NEOCITY ACADEMY

STEM PUBLIC HIGH SCHOOL School District of Osceola County, FL

2022 A4LE Planning & Design Awards

NEOCITY ACAD



EXECUTIVE SUMMARY

NeoCity Academy is a new 600-student, public STEM high school located on the NeoCity Campus in Osceola County, FL. It's also the first net-zero-energy school in the state of Florida. This new urbanist development is at the epicenter of a boom in the high-tech, advanced manufacturing industry that central Florida is currently experiencing. This rapid growth coupled with the Sunshine State's easement of regulation on solar energy production has created opportunities for the creation of new, high-performance, zero-energy facilities to educate and train the next generation workforce.

"Our mission is to develop students who believe the world can be a better place and that they can be the ones to make it happen." – Mike Meechin, Principal

The core stakeholder design team was given a mandate to design the new public high school within the state mandated budget and space requirements. **NeoCity Academy has been developed as a twenty-first century, Immersive Learning, STEMfocused** school that will offer students three curriculum paths: Advanced Engineering, Biomedical, and Cyber Security. The project was designed to LEED Certified standards but did not pursue certification per school district guidelines. The school was designed to meet a performance goal of 76 percent less energy use over typical and realize a zero-energy use. The project is located in the heart of a new advanced manufacturing corridor within the NeoCity Masterplan, and the school district of Osceola County has formed partnerships with industry leaders to inspire learning for the future.

The school's high-performance design and ultra-low energy use will save an anticipated \$113,000 per year on energy costs (equivalent to two teacher salaries in the state of Florida) and is expected to save almost \$2.2 million over 20 years in life cycle costs compared to a typical district school. Utilizing standard school construction with high-performance detailing, a distributed heat-pump system and a 226kw, roof and canopy mounted PV array, the facility can now be a designated prototype for other school districts throughout the state. This innovative new school will be a key teaching tool in support of the development and execution of its hightech curriculum.

NEOCITY ACADEMY

- The First Net-Zero Energy K-12 public school in Florida
- The First Immersive Learningscape environment in Florida
- 600-Students, 44,820 sf STEM high school
- Located within the NeoCity Campus, one of only 10 high-tech corridors in the world
- Meets state requirements for educational facilities
- Uses 76 percent less energy than a regular school
- Generates more power than it consumes on an annual basis
- Expected to save \$113,000/ year on energy costs
- Completed within cost per student station
- Focuses on three major areas of instruction: Advanced Manufacturing/Engineering, Biomedical Engineering and Cybersecurity



SCHOOL & COMMUNITY RESEARCH & ENGAGEMENT

NeoCity Academy is a 600-student, netzero energy, public magnet high school located in the NeoCity Campus in Osceola County, FL. Opened in August 2019, students have filled the space with excitement and ambition.

"I'm excited to lead this challenge," said Principal Michael Meechin. "We're going to be changing the landscape of everything we know about teaching and learning. I expect NeoCity Academy to become one of the top performing schools in the nation and disrupt what we know about traditional education." A little over a year after opening, NeoCity Academy has proved to accomplish just that.

NeoCity Academy is the number one high school in the state of Florida, as ranked by SchoolDigger.com

Key Stakeholders:

The project's planning process included multiple district stakeholders with two key goals: create a zero-energy facility and create an environment (Immersive Learningscape) supportive of transformative teaching and learning processes. Multiple District's voices included: Facilities, Technology, Security, Wellness, Curriculum, Industry Partners, the new Principal, Osceola District's Head of Academics and the Superintendent.

Key Challenge:

Design a zero-energy school in the hot and humid Southeast climate under highly restrictive FEFPA (Florida Educational Facilities Planners Association) EdSpec guidelines for educational environments and for the same cost per student station as other previous schools in the District (\$287/sf) - something that had never been done before.

