

2016 A4LE Exhibition of School Planning + Architecture

Project Name: Discovery Elementary School
Category: New Construction
School District: Arlington Public Schools (Arlington, Virginia)





Setting a New Standard for a New Century

Discovery Elementary School is the first new elementary school built in Arlington, VA in more than a decade. The goal of the PreK-5 project is to address growing student enrollment while reaching for the highest standards possible – in instructional space as well as sustainability, operating costs, and flexibility. Net zero energy design was a primary contributor to this mission. To date, the project is anticipated to become the first net zero energy school in the Mid-Atlantic and the largest in the United States.

Throughout a series of intensive community planning meetings, careful attention was focused on designing and building a school that supports how and where students learn. Every nook and cranny of the school is arranged to create a seamless integration between design, sustainability, and learning. Recognizing that students are the creators of our collective future, Discovery Elementary School sets the stage for the development of the skills necessary for long-term stewardship of our world.

District Mission Statement:

Arlington Public Schools instills a love of learning in its students and prepares them to be responsible and productive global citizens.



Creating a Sense of Ownership

To support student ownership, the mascot, colors, and school name were chosen by a vote by the student body. The “Discovery Explorers” name reflects the forward-looking, inquiry-based learning that takes place in the building and also pays tribute to John Glenn, who lived near the site when he became the first American to orbit the earth in 1962. In 1998, while still at sitting senator, Glenn returned to space on the shuttle Discovery.

As students progress through the school, their world expands – with the first floor themed around earth eco-systems and the second floor themed around the sky and solar system. This storyline is graphically communicated along an entry wall highlighting each Explorer grade level. Students start out as Backyard Adventurers in Kindergarten and finish Fifth Grade as Galaxy Voyagers. On the first day of school, Explorers “make their mark” in their expanding world and follow their mark as it moves throughout their journey at Discovery.

To encourage creative expression and student ownership, the school features a two-story slide that students may go down any time as well as “creativity” walls that mirror floor-based theming (1st floor = earth; 2nd floor = sky and solar system). Featuring cut-out white boards for students to draw/write/mark upon as desired, the creativity walls reverse the notion of “graffiting” or “graffiti” as being a destructive act to one that, in the Discovery context, supports expression and creativity.



Site Considerations

The result of a community-based design process, the school's design takes advantage of the hilly topography of the site to create distinct, tiered academic zones for early childhood, primary, and elementary grade levels. The hillside solution created the opportunity to layer and weave interior and exterior learning terraces with access across grade levels – fostering community while connecting students to the landscape. The public plaza and learning promenade provide further social mixing while nesting the intimate and sensory aspects of early childhood learning within the arms of the community in south-facing kinder-houses.

As a neighborhood school in a growing urban community, contextual sensitivity and adaptability were major design priorities. In support of these aims, the school tiers into an existing hill to minimize the perception of its size while featuring exterior materials that are residential in nature and scale. The school shares the site with an existing middle school and has been master planned for future middle school expansion and potential conversion to a PreK-8 campus. Open flat space for recreation is preserved as much as possible by situating a third of the building's footprint on existing slopes. The school, its playfields, and playgrounds support heavy after-hours community use while maintaining an environment tailored to foster the creativity, joy, and development of the community's youngest learners.



Inspiring Learning & Creativity

“The one constant in education is change. How do we create spaces that inspire people to use them in different ways?”

**John Chadwick,
Arlington Public Schools Assistant Superintendent**

Discovery Elementary inspires students and teachers to use the building creatively to facilitate everyday learning and lifelong exploration. To accommodate change and support engagement across grade levels, as advocated by Assistant Superintendent John Chadwick, the school features an extensive array of exterior playscapes and flexible interior furniture including stools, bean bags, height-adjustable tables and chairs, reading steps, and even a two-story slide – all of which encourage creative expression and student choice.

