



## Sustainability

a place to learn,  
practice and  
enjoy social,  
environmental  
and economic  
**SUSTAINABILITY**

## Laboratory

a LABORATORY  
for formal~informal  
research and  
creative  
exploration,  
interaction and  
experimentation

## Urban

an extension of  
and contributor to  
the energy,  
density, diversity  
and dynamic  
culture of  
downtown Tucson

## Garden

a place for  
individual, social  
and agricultural  
cultivation

# SLUG



# **“Collaboration is the construction of consensus through individual contribution.”**

- Kenneth A. Bruffee

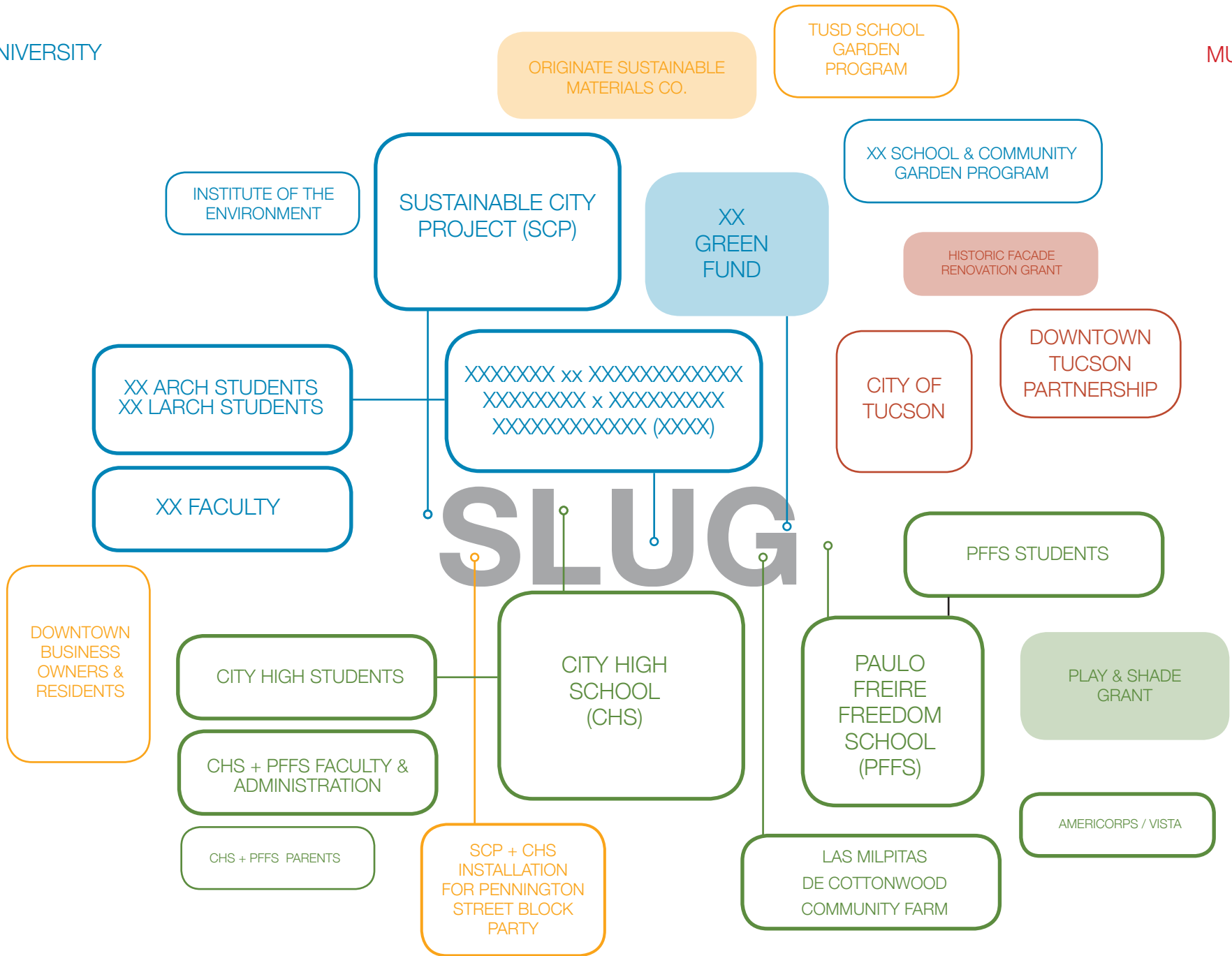
Like design work itself, collaboration is an iterative dance amongst partners of intentionally different voices, expertise and world views. Our project, the **SLUG – Sustainability Laboratory and Urban Garden** – brought together a team of educators, urban gardeners, middle and high schoolers, parent and neighborhood volunteers, design students from architecture and landscape architecture, and faculty with design/build and sustainability practice to envision and implement a new, experimental space for downtown Tucson. The SLUG began as a relationship between neighboring educational initiatives – XX’s urban research lab, the **Sustainable City Project** (SCP), and Tucson’s pioneer downtown charter school, **CITY High School** (CHS) – over their recognition of a common goal to use the city and its challenges as a teaching and learning laboratory. The addition of a middle school, **Paulo Freire Freedom School** (PFSS), to the CITY campus meant the burdens on their already encumbered space were soon to increase exponentially. A historic façade renovation grant put the purchase of a neighboring building within reach, leaving **an uninhabitable and publicly accessible alley** – the school’s only outdoor space – between the original CITY building and its future expansion. The landing of a \$35,000 Green Fund grant instigated the **Xxxxxxxx xx XXXXXXXXXX, XXXXXXXX, and XXXXXXXXXX XXXXXXXXXX** (XXXXX) outreach studio that would partner with SCP and CITY. This asphalt sliver of space – 12 feet wide by 127 feet long, easily reaching 120 degrees in the summer – became the instigation for a much more expansive collaboration, one that would work across ages and aptitudes, broadening the traditional disciplinary definitions of service learning, community engagement and design experimentation.