A First for the State of Florida

Neocity Academy shatters all the molds by becoming the first zero energy school in Florida, a Southeastern hot and humid climate, with a typical public school district client that never before had attempted anything even close to this (highly relevant to thousands of other districts in the US), under a highly restrictive FEFPA (Florida Educational Facilities Planners Association) guidelines for educational environments (EdSpec), in a highly restrictive New Urbanist District Zoning Guidelines of Neocity, Florida, and under the same cost as other previous schools in the District: \$287/sf. This project demonstrates that through an integrated design process and innovative leadership, schools can achieve high performance and zero energy regardless of geography or budget constraints.

NeoCity Academy was built on this tenet – learning can happen anywhere.

Through the implementation of the Immersive Learningscape concept, this project epitomizes the power that smart, transformative design can have in students across the US, and not just one-of-akind special projects with high budgets and minimal constraints. When students and innovation are placed at the center of the school's mission, learning can be transformed. The emphasis shifts to student-led, problem-based discoveries, and the careful crafting of the learning environments supports student agency, flexibility and adaptability. In parallel, teachers can deliver the curriculum with creative autonomy and focus on end results rather than prescriptive day-to-day processes.

Connecting Ideas + Industry

Strategically located in close proximity to Orlando, inside America's only Spaceport/ Seaport/Airport/Rail grouping, NeoCity is poised to serve as a catalyst for high-tech innovation and creation, including jobs and capital investment. NeoCity is already generating marketplace momentum, as well as leading this nation's approach to the advancement of research, development and commercialization hubs – all within the boundaries of locally-planned communities.

The school is recognized as the up-andcoming world epicenter for smart sensors, photonics, optics, nanotechnology and other leading technologies, and has ready-made synergies with the University of Central Florida (the nation's largest producer of aerospace engineers), University of Florida, University of South Florida, Florida International University, Florida Atlantic University and Northwestern University, as well as NASA, Blue Origin and Central Florida's large concentration of Department of Defense partners and contractors.

The ultimate goal of NeoCity Academy is for its students to spend 20 percent of their learning time as interns embedded within these agencies and industry partners. These experiences will bring applied relevance to their classroom education.

Create a Transformative Learning Culture

The client requested the design team to help them achieve this goal. **The careful intertwining of learning, wellness, technology, furniture, and space is crafted to enhance the student experience.**

Transparency also supports a culture where learning is celebrated and visible and where transdiciplinarity is simulated and teachers are encouraged to collaborate. The project includes walls in the hallways where student can write and collaborate, giving students the choice to select where and how they want to learn that day, helping to create a transformative learning culture.



SCHOOL DISTRICT DESIGN DRIVERS

- Immersive Learningscape
- High-Performance Learning
 Environment
- Flexible & Adaptable
- Efficient & Effective
- Microcosm of the BRIDG (Ideas + Industry)
- Strong Connection to NeoCity Partners
- Transparency (see learning happening)
- Colorful & Energetic
- EUI 20
- 1st Net Zero Energy School in Florida
- Inspire Learning at a Higher Level
- Create a Culture of Innovation
- WELL Inspired
- Use Building as a Teaching Tool





EDUCATIONAL ENVIRONMENT DESIGN

Training Tomorrow's Workforce Central Florida's recent boom in the hightech advanced manufacturing industry, coupled with the state's solar energy production, led to this new school to educate and train tomorrow's workforce in an innovative and high performing building. This school, as well as the future adjacent Middle School, will be the cornerstone of Neocity, a New Urbanist master planned high-tech community amid commercial areas South of Orlando. Strict guidelines mandated the location, frontage, and volume of the building and parking within the site. The building is designed to create a street edge, more pedestrian in nature. Once businesses come to Neocity, students will spend half their time at school, and the other half embedded as interns in various high-tech business such as Photonics, Nanotech, IoT and Microchip companies.



THE IMMERSIVE LEARNINGSCAPE

The Immersive Learningscape concept speaks to two important aspects of education in the new millennium:

Firstly, is the idea that learning happens best when it is immersive. Regardless of discipline, learning truly happens when students are immersed in the subject by interacting, manipulating, testing, adjusting and responding to questions and challenges through a multi-sensory method. Secondly, is the notion that the classroom gives way to the 'LearningScape': a combination of spaces that create a landscape for various methods of scholarship and multiple opportunities for size-specific differentiated learning. These spaces allow for technology-focused, projectbased learning; for flexibility of activities and education, unexpectedness in thought provoking, collaborative environments and brainstorming space for innovative, interdisciplinary and creative learning.



