

MaST II Community Charter School

Tacony Campus, Philadelphia



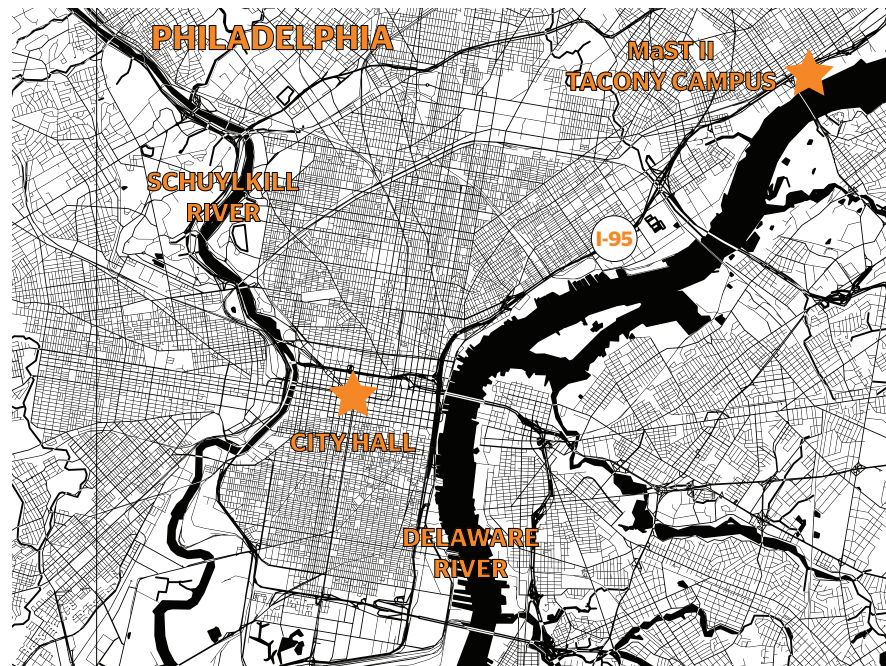
EXECUTIVE SUMMARY

The MaST II Community Charter School at Tacony is a new K-12 educational complex on 19 acres of reclaimed industrial land along the Delaware River in Philadelphia. Serving a student body of 1,300 from across the entire city, MaST II (Math, Science, & Technology) is the second campus of a community charter school organization known for its innovative education model which integrates technology both as a teaching tool and as a subject of learning. Interdisciplinary and project-based learning programs encourage students of all ages to explore and experiment in subjects as diverse as robotics, engineering, design, marketing, communications, entrepreneurship, computer programming, digital fabrication, medicine, and the arts as part of a comprehensive education.

OVERARCHING GOALS

The programming, planning and design effort was driven by three overarching goals:

- Support the innovative, award-winning pedagogy with a planning response that would allow flexibility as the school grows and evolves.
- Accommodate the incremental growth of the student population and work within financial constraints of the charter school model.
- Create a program- and site-specific planning response as well as a striking design concept to inspire students and advertise the identity of the school.





PROJECT RESULTS

The outcome of the project is the completion of all phases of a dynamic site and building design that is suited to the nuances of MaST II Tacony’s educational vision. To handle enrollment growth and financial limitations, the school is split into two distinct rectilinear volumes – each a separate phase of construction. The building forms are arranged to create a central courtyard with discrete spaces for elementary play and school-wide outdoor learning. The concept celebrates MaST’s commitment to technology and hands-on learning with bold exterior architecture and dynamic, flexible interior learning environments.

The design concept is based upon a rigorous, iterative process and a focus on design economy, where every move does double- or triple-duty, as a response to the complex site, program, and cost constraints; every move needed to be grounded in efficiency and built on consensus. Planning and development of the site, architecture, and interior is driven by simple ideas and striking gestures.

SCOPE OF WORK AND BUDGET

The project team was engaged by MaST II Tacony and their parent organization, The Isaac Newton Foundation, to provide full design services from the earliest phases of the project to post-occupancy evaluation. The scope of work included:

- Site Assessment and Analysis (Prior to Acquisition)
- Educational Programming
- Comprehensive Master Planning
- Complete Architectural, Interior, and Engineering Services from Schematic Design through Construction Administration Phases
- Permitting, Public & Municipal Approvals Processes
- Cost Estimating & Energy Modeling
- Post Occupancy Evaluation



Owner: Isaac Newton Foundation
Site Area: 19 Acres
Square Feet Per Student: 110
Student Capacity: 1,300
Grades: K-12

The cost model for construction was divided over two separate phases of construction. Completed construction costs (excluding land acquisition, environmental remediation, site work, and fees & soft costs) are:

Phase 1: \$15.7M
59,000 SF @ \$267/SF

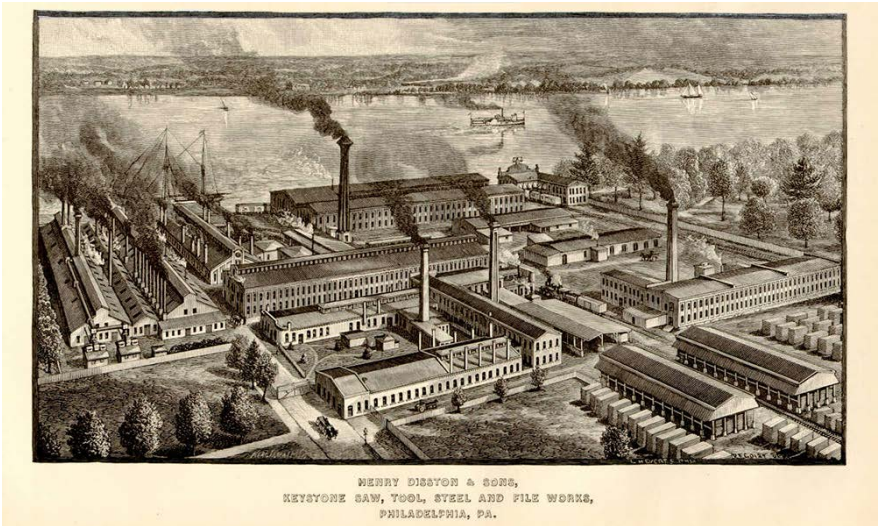
Phase 2: \$27.1M
84,000 SF @ \$323/SF

SCHOOL & COMMUNITY ENGAGEMENT

The MaST II Community Charter School programming, planning and design effort involved extensive engagement with stakeholders, comprised of three main groups: administrators, teachers, and staff; students and parents; and neighbors.

