



# Notes on Infrastructure

Ed Barker – 6/7/2018

# Education

## Academic Education

- Math & Science - STEM
- Reading & Writing
- Economics & Government
- Arts & Language

## Career Education CTE - CTAE

Limits of College of Education  
University Engagement

- Architecture & Construction
- STEM
- Arts, A/V, Communications
- Agriculture
- Business
- Business & Finance
- Computer Science & IT
- Public Administration
- Education & Training
- Health Sciences
- Hospitality & Tourism
- Law Enf. & Public Safety
- Transportation, Logistics
- Manufacturing
- Marketing
- Energy

- Engineering & Technology
- Engineering Design
- Electronics
- Cybersecurity
- Game Design
- Internet of Things
- Programming
- Web Development
- Computer Science
- IT Support & Services
- Networking
- Web & Digital Design
- Manufacturing
- Mechatronics
- Industrial Maintenance
- Energy Systems
- Energy & Power



**Education**

**Academic Education**

- Math & Science - STEM
- Reading & Writing
- Economics & Government
- Arts & Language

**Career Education  
CTE - CTAE**

Limits of College of Education  
University Engagement

**STEM**

- Engineering & Technology
- Engineering Design
- Electronics

**Computer Science & IT**

- Cybersecurity
- Game Design
- Internet of Things
- Programming
- Web Development
- Computer Science
- IT Support & Services
- Networking
- Web & Digital Design

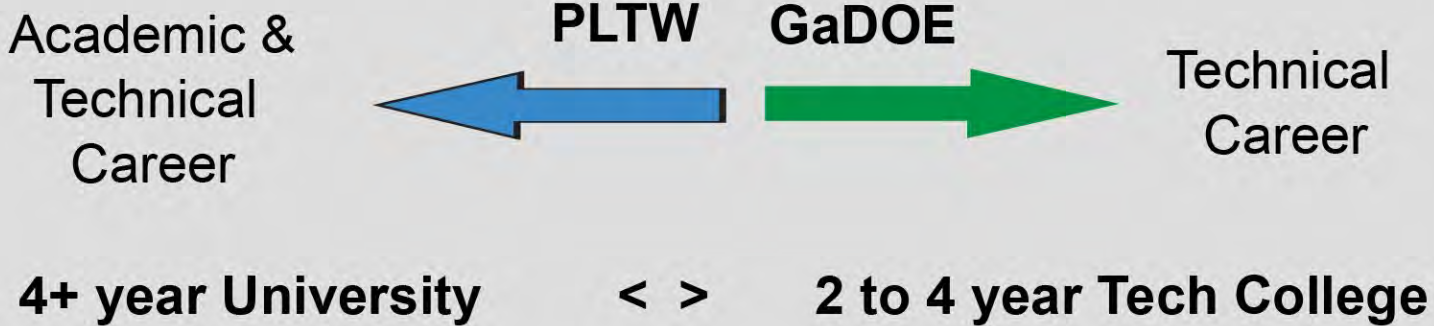
**Manufacturing**

- Manufacturing
- Mechatronics
- Industrial Maintenance

**Energy**

- Energy Systems
- Energy & Power

### Academic Emphasis in Tension



# EcoSystem Development for 21<sup>st</sup> Century STEM Education

- Strategic Teacher Initiatives
- Partnerships
- Infrastructure
- Creating Public Value - Communications & Engagement



# EcoSystem Development for 21<sup>st</sup> Century STEM Education

- Strategic Teacher Initiatives
- Partnerships
- Infrastructure
- Creating Public Value - Communications & Engagement





# kellrobotics

FIRST ROBOTICS COMPETITION CHAIRMAN'S AWARD 2017  
FIRST ROBOTICS COMPETITION CHAIRMAN'S AWARD FINALIST 2018 HOUSTON CHAMPIONSHIP  
FIRST ROBOTICS COMPETITION CHAIRMAN'S AWARD 2018 HOUSTON CHAMPIONSHIP  
FIRST ROBOTICS COMPETITION CHAIRMAN'S AWARD 2018 HOUSTON CHAMPIONSHIP  
FIRST ROBOTICS COMPETITION CHAIRMAN'S AWARD 2019 HOUSTON CHAMPIONSHIP

Carlton J. Kell High School  
Marietta, Georgia  
**InvenTeams**  
LEVELOON MIT PROGRAM

**kellrobotics**  
graphic design environmental communication engineering design  
3d animation career and leadership opportunities simulation  
web design marketing video production

FIRST ROBOTICS COMPETITION ROBOT ARENA FIRST & SITE  
EMORY UNIVERSITY  
Georgia Tech  
DELTA

FTC FIRST TECH CHALLENGE  
FLL FIRST LEGO LEAGUE  
JrFLL Junior FIRST LEGO League



EXIT

kellrobotics

DESIGN kellrobotics INVENT

13 1311

kellrobotics



FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2016 PEACHTREE DISTRICT KENNESAW EVENT

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2016 PEACHTREE DISTRICT STATE CHAMPIONSHIP

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2017 PEACHTREE DISTRICT GAINESVILLE EVENT

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2017 PEACHTREE DISTRICT STATE CHAMPIONSHIP

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD FINALIST  
2018 HOUSTON CHAMPIONSHIP

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2018 HOUSTON CHAMPIONSHIP

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2018 PEACHTREE DISTRICT STATE CHAMPIONSHIP

FIRST ROBOTICS COMPETITION  
CHAIRMAN'S AWARD  
2018 PEACHTREE DISTRICT KENNESAW EVENT

1 HOUR FIREWALL

1 HOUR FIREWALL

1 HOUR FIREWALL

kellrobotics FIRST

Carton J. Kell High School Marietta, Georgia  
InvenTeams

kellrobotics  
graphic design environmental communication engineering design  
3D animation career and leadership opportunities simulation  
web design marketing video production

girl scouts Delta Technology

ATLANTA SCIENCE FESTIVAL  
EMORY UNIVERSITY  
Georgia Tech  
Google  
DELTA

FIRST ROBOT ARENA: FIRST & SGT

FIRST  
Good Luck!

FIRST POWER UP

TEAM 1311

Creativity Unleashed

RIDGID

kell

EXIT

kellrobotics

DESIGN









2012  
NORTH CAROLINA  
REGIONAL

1311

13

MARKETING  
PAPER PRODUCTS  
MECHANICAL  
OFFICE SUPPLIES  
ARTWORK  
VIDEO  
BUMPERS  
HARDWARE  
SCREWS  
TAPES  
ADHESIVES  
BEARINGS  
TRANSISTORS  
TRANSISTORS







**MARINES**  
THE FEW THE PROUD.

1 HOUR  
FIREWALL

**FIRST**  
ROBOTICS  
COMPETITION  
CHAIRMAN'S  
AWARD  
2009  
PEACHTREE  
REGIONAL

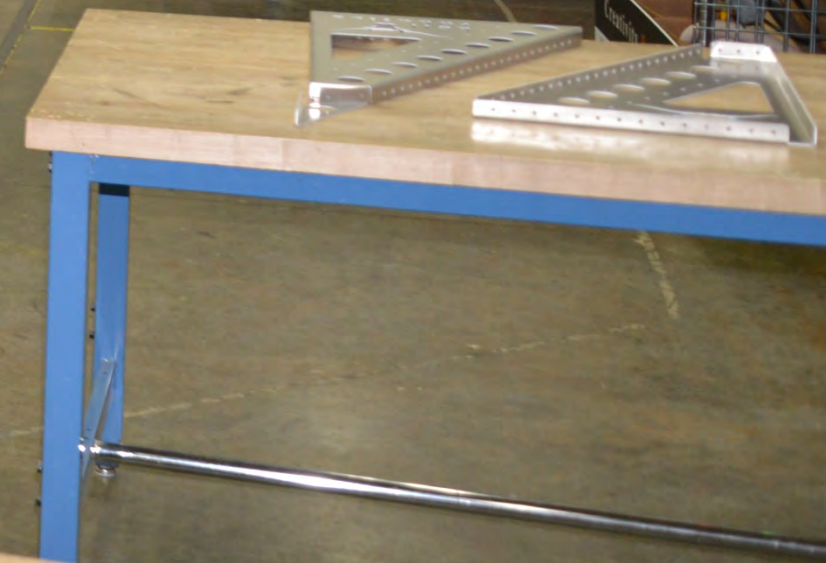
**FRC**  
FIRST Robotics Competition  
WOODIE FLOWERS  
FINALIST AWARD  
2012  
PEACHTREE  
REGIONAL

**FRC**  
FIRST Robotics Competition  
WINNER  
2012  
NORTH CAROLINA  
REGIONAL

**FRC**  
FIRST Robotics Competition  
CHAIRMAN'S  
AWARD  
2015  
SMOKY  
MOUNTAINS  
REGIONAL

**FRC**  
FIRST Robotics Competition  
IRMAN'S  
WARD  
2013  
SMOKY  
MOUNTAINS  
REGIONAL

**FRC**  
FIRST Robotics Competition  
CHAIRMAN'S  
AWARD  
2012  
PEACHTREE  
REGIONAL







REZMOR

1 HOUR FIREWALL

1 HOUR FIREWALL

S

The Carlton J. Kell High School  
Team 1311  
Marietta, Georgia

Department of Defense  
**DoDSTEM**  
Defense Science and Engineering Graduate Fellowship