IMMERSIVE LEARNINGSCAPE









SUPPORTING STUDENTS

21st-century immersive learning environment supports inquiry-based curriculum

Design incorporates WELL building design attributes to promote health and wellness and reduce absenteeism

Student performance enhancement features include air purification technology, enhanced lighting, natural daylighting, collaboration laboratories and break-out spaces

Building is designed to be used as a teaching tool and allows for instruction to be delivered in new and innovative ways



ADAPTABLE & FLEXIBLE

Scalable to all K-12 prototypes

Incorporates a more innovative food cantina truck that reduces operational costs versus a traditional cafeteria

High-Performance building design focuses on energy use reduction and "right-sizing" MEP systems

Targets an Energy Use Intensity (EUI) rate of 20 (an average building achieves an estimated 65-75 EUI)

Standard Tilt-Wall Construction, code min. roofing, & punched openings



PHYSICAL ENVIRONMENT DESIGN

Vision:

The School District of Osceola County felt that the cost of net-zero design and construction was a "no brainer" when considering the savings in energy costs that, theoretically, could be diverted to more deserving causes, like increasing teacher salaries, at a time when school districts are struggling to control their operating costs. They also had a vision of using the school's own sustainability systems as a teaching tool for the STEMfocused students, while simultaneously serving as an example for the community.

Design Resiliency:

Given the high probability of hurricane events, resiliency became a key design driver. Resilient strategies for the project included: elevating the building to manage flooding, tilt-up concrete construction, utilizing commonly used local materials, thermal properties and hurricaneresistant construction, abundant daylighting to reducing interior lighting system sizes, natural ventilation, and a 202 KW Solar PV Array to offset building energy demand.

Landscape Design:

As a net-zero facility, NeoCity Academy offsets the use of fossil fueled energy and associated greenhouse gas emissions, not only doing less harm, but ultimately benefitting the ecosystem. The landscape design included an all-Florida native landscape that thrives in the ecological conditions present on site. This helps reduce the need for additional irrigation and increases the natural habitat for pollinators and other local fauna.

In addition to energy savings the mechanical system also saves on building water use. Condensation that is removed from the hot, humid incoming air at each heat pump is recycled back to the fluid cooler as make up water significantly reducing the use of utility water in the system, reducing water utility costs. The condensate recycling system has a return on investment of less than one year.

The power of design lies in providing clients with transformative ideas that create a better future. We approached this project by looking at ALL aspects of making this school a High Performing, healthy learning environment. We reduced the EUI by 72 percent. We reduced Air Infiltration by 80 percent. We provided a 202 KW Solar Photovoltaic array, a 12-year payback investment, to make the project reach Zero-Energy. NeoCity Academy also features a super tight building skin with an air leakage rate of .027cfm reducing the required cooling system by 62 tons. All of the lighting in the school is LED which uses at least 75 percent less energy than a typical lighting system. The facility has been operating at NET POSITIVE energy since opening.

BUILDING A

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We know that schools, in terms of their practice, have not changed in over 100 years. Schools that our grandparents sat in, unfortunately, look the same as schools our kids sit in today. We wanted to create a school that was more student centered.

- Mike Meechin, Principal

PROCESS & PROJECT RESULTS

Educational Goals & Objectives:

With the core challenge of creating a truly transformative learning experience, the design team incorporated the 'Immersive Learningscape' concept as a main driver of the project. The concept integrates the four key educational challenges found today (multiple modalities of learning, new technologies, customization of education, and the teaching and learning of 21st century skills) to create a flexible, adaptable, active and engaging learning environment. It's also designed for the main purpose of encouraging self-direction, inquiry, research, innovation, and a true love for learning.