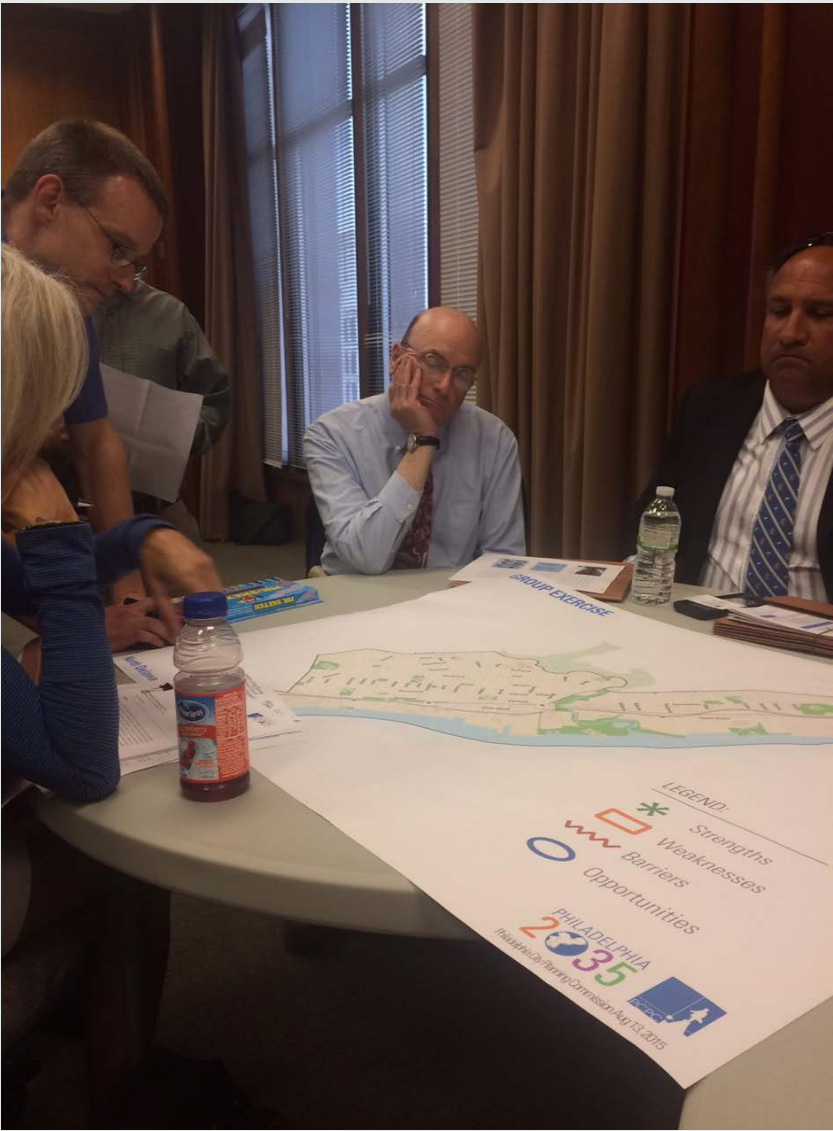
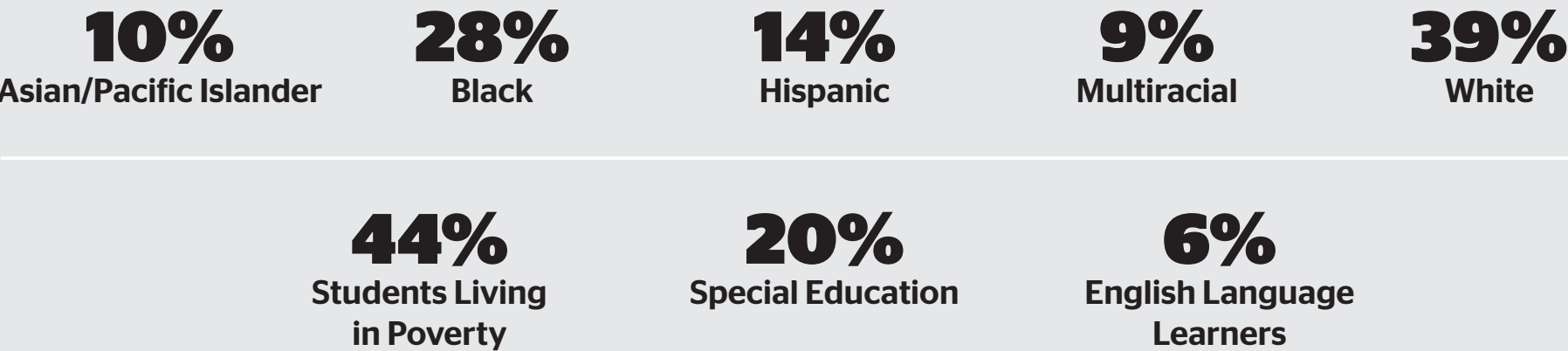
Since MaST II was a new school, one of the first challenges was simply identifying interested parties. Students at MaST II are drawn from across the City of Philadelphia as part of a lottery system, so early programming and planning began before there was an invested community of teachers, students, or parents. By the same token, there wasn't an established group of teachers or staff to engage. Finally, the lottery system gives no preference to students living within proximity of the school; there was no guarantee that members of the Tacony neighborhood would directly participate in the school community.

Fortunately, MaST II's leadership was able to draw on experience from community members from their first school, established two decades earlier in the nearby Byberry neighborhood of Philadelphia. Additionally, the construction manager and developer of the property had deep ties to the Tacony neighborhood; residents vocally embraced the idea of a school within a largely industrial waterfront area as an asset to the community and harbinger of future investment in the area.



STUDENT DEMOGRAPHICS

The student body draws from over 41 zip codes in Philadelphia, and are racially and ethnically diverse:



During early design phases, public meetings were conducted, as well as public hearings by the planning commission (Civic Design Review), where the design received unanimous support from zoning and city planning officials. At a special meeting of the Tacony Civic Association, members voted unanimously to approve plans for the new MaST II Charter School on the site of the former Dodge Steel plant near the Tacony-Palmyra Bridge along the Delaware River. Businesses and community members alike noted the advantages of the school in this location, spurring further investment, jobs, amenities, and greatly enhanced access to the Delaware waterfront.

A post-occupancy evaluation conducted with teachers and students after the first phase helped the design team identify areas of success – the flexible, daylit spaces and clear circulation, for instance, were widely appreciated – as well as areas for improvement – such as the open collaboration spaces, which benefited from acoustic retrofits as part of the phase 2 construction.



EDUCATIONAL ENVIRONMENT

MaST II's innovative pedagogy and project-based, interdisciplinary learning model was the basis for the planning and design concept: a simple, adaptable framework that would allow for open-ended discovery and evolution over time.

Programming and planning placed utmost emphasis upon an efficient use of resources for maximum impact on the educational opportunities this development would provide for the city. For instance, the footprint of each building phase was simplified to a rectangular form – based on a challenging “cost model” of “a building with 4 corners”, as

the construction manager specified early in the design process. Furthermore, efficient planning strategies were leveraged to offset the costs of less conventional, but highly beneficial, design gestures – by way of example, a double-loaded corridor provides efficiency and affords opportunity for bolder moves like full height glazing or much needed collaboration space outside of classrooms. The steel structural frame, with regular modular bays, means that as classroom needs change, future renovations can be cost-effective and expedient, conducted over summer break.