**“If you want to go fast, go alone.  
If you want to go far, go together.”**

– African proverb

UNIVERSITY

MUNICIPAL



PUBLIC + LOCAL

FUNDING

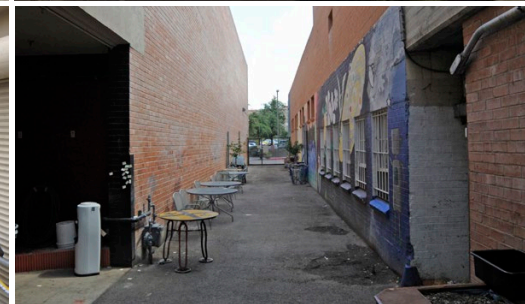
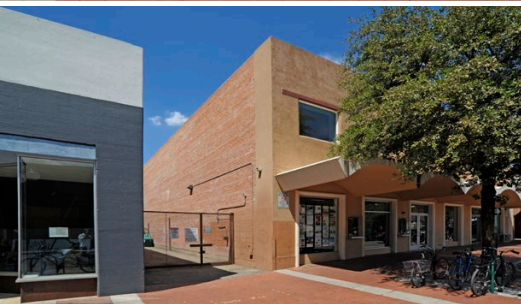
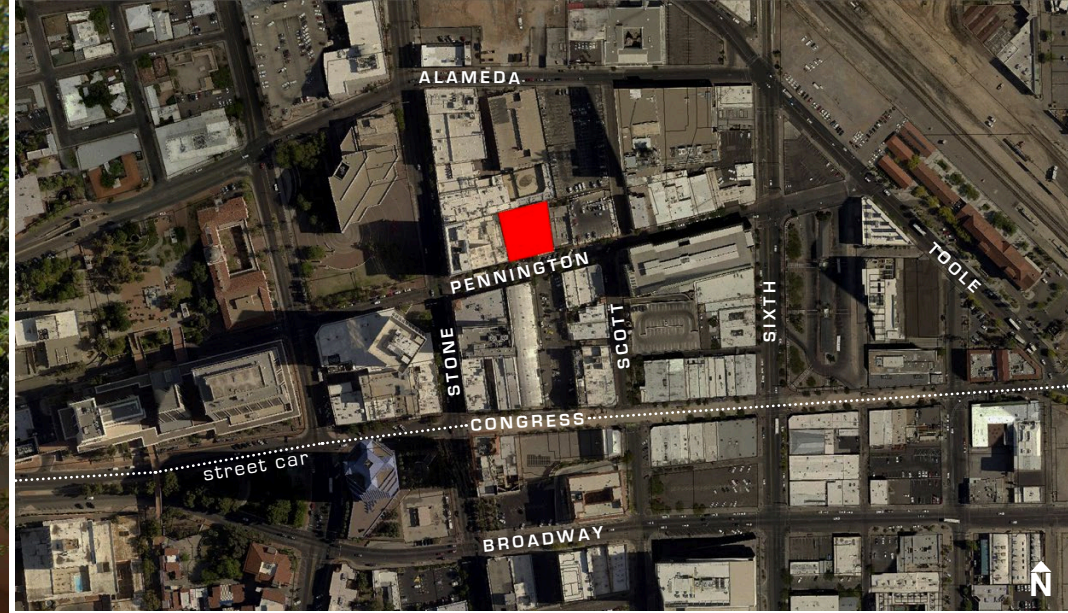
CITY HIGH SCHOOL / PFFS

stakeholders

The project was delivered by four groups of stakeholders: 1) University entities coordinated by School of Architecture Faculty and students 2) School community comprised of administrators, faculty, students, parents and supporters 3) General public, neighbors and local businesses and 4) Municipal including the Fire Marshall, Development Services and the Department of Transportation. Principal stakeholders were considered collaborators each with distinct interests, relationships, and responsibilities that required sustained partnerships and negotiations to build trust and achieve consensus.

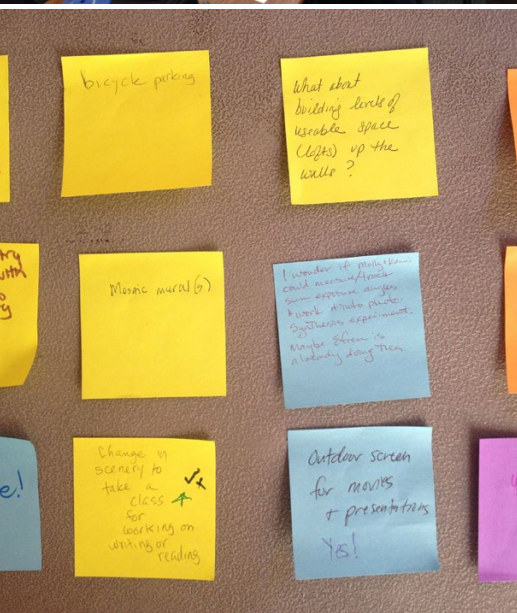
SLUG





Tucson is a brutally hot, dry climate boasting nearly 50 days over 100 degrees and less than 10 inches of rainfall annually. In summer the combination of masonry and asphalt elevate and hold higher temperatures in the alley, where a hot dry wind exacerbates conditions. At the start of the project, the space was uninhabitable most days, used typically for storage. City High School (on the right) had recently purchased the building next door (Shoe City to the west) to accommodate an expanding population when our project began. The alley separates the two.