Inside classrooms, flexible details such as foldable partitions, retractable garage doors, and reconfigurable furniture support teacher collaboration and cross-pollination. Throughout the school, one-to-one technology enables research and collaboration to happen anytime, anywhere. These in-between spaces spark creative collision: creativity walls encourage student expression and ownership, scrabble and LEGO walls fuel linguistic and spatial exploration, and the “Hedge” (found outside the Backyard Adventurers’ Kindergarten classrooms) provides nooks and crannies that buzz with activity before, during, and after school.

With a range of dynamic learning spaces, the positive relationship between pedagogy, student engagement, and high performance architecture has become a centerpiece for the local community. Creativity and joy are visible and celebrated throughout the school’s learning environment and foster a living lab for sustainable, active practices for the future.



Theming & Graphic Wayfinding

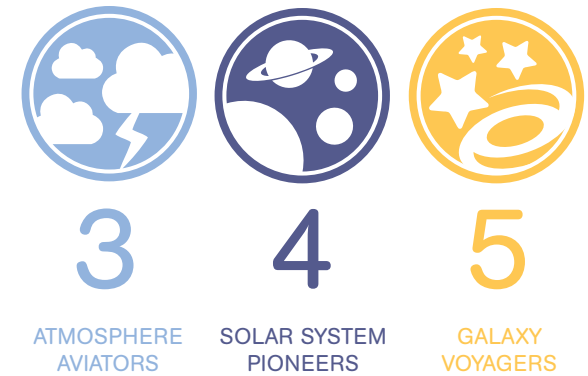
The school's wayfinding goes beyond basic navigation to support a larger vision of learning that reflects each grade's expanding curriculum and identity. This approach supports grade-level identity while also engaging and educating users as they interact with the building and develop on-going relationships with the space over time.

When students advance grade-wise, so does the scope of their expanding world, both in graphics and in pedagogy. Integrated in the wayfinding are colors, icons, and educational signage featuring real-world facts related to grade-level theming – which collectively transform wayfinding features into creative educational opportunities.

The theming fosters a safe and secure environment for students of all ages and learning abilities to feel comfortable in, while also allowing opportunities for choice and flexibility to support different learning styles, expressions, and arrangements. Taken together, these spaces add up to a school that students do not want to leave at the end of the day and can't wait to return to in the morning.

“Curriculum is just something the state gives to us and you can teach that anywhere, but with this space, we can really get creative, and experiment, and shepherd meaningful experiences.”

Erin Russo,
Discovery Elementary School Principal



Materials & Massing

The sunny early childhood kinder-houses are accented on the outside by warm colors – reflecting their south-facing solar orientation. On the north side, the school features cooler colors, such as greens and blues, echoing the natural expression of moss that grows on the north side of trees. The school's public spaces are defined by a large roof canopy with a cedar soffit that runs the length of the school and serves as the school's "front porch" with covered outdoor dining and play spaces. All fifteen early childhood and primary classrooms on the first floor open to the exterior, providing physical and visual connections to the outdoor landscape.



Net Zero Energy Design

During the earliest stage of project planning, the client and design team identified net zero energy as a primary project goal –meaning that the amount of energy provided by on-site renewable energy sources needs to be equal to the amount of energy used. To meet this goal, considerations for site footprint, solar orientation, building construction, and energy use were given top priority early in the design process. With a capacity of 650 students in grades Pre-K through 5, the 97,588 GSF building is designed for an Energy Use Index (EUI) of 23 kBtu/sf/year. This ultra-low EUI allowed on-site photovoltaic energy generation to be possible within a traditional school budget.

Achieving an EUI of 23 involved meticulous evaluation of the way Arlington Public Schools (APS) builds and operates its facilities. Discovery's sustainable features include:

- 1,706 roof-mounted solar panels
- A geothermal well field
- Solar pre-heat of domestic water
- 100% LED lighting
- Ideal solar orientation and shading
- Exterior walls with high thermal mass
- Bioretention areas that clean and slowly release all of the water from the site



Return on Investment

An equally-sized APS school accrues approximately \$120,000 in annual energy costs. As an all-electric building that fully offsets energy use through photovoltaic generation, Discovery helps redirect funds that would be dedicated to energy costs back to the APS operating budget, while allowing the school community to enjoy the environmental benefits of a fully offset carbon footprint.