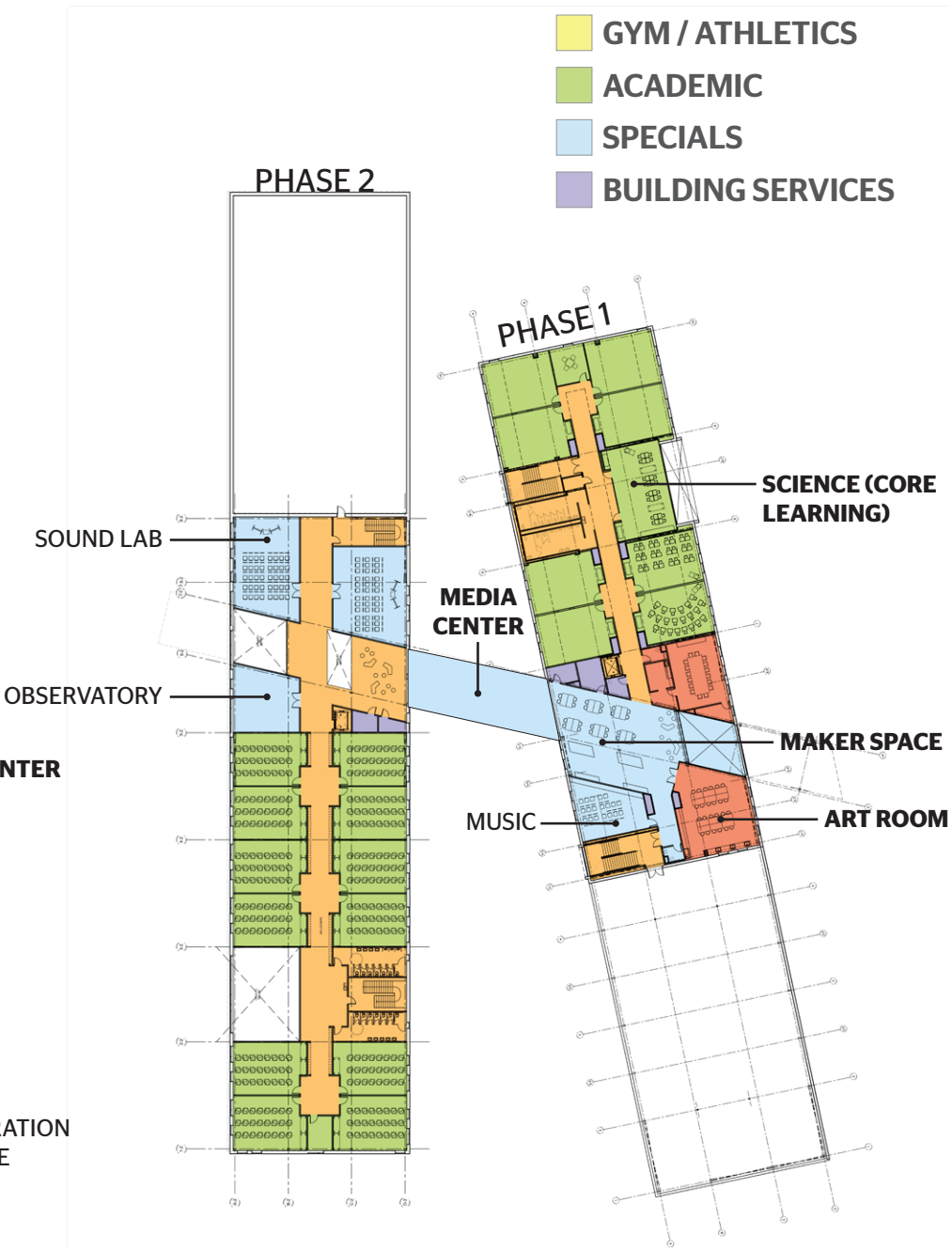
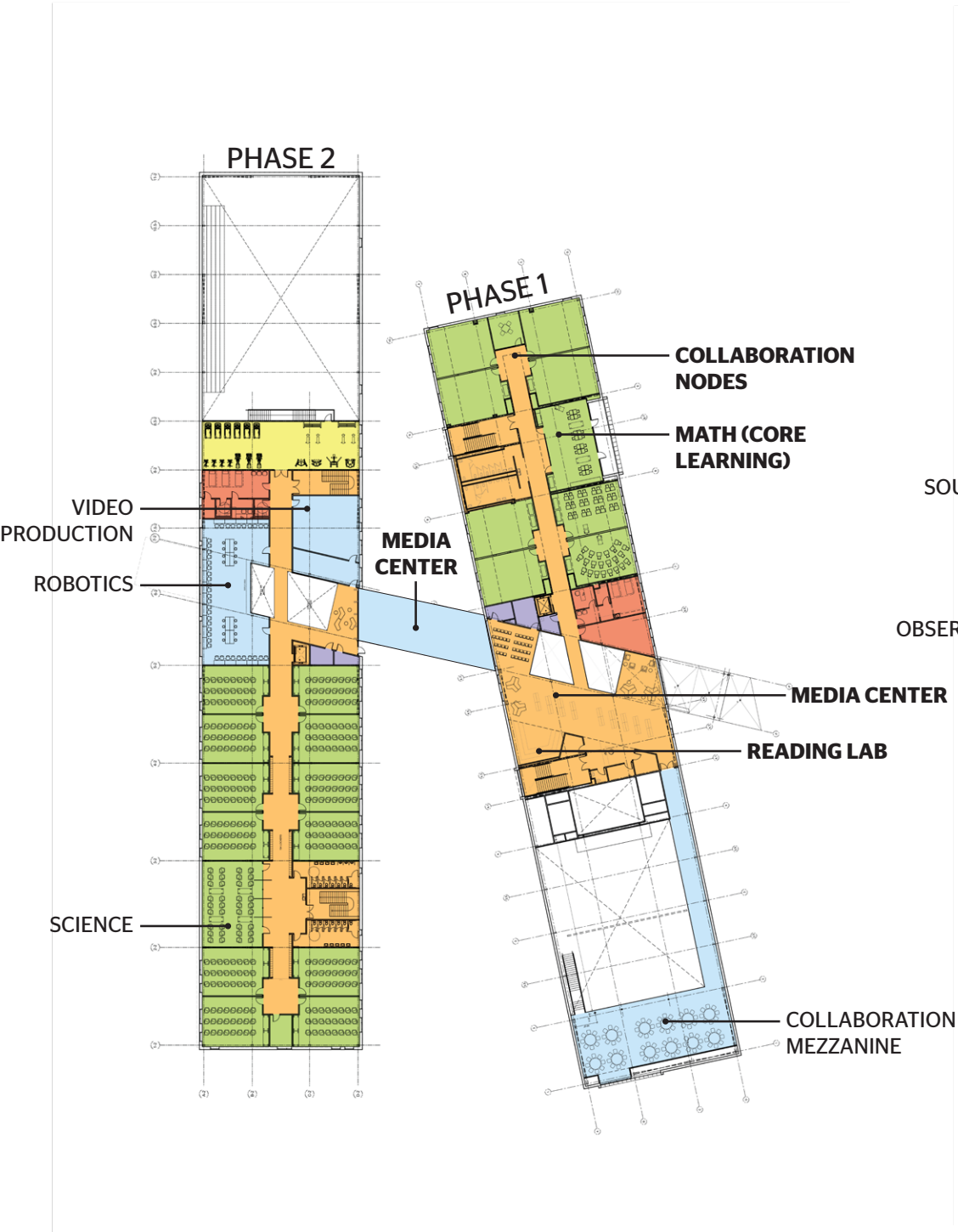


PROGRAM & PLANNING

FLOOR PLANS

The school is broken into two simple rectangular masses: lower school and upper school, to correspond with the phases and projected growth of the program. The gymnasium and 'cafetorium' anchor each end of the complex, while shared spaces punctuate the learning communities, which in turn are organized by nodes along an efficient double-loaded corridor. An enclosed link will further connect and activate the light-filled atria once Phase 2 is constructed.