# listening

Over the course of a year, the full dedicated team met almost weekly, learning collaboration, design, construction, and management skills through an assortment of team-based methods. Weeks were spent collectively establishing performance criteria that covered environmental and social needs of the future users. These were established through conversations, brainstorming and sketching exercises, and surveys – sometimes led by CITY students. Faculty and students of all ages were equal participants.

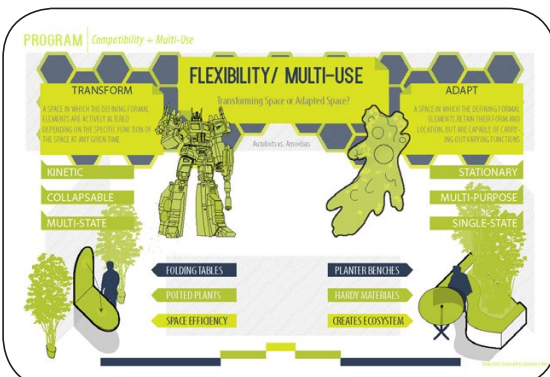
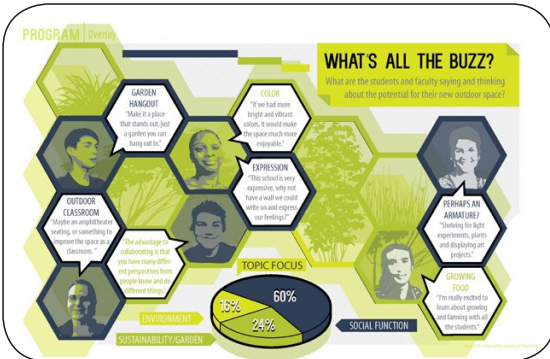




learning | fieldtrips

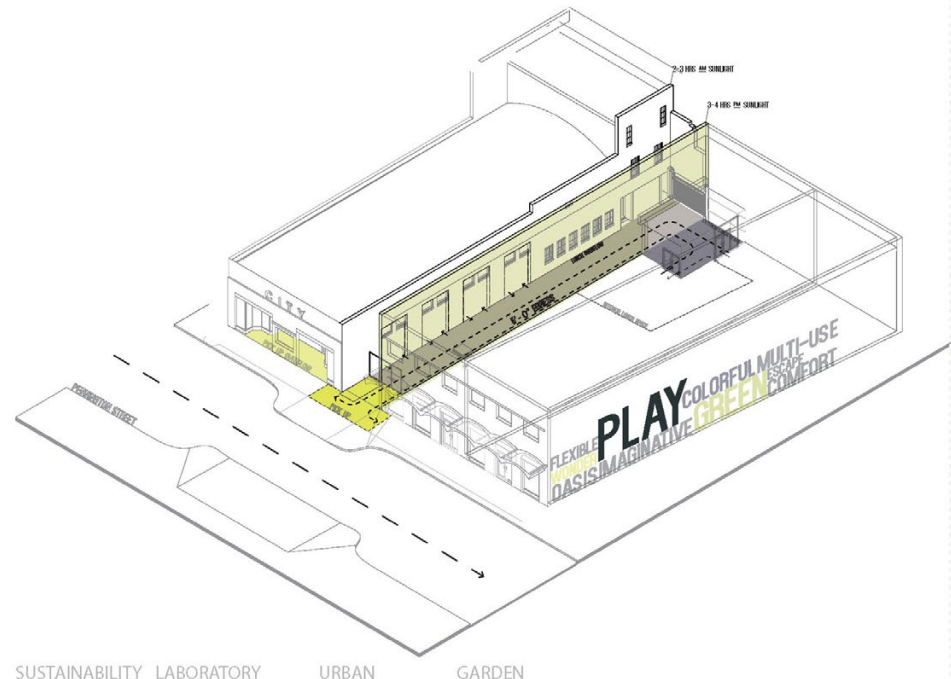
The university faculty and student team took several fieldtrips to community gardens, fabrication facilities, and schools with student-centered agricultural programs such as the one depicted above; Manzo Elementary School, tour given by lauded specialist Moses Thompson. Manzo's facilities include comprehensive water harvesting systems replete with first flush mechanisms, cisterns, and irrigation. They have ornamental and edible plants in surface gardens and planters, and an aquaponics system for the cultivation of tilapia and plants which are sold at farmers' markets to raise funds to sustain their programs. Student engagement is integral to the school culture.





## SLUG.

The Sustainability Laboratory and Urban Garden embraces the broader sense of sustainability beyond "maximizing use and minimizing resource depletion?" and understands the value of play in experimentation, allowing students the opportunity to interact with the dense, urban environment through a teaching and community garden.