Schools' operating dollars are some of the most precious of all public tax dollars – and are increasingly under strain. Savings from conservation alone are predicted to be \$52,000 in year one and \$1,400,000 over twenty years. Income from the solar array will cover the array's portion of the bond payment around year six and produce a 20 year annual average return-on-investment of 16%. As an all-electric facility, the building hedges against future energy inflation by offsetting all of its power consumption with on-site generation. In fact, the more electricity prices go up, the higher the return on investment for the school.

The school's entry canopy features an oculus that measures the movement of the sun – creating an opportunity for a solar calendar in the front plaza that allows students to track the time and the season. Connections to the sun – through the oculus, solar panel, and other design features – become learning tools throughout the school.



Net Zero as a Learning Opportunity

In collaboration with the client, the design team has designed (*pro-bono*) a custom dashboard system that tracks energy data and measures it in real-time and against the energy model. The installation of an unprecedented amount of sub-metering throughout the school – for measuring plug load, lighting, IT energy use, and other expenditures of energy – allows data to be measured, tracked, and published on the dashboard and on every school device connected to the internet.

Installed near the school entry, the dashboard encourages visitors as well as students, teachers, and community members to engage with the school's low-energy culture on a continual basis. Publicly available and connected to an array of learning opportunities – such as the school's rooftop solar lab, which allows students to conduct real time and on-going experiments – the dashboard motivates students and teachers to modify their behavior in order to help the building achieve not only net-zero energy status, but also net-positive energy status.

“The physical design of the school itself is very inspirational to students. They love coming here, they love being in this space, and they love learning in this space ... The students know that they’re in a special place.”

**Chris Vaccaro,
Discovery Elementary School 3rd Grade Teacher**



Community Planning Involvement

As the smallest county in the United States in area, the civic process in Arlington is rooted in a very high level of community engagement. This project was under particular scrutiny, as it was the first new building in a capital improvement program that is in the process of adding over 500,000 square feet of new school construction to a rapidly growing county. Three major groups were heavily involved in planning this vanguard facility:

- Instruction Committee: Consisting of division leaders and in-school educators at the primary and elementary levels.
- Building Level Planning Committee: Consisting of neighbors, parents, PTA members, local civic association representatives.
- Public Facilities Review Committee: Consisting of county-wide representatives from various local government commissions, including planning, transportation, environmental, and parks & recreation.

“Designing an energy efficient school is a complex task, and involves engaging numerous stakeholders, public agencies, and a number of consulting firms. [The architect] orchestrated this process very well and provided a valued outcome for Arlington County.”

Chris Munson, LEED Green Associate
Arlington Public Schools Building Level Planning
Committee Member

Building Level Planning Committee:

Leslie Paul, Chair, Nottingham Parent
Donna Snyder, APS Director Elementary Education
Pam Farrell, APS Dept. of Instruction Staff Member
Matt Hubbard, APS Dept. of Instruction, Staff Member
Ann McCarty, APS Williamsburg MS Administrator
Erin Russo, APS Williamsburg MS Administrator
Robert Dudek, APS Williamsburg MS Teacher
Lara Meadows, Jamestown Parent
Carmen Romero, Jamestown Parent
Sherry Brown, Nottingham Parent
Robin Puttock, Tuckahoe Parent
Scott DeFife, Tuckahoe Parent
Beth Bruns, Williamsburg MS Parent
Joe Delogu, Williamsburg MS Parent
Chris Munson, Rock Spring Civic Assoc. Rep.
Kevin Scott, Rock Spring Civic Assoc. Rep.
Katherine Schroder, Williamsburg Civic Assoc. Rep.
Noah Israel, Yorktown Civic Assoc. Representative
Ron Molteni, FAC Member
Kate Marshall, SAC Member
Robin Leonard, Arlington County Parks & Recreation
Matt Pfeiffer, Arlington County Planning
Melanie Jesick, Arlington County Transportation
Robert Gibson, Arlington County Transportation
John Chadwick, Assistant Superintendent. Facilities & Operations
James Meikle, Director, Maintenance, Facilities & Operations
Steve Stricker, Interim Director, Design & Construction

