYFINDING

A reflection of the school's highest ambitions for healthy, happy students, the graphics and wayfinding enliven a future-forward community of healthy and engaged learners.

At every scale and surface, the design of the signage and graphics strives to tap into the inherent intelligence and natural wonder of young learners. The campus-wide exhibition works to make 'all things possible' by rendering educational moments visible on nearly every surface of the school. Illustrated, inquiry-based lessons about human and environmental systems are strategically scattered throughout the campus – prompting students to question, reflect, and become active participants in the design.

The exterior details of the signage and graphics highlight natural ecologies and local resources to spark environmental awareness, stewardship opportunities, and hands-on active learning.

Students and teachers have their own Tour Guide Booklets to help lead visitors around their school. The creatively engaging campus inspires ownership and stewardship as building users become active participants in their larger environmental landscape.



03

PHYSICAL ENVIRONMENT

LISTENING TO WHAT CHILDREN LOVE

Designing Enriched, Active Environments as a Natural Necessity for Learning

Educational Site Plan

WELCOME

TO THE ACTIVE LANDSCAPE AT

BUCKINGHAM COUNTY PRIMARY & ELEMENTARY SCHOOLS

CARTER G. WOODSON EDUCATION COMPLEX

BE ACTIVE!
PHYSICAL ACTIVITY ZONES

1. GYMNASIUM + FITNESS ROOMS
2. K-2 PLAY TERRACE + WATER STATION
3. 3-5 PLAY TERRACE + WATER STATION
4. TOT LOT NATURAL PLAY AREA
5. ECO-WALKS / JOGGING PATHS
6. RECREATIONAL SPORT FIELDS
7. OPEN + FREE PLAY
8. K-2 EXERCISE LOOP (4 LAPS = 1/4 MILE)
9. 3-5 EXERCISE LOOP (5 LAPS = 1/2 MILE)
10. WEEKEND + OFF PEAK BICYCLE LOOPS

EAT HEALTHY!
FOODSMART KIDS ZONES

1. DINING COMMONS + FOOD LAB
2. TEACHING KITCHEN LAB
3. KITCHEN GARDENS
4. EDIBLE COMMUNITY GARDENS
5. GREAT LAWN + GRAB-N-GO BERRY PATCH
6. FRUIT TREE ALLÉE
7. NUT TREE CIRCLE
8. COMPOST DEMONSTRATION GARDEN
9. PICNIC KNOLL
10. OUTDOOR DINING + CLASSROOM

EXPLORE NATURE!
ECO-ACTIVITY ZONES

1. NATIVE MEADOW GRASSES
2. FROG BOG OBSERVATION DECK
3. K-2 SCIENCE GARDEN
4. ARTS TERRACE + GARDEN COURTYARD
5. SONATA TERRACE + GARDEN COURTYARD
6. POLLINATOR BEE + BUG GARDEN
7. WOODLAND HUB

FIND THE WATER!
HYDROLOGICAL SYSTEMS

1. BIOSWALES + CLEANSING BIOTOPES
2. FROG BOG WETLAND
3. SLATE CHANNEL + WATERFALL SCUPPER
4. RIVER ROCK STREAM
5. RAINWATER CISTERN (1,400 GALLONS)
6. PERVIOUS PARKING COURT

