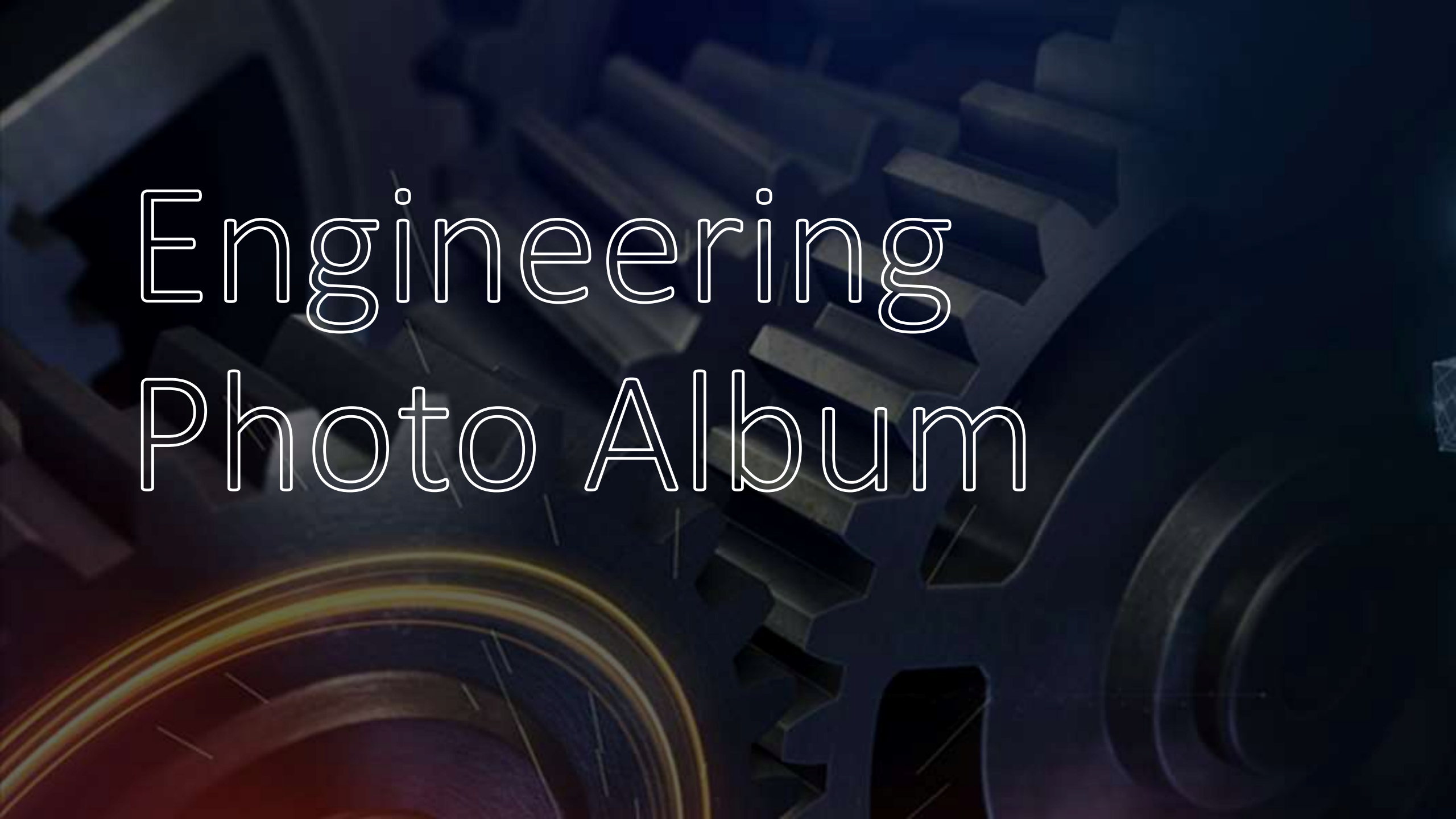

Engineering
Photo Album


THE PROBLEM
•Honeybee decline from about 6 million hives in 1947 to 2.4 million in 2008, a 60% reduction
•Droughts further accelerate their decline
LSU
TEAMS
Lenovo


THE MODEL
AQUAFINA


TEAMS
Lenovo


Current Solution
Climatologists use aerosols to study and cool the atmospheric changes
These are harmful chemicals
Use of planes produce CO2 emissions and costs hundreds of thousands of dollars per flight
benq


Casey Della Rocco
Zachary Hiers
Morgan Sembach
Lauren Sonnier
Cody Thompson
The Water Walker
BenQ


Blaze-Be-Go
The soundwave fire extinguish
benq
AQUAFINA
Voted


The Poseidon Barrier, The Barrier of the Future
No more Runoff, no more Erosion, no more destruction
More Effective, more innovative, more reliable
BenQ

The Ojea Community Health Clinic, Puerto Rico

Urgent Architecture

Gavin Glocke · Riley McNaron
Kyle Goldberg · Juliana Monroy
Alexis Jackson · Spencer Reagan
Taryon Kaelin · Joseph Watson V

ACE MENTOR PROGRAM

Project Response

Project Selection

From the choices provided within the RFP, we selected the health facility. This was a personal choice for our team because we have all been to a health clinic and seen how unenjoyable and unwelcoming they can be. Some of the questions brought up when we were deciding were: How can we adapt this prompt to fit a personal story or background? What amount of lasting positive impact could a project have? How can we use our members' strengths to bring the best project possible forward? In the end, we decided that a health clinic would not only give us a connection to one of our team members' past - she grew up in Puerto Rico - but it would also allow us to focus on an innovative design and an outreach program. Our group divided responsibilities, using our strengths, such as artistic design, future architectural majors, cultural ties, and more to create a project that managed to connect to each team member uniquely. We also chose Puerto Rico because of the lack of medical care that some areas possess.

$139B in storm costs

2,975 Fatalities

500,000 people fled the island

Poverty level rose to 52.3%

1.5+ years and still no full power

$7,235 per capita income

700 people per sq. mile

Project Objective

When first brainstorming where the location of our project would be, we decided that we not only wanted to create a facility that would help people, but we also wanted to place it where it would provide a greater impact. We plan to further help the surrounding area economically. We will do this by employing local labor and businesses for the workforce and materials required. We are committed to providing sustainability and will achieve this by including features such as collapsible solar panels and locally sourced materials. Our clinic is focused on all aspects of health care, including examinations, minor surgeries, imaging, therapies (physical and mental), and virtual exam rooms. Even with the features spanning two floors, we strive to incorporate light, resulting in bright environments in all of the spaces. Outdoor amenities include nature walks and paths to help patients and their family members relax during visits or stays. We will also provide on-site housing for traveling doctors and patients and their families.