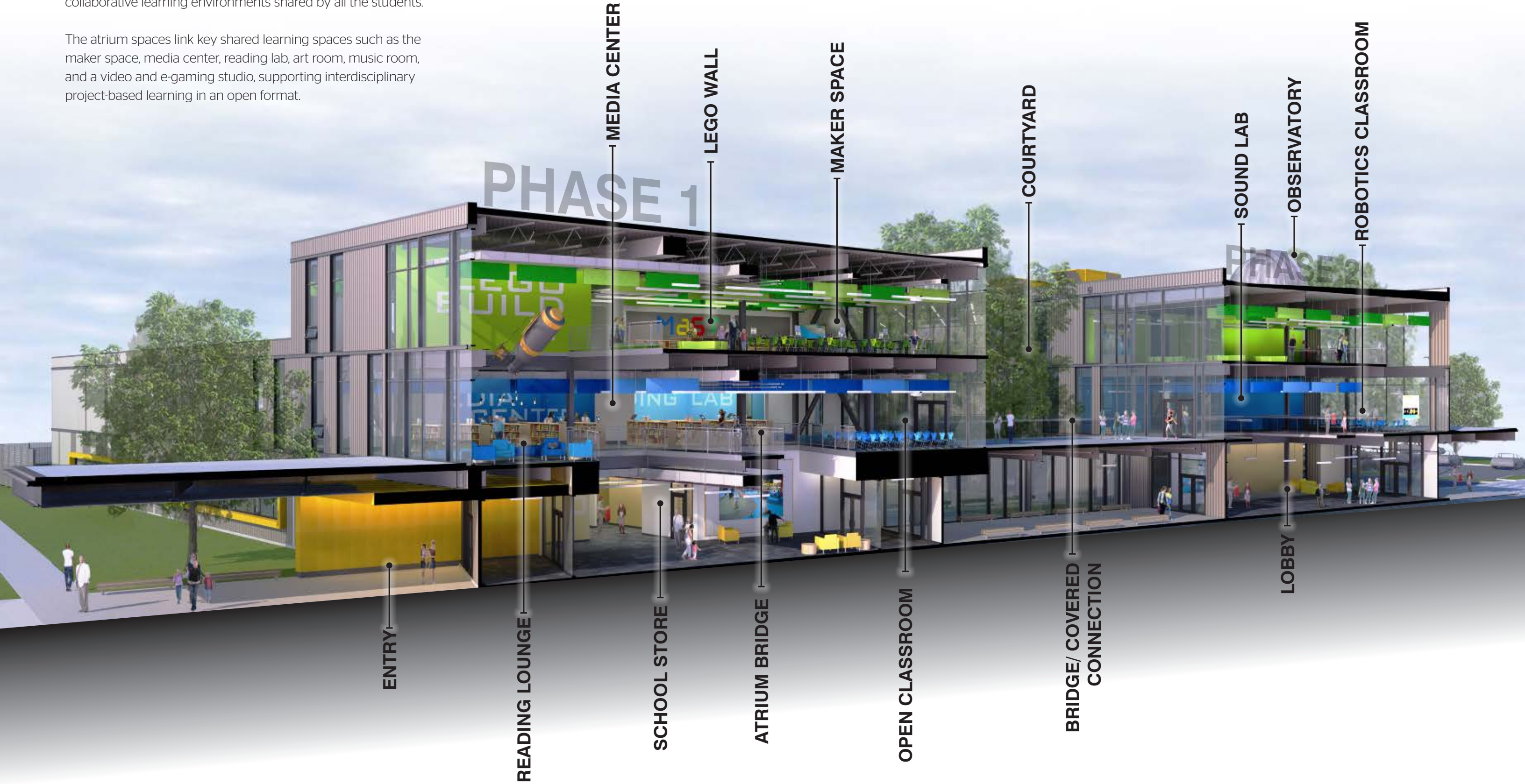
- ADMINISTRATION
- PUBLIC SPACE
- GYM / ATHLETICS
- ACADEMIC
- SPECIALS
- BUILDING SERVICES



BUILDING SECTION

The heart of the school is a pair of linked 3-story atria featuring collaborative learning environments shared by all the students.

The atrium spaces link key shared learning spaces such as the maker space, media center, reading lab, art room, music room, and a video and e-gaming studio, supporting interdisciplinary project-based learning in an open format.



FIRST FLOOR ATRIUM COMMONS/LOBBY

Upon entering the public lobby from either building phase, visitors are greeted by a series of shared learning spaces interconnected via a staggered vertical atrium. The open interior space is cut at a sharp angle, oriented towards the Tacony Bridge, which is both a compelling visual focal point as well as a metaphor for the opportunities a strong K-12 education can offer. The atrium spaces link key shared learning spaces such as the maker space, media center, reading lab, art room, music room, and a video and e-gaming studio, supporting interdisciplinary project-based learning in an open format. Students can engage one another freely and fluidly in spaces that are designed to encourage chance interaction and unconstrained creativity. Visibility between different levels and from one space to another fosters a sense of community and collaboration.



SECOND FLOOR ATRIUM MEDIA CENTER

The juxtaposition of conventional as well as experimental learning techniques with cutting-edge technology typifies the pedagogy of the school, and is reflected in the configuration and design of various learning environments such as the Media Center. This space is filled with light and is visually connected to the entrance, shared learning areas, and the landscape and city beyond. Discrete nodes for collaboration, reading, playing, and simply relaxing are integrated into the planning and design.

While open collaboration space is prominently featured adjacent to the media center and multi-story atria, smaller, more intimate spaces abound within the interior to support the variety of learners who come to the school. Acoustically separated spaces are provided for students with specific learning, social, or emotional needs. Discrete areas populating the edges of larger spaces also offer refuge and overlook for students wanting to engage at a distance, but still be part of the activity.



THIRD FLOOR ATRIUM MAKER SPACES

The third floor offers a dynamic array of collaborative spaces oriented about the atrium, with an Art Room, Music Room, and Maker Space supporting interdisciplinary project-based learning in an open format. Students can engage one another freely and fluidly in spaces that are designed to encourage chance interaction and unconstrained creativity.



THIRD FLOOR ATRIUM ART ROOM

While the school's focus is on math, science, and technology, the educational program also integrates art and music into these core competencies. Early learning includes art instruction, while more advanced grades use a "STREAM" model which incorporates the arts as a critical component of interdisciplinary and project-based learning. The Art Room seen here offers flexibility and inspiring views, but also direct connection to the Maker Space and Music Room to foster novel ideas and experimentation.