Place-Making & Materiality


primary school before


site before

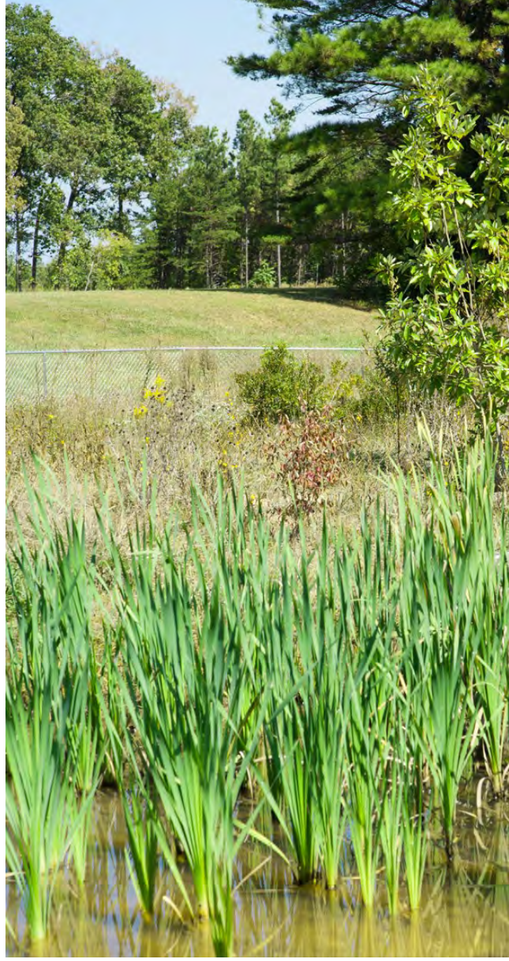
HISTORY + RENOVATION STRATEGY

The existing school campus was re-designed as a 14-acre sustainable landscape that promotes active and diverse opportunities for play, exercise and learning to serve 1,000 children in grades K-5. Themed around health, the school highlights natural ecologies and local resources to spark environmental awareness, stewardship opportunities and hands-on active learning. The Buckingham County Training School, which operated from 1924 to 1953 near the current school site, was the first high school in the county for African American students. Eventually, the Training School dissolved, and the Carter G. Woodson High School for African Americans opened on the current project site in 1954. The renovation capitalizes on a landscape once under utilized – newly incorporating the lush Virginia Piedmont forest into the campus' programmatic purview as a shared community and learning resource with infinite hands-on, active educational opportunities.

Removal of the old high school cafeteria/kitchen widened the central gap and provided the additional space needed to successfully create and share "one school" while also demarcating distinct entries and identities for primary and elementary school children. The existing gap was reinvented to become the community center of the campus – programmatically, architecturally and ecologically.