## PROGRAM. USER FEATURES. QUALITIES.

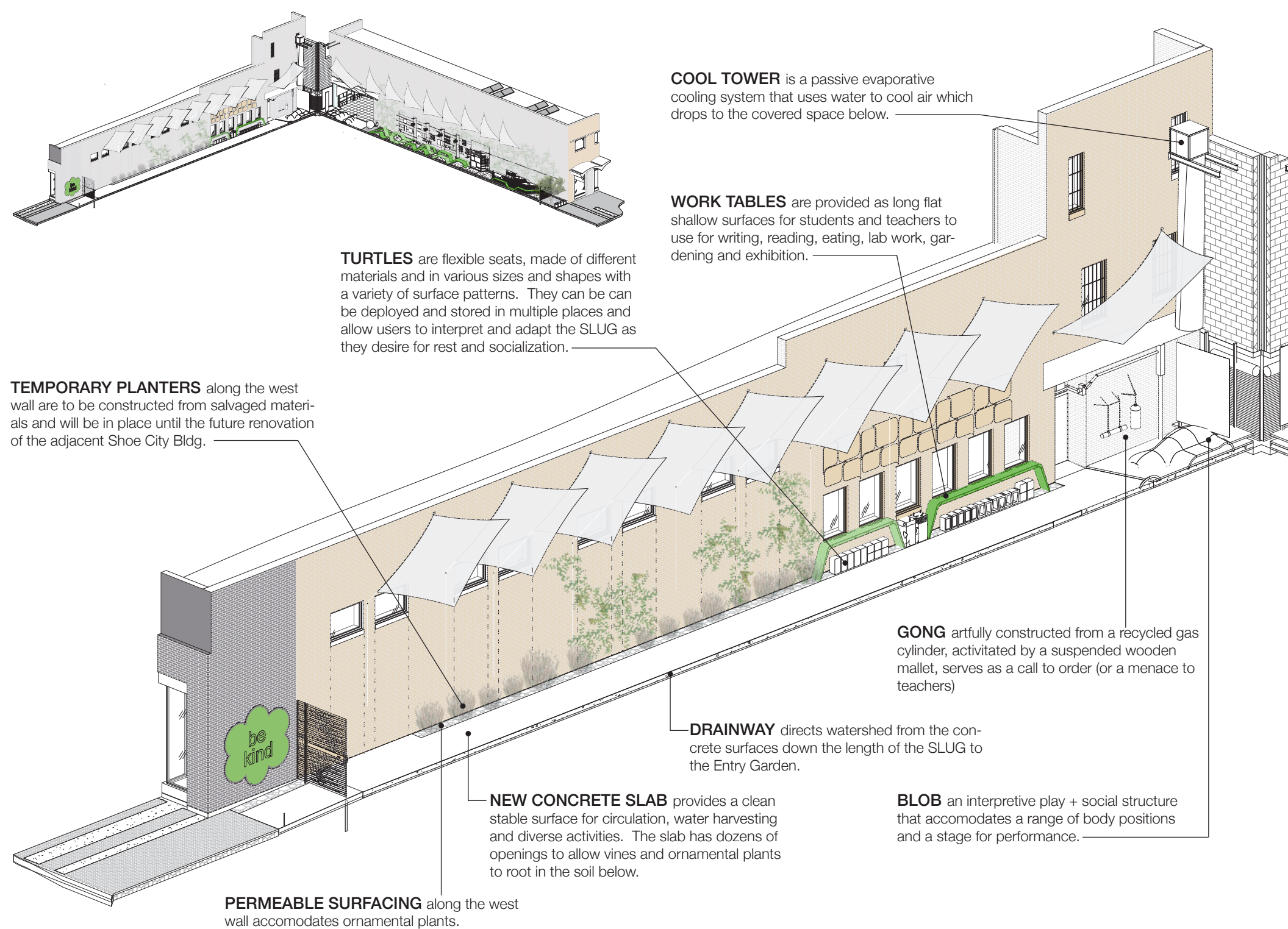
- ACTIVITIES:**
- dining/roasting: 180 total students
  - approx. 60 students outside
  - juniors + seniors off-campus
  - 15 faculty
  - 2 to 3 with students
  - teacher lounge
  - tables, seating, trash, recycle, composting
  - classroom/instruction/socializing:
  - large group - 24 students, 1 to 2 faculty (~st.)
  - medium group - 12 students, 1 faculty (~st.)
  - small group - 2 to 5 students (~st.)
  - individual space - 1 student (~st.)
  - community events:
  - music, film, school display, garden/market
  - seating, display area, performance space, projection screen
  - display:
  - art + science projects, event banners/posters, chalkboards, projection (?)
  - agriculture/cultivation:
  - types of edibles:
  - leafy greens
  - herbs
  - vines
  - some root vegetables/tadishes etc...
  - tool storage, handwashing/cleanup station, water storage, water harvesting, composting
  - pick up/egress:
  - zoned by time of wait: immediate + delayed
  - shading, seating
  - bike storage:
  - 3-5 temporary bike storage for students/faculty biking to school
  - other bike storage located in new City building
- USER GROUPS:**
- middle school students
  - high school students
  - faculty + staff (15 total)
  - family + friends
  - exterior community
- FEATURES + RESOURCES:**
- shade: operable for change in season, day, hour
  - cooling: evaporative, cooling tower?
  - water harvesting: collection of condensate, rain water, grey water (in future)

programming

The primary programmatic components emerged from the need to accommodate multiple age groups, school-based and public events, growing and eating space, and formal and informal teaching and learning; every component had to be flexible, adaptable, and multi-functional, guided by the collectively developed SLUG performance criteria – sustainability + laboratory + urban + garden.

SLUGS





**COOL TOWER** is a passive evaporative cooling system that uses water to cool air which drops to the covered space below.

**WORK TABLES** are provided as long flat shallow surfaces for students and teachers to use for writing, reading, eating, lab work, gardening and exhibition.

**TURTLES** are flexible seats, made of different materials and in various sizes and shapes with a variety of surface patterns. They can be deployed and stored in multiple places and allow users to interpret and adapt the SLUG as they desire for rest and socialization.