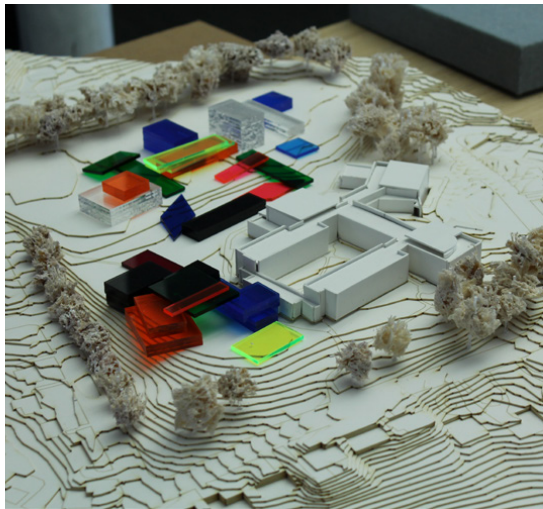
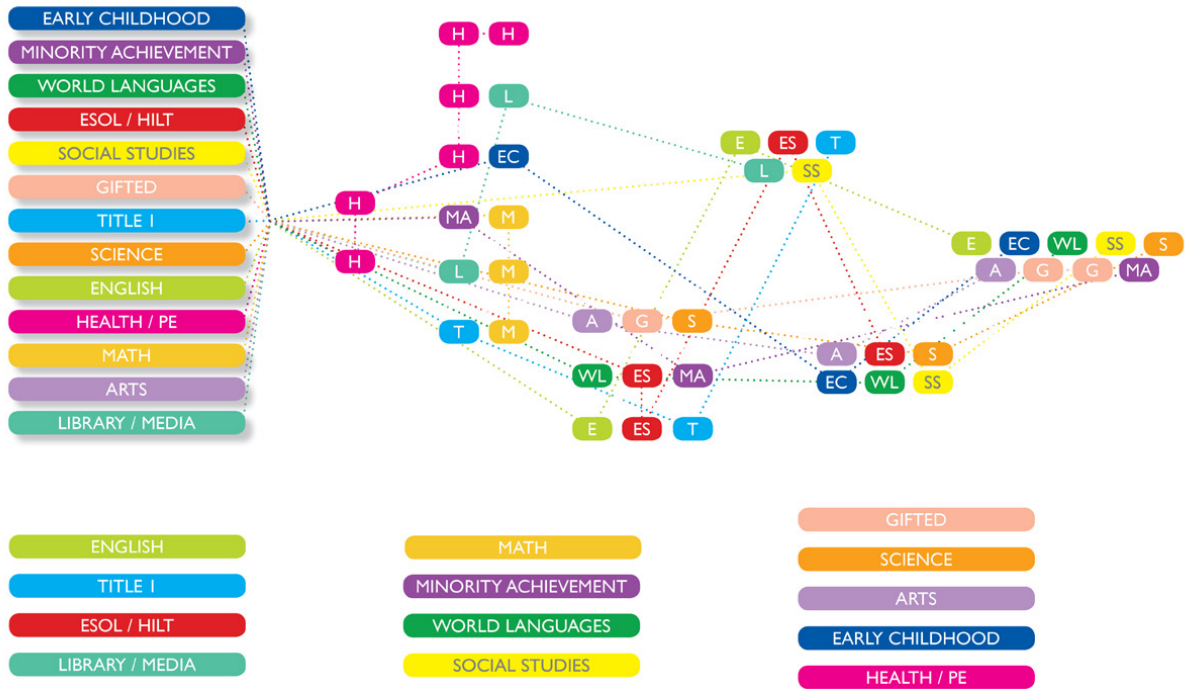
Public Facilities Review Committee:

Charles Monfort, Chair
Freida Wray, Staff Coordinator
John Miller, At-Large
Betty Siegel, At-Large
Eric Harold, Environment & Energy Commission
Jason Widstrom, Fiscal Affairs Advisory Commission
Jeffrey Certosimo, Housing Commission Rep.
Elizabeth Gearin, Parks & Recreation Commission
Brian Harner, Planning Commission
Inta Malis, Planning Commission
J. Lander Allin, School Representative
Heather Obora, School Representative
Craig Esherick, Sports Commission
Jana Lynott, Transportation Commission
Larry Finch, Urban Forestry Commission
Ann Hafer, Franklin Area Civic Association
Moe Kabiri, Rock Spring Civic Association
Lynn Pollock, Rock Spring Civic Association
Paul Cullen, Jr., Williamsburg Civic Association
Jim Lunson, Williamsburg Civic Association
David Friedman, Yorktown Civic Association
David Haring, Yorktown Civic Association

Learning Environment Planning

One of most revealing exercises was part of an early visioning session with the Instructional Committee. Each discipline/subject matter (math, language, PE, gifted, etc.) was given a unique color post-it note pad and asked to identify both room types and activities most critical to their specific discipline. Correlations and commonalties were then used to create layouts and adjacencies in the building design.

The community process also dictated the location, size, and nature of the outdoor learning spaces, including the bio-retention labs, pollinator garden, age-specific playgrounds, covered outdoor dining/play areas, and school garden.

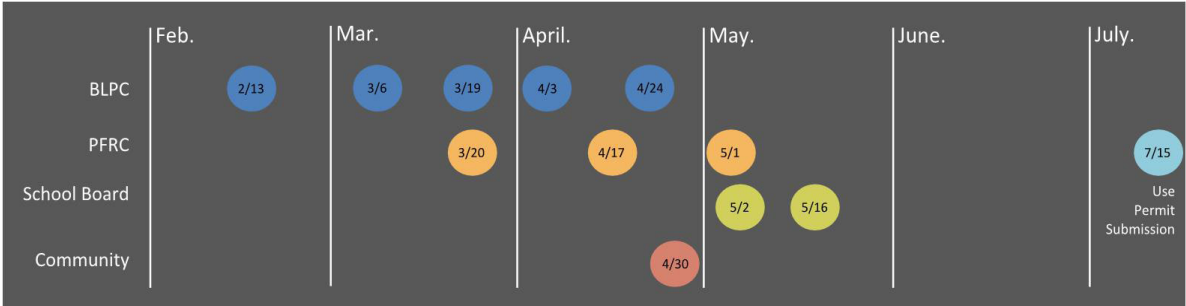
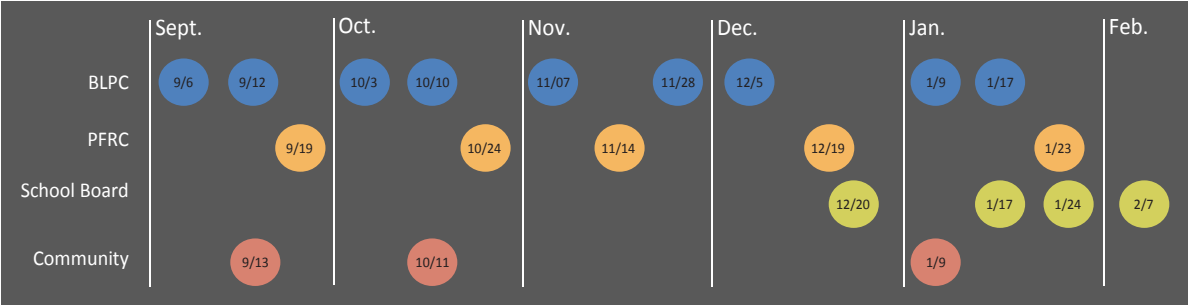


Maintaining Planning Team Involvement

The space program was principally established by the Instructional Committee, then the two design Committees met on a regular basis until the design was established.