elementary school before

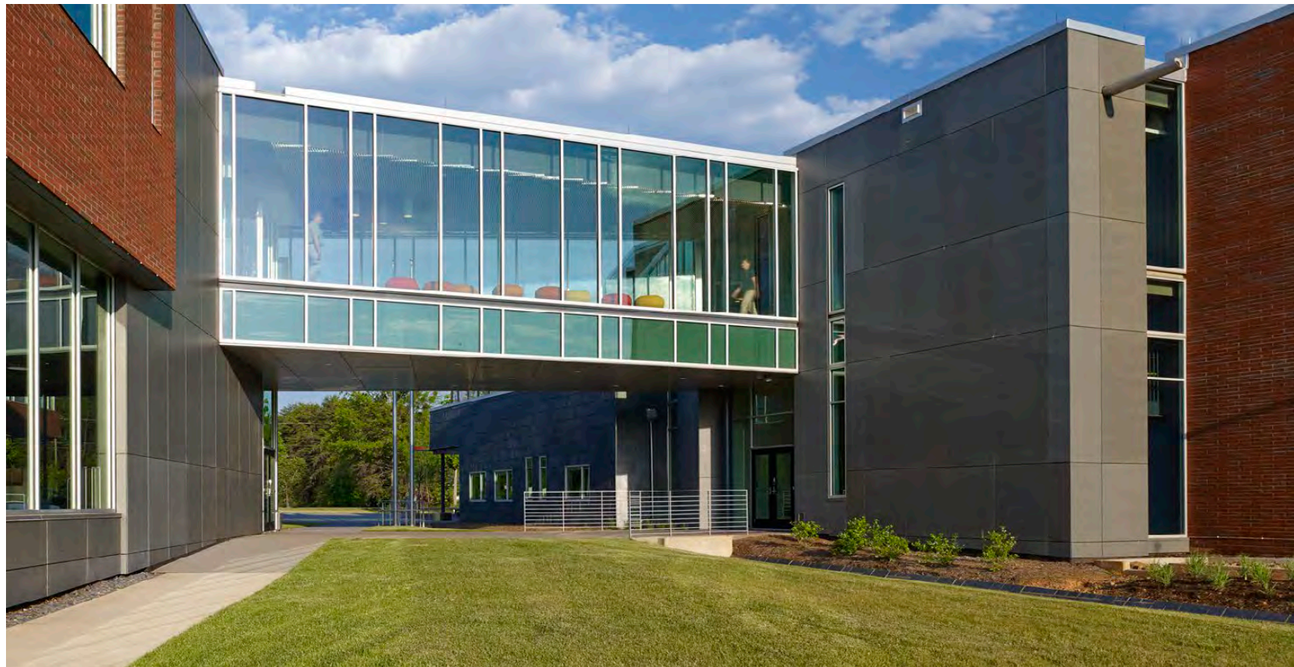
Sustainable Futures



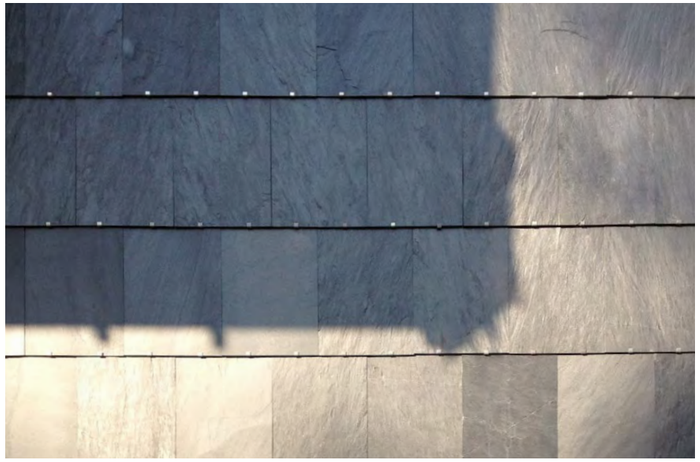
GREEN TEACHING

To help young learners and community members think more critically about future needs, the team hosted a sustainability charrette to develop a robust set of environmental site strategies including stormwater, energy, artificial lighting and habitat ecology management goals. Overarching goals to reduce heat island effect and heat gain while increasing natural ventilation and daylighting were met through the LEED framework, overall achieving LEED Gold status. Through both conservation and renewable methods, the Buckingham campus sets a community standard for local and regional healthy watershed eco-stewardship, as the county crosses three primary Virginia watersheds. Sustainable futures play a vital role in every child's learning by bolstering the following:

MOTIVATION
ANTICIPATORY SKILLS
CRITICAL THINKING
VALUE JUDGEMENT
CREATIVE IMAGINATION
RESPONSIBLE CITIZENSHIP & TAKING RESPONSIBLE ACTION



Supporting Local Economies



LOCAL RESOURCES

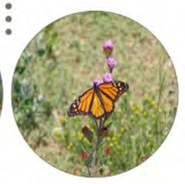
Sustainable material choices highlight local natural resources and prompt teachable moments. Local Buckingham slate – quarried 12 miles away and featured in 10 different uses inside and outside – appears prominently throughout the campus, reaffirming the community's connection to its natural context. A unique use of slate is found in the slate lined stormwater conveyance channel cutting through the entry plaza. The channel measures the size of storm events, allowing students to understand the occurrence and volume of water associated with each storm. All local materials and sustainable systems are further explained in the educational signage, promoting engagement and a sense of ownership.