Hurricane Maria stats are for the territory as a whole; per capita income & population density are for the Pole Ojea region




Cafe - will be a relaxing and welcoming space for all ages!

Partial wall - will allow airflow through the patio and the majority of the building

Example exam room - designed to promote relaxation

How did we get here?

We first began our design by deciding what we wanted from our site: imaging capabilities, teleconference and in-person examinations, the ability to function off-grid, sustainable features, hurricane protection measures, resilient design and a positive patient experience. The first iteration was an ambulatory care unit in the heart of Guayama City. With the discovery of a nearby hospital, however, we moved our site to the Pole Ojea province. This is a rural area in the southwest, 30-minutes away from the nearest hospital. With a location selected, we moved to the actual design. We focused most clearly on the local aspect of the plans, which our building reflects. The campus has many resources to help fill needs in a community left devastated by Hurricane Maria.


Some of the first driving forces in our design were reflections of the culture, local architecture and building flow that are unique to Puerto Rico. We wanted to create a medical building that looks and feels like it belongs. In the first drafts, we focused on creating a layout that centered upon an easy flow of people to ease congestion and make patients feel at home. We ultimately decided to go with a circular flow pattern for the lower medical floor. In addition to clear labeling in the hallways, if someone were to keep following the hallway, they would eventually find the exam room or lab they were asked to visit. For the upper floor, we have two main sections - a public and a private sector. The public area encompasses a large communal area that looks over the shaded deck and into the landscape beyond. In the rooms surrounding this area, we have physical and mental therapy rooms and a cafe. The private areas of our building include a hallway for private offices and a tenant suite.



Constructability

We are using as many locally sourced materials as possible to reduce material costs. Much of these costs are due to shipping. Using local materials will also help achieve on our goal of giving back to the people by supporting local farmers, workers and other businesses in the area. We plan to use shipping containers for lodging because they are easily sourced from cargo carriers. We also plan to employ local construction management groups and contractors to complete the site, even if that means training workers or altering the site design to work with available machinery and conditions.

Hurricane Relief & Protection

- With the possibility of power shortages in mind, solar fields and backup generators will be used to aid in the power production for our clinic.
- Puerto Rico is exposed to approximately 229 hours of sunlight per month.
- Our solar fields we will produce an estimated 141,075,000 watts per month.
- Our solar panels will be rated to withstand 160 mph winds.
- We will have a protective cover to keep the panels from getting damaged by debris.
- Rainfall will be collected with rain barrels and used along with a water purification system to create drinking water.
- The upper floor and lower entryway are designed to function without power during an emergency situation using natural air flow and light.
- Exterior walls will incorporate hay bales, reinforced with steel bands and coated in a flexible concrete solution.
- Micro-fissured glass to prevent shattering will be installed. Rolling doors will be installed to protect the large windows on the deck spaces.

Layout Schematic

The roof of our building reflects local architecture in its style and use of Spanish tile. One optional addition to the site would be a sun shade on the east side of the building to cover the plaza for classes and general comfort.

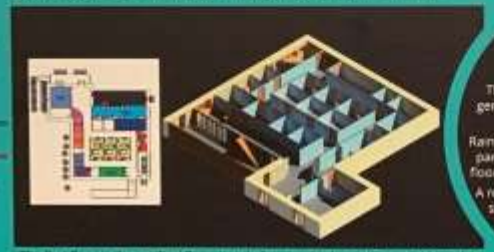
Innovative Design

During the past several years, Puerto Rico has endured a massive decline in their economy due to natural disasters and an increase in emigration of health care professionals. With our idea, we are driven to bring safety and stability to Puerto Rico through our health care outreach design. One thing that sets our outreach clinic apart from other clinics in the area is the use of virtual reality exam rooms. These rooms allow doctors to check up on patients without having to be in the actual exam room.

The second floor features the therapy facilities, as well as our on site café which will add to a positive patient experience. This floor also includes a large common room to hold classes, meetings etc., and the offices for permanent staff.

Lodging

Since most products that go into Puerto Rico must come through a shipping carrier, we plan to use shipping containers for housing. The containers will be repurposed into stack-style housing for visiting families, doctors or on-site patients. Standard ISO shipping containers are 8 ft wide, 8.5 ft high and come in two lengths: 20ft and 40ft. This will allow plenty of space for an on-site lodge. These spaces will be finished to provide a comfortable living area.



The first floor is the medical floor. It includes standard and VR exam rooms, labs, an operating room, and a nurse station. The floor also functions as the check-in, and a large waiting room that has access to the patio and upper floor. This floor also has our pharmacy, which allows patients to quickly receive any required medications.

Civil Engineering

There will be two entrances, one for the general population and one for emergency vehicles and staff.

Rain water will be channeled to the south-east part of the site toward the gardens to avoid flooding within the main building and lodges.

A retention pond on the eastern side of the site will act as a water feature and help mitigate flooding of the property.

Our full site is 9.7 acres. This is a basic plan showing our building, parking, paths, lodging, solar field and landscape features.

Site Info

The site is along a main road in the landlocked Pole Ojea region with access to standard utilities. Due to storm damage, we decided against renovating an existing structure and opted to construct a more reliable building. A parking lot is currently located where we plan the place the building. The rest is wooded and we plan to keep the remaining trees, incorporating the woodland into the landscape architecture. The site is approximately 420,000 square feet or 9.7 acres. The site has a mild slope with an elevation as high as 42 feet and as low as 32 feet above sea level.

Site Features

The building itself will function as an Ambulatory Care Facility which provides four basic types of health care:

- **Wellnesses**, which covers basic medical care and prevention much as a standard physician would provide.
- **Diagnosis**, which includes testing such as X-Rays, MRI, lab and blood work, and CT Scans.
- **Treatment**, which covers non hospital level surgical procedures.
- **Rehabilitation**, which covers post-op care, mental and physical therapy.