ULTIMATE FLEXIBILITY

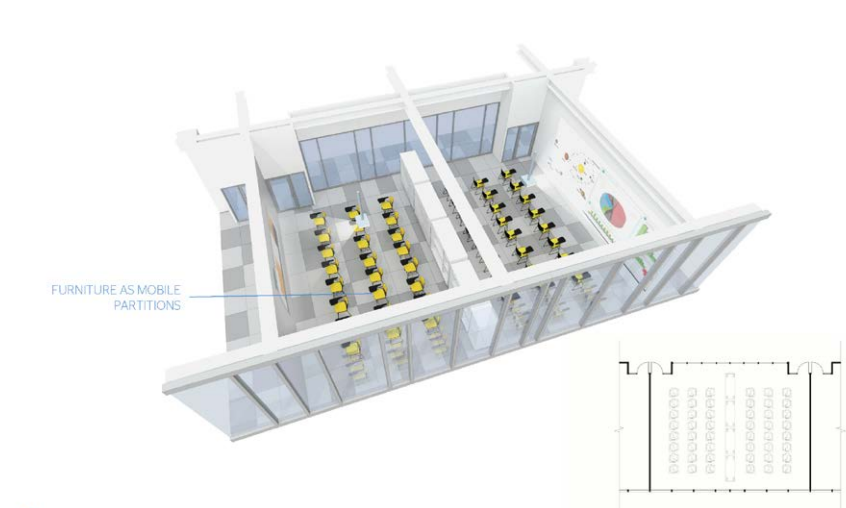
CLASSROOM DESIGN

The design of the typical classroom was an iterative exercise that was driven by three key factors that often work against one another: every day flexibility for teachers and students; adaptability for future changes; and integration of technology to support both of these ideas.

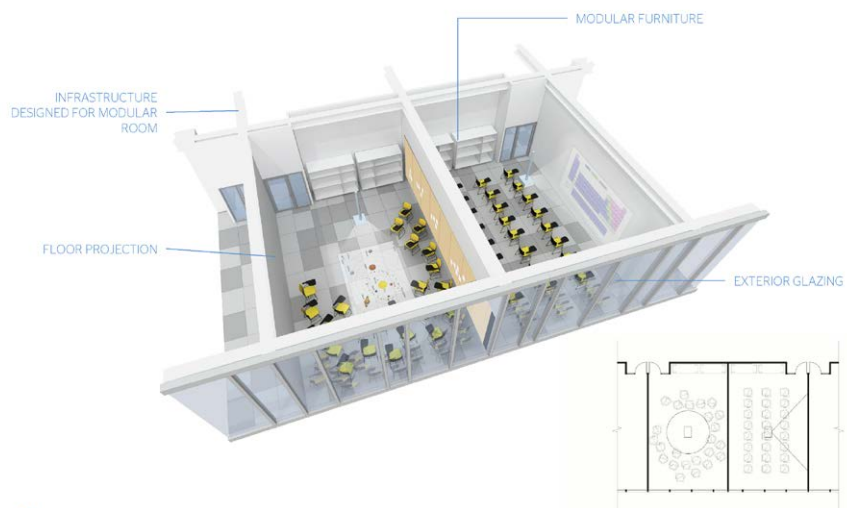
The design process mapped different potential layouts - everything from a conventional “sage on a stage” paradigm to more group and collaborative teaching styles to configurations for special education. Integrated technology uses off-the-shelf and readily available solutions for wall and floor projection, wireless access, and screen sharing. During the pandemic, the technology set-up was easy to adapt to hybrid and remote learning scenarios, an unforeseen but added benefit to the school community. Writable wall surface wraps every wall to allow many teaching and learning modes, while fixed millwork was all but eliminated because it limited teacher autonomy and the ability to change the room for different subjects or learners. In fact, the only fixed elements are the walls, windows, and a charging station for technology.

The partitions are designed for easy knockout between pairs of classrooms, and laid out in lockstep with the structural frame above, should a larger classroom or operable partitions ever be desired as part of a retrofit. While more expansive glazing to the exterior and the corridor was reduced due to cost, ample connection and daylight is achieved with more modest and cost-efficient apertures.