**TEMPORARY PLANTERS** along the west wall are to be constructed from salvaged materials and will be in place until the future renovation of the adjacent Shoe City Bldg.

**GONG** artfully constructed from a recycled gas cylinder, activated by a suspended wooden mallet, serves as a call to order (or a menace to teachers)

**DRAINWAY** directs watershed from the concrete surfaces down the length of the SLUG to the Entry Garden.

**NEW CONCRETE SLAB** provides a clean stable surface for circulation, water harvesting and diverse activities. The slab has dozens of openings to allow vines and ornamental plants to root in the soil below.

**BLOB** an interpretive play + social structure that accommodates a range of body positions and a stage for performance.

**PERMEABLE SURFACING** along the west wall accommodates ornamental plants.





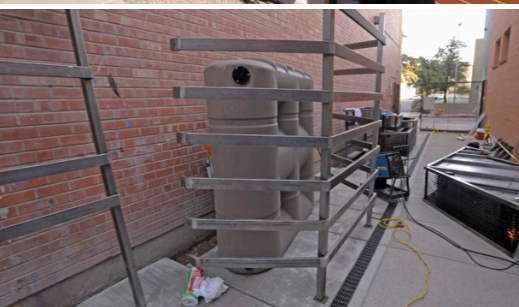




public feedback

Design ideas were tested with broad public input at two points during the process. The first was at conceptual development where three strategies were presented to the public, students, faculty and parents and feedback was provided with colored dots, sticky notes, and "I Wish This Was \_\_\_" tags. The final proposal was shared at the Pennington St. block party where visitors could converse with project participants and discuss future planting and use.



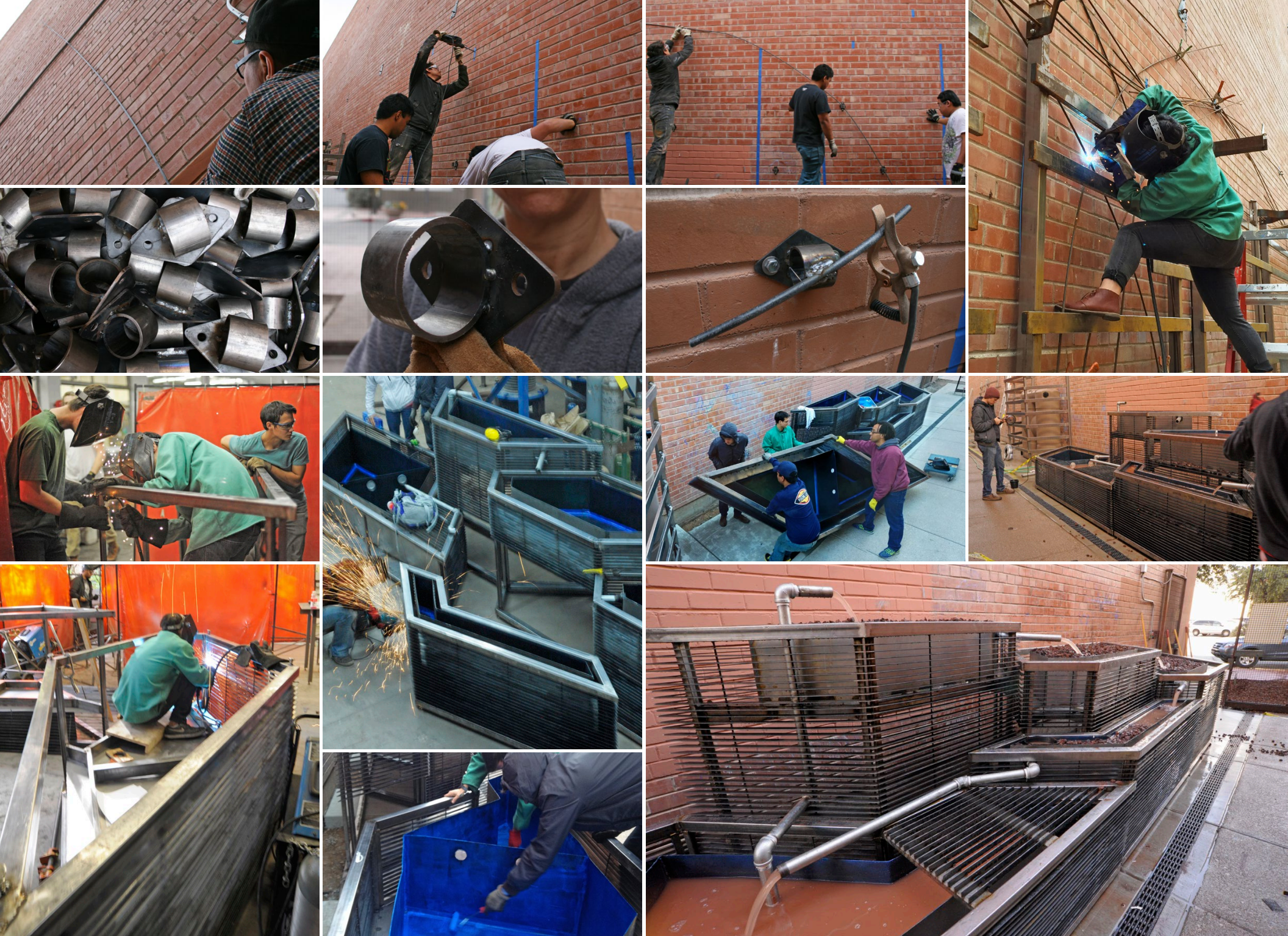


slab | armature

Our university team demolished the existing asphalt and worked shoulder to shoulder with a concrete contractor to install formwork and re-bar, and to pour, distribute and finish the concrete slab and install the central drainage system. The steel armature located on the east wall of the SLUG was prototyped, tested, refined and fabricated in the School of Architecture's Material Laboratories before being transported and installed on site.