Landscape as a Learning Ecology

Grab-n-Go Berry Patch

Kitchen Gardens

Rock River Stream + Native Meadow

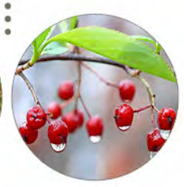


Pollinator Bee + Bug Garden

K-2 Science Garden

Fruit Tree Allée

Frog Bog + Observation Deck



Bioswales + Cleansing Biotopes

Cultivating Eco-Stewardship

GARDEN RESEARCH AND EDUCATION

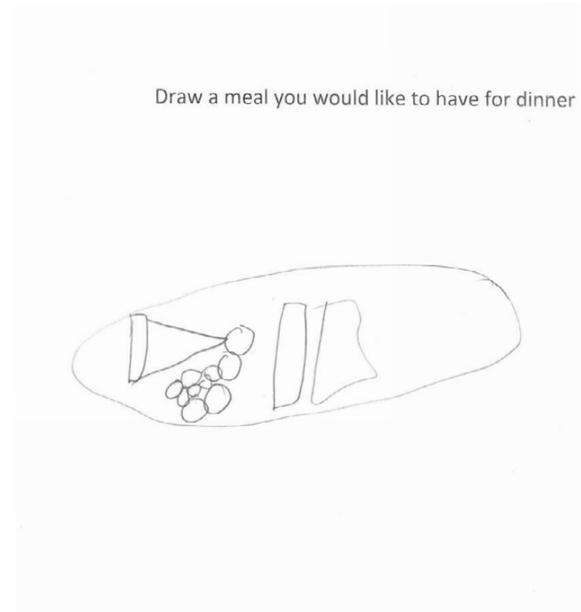
A pilot study conducted by the University of Nebraska Medical Center, College of Public Health / Department of Health Promotion and Social and Behavioral Health outlined best practices for the integration of Schoolyard Curriculum into the Healthy Eating Design Guidelines. The education team allocated summer school months to teach students about gardening and food education through the use of the Kitchen Gardens in collaboration with researchers. The goal was to assess best practices pertaining to the integration of school gardens into core academic classes to promote synergistic health and academic outcomes with 4 key objectives:

1. **Perform qualitative review of best practices for curriculum integration.**
2. **Identify stakeholder and key informant beliefs pertaining to barriers and strengths in the implementation of school gardens and garden based curriculum.**
3. **Determine feasibility of school garden curricula.**
4. **Engage with school stakeholders to develop recommended strategies for incorporating school gardening into the regular academic school year.**

Kitchen Garden as A Classroom

GARDEN RESEARCH AND EDUCATION

Designing the research model to assess best practices for garden curriculum involved identifying activity development (curricula vs. activities), standards of learning in math and science investigation, STEM teacher collaboration and the use of online resources. After building the garden, the researchers, educators and students created community rules, studied the life cycle of plants and the anatomy of edible plants, grew soil "babies" (e.g., seedlings) and made mini-pizzas and fruit salad with ingredients from the garden. Using quantitative and qualitative methods to analyze children's knowledge, beliefs, and attitudes about healthy eating, both pre- and post-testing, demonstrated a strong increase in food and nutrition knowledge. In a series of student reflection drawings (depicted right) there was a remarkable change from pre-and post-assessment with children choosing vibrant colors, shapes, garden designs and a variety of fruit and vegetable preferences after their short summer session immersed in the garden as a classroom.



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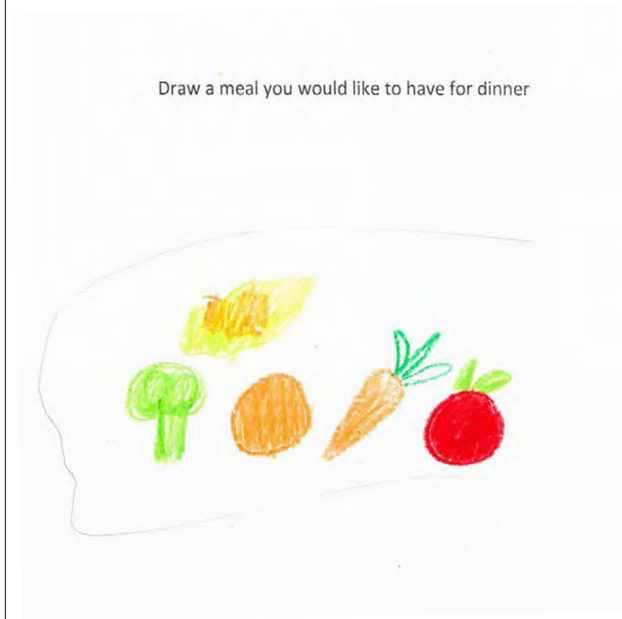