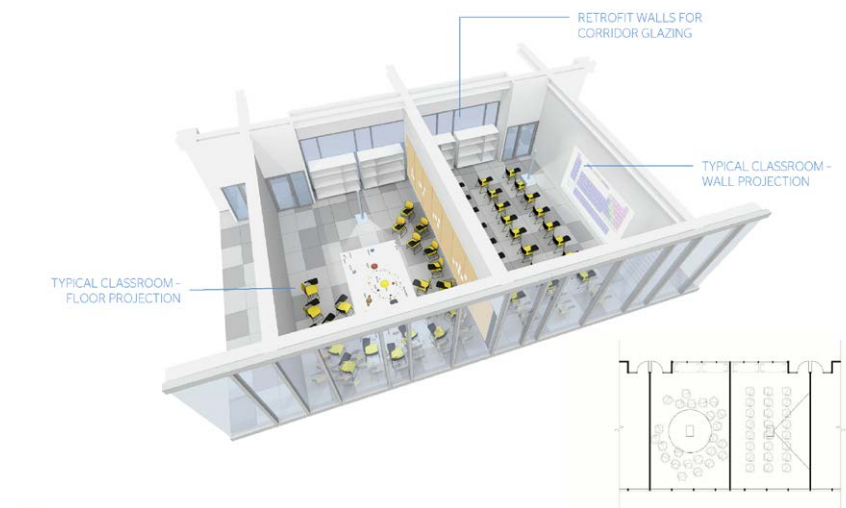
FURNITURE AS PARTITION



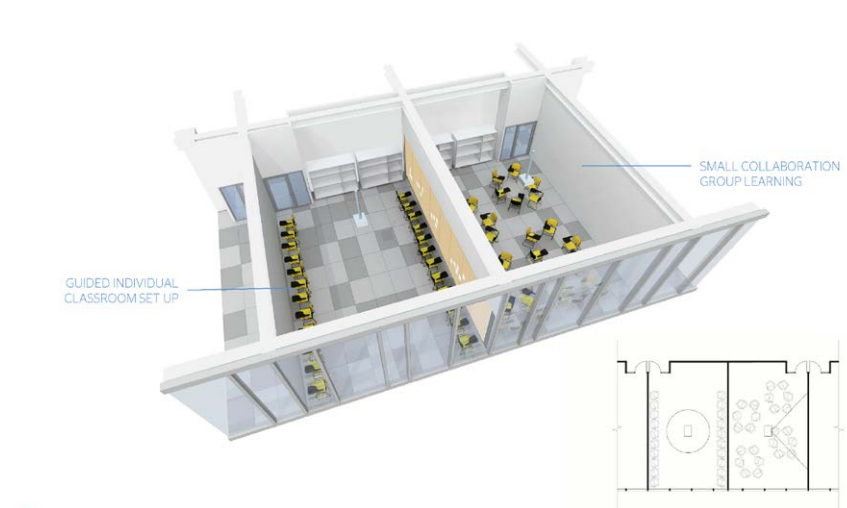
WALL AND FLOOR PROJECTION



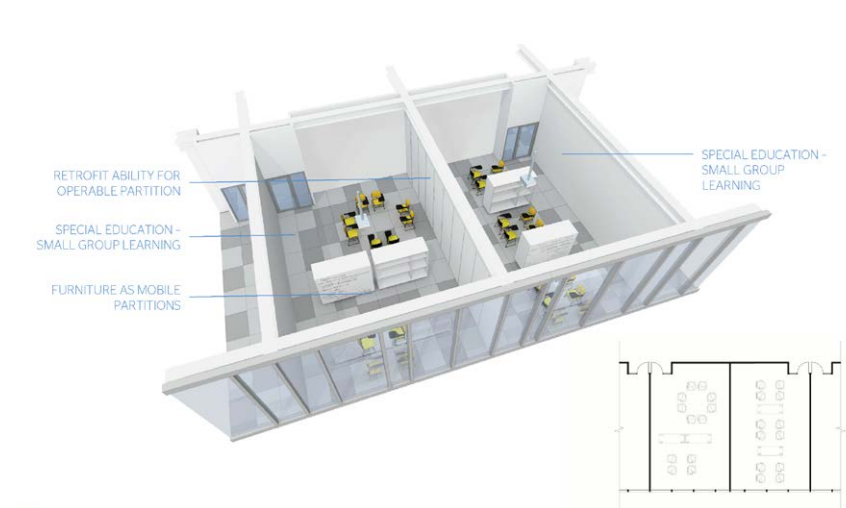
CORRIDOR GLAZING



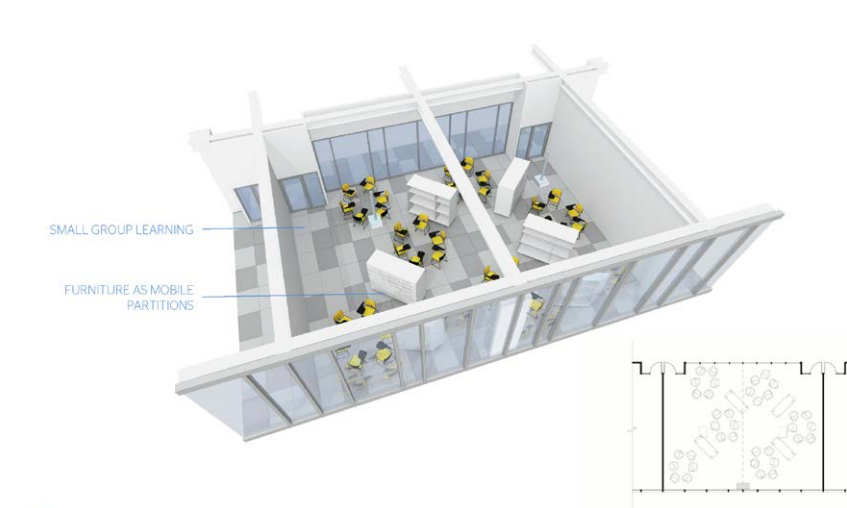
GUIDED INDIVIDUAL AND SMALL GROUP LEARNING



SPECIAL EDUCATION



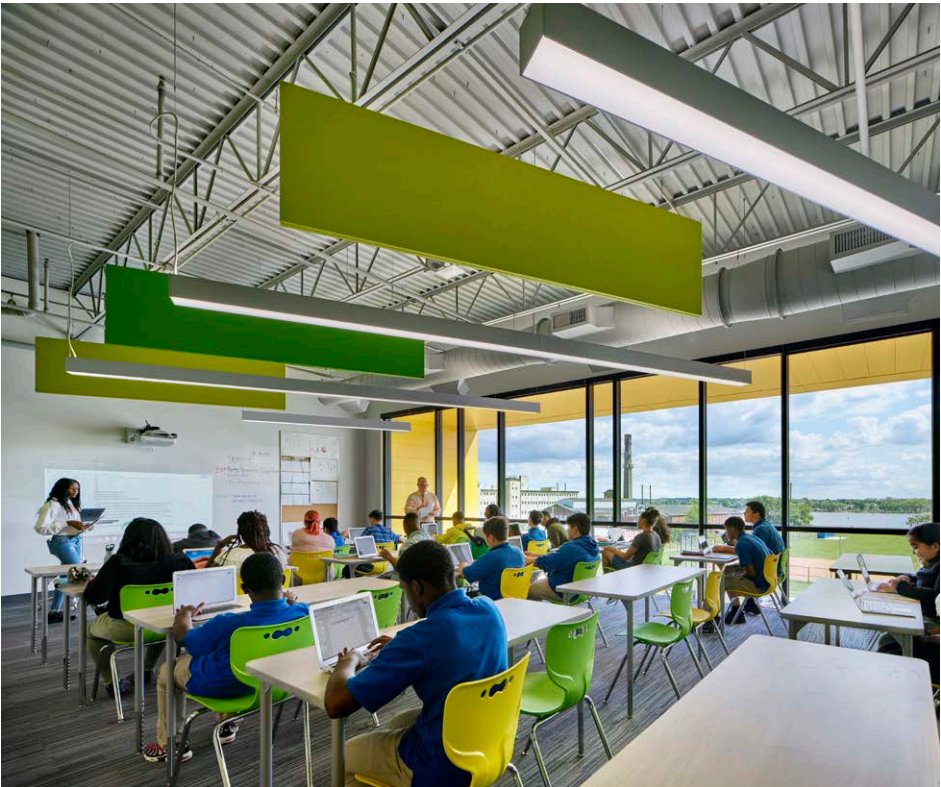
OPERABLE PARTITION





COLLABORATION NODES

Corridors are punctuated with wider collaboration nodes, organizing each grade level into a 4-classroom hub with high transparency and interactivity between spaces. A gradient floor pattern takes cues from digital bitmapping while mitigating the perceived length of the building, and bright color identifies each floor level for easy wayfinding.



CORE LEARNING

MaST's innovative, project-based programs are complimented by intensive learning of core subjects like math and science. Math and science classrooms employ a raw aesthetic to foster open-ended thinking and experimental learning. Floor-to-ceiling glass provide transparency to both the circulation spine as well as the campus and adjacent industrial environs outside.



“ULTRLIGHT CLASSROOMS”

The approach to individual classrooms was determined by a program requirement for extreme flexibility to evolve as the student population grows and learning paradigms shift. The adopted approach was inspired by ‘ultralight’ hiking – providing a minimalist approach to fixed infrastructure and systems. Thus, writable and tackable wall surfaces abound, technology can be adapted and modified by on-site staff, casework is minimized, and furniture is designed to accommodate multiple age groups. Floor to ceiling glazing and operable windows are standardized in every classroom space to provide light and natural ventilation to be controlled by occupants.



READING LAB

MaST implements a group-based literacy program organized by competency level, and supported by unique applications of technology. An open classroom area is positioned adjacent to an immersive, mini amphitheater with video floor projection as well as conventional wall-mounted video screens. Technology can be controlled by the instructor but easily delegated to individual students for an interactive learning experience.