SLUGS

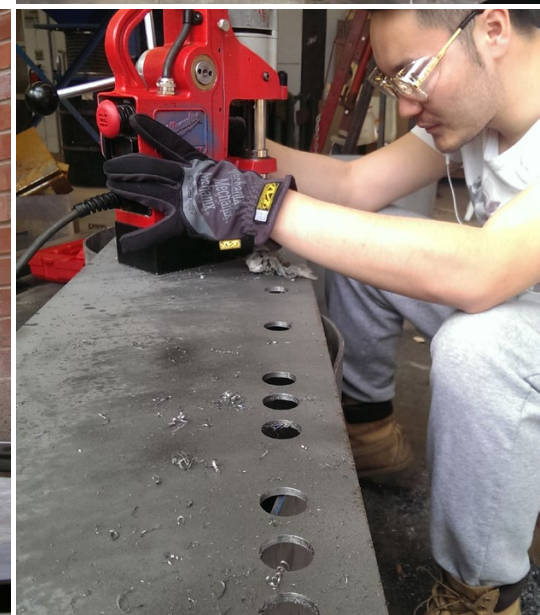
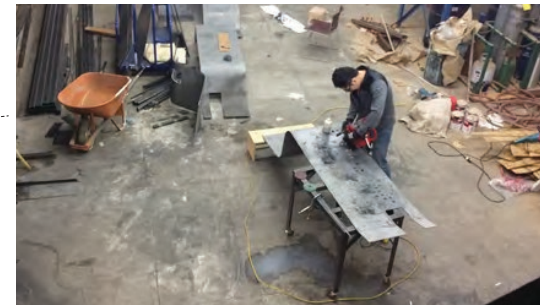
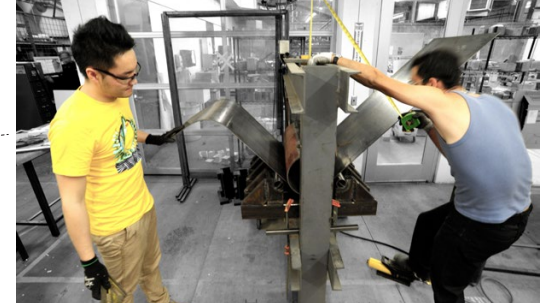
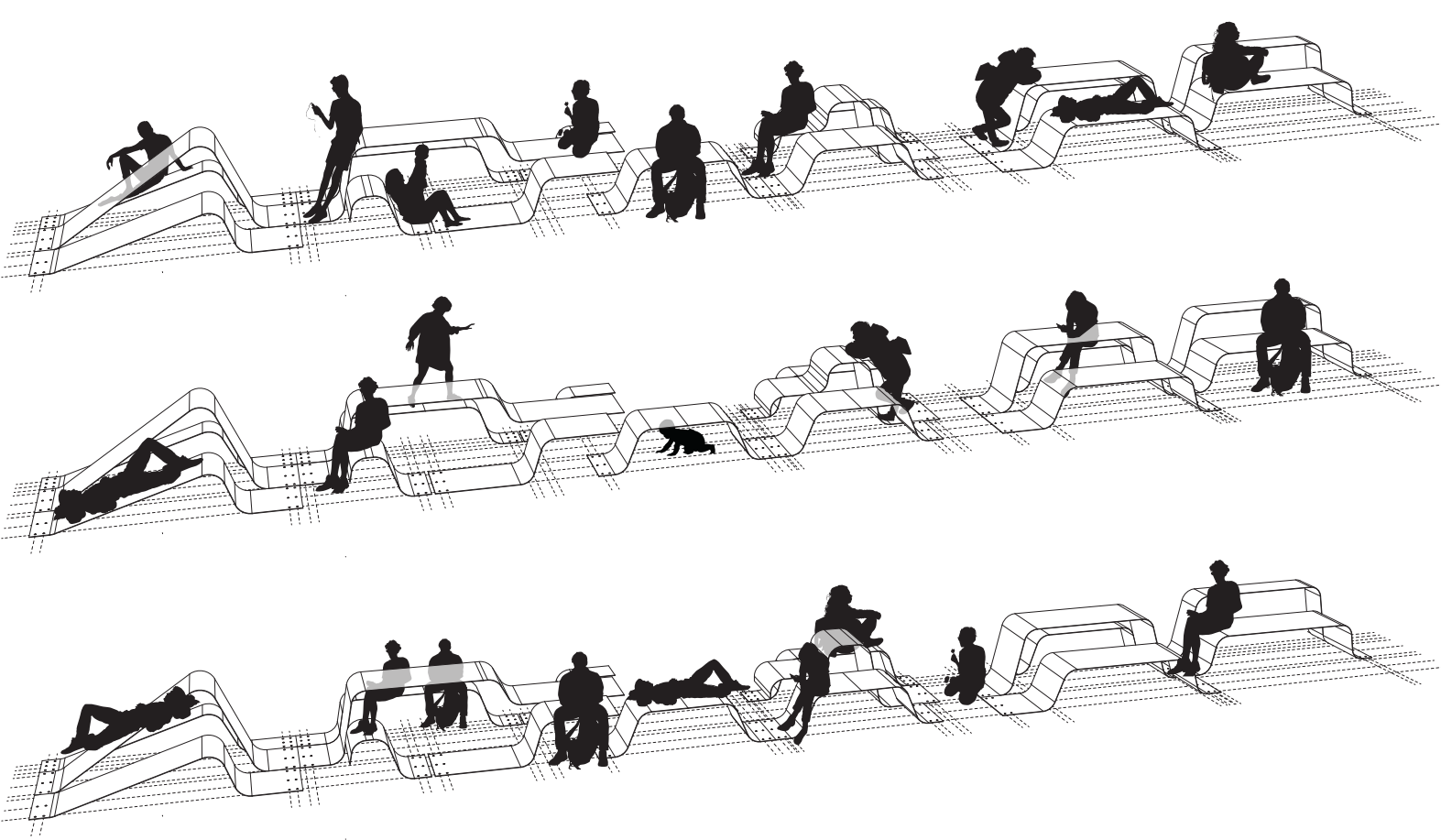