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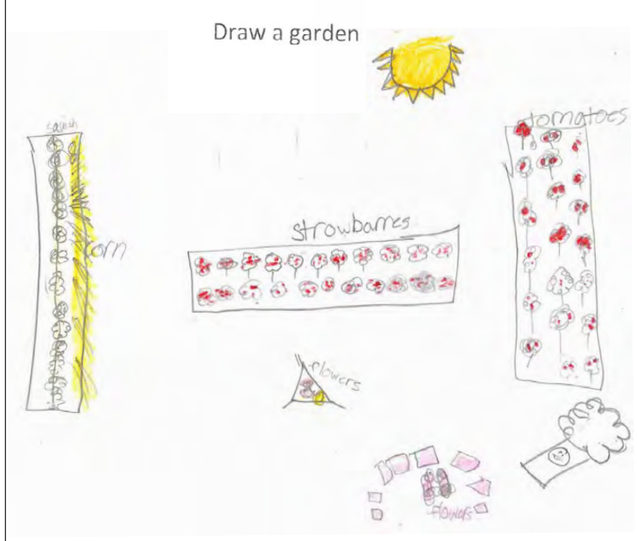

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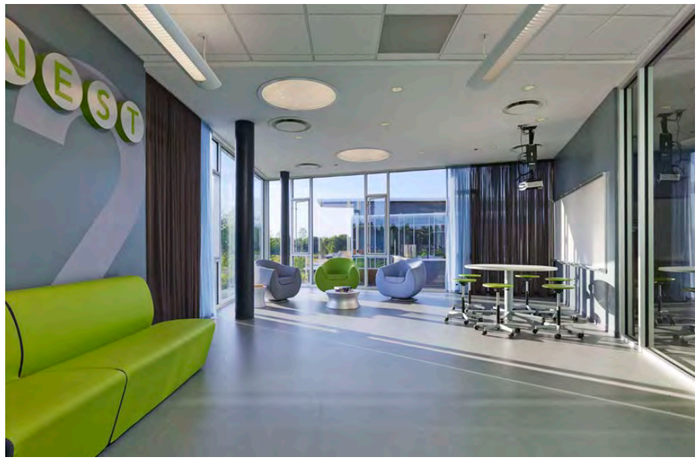
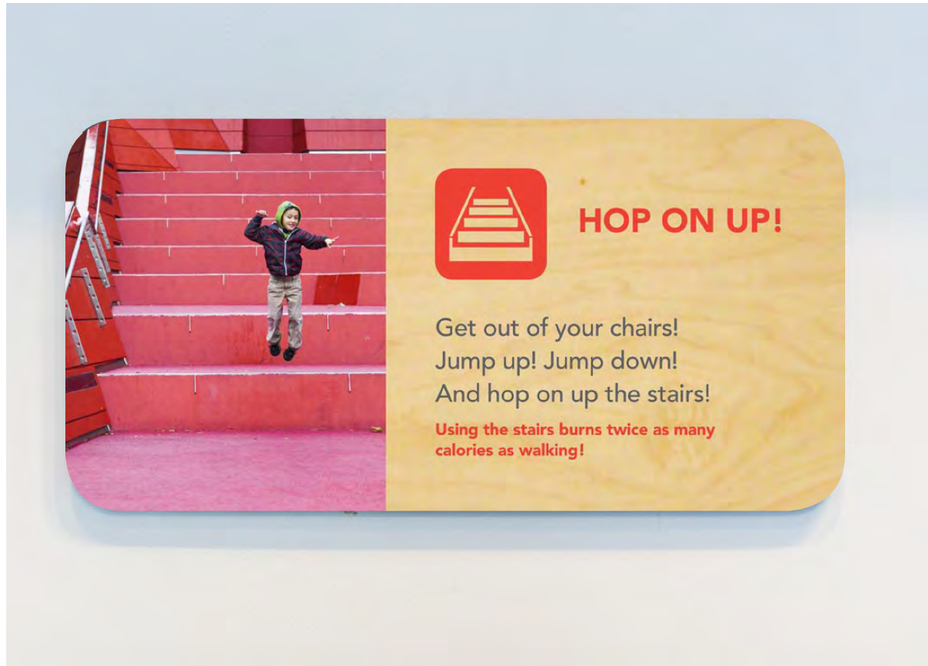
Active Design Features