School District Goals:

NeoCity Academy was designed and constructed in response to the school district's goal to transform what public education looks like in Osceola County. "NeoCity Academy is the proof of concept," Meechin said. "The hope is to scale up what we're doing to other school programs, regardless of their facility space."

Community Goals:

The school culture of NeoCity Academy helps to prepare students for life after graduation. From their first day, every student maintains a digital portfolio of their work to document outcomes they have achieved over time. At the end of the school year, each student presents five learning takeaways from the school year, helping them understand the value of schooling beyond the classroom. At NeoCity Academy, teachers are granted the autonomy to teach the school district curriculum with flexibility and freedom. The school actively values their input within the community and seeks to "bring art back to teaching."

SUSTAINABILITY & WELLNESS

Energy Efficiency

NeoCity's high-performance design features renewable energy on the roof and in the entry canopy. The 176-kW roof-mounted system with the 50-kW transparent photovoltaic canopy is expected to generate all the building's required energy over the course of a year. The school's Energy Use Intensity rate is 20, compared to the 65-75 EUI rate of an average school building. The high-performance building envelope was the main contributor to reducing the EUI. All interior and exterior lighting is highefficiency LED with vacancy sensors and daylight harvesting. The main mechanical system consists of simply maintained, various zones of the building coupled with an enhanced DOAS (Dedicated Outside Air System) to maximize fresh air in the building. During COVID, NeoCity Academy was able to bring in more fresh air than any other school in the district, contributing to being the school with the highest attendance rate.

The roof of NeoCity Academy hosts 650 self-ballasted solar panels that will lead to 228kW of energy production, and low-tech approaches to high-performance building skin joints significantly reduce air leakage. After more than a full year of use, this school is tracking at 72 percent less energy than a conventionally constructed school of comparable size and has saved the School District \$113,000 per year on utility costs.

DESIGN FEATURES

- Sensors throughout the building monitor IAQ, temperature, and room occupancy
- 650 self-ballasted solar panels
- 180-kW roof mounted photovoltaic system
- Tilt-wall building envelope with 7¼-inch panels
- LED Lighting
- Insulated roof system
- Dedicated Outdoor Air System (DOAS)
- 21st-Century Immersive Learning environment



76% Less Energy Utilized

SUSTAINABILITY & WELLNESS

Results:

Through a low-tech approach to the design of the exterior skin, exterior details, and simple mechanical systems, this high performing school utilizes 76% LESS energy than similar schools.



- 1. One of the tightest buildings in the world
- No roof penetrations + reduced heat transfer and less leaks
- Cost effective + High performing skin. The tilt-wall concrete panels serve as the best air and water barrier
- 4. High Albedo walls. The panels are coated wioth a high-performance paint on the exterior that helps to further reflect solar radiation

- 5. Energy-efficient glazing daylight harvesting
- 6. Small, nimble and efficient HVAC system
- 7. High performing HVAC
- DOAS Decoupled system of fresh air from cooling system
- 9. captured condensate water
- 10. low maintenance design

- 11. Smart, optimized passive roof construction
- 12. Sensors and BAS system
- 13. All LED lighting
- 14. Energy metering
- 15. Building as a teaching tool
- 16. WELL Inspired

HEALTHY, COLLABORATIVE LEARNING ENVIRONMENTS

Incubator/Gathering Area: Flexible, fun learning spaces spark joy for learning and inspire both students and teachers to support social wellness through schoolwide community building.

Mixer Space: Collaboration spaces provide connections to the outdoors, building systems and materials that support and enhance inquiry-based learning and schoolwide events.

Food Truck Cantina: In partnership with district food nutrition specialists, the school's food cantina truck that provides healthier food options versus a traditional cafeteria. **Building Performance Dashboard:** Electronic display wall showcases energy consumption of the building on an hourly, daily, weekly and monthly basis, promoting environmental consciousness among students and faculty.

Outdoor Learning: Outside dining spaces under the solar canopies double as learning spaces. The plaza becomes an extension of the lower-level STEM labs, so students can work on projects outdoors.