CONNECTION TO OUTDOORS

MAKER SPACE & DRONE LAB

The ground floor maker space features adjoining workshop and technology spaces for “clean” robotics and coding to take place adjacent to “dirty” fabrication and assembly. A display wall in the corridor allows teachers and students to put project work on display, while large 10'x10' sliding doors with dry-erase surfaces give flexibility to integrate or separate the central flex space into any given class. The star of the show is the large bi-fold door creating a connection to the courtyard outside; this dynamic element gives opportunity for students to work, collaborate, and socialize outside. Robot wars and drone testing can quickly go from the computer screen to the competition field and future “drone zone” outside.

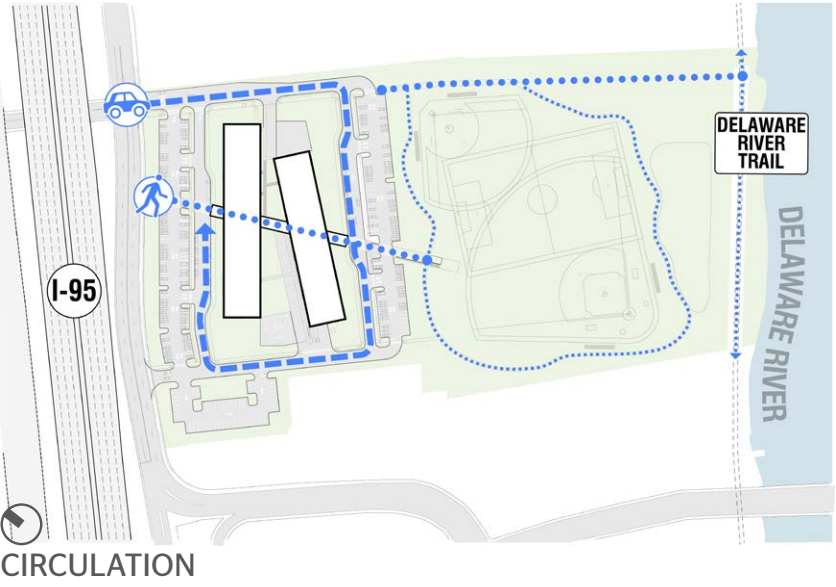
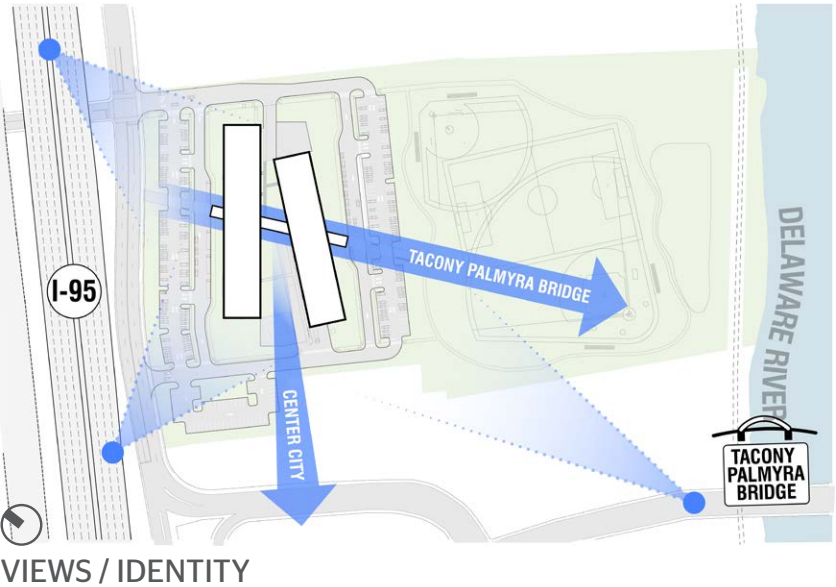
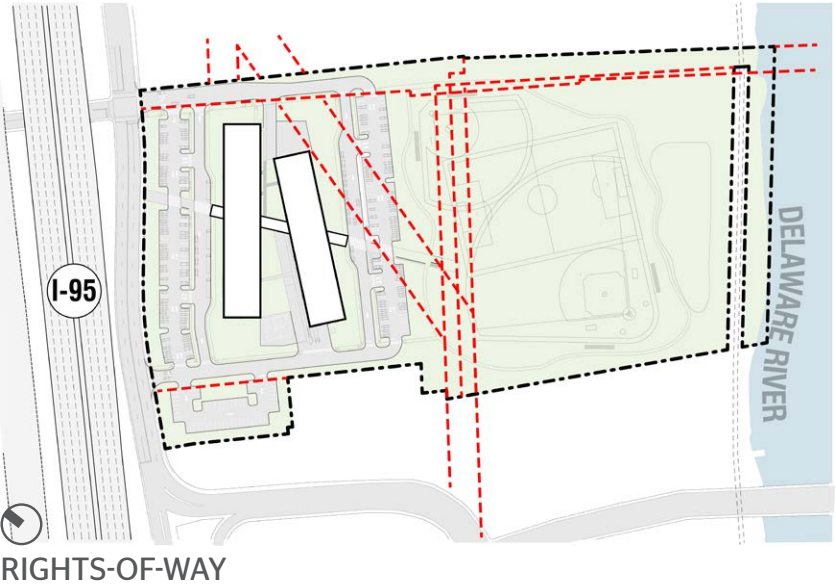
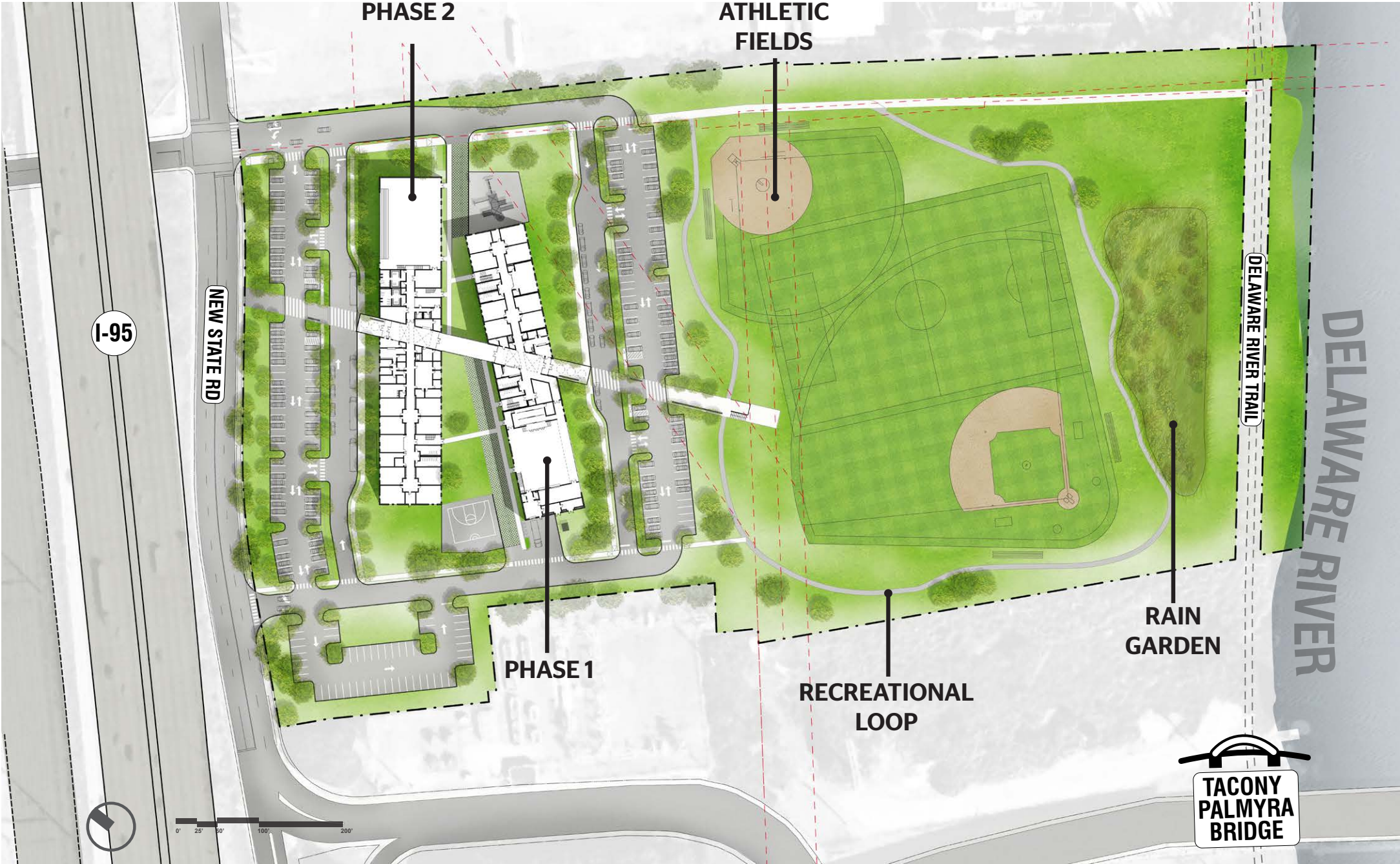