Additionally, our site will provide some unique opportunities:

- **Virtual reality exam rooms**, which will allow patients to meet with off-site doctors with the aid of a nurse in a simulated exam performed in one of the specialized exam rooms.
- **On-site pharmacy**, to provide easy access for local patients.
- **Lodging and a full kitchen**, for post-op patients, visiting families, and traveling doctors that come in for procedures or emergency situations.

Landscape Architecture

A goal for our exterior design is to spark curiosity and exploration.

- **A Large cobbled plaza** leads out of our patio and is covered by a large shading roof line. The plaza is an area for both patients and employees to relax. It can be used as a place for therapy and invitingly opens to the rest of the nature walk on the property.
- **Nature walks** include many different paths that eventually loop back to the clinic. They pass over water features, gardens and by patient-created mural walls that add visual interest to the path itself. Along the main path, there will be trees that follow the path to the open concept building.
- **A Patient-created mural wall** allows anyone coming to the clinic to add to the visual aesthetic around the building, providing patients and visitors a creative outlet during their stay.

Structural

- **Locally sourced hay bales**, banded in steel and plastered will insulate the exterior walls. This uses local materials, helps aid in insulation and provides a sturdy wall to protect against storms.
- **Bendable glass** with "micro-fissures" can bend without shattering. The jigsaw-shaped engravings stop fractures from spreading, making the glass 200-times stronger than standard glass.
- **Ultra-high-performance concrete (UHPC)** can bend and give, yet is six times stronger than regular concrete.
- **Perforated brick walls** placed along the patio will provide privacy and still allow air flow through the building in case of a power outage.

Schedule

496 Days

From mobilization, we expect a total of 496 days until project completion. About a third of that time is dedicated to finalizing layout, designing the facility and acquiring permits. Hurricane season has been taken into account.

Interior

With our design, we strive to reflect on the vibrancy and liveliness in Puerto Rico in order to display this distinctive culture. From the **painted murals** to the openness of the **nature trails**, we looked to connect to the culture of Puerto Rico with our outreach clinic. **Open space** and **abundant greenery** tie ties to nature to promote healing and stress relief. We plan to focus on healing rather than sickness to keep the positivity flowing throughout our building. The interior will include many earth-like aspects, including wood features and softer neutral colors, with splashes of blues and violets. Our team is looking to **blend the aspects of Puerto Rican culture** into the interior furniture. In the waiting room, we have a comfortable seating area, which provides a **bright and calming atmosphere** for our patients. The waiting room also has an outdoor patio that would allow patients to experience the weather and the liveliness of the nature surrounding them. The **upstairs café** is also a place to **take a break from the typical feeling of dread and anxiety** of most hospitals.

Electrical & Mechanical

- **LED Technology:** longer lasting, more efficient bulbs will keep our building well-lit, yet comforting and soft on the eye.
- **TekTone Emergency & Nurse Call Systems:** this system aids during emergency situations and can help staff form quick and efficient responses to provide help to patients.
- **Suite 4 HVAC unit:** capacity ranges to 5.5 tons, low dewpoint discharge capability down to 39 degrees without desiccant dehumidification, UV Lights for sterilization and high-grade filtration
- **Integrated Fire and Security Solutions:** provides security alarms, security consulting, fire-detection and a fire-alarm system, as well as a mass notification system
- **CAT 2 generators:** ensure critical life support power to some of the world's largest hospitals, supported by CAT uninterruptible power supply (UPS) systems, automatic transfer switches (ATS) and switchgear
- **Stanley Healthcare RFID-based patient tracking system:** the key component of our Patient Flow and Security solutions. The patient's bracelets have an integrated location transmission device
- **Healthcare Grade Network:** provides technical architecture services, installation\upgrades, performance improvement, backup and data recovery, wide area network and telecommunication

Sustainability

Due to Puerto Rico's storm risk, it is extremely important to implement sustainable techniques into any facility being built there in order to alleviate storm damage and make it easier for the site to **run off-grid** if needed. Some of the techniques we used to help with this are applying **local and recyclable materials** such as ashcrete and recycled steel along with **locally sourced hay** for our exterior walls. We are also **repurposing material from storm damaged sites** to level our site and create a new foundation as well as **reusing shipping containers** as housing. We are also implementing leading LED lighting technology and **geothermal heating**. Our LEED rating is LEEDGold.

79 | 0 | 27 TOTALS

LEED v4 for BD+C: Healthcare
Project Checklist

Budget

$3,813,570

We estimate the project will cost approximately $413 per square foot resulting in a total cost of $3.8 million. This excludes the cost of the expensive medical equipment. Also, not factored in is the solar field and UPS equipment. Local resources and labor will offset the higher rate of bringing in specialists to install the sensitive machinery and other delicate operations.

VERGE DESIGN STUDIOS

MILLENNIUM HIGH SCHOOL

Circular hallways with glass dividers create a smooth flow of traffic. The glass barriers go through the levels of the building as well as the roof, acting as a skylight for both floors. The effect is adding more natural light to the first floor, highlighting both function and aesthetic.

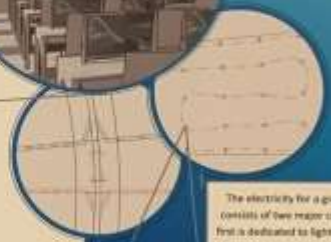
Rather than conventional hinge-based doors, our school uses recessed sliding doors with both traditional and smart locks. The doors promote easy traffic rotation and eliminate the possibility of students colliding with the doors when opening.

On the inside of the classroom, an additional panel with room-specific controls, such as light and air conditioning control and interfaces are included. Every room will be equipped with a lock that requires a scanned ID to open or close the door outside of class change. In an emergency situation, electricity could potentially fail, so a manual release for the door is embedded under a removable cover.

Each classroom consists of two permanent walls and two sound proof, adjustable walls, separating the individual rooms, allowing expansion and more utility. This grants the school the ability to be modularly adaptable on demand.

The cafeteria is a multi-level design with the first floor dedicated to producing and serving food and the second floor is dedicated to dining. This allows a larger number of students to access their food and get seated in a reasonable amount of time, thus permitting the rest of the period for eating and socializing. Additional space on the lower floor can be utilized both for further seating and congregation points for clubs.

Our multi-purpose classroom is designed as a lab space first, with optimal electrical systems and open space to support individual computers and machinery. Alternatively, the room can be used in a traditional sense if needed, with no additional modifications.