# neurotrellis | aquaponics

The neurotrellis, a system of bowed rods to support vine growth on the east wall, was constructed in contrast to the grid of the armature as a strategy to shade the masonry wall and insert a permanently organic component into the orthogonal system. Beneath the neurotrellis, the aquaponics system recycles water through four plant and one fish tank made of welded slats to expose the inter-workings of the tank and allow for air cooling. The multi-height form allows for kids of all ages to engage both fish and food.

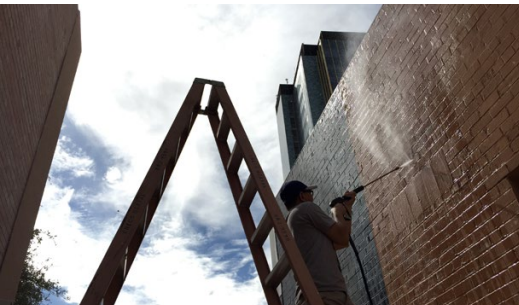




ribbons

the ribbons are 3/16" thick steel plates cold rolled in a hydraulic press with a custom jig designed and fabricated by our university student team. The perforations are hand drilled braille representations of relevant inspirational quotes, riddles and paradoxes. The ribbons were brought to the site for a temporary installation, removed, sandblasted then professionally powder coated, then permanently installed.

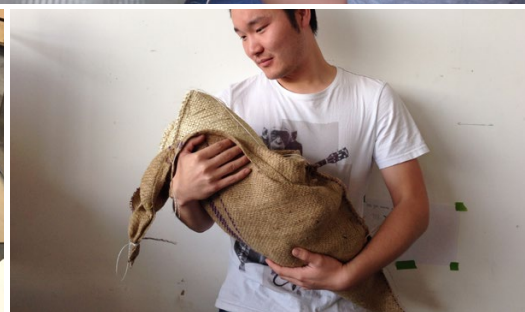
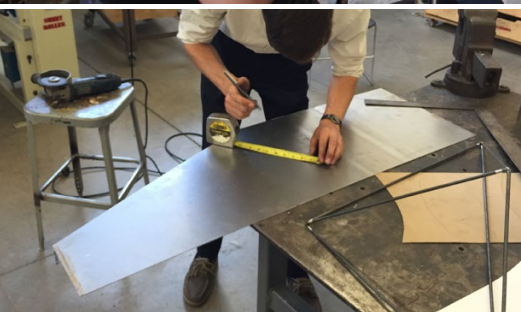




# prep + paint fest

Multiple layers of old paint covered the west wall of the alley. The difficult and messy paint removal process took longer than anticipated, providing unexpected but useful time for team bonding and spatial investment. Parent volunteers joined the process. The school-wide weekends of paint-stripping and then additional weeks of re-painting catalyzed the commitment of the larger community by democratizing the core transformation of the space. The result of a public selection process, the two shades of bright yellow color became a signature for collective reinvention.





# planters

the university student team organized a planter design and fabrication session; inviting fellow students that had no prior direct involvement in the SLUG project. Participating students were given a project orientation, introduced to the performance criteria for the planters and the constraints + opportunities provided by the host armature. Fabrics, woods, solid and perforated sheet steel materials were provided. This one-day community design build workshop produced the majority of the planters that are installed in the SLUG.