**FRC**  
FIRST Robotics Competition

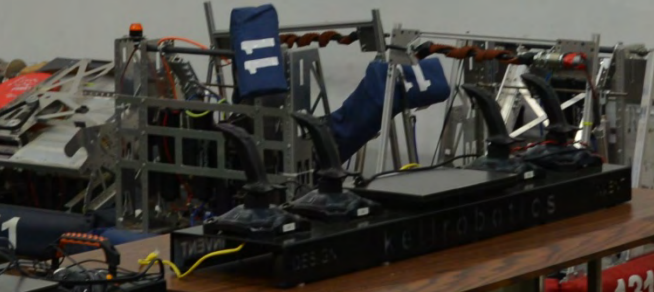
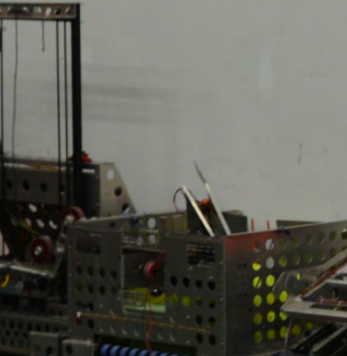
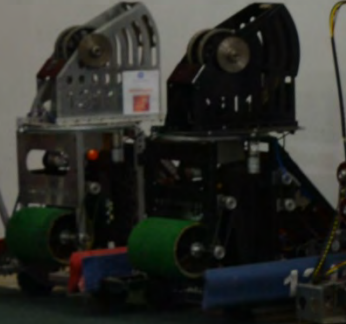
**FTC**  
FIRST Tech Challenge

**FLL**  
FIRST LEGO League

**Jr.FLL**  
Junior FIRST LEGO League



**MARINES**  
THE FEW. THE PROUD.





# kellrobotics



The Carlton J. Kell High School  
Team 1311  
Marietta, Georgia

DoDSTEM  
Learning. Teaching. Inspiring. Innovating.



EXIT

kellrobotics  
public design  
entertainment  
education  
3d animation  
user interface  
web design  
marketing  
data science

FIRST  
ROBOT ARENA  
FIRST & SCIENCE

Georgia Tech  
Google  
DELTA

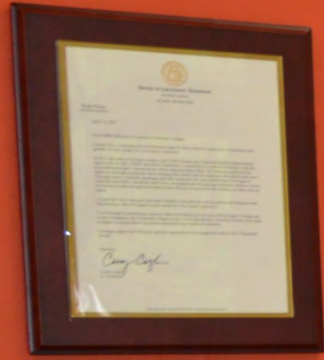
FIRST  
Good Luck!

DO NOT TOUCH  
THIS IS NOT  
A TOY

13  
11

kell

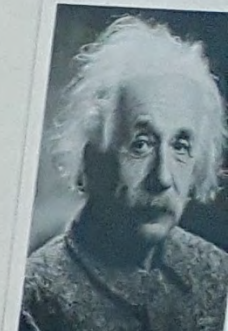
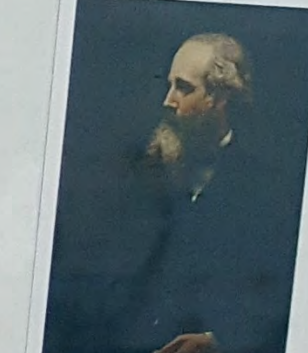
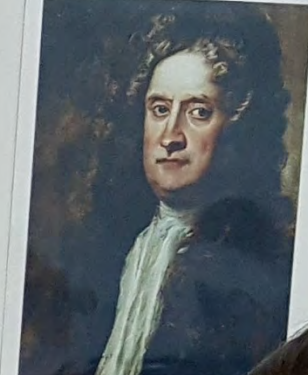
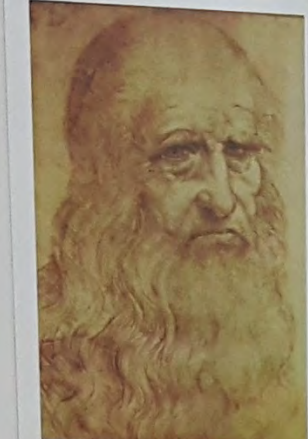
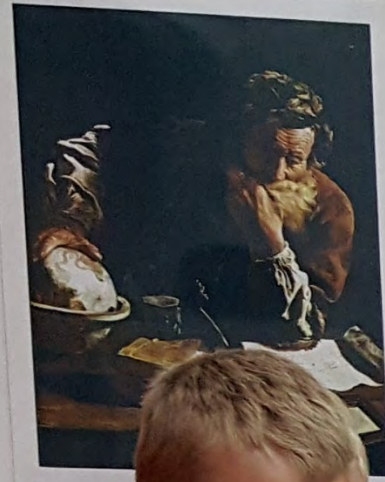




Please Do Not Touch

UNIVERSITY RENAISSANCE CENTER





NATIONAL INSTRUMENTS education

FIRST

3M

ANIMAL ALLES

GO TEAM!  
FITNER ROBOTICS

GO TEAM!  
FITNER ROBOTICS

GO TEAM!  
FITNER ROBOTICS



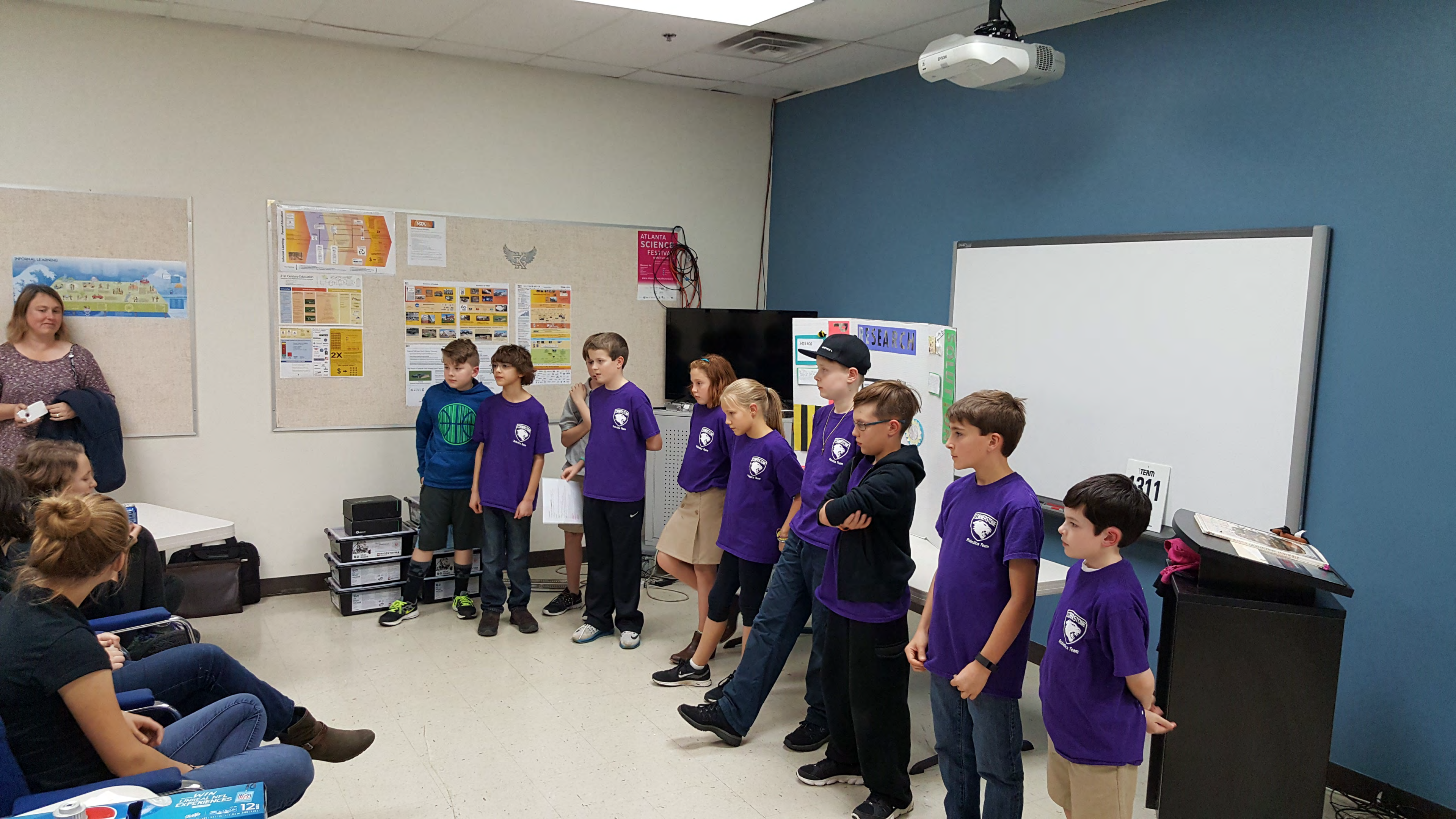


InvenTeam LEMELSON-MIT



LAS VEGAS





INFORMAL LEARNING

21st Century Education

2X

ATLANTA SCIENCE FESTIVAL

RESEARCH

TERM 1311

WIN NFL EXPERIENCES

12





RIFTH THIRD BANK Official Bank of Kansas State Athletics

KANSAS STATE UNIVERSITY

WELLSTAR Coca-Cola





The City of New York  
New York City Economic Development Corporation



UNC Charlotte | Research & Economic Development  
Charlotte Research Institute



State Of Tennessee



The State of South Carolina



Florida Atlantic University





Five career interest-themed academies

- Aerospace & Logistics
- Criminal Justice & Law
- Healthcare & First Responders
- Hospitality & Design
- Mechatronics & Energy

Career oriented magnet-like school, not career academy as defined by law.