The electricity for a given room consists of two major circuits; the first is dedicated to lighting and the control panel, the other to the outlets placed throughout the room. An interesting note is that these outlets are placed in the floor, so as to not interfere with the moveable walls. Each circuit contains an uninterruptable power supply.

The ventilation of this building is centered around its circular design with two main pathways flowing in the same direction with opposing openings. The repeated pattern of vents around the school creates a minor, but constant, breeze inside of the main hallway and each individual classroom.

The administration area is designed to be easily accessible to students and visitors. This includes: work spaces for faculty and students, a stairway for immediate access to the upper floor, and a hallway passing through the office space. This will allow the natural traffic flow established by the rest of the school.

Special thanks to our partners and mentors:

HASKELL

MATTHEWS DESIGN GROUP

AES

AULD & WHITE CONSTRUCTORS, LLC

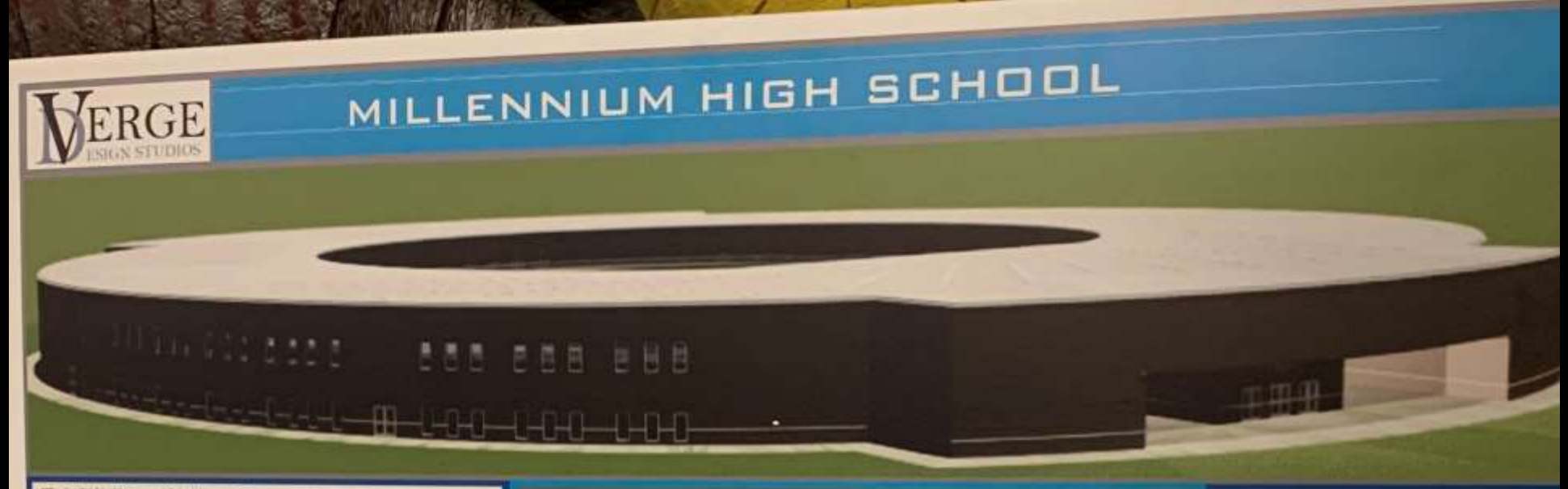
McVEIGH & MANGUM ENGINEERING, INC.

NAVFAC

TRC

MILLENNIUM HIGH SCHOOL

VERGE DESIGN STUDIOS



Millennium High School is a conceptual, "school of tomorrow," that sets the stage for better education for decades to come. Its unique and intelligent design reimagines existing educational infrastructure in every aspect possible. Its simplistic, yet beautiful, shape is functional in every way—from stimulating relationships between peers to maintaining traffic flow—and its modular classrooms are loaded with technological advancements to transform the learning environment. Millennium High School leaves outdated infrastructure behind with distinguished LEED ratings, the highest quality security available, unique social spaces, and more.

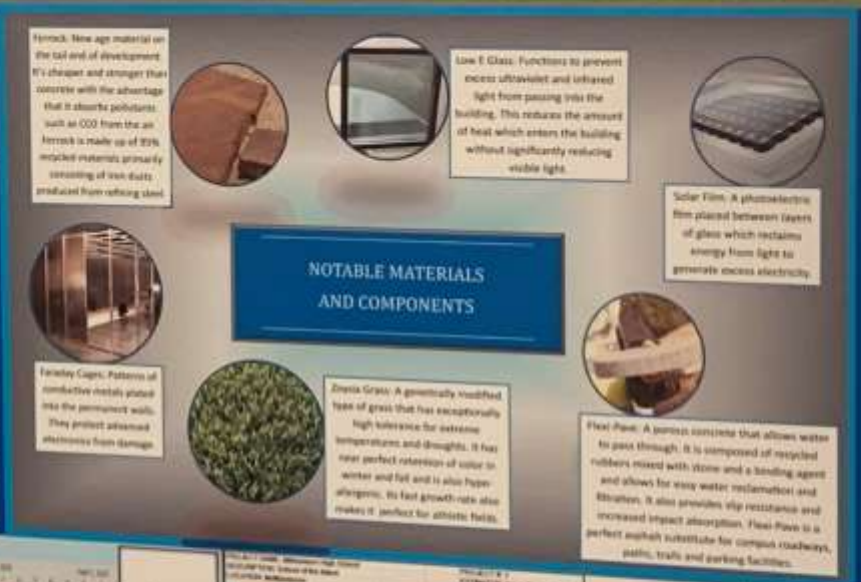
At the start of the project, our team faced challenges deciding upon the initial design idea—a school, urban block, or flexible frame. A number of unique ideas entered discussion. The team resolved these issues by making individual proposals of the benefits of their design choice to the rest of the team. After everyone expressed their thoughts, the team took a vote on which design would be the basis of our future work, narrowing it down to two of the following designs: the organically-shaped circular school or the geometrically hexagonal school. This time, the team came to a unanimous agreement on the structural and cost benefits of a circular design.