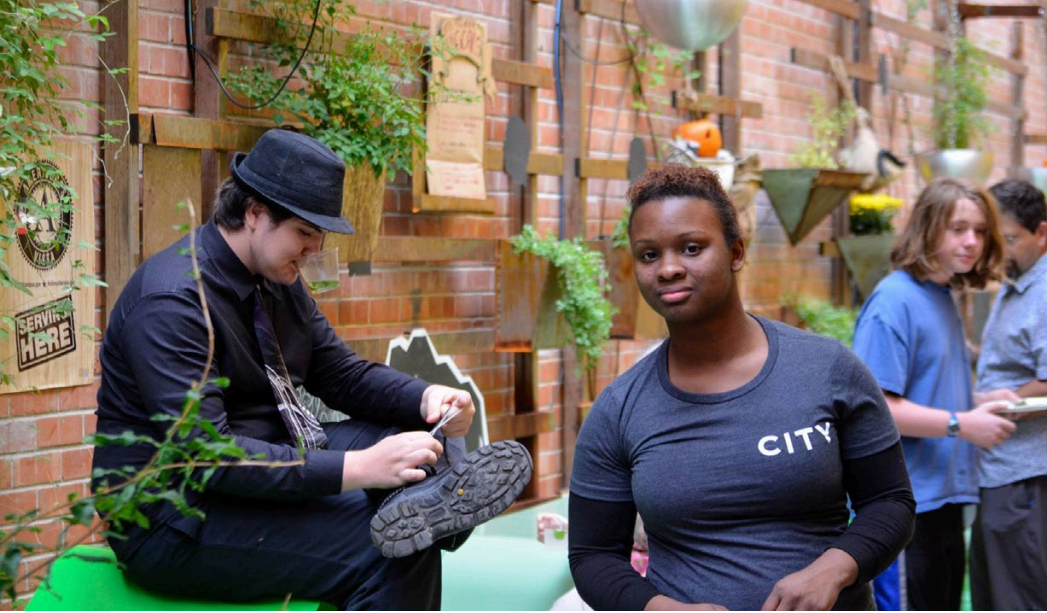


use | entry

The entry garden and steel gate is a controlled access point which physically mediates the school community and the public; providing security, egress and access for public events. The gate explores the boundaries of the project (i.e. project info, site context, historical context) by informing users through physical and visual engagement. The users cross the "bridged" garden space upon arrival. The entry features a series of Sit-n-Spin cubes, each with different letters on their respective faces; spelling SLUG, grow, play or random letter combinations.

SLUG



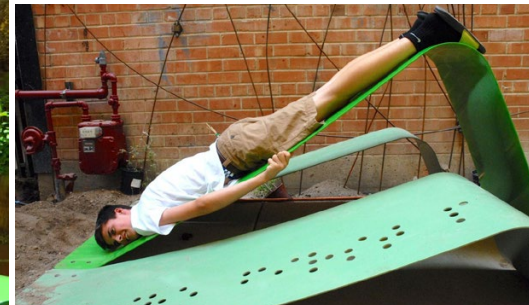


use | gather

Once an uninhabitable alley, the SLUG is now a fully functional public space, supporting formal and informal gatherings in the life of the school and the neighborhood including the annual block parties and graduation celebrations. Integrated into the culture of the school, the SLUG literally and philosophically brings the middle and high school together. The multi-sensory, multi-scalar environment appeals to a broad range of learning types and development stages. For middle schoolers in particular, the opportunity to move and play freely supports mental health and attention. High schoolers often use the space for reflection between classes.

SLUGS





use | ribbons

Ribbons are a field of rolled, powder coated, steel planes designed to accommodate the activities + natures of high school students: formal discussions, casual conversation, reading, writing and eating lunch. They also accommodate the activities + natures of the middle school students; such as LARP and unstructured play (hiding and climbing over, under, in and out).





use | garden

The most sustainable form of urban agriculture due to its highly efficient water use, the aquaponics system produces food year-round. Crops are well fertilized due to by-products from the fish in the re-circulating water. There is at least one farm/garden class per semester, sometimes one from both the high and middle schools, that uses the SLUG as a primary space and takes on the responsibility for its maintenance and food production. This year a high school biology class is also using the space as a "living lab" and measuring various water, energy, and plant life metrics in the space.

SLUGS



# SLUG Sustainability Laboratory & Urban Garden

**“The space continues to be a wonderful oasis. It actually has its own microclimate! A staff member and I were standing on the sidewalk this summer in 100+ degree heat and the gate was wide open and there was a breeze flowing out of the garden that felt like an air conditioner or fan blowing on us. I was convinced that doors had been left open and we were feeling inside air - but that was not the case!**

**On every tour I give people ooh and ahh, and I always explain the collaboration with XXXXX that made it happen. I also often describe how with most architecture projects, the renderings are just pie in the sky beautiful aspirations that never quite come to fruition; but in this case the reality actually exceeded the renderings!”**

**– Carrie Brennan, City High Principal, September 2018**

## **XXXXXXXXXX XX XXXXXXXX COURSES**

F14 / Outreach Studio + S15 / Independent Study

## **XXXXXXXXXX XX XXXXXXXX FACULTY**

Xxxxx XXXXXXXX I XXXXX XXXXXXXX

## **XXXXXXXXXX XX XXXXXXXX STUDENT TEAM**

Dulce Arambula, Dengjie Chen, Andrew Cusick, Peng Gao, Ryan Haines, Nikota Litzin, Dailong Ma, Dillon Mariano, Joe Miranda, Jordan Pascua, Crosbie Roper, Michael Vo, Mekael Wesley-Rosa, Gina Trautner (LAR) I Dan Maher (TA); Samuel Paz (block party installation)

## **PRIMARY PARTNERS**

City High School (CHS) and Paulo Friere Freedom School (PFFS)

## **CHS / PFFS FACULTY & ADMINISTRATION**

Carrie Brennan, CHS Principal / school co-founder; JoAnn Groh, PFFS Principal and school co-founder; Jeff Hartman, CHS Dean of Students; Brett Goble, lead teacher and school co-founder; Efren Martinez and Leah Farbstein, AmeriCorps Farm to School Specialist

## **CHS CORE STUDENT TEAM**

Sophia G Almgren, Anais Camacho Janae Cortez, Raevyn Crews, Thomas Dahlberg, Sarah del Castillo Garifo, Andrew Flores, Ethan Freel, Maxwell Gay, Johanna Hand, Joseph Kemp, Joshua Laing, Ian Peterson, Melodia Rumpf, Avery Stannard, Alfredo Vasquez

## **FUNDERS**

XXXXXXXXXX XX XXXXXXXX Green Fund Grant (\$35,000); PFFS Play & Shade Grant (\$22,000); Originate Materials (in-kind donations)