Activating Bodies & Minds



ACTIVE DESIGN

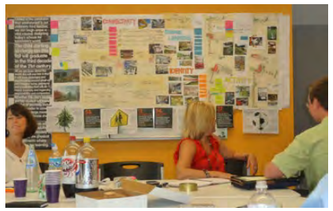
Active Design Guidelines focus on building-scale features that can help promote daily physical activity among school occupants. The team sought to combine healthy eating design strategies with active design features to better optimize the school architecture and interiors to shape health-oriented attitudes and behaviors. The team identified physical program areas such as circulation corridors, gathering spaces, classrooms, gyms and monumental stairs as catalysts for change in the sedentary culture at school. Specific features like gyms with cushioned flooring, ergonomic furniture, standing desks and mobile furniture were integrated throughout the school for better learning and health. Sensory attributes and aesthetic qualities were highlighted in the interior design to enhance the enthusiasm, curiosity and spirit of adventure in the children and staff – design prompts which correlate with increased active and engaged use of building spaces. To document these active design strategies , the team developed Physical Activity Design Guidelines for School Architecture – featuring specific strategies in 10 school design domains. Implementation of the guidelines is expected to enable students to adopt healthier active behaviors. This innovative planning tool bridges a translational gap between research and environmental design practice, and may contribute to setting new industry and education standards.



Making the case for vibrant, high quality interiors: Every setting contributes to community health by providing–materials with healthy ingredients, a variety of textures and textiles, furniture that is designed for the ergonomics and kinetics of kids, and visual expertise behind the use of color to create a positive, safe sense of ownership of space. Spaces were designed to meet the needs of all children, no matter what their physical, cognitive, behavioral and social abilities. Interactive learning spaces with high degrees of flexibility and movement are woven together with quieter spaces for reflection. A warm-to-cool color system was devised to bring deeper and more meaningful relationships to the spaces children inhabit while enhancing their sense of wellbeing.

KIDS NEED TO MOVE – TO LEARN

The stakeholder group defined a project goal to invest in health for each member of the learning community at the scale of the furniture landscape after a design-thinking planning session. Planning for each space to have the affordance of flexibility, agility, and adaptability included the human factor of postural choice. Being able to lie down, stand, sit dynamically, wiggle and lounge are some of the spontaneous and necessary low-to-moderate movements that are encouraged for both physical and cognitive development all throughout the school day. The conscious tactile connection to natural, healthy materials and the systematic use of color reinforces the playful atmosphere that is so appealing to children.



04

RESULTS OF PROCESS + PROJECT

DESIGNING FOR FUTURE GENERATIONS
The Role of Architecture as a Catalyst for Health & Lifelong Learning

ENHANCING HUMAN AND ENVIRONMENTAL HEALTH THROUGH ARCHITECTURE

Designing for health has transformed a rural community like Buckingham County and helped shape the next generation of healthy kids. The re-design of the school campus sought to enhance and influence the physical and mental well-being of the county's educators, staff and youngest learners through the planning of innovative learning environments at a variety of scales for hands-on, real world teaching and learning.

In this way, the project has become a national reflection of the future of learning and the future of practice. The design, research and evidence contributed to multiple disciplines could not have been made without a deeply engaged and collaborative District leadership group who paved the way for an interdisciplinary team to design and launch a two-year mixed method longitudinal study. Recognizing the impact of the project, the American Institute of Architects has promoted the project as a Case Study example of a multidisciplinary approach to move schools forward toward a culture of health. The project also aligns with a national objective to build a stronger intersection for public health and built environment experts to address multi-scale solutions for healthier communities across the country. The project overwhelmingly aligns both District educational goals and the American Institute of Architects' six areas for architects to pay particular attention to when designing for the public realm:

ENVIRONMENTAL QUALITY
NATURAL SYSTEMS
PHYSICAL ACTIVITY
SAFETY
SENSORY ENVIRONMENTS
SOCIAL CONNECTEDNESS

"The impact architecture has on a person's mood is huge. How we feel it, through the way it allows us to act, behave, think and reflect."