With a general concept of the school, we split up into groups to work on individual sections of the building, each designed to correlate with the others. Using software such as AutoCAD to sketch the building, we gradually added and changed the design to solve problems which schools face. Next, we began compiling our work and ensuring the final phase of the project, finishing components and creating our building in Revit. While we were given no time or budget constraint, we still aimed toward a school that could be built both quickly and inexpensively, while still maintaining quality. The main focus for the school was to improve efficiency, comfort, cost, and security. The circular design also improves the efficiency of navigation, therefore solving traffic problems typically present in schools. The design also decreases cost due to its minimization of exterior walls and allows an air current to flow through the building, providing a refreshing, constant rush of air to the students. Individualized smart controls allow for customization of this air flow to maximize comfort. Most rooms also have access to natural light through an abundance of skylights and windows, as well as being equipped with smart locks, which are ID-based, to ensure the safety of students.

The school will have a universal design that, while optimized for temperate climates, can be implemented nearly anywhere with minimal changes. The school will also be constructed of many environmentally friendly materials, all of which contribute toward the sustainability and cost of the building. For example, our main building material is Ferrock, a substitute for concrete that is made from 95% recycled materials; it is both less expensive than concrete and also absorbs excess carbon dioxide, reducing the cost and potential carbon footprint. Other notable features include Low E glass, Heat Deflectors, and Solar Film.

Through this competition and collaboration between members of the team, we have grasped many new lessons. We were faced with many challenges and obstacles. By overcoming them, we have learned to look at issues with a new perspective, not only for a general problem/solution pairing, but for specific details such as new problems that originate from a solution. Over time, we discovered how to compile and integrate ideas and plans from multiple people into one seamless, comprehensive design.

NOTABLE MATERIALS AND COMPONENTS



Ferrock: New age material on the tail end of development. It's cheaper and stronger than concrete with the advantage that it absorbs pollutants such as CO2 from the air. Ferrock is made up of 95% recycled materials primarily consisting of iron dusts produced from refining steel.

Low E Glass: Functions to prevent excess ultraviolet and infrared light from passing into the building. This reduces the amount of heat which enters the building without significantly reducing visible light.

Solar Film: A photoelectric film placed between layers of glass which reclaims energy from light to generate excess electricity.

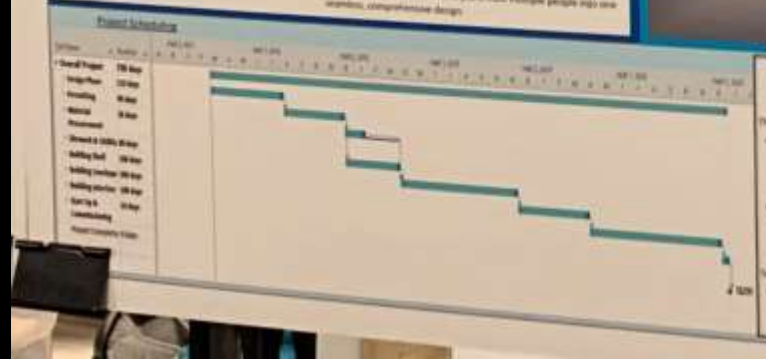
Faraday Cages: Patterns of conductive metals plated into the permanent walls. They protect advanced electronics from damage.

Zoysia Grass: A genetically modified type of grass that has exceptionally high tolerance for extreme temperatures and droughts. It has near perfect retension of color in winter and fall and is also hypo-allergenic. Its fast growth rate also makes it perfect for athletic fields.

Flexi-Pave: A porous concrete that allows water to pass through. It is composed of recycled rubbers mixed with stone and a binding agent and allows for easy water reclamation and filtration. It also provides slip resistance and increased impact absorption. Flexi-Pave is a perfect asphalt substitute for campus roadways, patio, trails and parking facilities.

PHASING & EXPANSION OPTIONS

The school can be expanded in distinct ways. If sufficient land is available, the building can be expanded outward in concentric circles. If outward expansion is not suitable for a given site, the design can support additional floors.



Project Scheduling

Schedule

The project will take an estimated 718 days.

If initiated now, students could be enjoying the benefits of Millennium High School by the spring semester of 2021.

Budget

The school will encompass 242,211 SF, with a cost of $213.04 / SF.

While higher than a typical school's construction cost, it is justified by distinguished security, futuristic technology, adaptive modularity, energy efficiency and an enhanced student learning environment.

LEED v4 for BD+C: Schools

Project Checklist

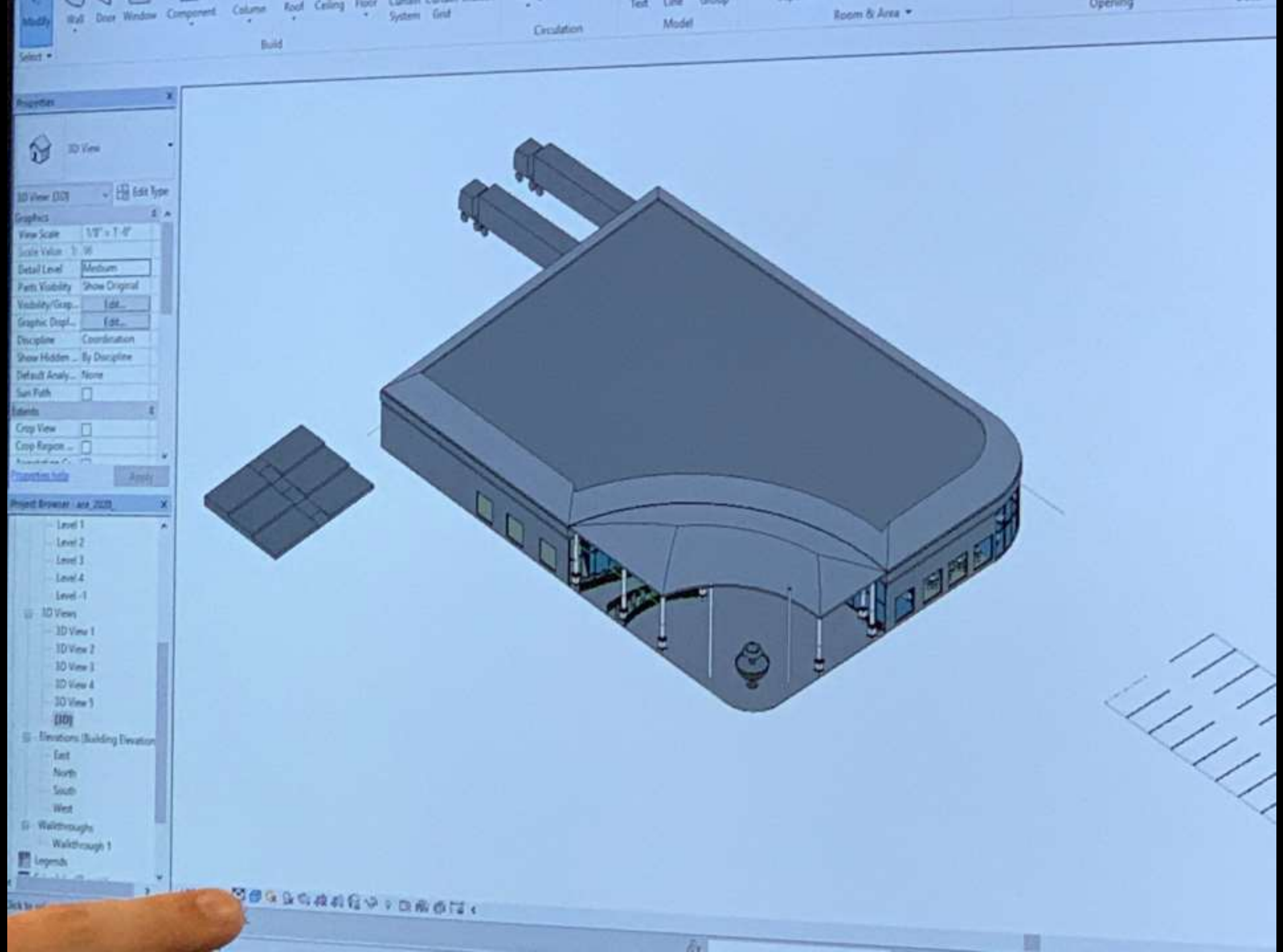
Project name: Millennium High
Date: February 8th, 2018