Offers Advanced Placement (AP) courses  
CTSOs, Honor Societies, and Clubs.

No fine arts courses or athletics

\*Interesting starting point for a CCSD Career Academy

Forsyth Georgia

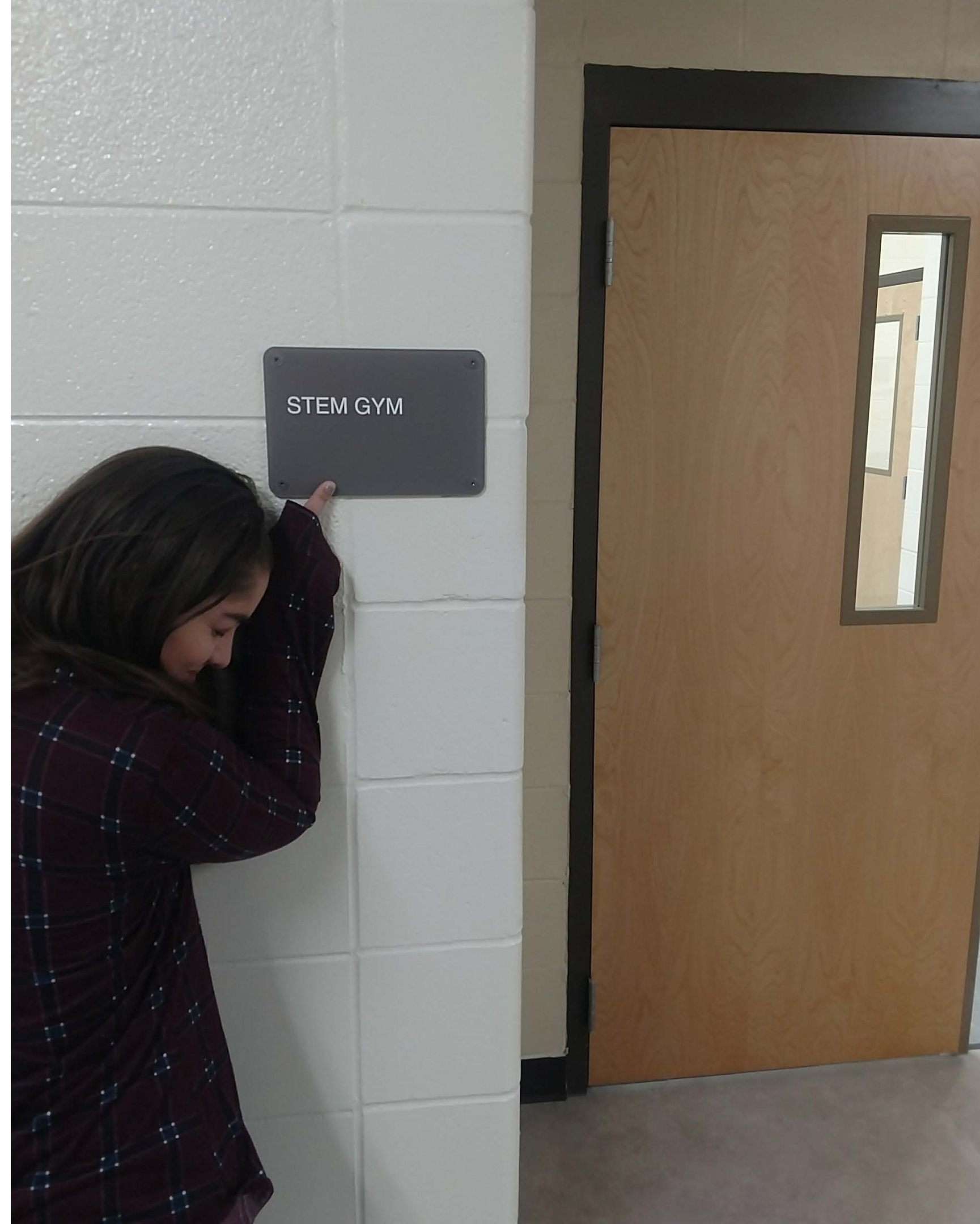




2014

Albany Georgia

2018







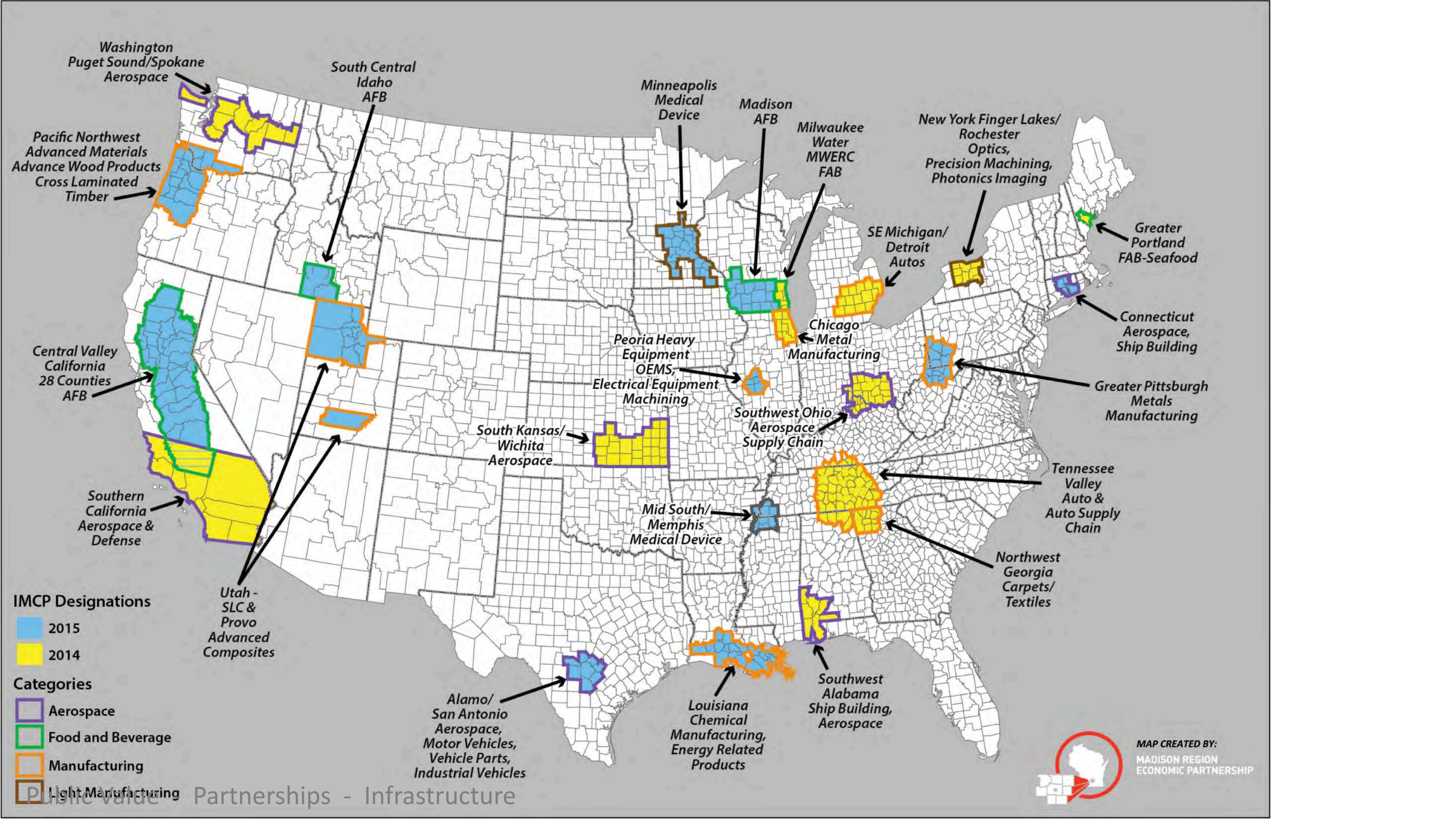
# STEM *camp*

*Robots! Drones! Experiments and More!*

STEM CAMP APPLICATION

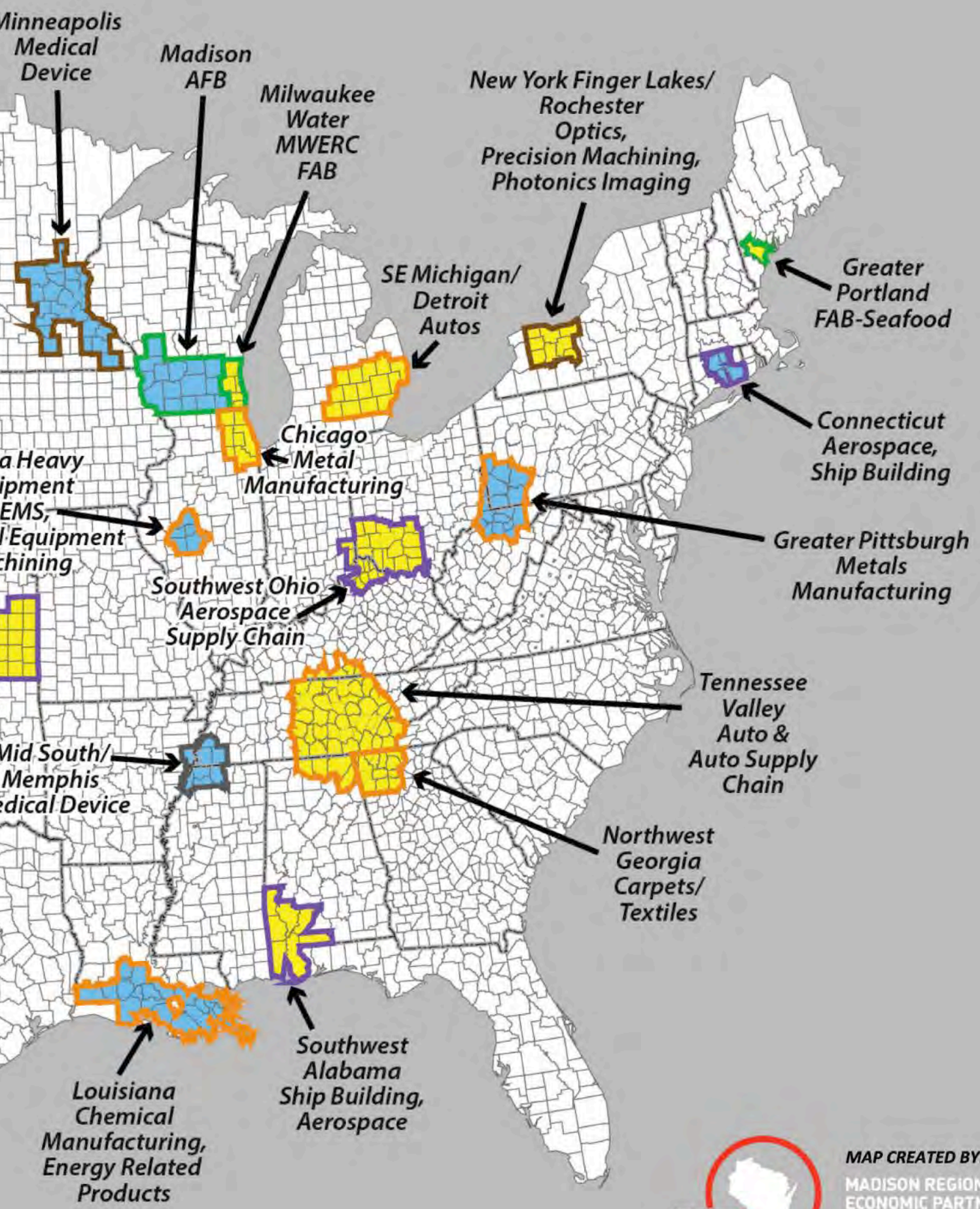






MAP CREATED BY:  
MADISON REGION  
ECONOMIC PARTNERSHIP





MAP CREATED BY:  
MADISON REGION  
ECONOMIC PARTNERSHIP

# EASTMAN



EAST TENNESSEE STATE  
UNIVERSITY



State Of Tennessee

## \$ 1 M Lab Modeled after Kell Robotics

- Kingsport / Johnson City / Bristol
- Anniston Alabama
- Switzerland
- Japan

## Site Visit to Kell Robotics / KSU







Perkins+Will, AIA

Kingsport Tennessee



## **As designed the new three-story facility will include**

- 18 science/tech labs
- Two teacher work spaces
- Six student work spaces
- One TEAL (Technology Enhanced Active Learning) lab
- One large research lab
- Four small research labs
- A student cafe
- Administrative offices

**The new facility would raise the D-B capacity to support 2,500 students at 85% utilization.**



# STEM PROJECT CENTER



STEM PROJECT CENTER  
Science Technology Engineering Mathematics  
Katy Independent School District

Central Robotics Facility + other near-field related STEM activities  
8 High Schools, 70,000+ students