There were fourteen design meetings over five months during conceptual design, followed by eight design meetings over four months during schematic design. This nine month process of community-based design is the equivalent to the total design and documentation schedule for many schools! Combined with presentations to civic associations, the school board, and the county board, the design of the new school was publicly presented and discussed over 45 times during the course of design.

Members of both building committees were included in the planning of all subsequent project milestones, including groundbreaking, school-naming, selection of school colors and mascot, move-in, and dedication. Post occupancy, members of the PTA even worked with the design team to produce graphics consistent with the educational themes of the building. (The planning process timeline is featured to the right.)



Realizing Vision and Goals in the Final Product

The civic approval process in Arlington requires a heavy emphasis on the development of the site plan and building exterior during the early design phases. Prior to breaking ground, the Use Permit submission required 3 months of review to ensure compliance with 53 conditions established during the design phase.

From an educational perspective, there were several steps taken to ensure the intent behind the learning environments was carried through to final execution. The information technology coordinator was the second hire after the principal, and worked closely with the design team to make adjustments to support the desired benefits of a one-to-one-device school. The design architect was used for all furniture selection, which were made with the Instructional Committee.

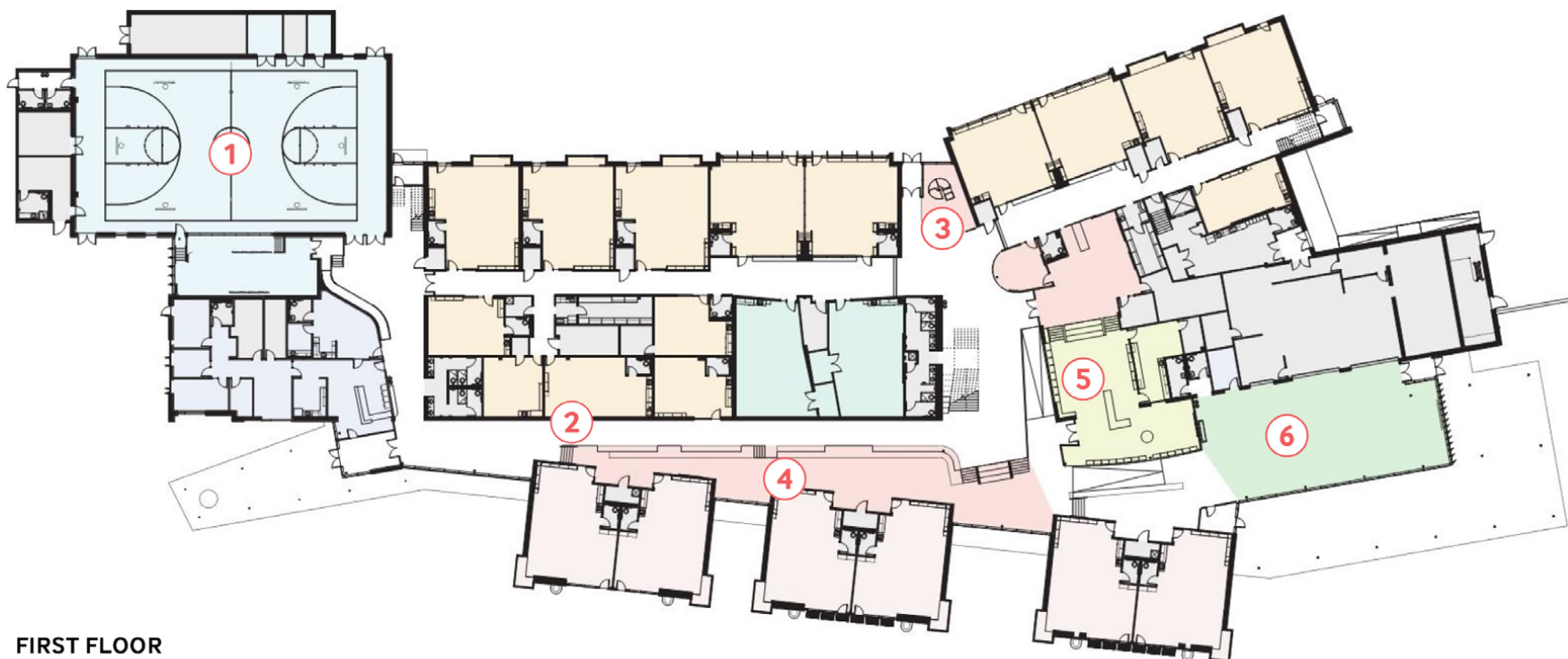
After being unhappy with what was commercially available, the architects and engineers custom designed a building data dashboard for the school. Most significantly, a unique wayfinding and environmental graphics package was developed in concert with the educators. This “expanding world” concept has been wholeheartedly embraced by the school community, inspiring a second grader to write a poem about the “journey of Discovery” that takes place within the school (displayed to the right).