Y	?	N		
16	0	0	Location and Transportation	16
11	0	0	Sustainable Sites	10
10	0	1	Water Efficiency	11
20	0	0	Energy and Atmosphere	33
9	0	0	Materials and Resources	21
16	0	1	Indoor Environmental Quality	19
5	0	1	Innovation	6
3	0	0	Regional Priority	4

91 | 0 | 19 TOTALS

Millennium High School utilizes an array of resource-saving techniques—including solar energy production, recycled materials and efficient energy usage—to reduce its footprint on the surrounding environment.


THE GATOR NATION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Parts Visibility
Show Original
Discipline
Coordination
Show Hidden ...
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Sun Path
Extents
Crop View
Project Browser
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Level 3
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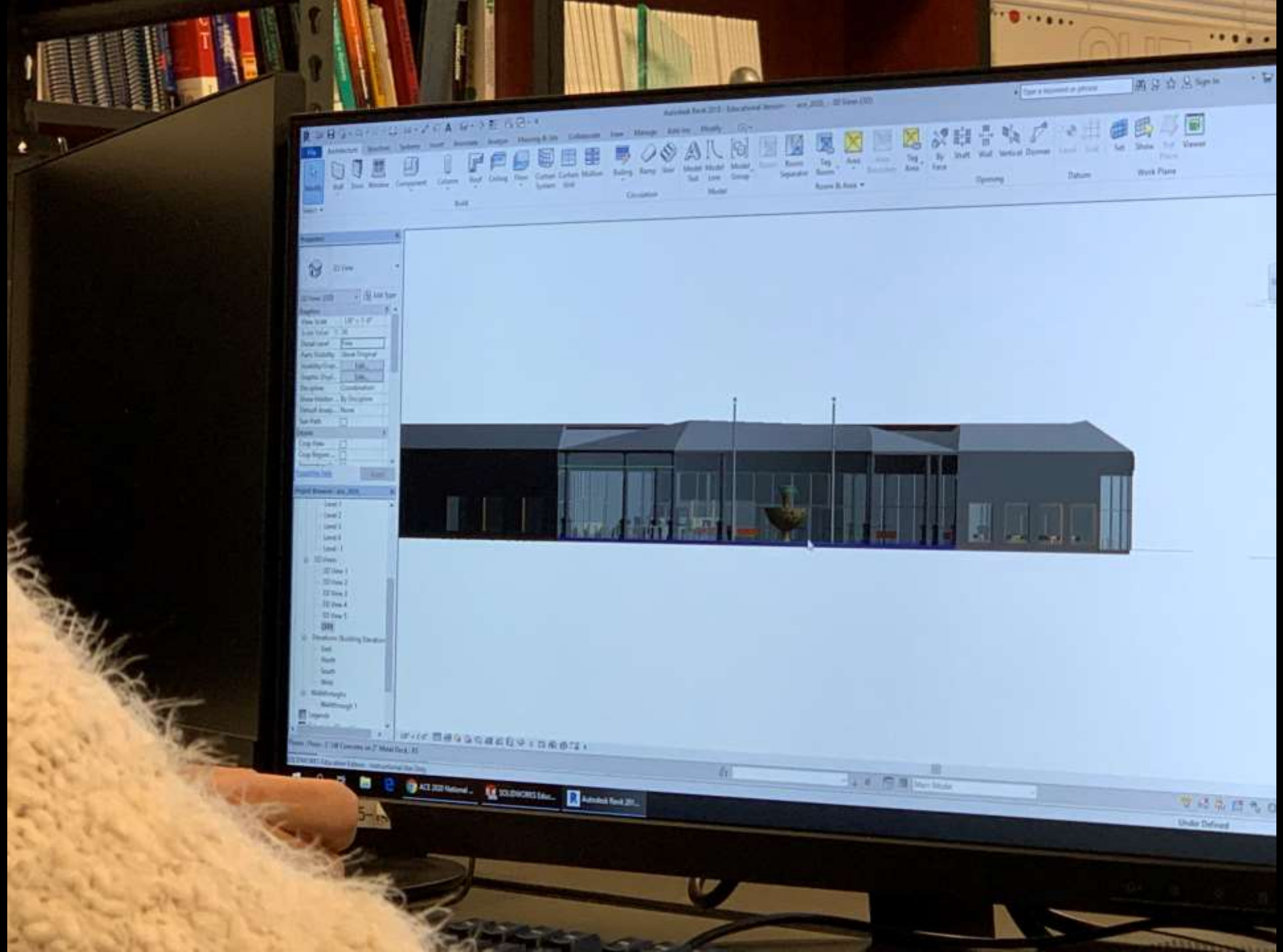