Katy Texas

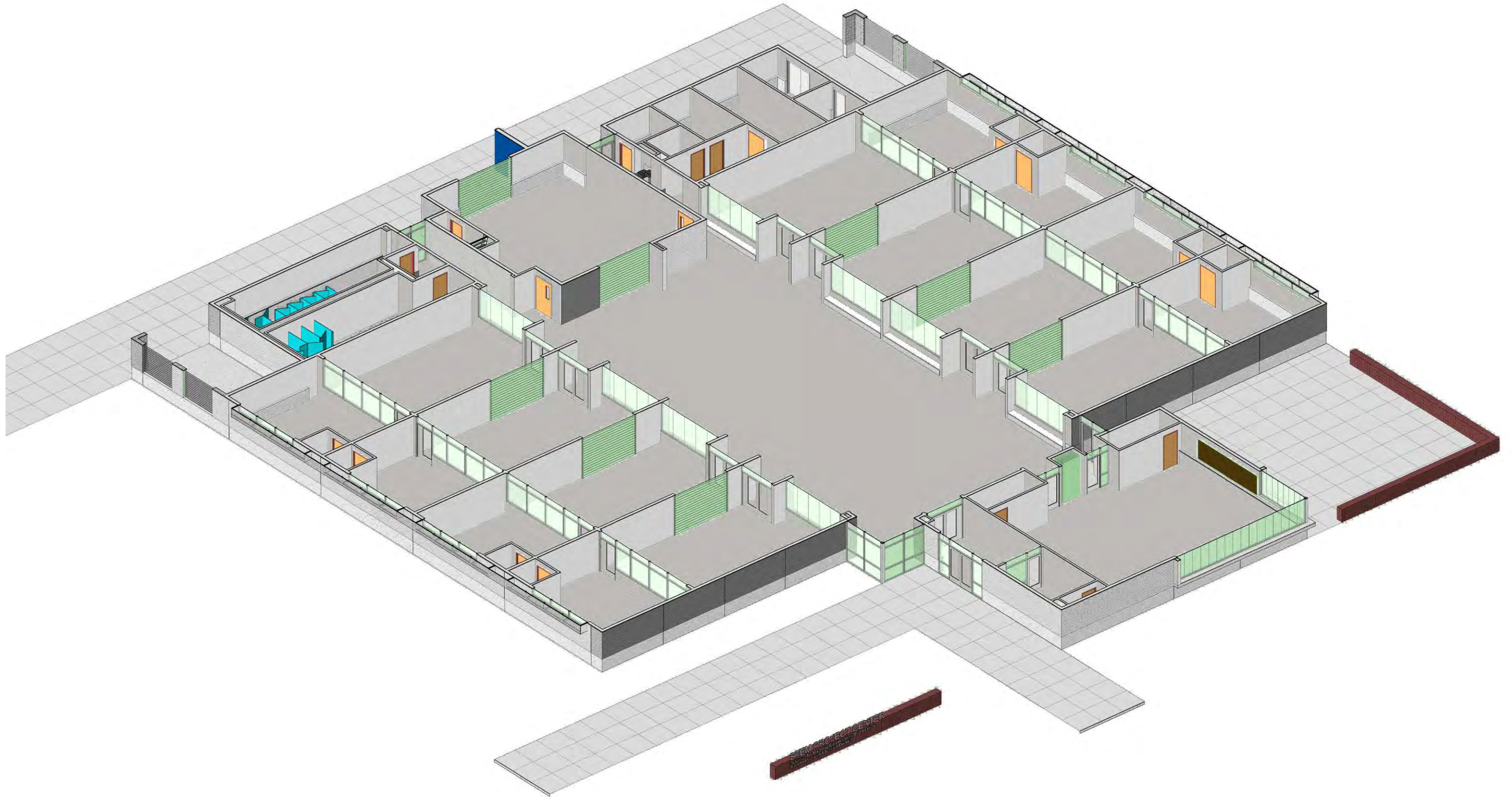












STEM PROJECT CENTER  
1000 W. 10TH AVENUE  
DENVER, CO 80202







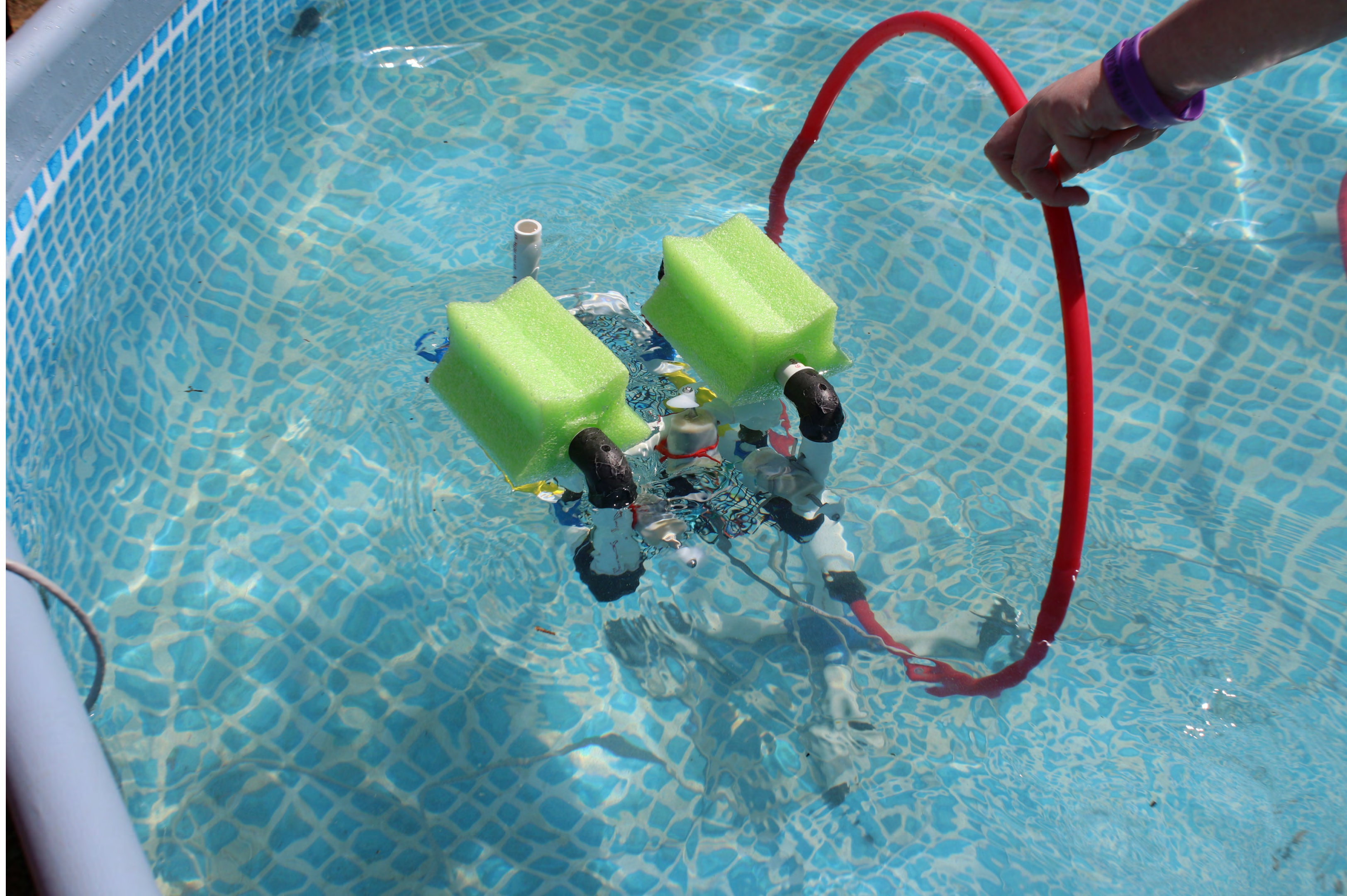
# Regional STEM Support Center











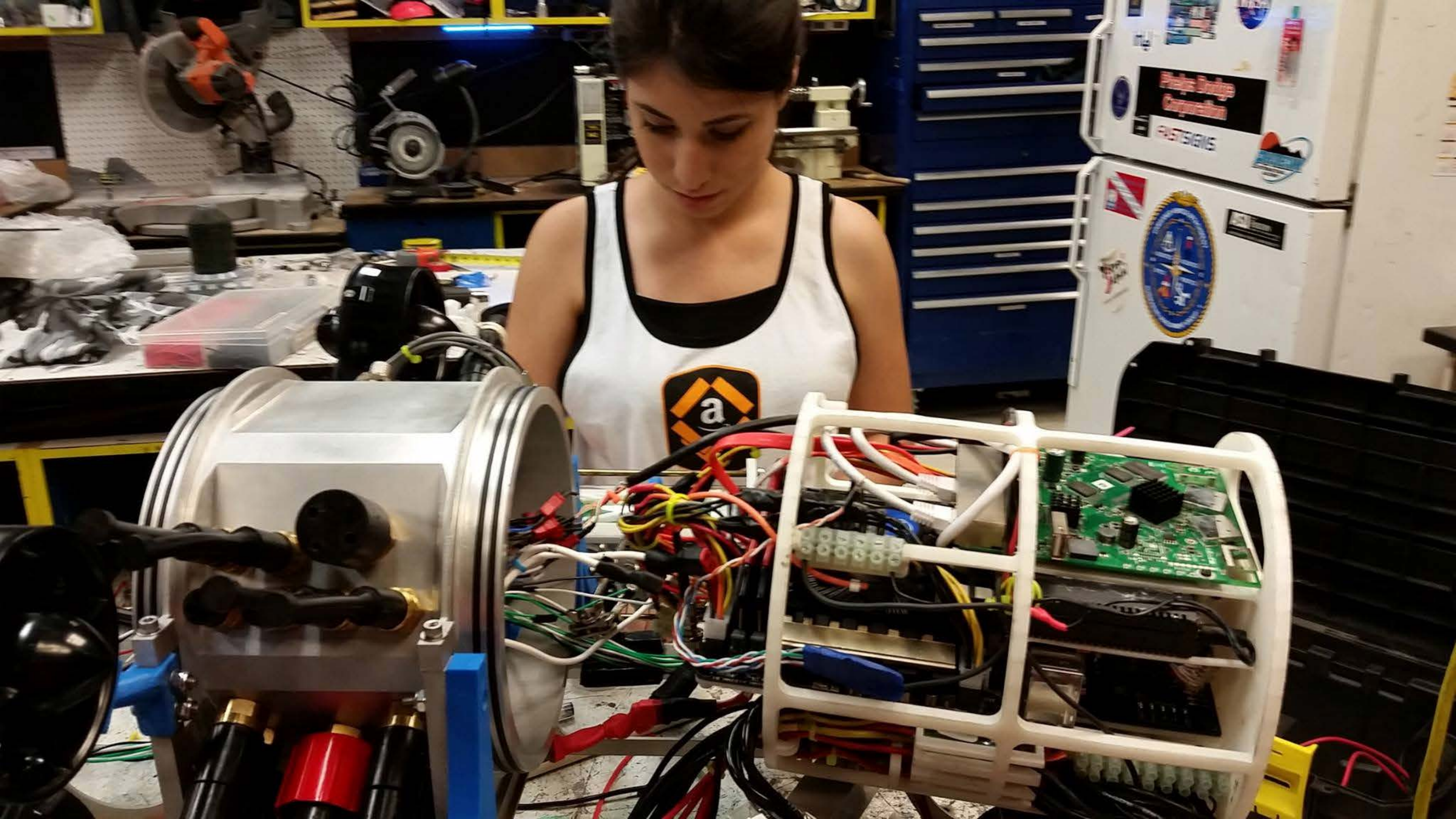




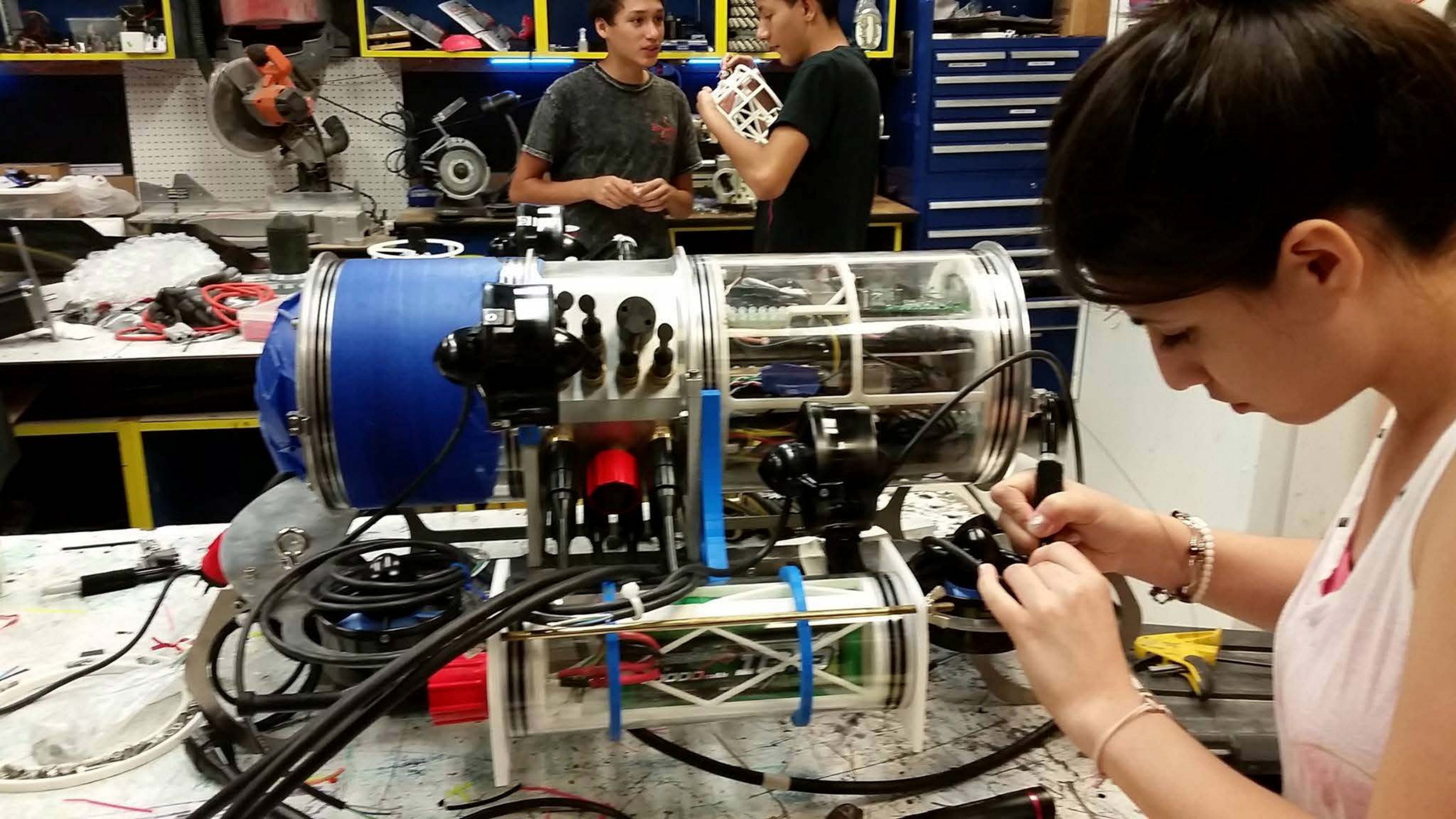




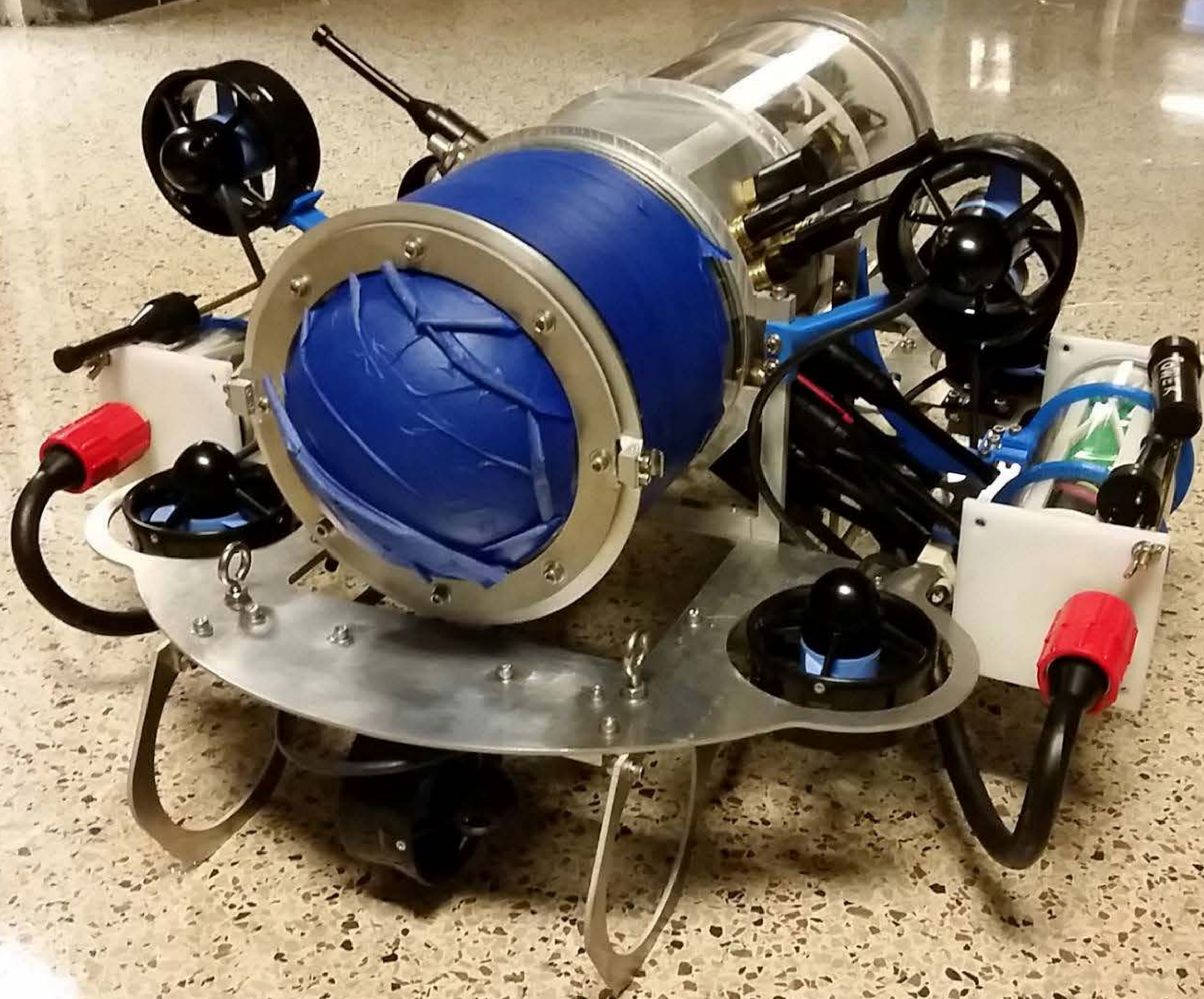
















TEAM 842

842

842

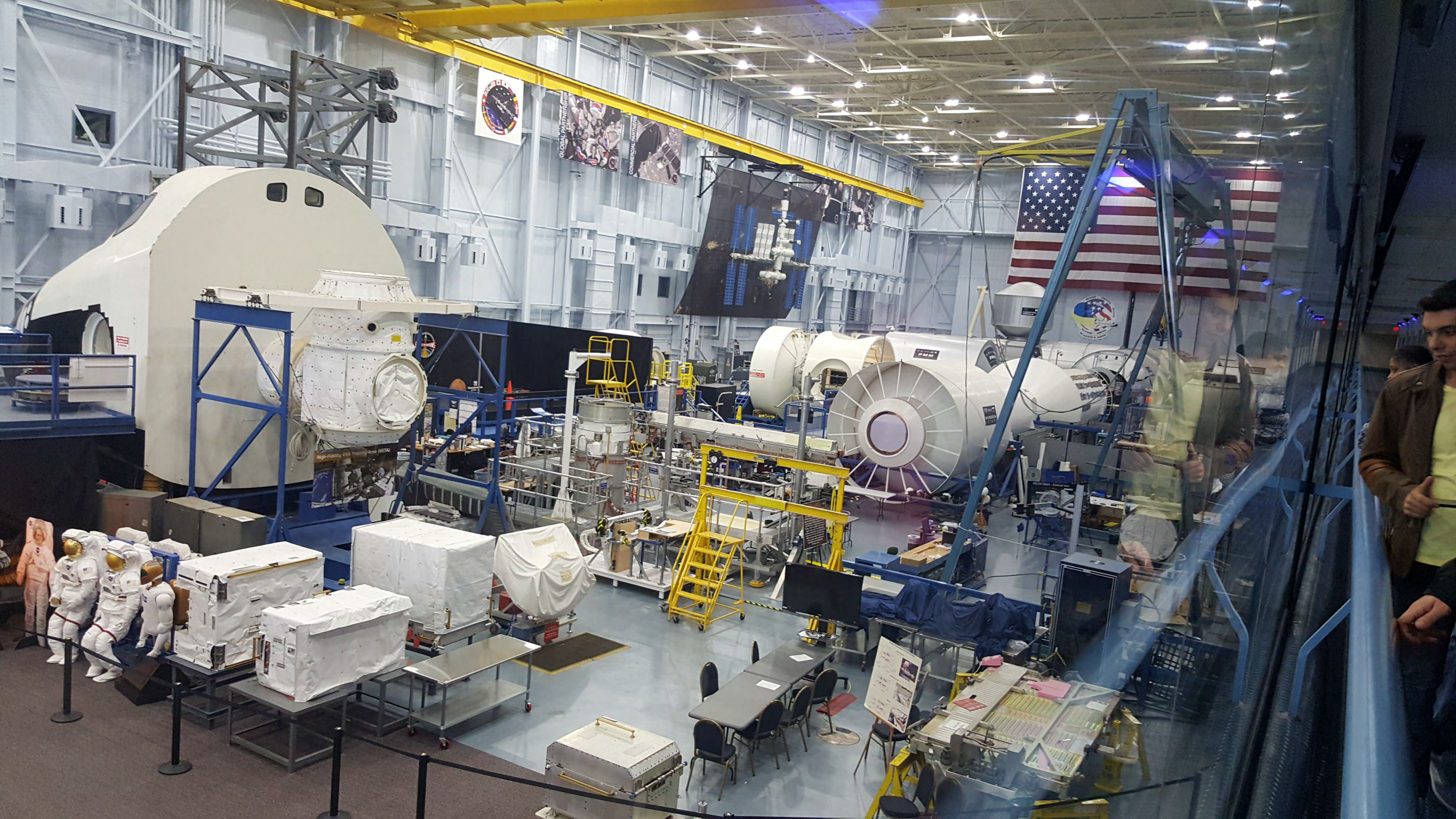
















STATES  
MODULE



ORION



BOEING

BelAir







ORION

ORION

SDSIS  
SIX DEGREE STEERING SYSTEM

COMMERCIAL  