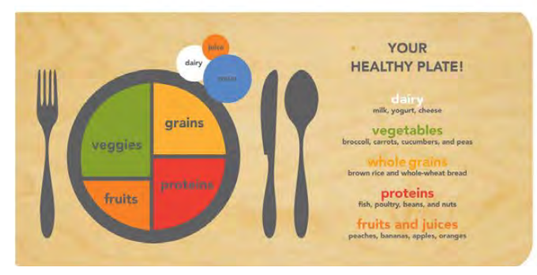
[Dr. Melanie Dodd signals a new driving paradigm in school siting, planning and the architecture that can be a catalyst for learning futures.]

Measuring Success

RESEARCH FINDINGS: CHILDREN

With such limited global research exploring children's understanding and conceptualization of food and healthy eating to inform the development of curricula and messaging strategies, one component of the project research was to identify patterns and themes regarding children's perceptions of food and healthy eating as a result of the new school design. 7 focus groups were held with a cohort of children in grades 3-7, both pre-and post-design and occupancy, as a component of the 2-year longitudinal research. The evidence demonstrated an improvement in the awareness of dietary knowledge and positive gains in food choice and dietary intentions. The research also concluded that nutrition education should expand strategies beyond promotion of health benefits to include taste and socio-cultural familiarity. Drivers of food likability were expressed through taste, texture and visual appeal in addition to their associations with positive home and family experiences.

"TELL YOU LIKE COOL FACTS ABOUT LIKE THE MOUNTAINS AND WATER AND FOOD AND HEALTH"



Measuring Success

RESEARCH FINDINGS: TEACHERS & STAFF

The new Buckingham Primary & Elementary Schools needed to serve a diverse demographic in a rural context, including early and young learners from around Buckingham County. Starting with Kindergarten and remaining on the new campus through Fifth Grade, the children now have a school that is designed to benefit their diverse range of needs for health, learning and responsible citizenship. And the community now has a vibrant architectural focal point and gateway for social events. But it has been acknowledged that teachers are in fact the drivers of change and it is their day-to-day creative contributions that make school culture a rich, warm, safe and resourceful 'home away from home' for children. The project research provided evidence that the school's design was a catalyst for social and organizational changes, shifts in the awareness and influence of space as well as psycho-social and behavior outcomes. Teachers and staff created new school policies and programs in gardening, healthy play, after-school nutrition programs and healthy eating messages incorporated into daily announcements. They also took charge of their own health with incentivized contests, cross-fit programs and daily walking routines using school grounds and gymnasiums.

Teacher Move-In Day

New Planning Tools for Innovation

The process of creating the Buckingham school food environment to facilitate healthy eating among children resulted in the publication of the Healthy Eating Design Guidelines for School Architecture. This replicable set of design guidelines draws on research in environmental health, environmental psychology, behavioral economics, and socio-ecological models. The interdisciplinary team developed 10 spatial domains organized around 5 core principles based on the research and recommendations of several agencies to address healthy eating design with:

1. Provision of equipment and spaces that facilitate the incorporation of fresh and healthy food choices into the school and its community.
2. Provision of facilities to directly engage the school community in food production and preparation.
3. Application of evidence- and theory-based behavioral science principles to "nudge" the school community toward healthy eating behaviors and attitudes.
4. Use of building and landscape features to promote awareness of healthy and sustainable food practices.
5. Conception and articulation of school spaces as community assets to multiply the benefits of school-based healthy food initiatives.