O'NEILL
Milwaukee


ACE


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THE GATOR NATION
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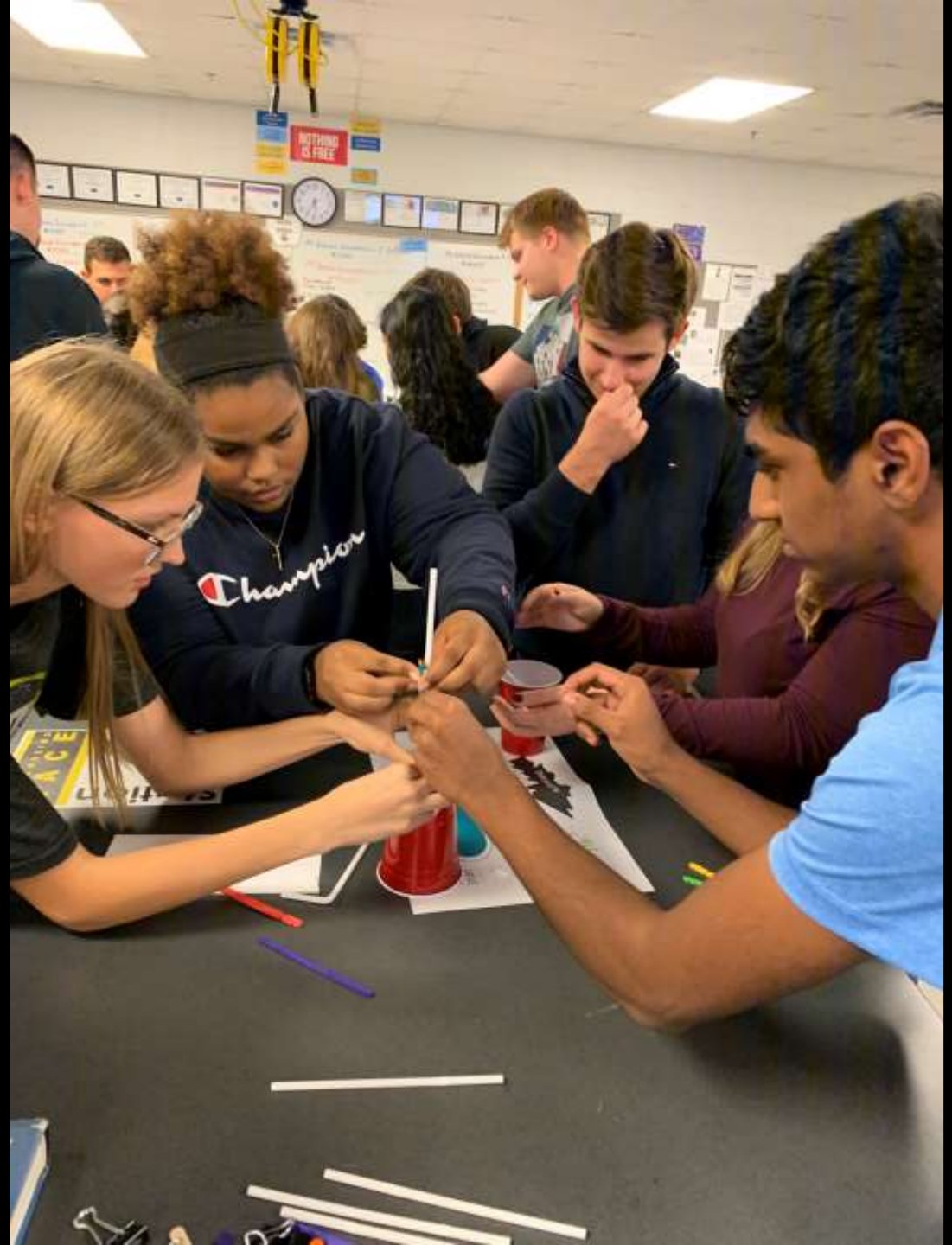
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JACK&JONES