CREW  
PROGRAM

BOEING  
STARLINER













kellrobotics



**FIRST POWER**

MSDS - Fire Extinguisher    First Aid - Medical    PPE - Glo

**TEAM 13**

Pneumatic    Electrical    Hardware

**Creativity Unl**

Drills & Chargers    Fabricated & Misc Parts    Fabricated & Misc



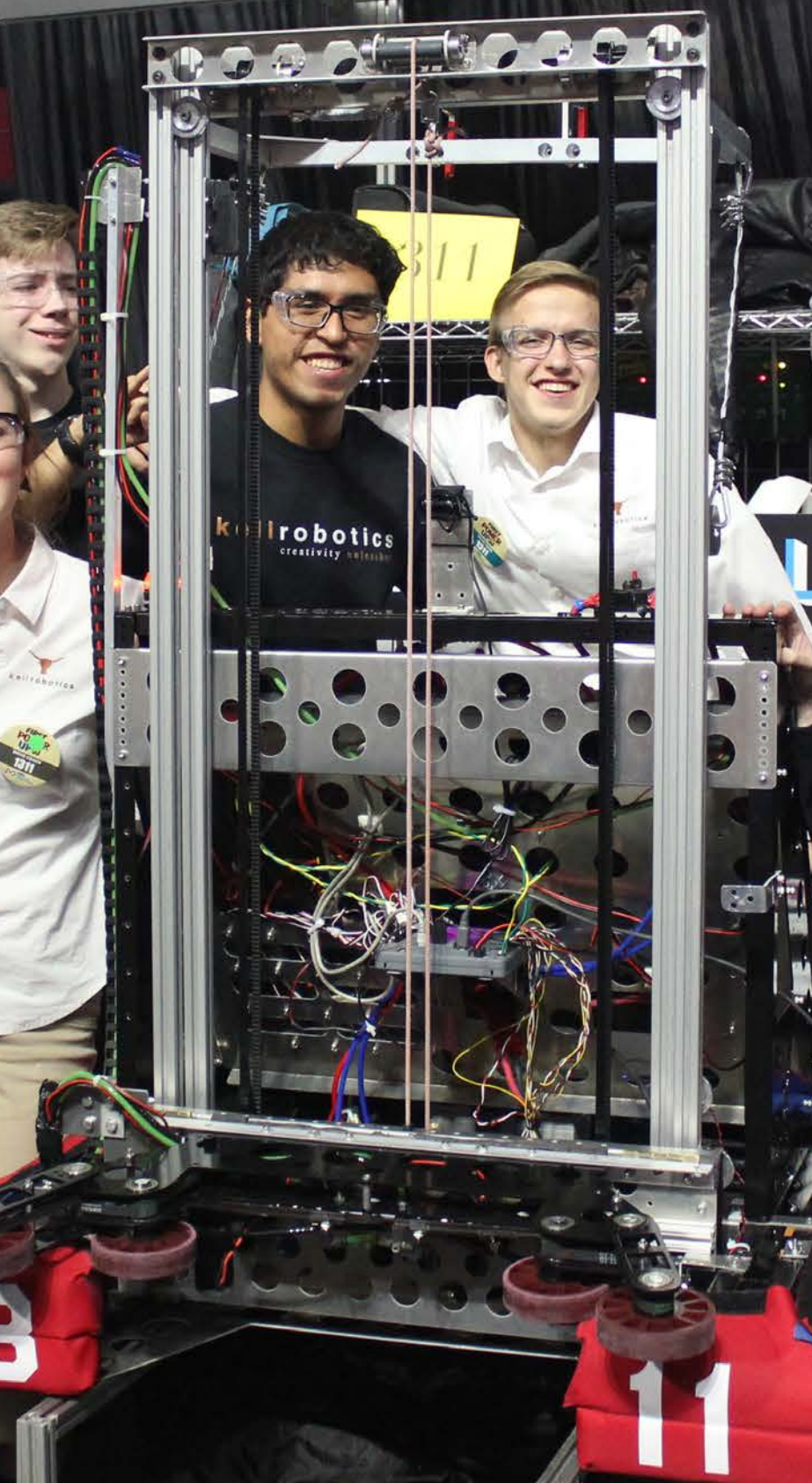


BULLDOGS

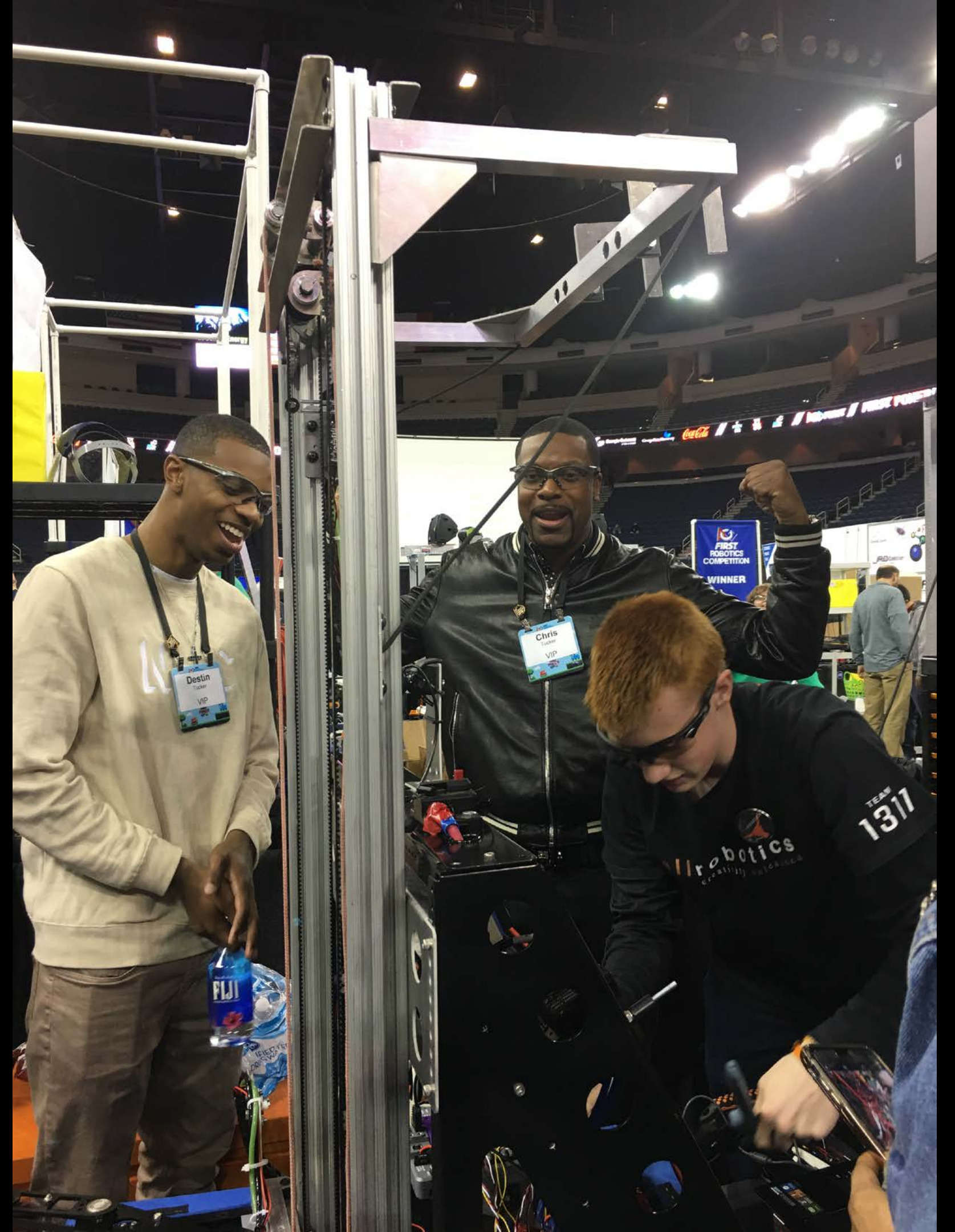
COLISEUM



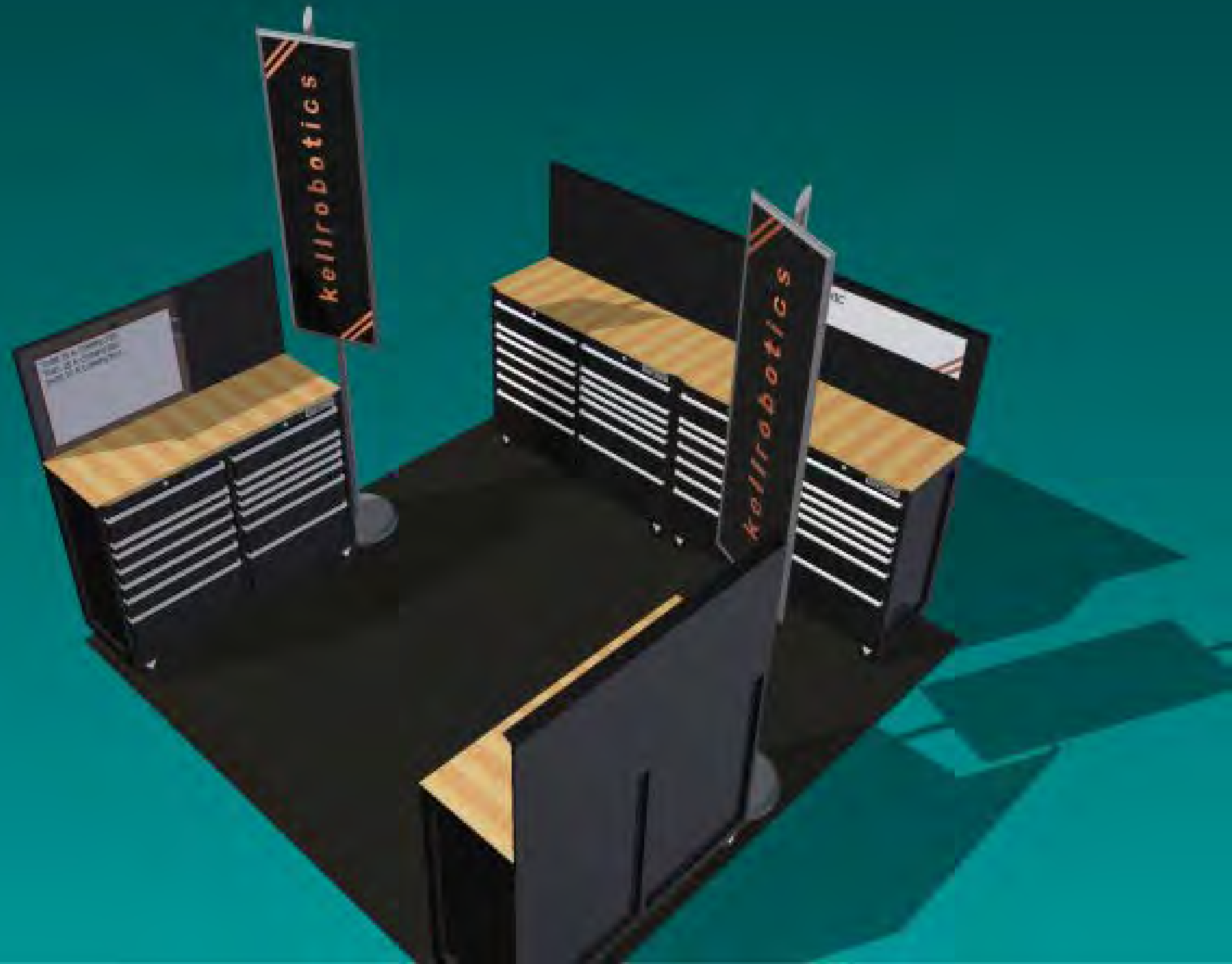
kellrobotics













kellrobotics

kellrobotics  
Let's just build something better.



mission to planet earth