Discovery

By Ann M on 2 May 2016

I am a bird
Who flew out of a wooden house
Who flew through the whispering leaves of the forest
Who soared over the depths of the ocean
Then I went into the atmosphere
Spinning through sparkling snow
And flew into the solar system
Dancing through twinkling stars
And flew into the galaxy
where I thought I came from a backyard



FIRST FLOOR

GYMNASIUM

DINING COMMONS

MEDIA CENTER

STUDIOS

ACADEMIC SUITE

EARLY CHILDHOOD

LEARNING COMMONS

MECHANICS / SUPPORT SVS

ADMINISTRATION

1 GYMNASIUM

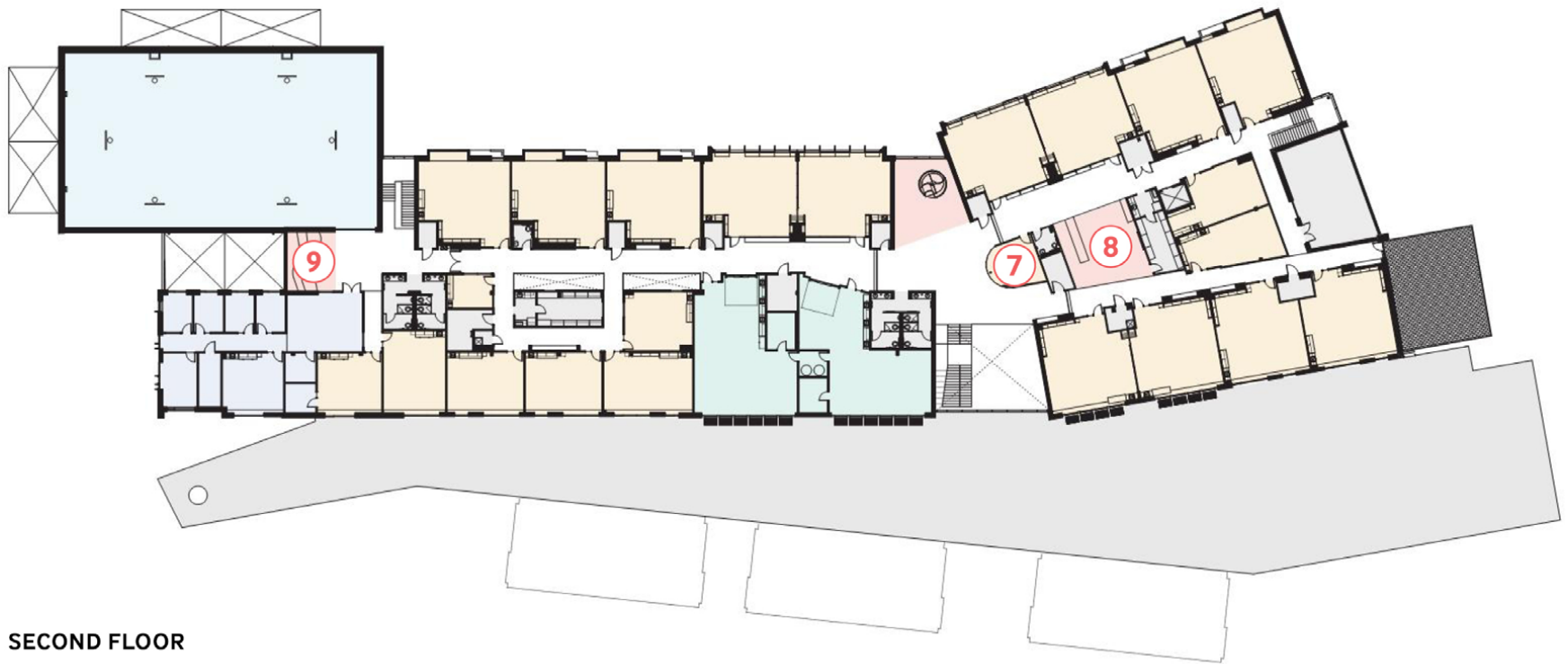
2 PROMENADE WALL

3 SLIDE













4 KINDERHOUSES & HEDGE

5 LIBRARY

6 DINING COMMONS



SECOND FLOOR

- | | | | |
|--|---|--|--|
|  GYMNASIUM |  STUDIOS |  LEARNING COMMONS |  7 TEACHER WORK ROOM |
|  DINING COMMONS |  ACADEMIC SUITE |  MECHANICS / SUPPORT SVS |  8 COLLABORATION COMMONS |
|  MEDIA CENTER |  EARLY CHILDHOOD |  ADMINISTRATION |  9 CLOUD COMMONS |

| | |
|-----------------------------------|-------------------------------|
| Submitting Firm: | VMDO Architects |
| Project Role | Executive Architect |
| Project Contact | Wyck Knox, AIA, LEED AP |
| Title | Associate Principal |
| Address | 200 East Market Street |
| City, State, or Province, Country | Charlottesville, VA 22902 |
| Phone | (434) 296-5684 |
| | |
| Joint Partner Firm: | |
| Project Role | |
| Project Contact | |
| Title | |
| Address | |
| City, State, or Province, Country | |