PHYSICAL ENVIRONMENT

The 19 acre site, formerly the location of Dodge Steel and Tacony Ironworks, where City Hall's William Penn statue was cast, is situated between the I-95 elevated highway and the Delaware River, and immediately adjacent to the Tacony-Palmyra bridge linking north Philadelphia to New Jersey.

SITE DESIGN

The site planning and building architecture are a fully integrated design response to a number of constraints and prompts. Major roadways, floodplains, and rights-of-way as well as budget and phasing considerations were all significant constraints. At the same time, the Tacony Bridge, Delaware River, and even the history of the site (the former Dodge Steel and Tacony Ironworks, where City Hall's William Penn statue was cast) presented unique opportunities for design inspiration and place-making. Two distinct building masses accommodate phasing limitations and offer program separation between lower and upper schools, while a void cut through both phases, linked with an elevated bridge, provides primary pedestrian circulation, multistory atria with media and maker spaces, and scenic views of the Tacony Bridge. Athletic fields and recreation space step down towards the river, and at the river's edge the Tacony community has direct access to the recreational Delaware River Trail.





EXTERIOR ARCHITECTURE MAKER COURTYARD

The building structure's exterior lies in stark contrast to the surrounding brick and mortar warehouses and manufacturing facilities yet is derived from a pared-down utilitarian aesthetic. Clad in grey corrugated metal with yellow composite metal panels framing larger expanses of glazing, the exterior design references maritime commerce and pays homage to the site's industrial history. Cost constraints prioritized interior space and learning environments over exterior architecture, so every element was closely considered. Perhaps the most visible instance is the roof: a screen to hide mechanical equipment didn't fit the cost model. Instead, the rooftop mechanical units - painted a bright, eye-popping yellow - turn what is often considered an eyesore into an asset, playfully calling attention to the school.

Overall, the design is intended to balance several ideas: utilitarian efficiency in the planning concept and technical execution; playful, creative solutions to inspire delight; and aspirations to explore and discover whatever lies beyond, symbolized by the school's orientation towards the Tacony-Palmyra bridge.



CIRCULATION

VIDEO STUDIO & E-GAMING

Circulation space is often a challenge to incorporate as breakout or collaboration space because of distracting acoustics and activity. In the distance, tables and chairs offer a place for individual study or small group collaboration outside of subject classrooms, taking advantage of the dampened acoustics and floor to ceiling glazing of the bridge that links construction phases. In the foreground, at the intersection of a louder and more quiet corridors, and just outside of the digital design studio, an e-gaming setup allows students to test software or simply take advantage of some downtime with friends.



ATHLETIC & RECREATION SPACES

Often a challenge in urban schools, outdoor space for learning, sports, recreation, and socializing is prioritized at MaST II. Within the interior, gymnasium, auditorium, and multipurpose rooms are planned to be readily accessible both from within the school as well as for non-school community events. The gym, with the fitness overlook seen above, creates a flexible venue for daily use and events that support student health and wellness in addition to competitive sports.



RESULTS OF THE PROCESS & PROJECT

The end result of the comprehensive programming, planning, and design process is a school that sits at the intersection of pedagogy and place: uniquely suited to MaST's technology-integrated education programs, and uniquely inspired by its physical context. The planning framework and apparently simple design response belie an incredibly complex set of constraints and parameters.

The flexible building plan, phased construction, and efficient design elements allocate resources to maximize educational program space for teachers and students. This creates a singular experience within the school and on the site that is unusual in any urban setting, and even more striking within the industrial development along the Delaware River waterfront.

The project augments Philadelphia's public school offerings with a charter school that is available to any student from any family from any neighborhood in the entire city limit. The revitalized waterfront creates an oasis for the neighborhood and a bellwether for future investment within the Tacony community. An unexpected consequence of the planning is the incorporation of traditionally "suburban" amenities – outdoor space for learning and recreation, athletic playing fields, expansive views, and easy vehicular access – at a decidedly urban campus.

According to Philadelphia Inquirer architecture critic, Inga Saffron, "The quality of the new design ups the game for public education in Philadelphia. MaST's buildings aren't so much fancy as they are smart."

EDUCATIONAL VISION

MaST II Community Charter School at Tacony aspires to expand upon their model of innovative learning and integrated technology, and the completion of both phases of construction supports their efforts. The success is evident in the demand, with 16 applicants for every open seat, and equally visible in the statistics: **a 100 percent graduation rate, with 94% of graduating seniors pursuing higher education after high school.**

MAST II'S VISION IS CLEAR:

In an ever-changing world and global landscape it is essential for schools to evolve in order to properly train students for future careers and opportunities. STREAM will provide students with even more hands-on and creative activities and lessons in order to prepare students for careers in any field but specifically in the fields of Math, Science, Technology, and Engineering. MaST incorporates elements of the STREAM curriculum in all levels K-12. Through STREAM students learn vital skills such as problem solving, critical thinking, collaboration, and innovation along with essential technology skill sets.

The success of the project can be seen in enrollment: spots in MaST II are in high demand by families seeking the opportunity for a better education, with over 16 applicants for every open seat in the school.