NASA


CARLISLE
INTERCONNECT TECHNOLOGIES


PERFORMANCE MATTERS
Coast to Coast
Hurley


EXIT
USS GROWLER


Questions?
CARLISLE


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NASA
Station
STEM


CLEMSON
THE GATOR NATION


USA-1977

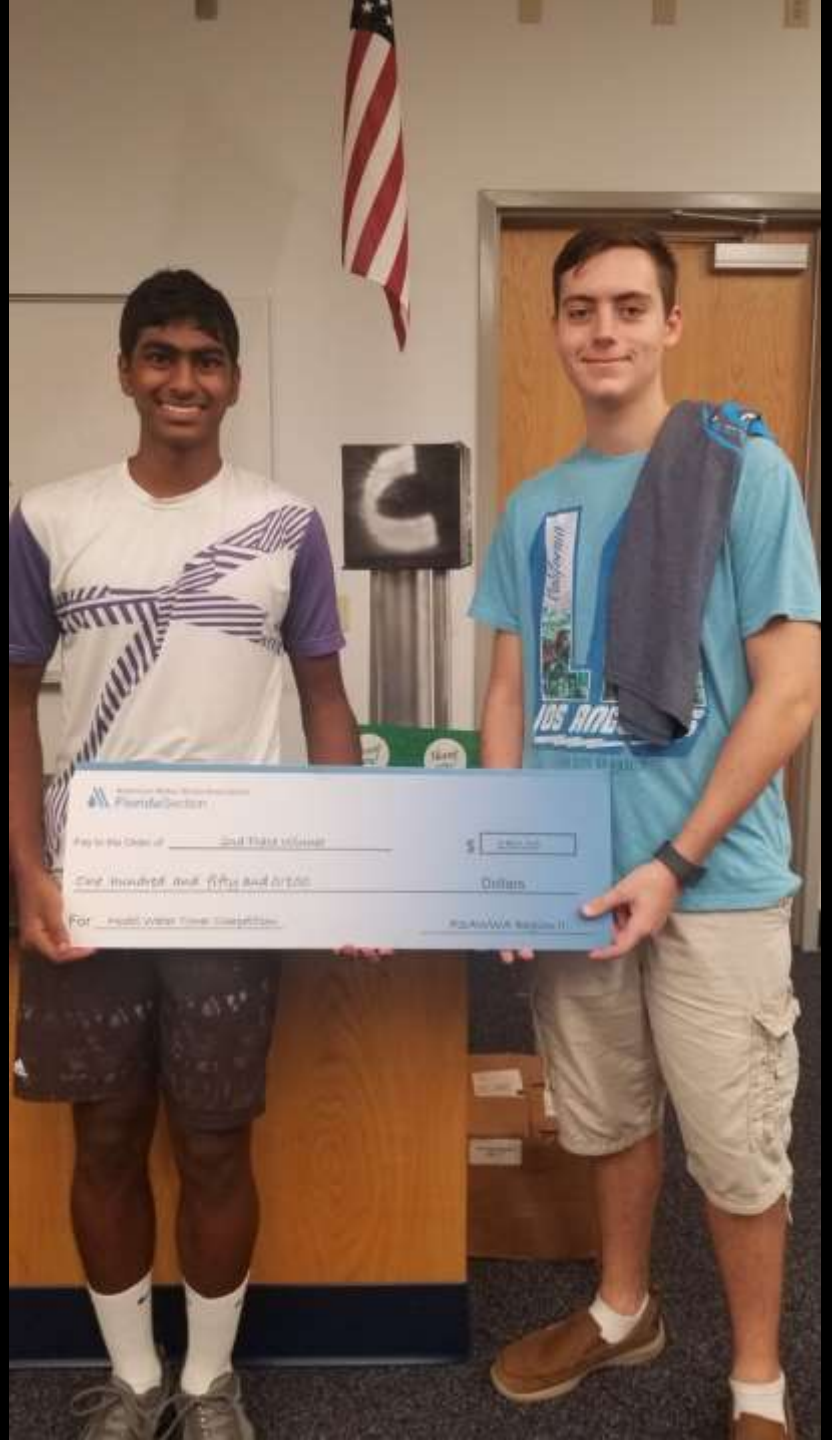

JACK&JONES
The Gator Nation
AUTICA


THE NORTH FACE


V
NOTHING IS FREE
TEMSCO
Lenovo
Lenovo


ARCH BRIDGE
TEAM


MMRI:
Movable
Magnetic
Resonance
Imaging
TRUSTWORTHINESS
CARING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REFLECTION
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SALT LAKE CITY
UTAH
FRIENDS
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UNF
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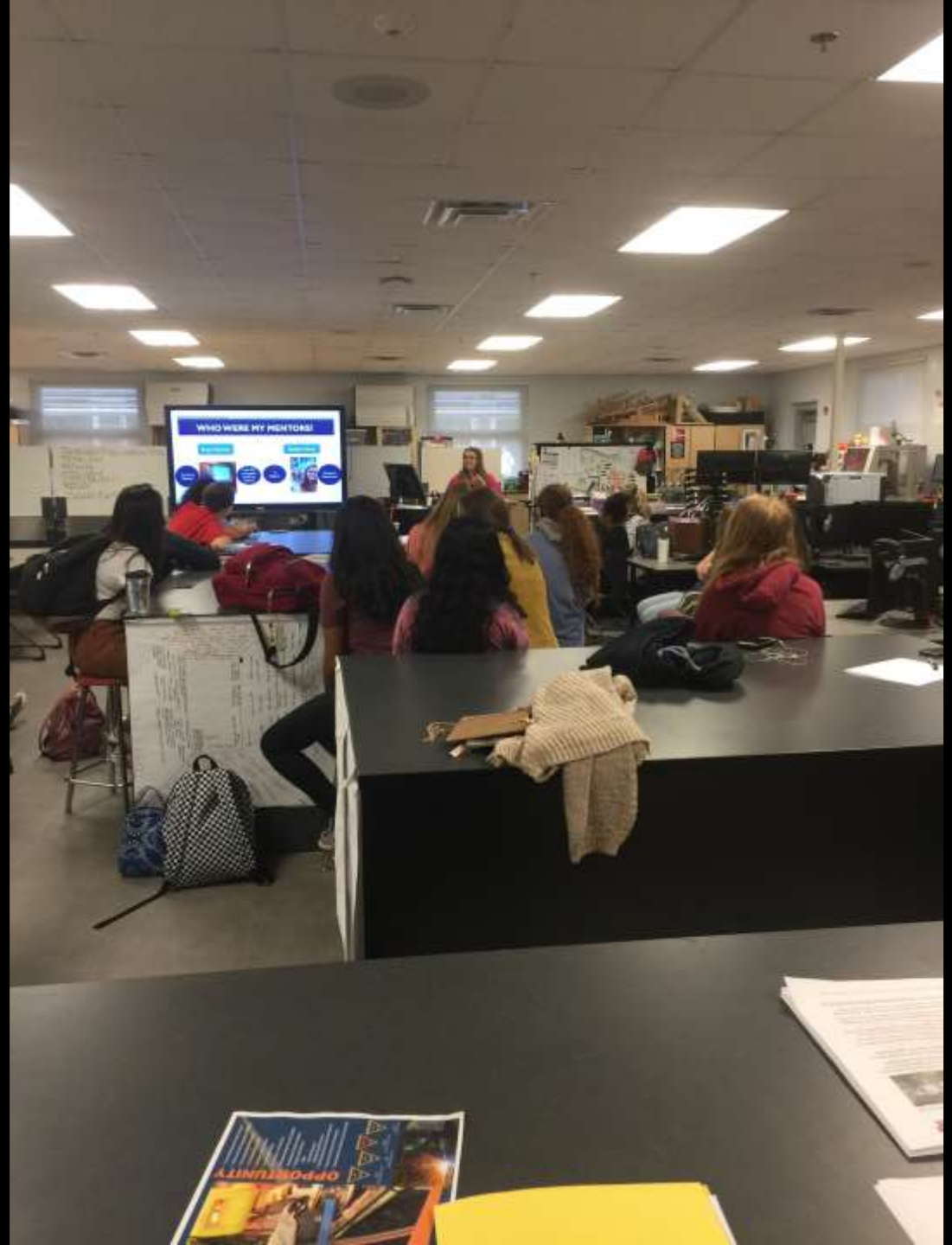
SWE
Society of Women Engineers
About the Club
the Vision of SWE
Changing Society
Aspire.
Advance
Achieve


WHO WERE MY MENTORS!

These images were taken during the 2019-2020 school year (before COVID) during:

- Classroom activities
- Extracurricular organizations
  - ACE (Architecture, Construction, Engineering)
  - SWE (Society of Women in Engineering
- Community service project
- Field trips