MEASURING SUCCESS

The team focused on developing a tool that identifies zones that could potentially affect healthy eating in the school, provides exact recommendations for the physical design of each domain, and includes testable elements for the purposes of certification and post-occupancy evaluation which were undertaken with a 2-year longitudinal study. The co-creation process relied on 6 process elements:

1. A unified vision and common goals.
2. Identification of multidisciplinary skills and resources.
3. A focus on connecting conceptual and practical considerations.
4. Development of a common lexicon
5. An open and iterative culture for exchanging ideas (brainstorming, researching and conceptual testing).
6. The integration of academic research into the operations of a private practice design firm.

New Planning Tools for Innovation

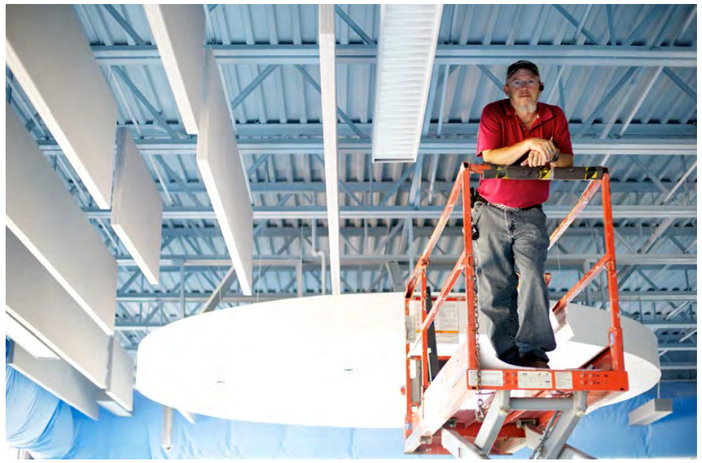
The collaborative research and design process resulted in both Healthy Eating Design Guidelines and the complementary Physical Activity Design Guidelines for School Architecture. The later guidelines cover the breadth of research related to physical activity and movement in K-12 school physical or 'built' designs and translate the research into a new planning tool for design practitioners, educators and scientists wishing to create a less-sedentary learning environment with health and learning benefits for school communities. As a foundation for the development of school design guidelines, the team formulated a set of core principles as follows:

1. Maximize opportunities for physical activity (both unintentional and intentional) as part of the school routine.
2. Consider school spaces and features as opportunities to promote children's natural inclination to move, play and explore.
3. Apply theory- and evidence-based behavioral science practices to enable the school community to engage in higher levels of default physical activity.
4. Conceive and articulate school spaces as community assets, and identify nearby community spaces as school assets, to multiply the benefits of school-based healthy physical activity initiatives.
5. Leverage inherent synergies with current trends in sustainable and universal design, which respectively define good design based on sensitivity to environmental impacts and accommodation of all user needs and perspectives.

MEASURING SUCCESS

The design of the school supports the District goal to integrate low-to-moderate intensity movement throughout the school day in addition to high intensity physical activity through sports and recess. The accelerometry data showed significant impact on reduced sedentariness and increased light physical activity. There was a general shift from MVPA (moderate to vigorous physical activity) to LPA (light physical activity), which is not unexpected given the design was geared more towards LPA, but this does call attention to the need to think about future design for both LPA and MVPA separately. Given the limitations of a natural experiment, the design of the school campus provided a first set of evidence of how comprehensive school design can indeed impact physical activity.

Project Data



Site Area: 40 acres
Site Development Area: 14 acres
Total Gross Building Area: 134,000 GSF
Construction Cost: $18,570.000
Furnishing Cost [FF&E]: $1,200,000
Technology Cost: $1,000,000
Environmental Graphics Cost: $125,000

Construction Dates: Fall 2010-2012
Opening Date: Fall 2012
Sustainability Rating: LEED Gold

National EUI Baseline: 70
Predicted EUI Model: 45.3
Actual EUI: 47.5

"IN THE CASE OF SCHOOLS, WORKING ACROSS THE EDUCATIONAL, PUBLIC HEALTH AND DESIGN SECTORS CAN PRODUCE NOT ONLY BEAUTIFUL BUT MEANINGFUL ARCHITECTURE AS WELL AS IMPROVE WELL-BEING AND SCHOOL PERFORMANCE."

RESEARCHER : DR. TERRY T-K HUANG, PhD, MPH, CPH