| Phone | |
| | |
| Other Firm: | |
| Project Role | |
| Project Contact | |
| Title | |
| Address | |
| City, State, or Province, Country | |
| Phone | |
| | |
| Construction Firm: | SIGAL Construction |
| Project Role | General Contractor |
| Project Contact | Chris Ross |
| Title | Project Manager |
| Address | 2231 Crystal Drive, Suite 200 |
| City, State, or Province, Country | Arlington, VA 22202 |
| Phone | (703) 302-1500 |
| | |

| | |
|---------------------------|------------------------------------|
| Project Name: | Discovery Elementary School |
| City | Arlington |
| State | Virginia |
| District Name | Arlington Public Schools |
| Super/President | Dr. Patrick Murphy |
| Occupancy Date | September 2015 |
| Grades Housed | PreK-5 |
| | |
| Capacity (Students) | 630 |
| Site Size (Acres) | 15.5 Acres |
| Gross Area (sq. ft.) | 97,588 sq. ft. |
| Per Occupant (pupil) | 155 sq. ft. / pupil |
| Gross/Net please indicate | 97,588 GSF / 63,695 NSF |
| | |
| Design and Build? | No |
| If Yes, Total Cost | |
| Includes: | |
| | |
| If No: | |
| Site Development | \$ 8,500,000 |
| Building Construction | \$24,330,000 |
| Fixed Equipment | N/A |
| Other: | |
| | |
| Total: | \$32,830,000 |



Discovery Elementary School

Creativity Walls & 2-Story Slide







Discovery Elementary School

Dining Commons with View to Dining and Play Terrace



Discovery Elementary School

Art Room with Flexible Garage Door