TEAM 1311



kellrobotics

THIS IS A GRAPHIC  
THIS IS A GRAPHIC  
THIS IS A GRAPHIC

THIS IS A GRAPHIC

THIS IS A GRAPHIC





## Proposed Programs

### - Maker Industries

- Construction (HVAC, Welding)

- Auto Tech/Repair

- Adv. Manufacturing ↖

- Engineering/Aerospace ↖

### - Health Sciences / Bio Tech

- TBD

### - Emerging Tech

- Gaming/Animation ↖

- Cyber security ↖

- Mechatronics ↖

- CISCO (certifications) / IT Networking ↖

- Embedded Programming ↖



## Proposed Programs

### - Maker Industries

- Construction (HVAC, Welding)
- Auto Tech/Repair
- Adv. Manufacturing ↗
- Engineering/Aerospace

### - Health Sciences / Bio Tech

- TBD

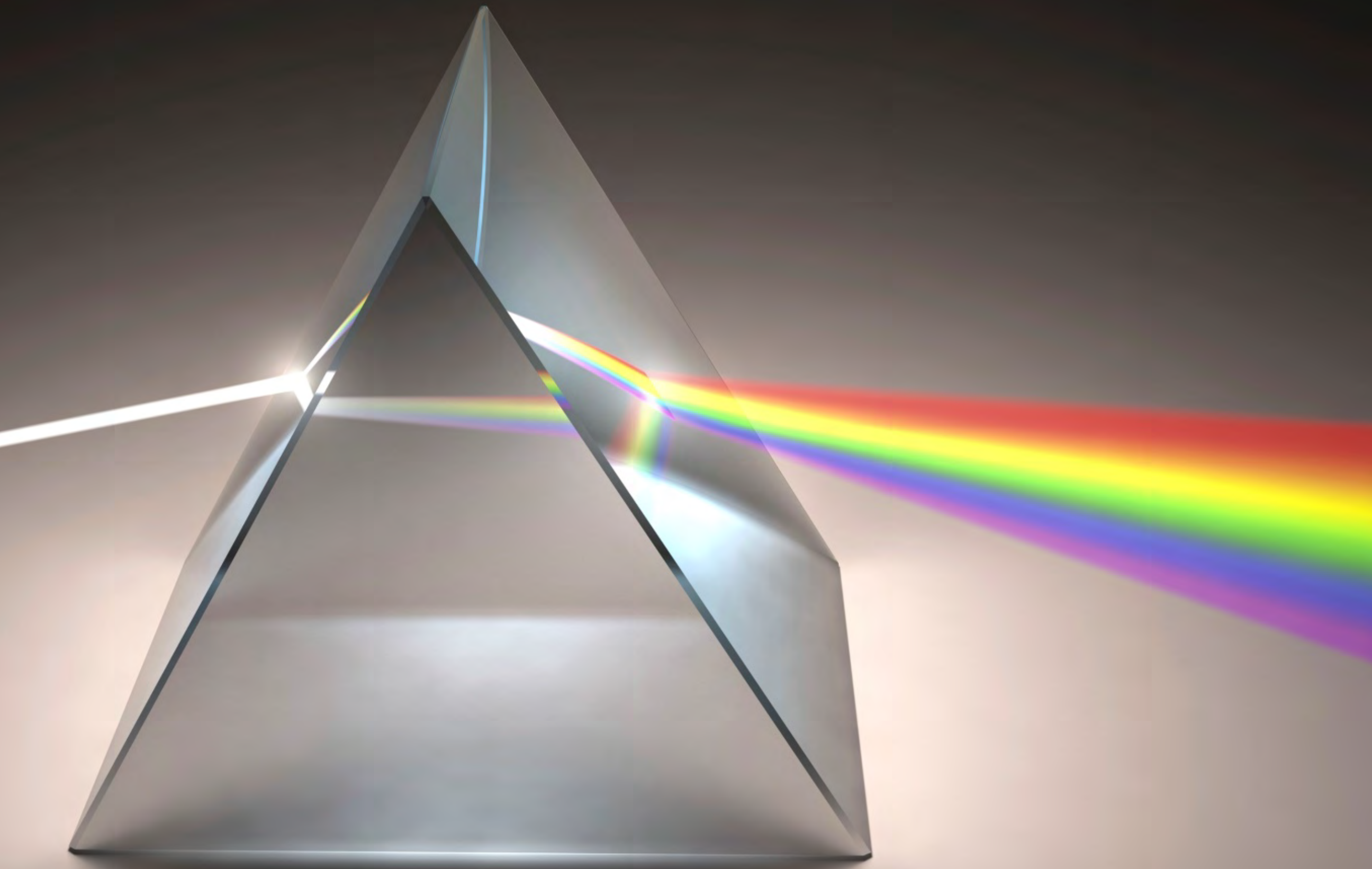
### - Emerging Tech

- Gaming/Animation
- Cyber security
- Mechatronics ↗
- CISCO (certifications) / IT Networking
- Embedded Programming

## 17 Equations That Changed the World by Ian Stewart

1. Pythagoras's Theorem  $a^2 + b^2 = c^2$  Pythagoras, 530 BC
2. Logarithms  $\log xy = \log x + \log y$  John Napier, 1610
3. Calculus  $\frac{df}{dt} = \lim_{h \rightarrow 0} \frac{f(t+h) - f(t)}{h}$  Newton, 1668
4. Law of Gravity  $F = G \frac{m_1 m_2}{r^2}$  Newton, 1687
5. The Square Root of Minus One  $i^2 = -1$  Euler, 1750
6. Euler's Formula for Polyhedra  $V - E + F = 2$  Euler, 1751
7. Normal Distribution  $\Phi(x) = \frac{1}{\sqrt{2\pi\rho}} e^{-\frac{(x-\mu)^2}{2\rho^2}}$  C.F. Gauss, 1810
8. Wave Equation  $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$  J. d'Alembert, 1746
9. Fourier Transform  $f(\omega) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \omega} dx$  J. Fourier, 1822
10. Navier-Stokes Equation  $\rho \left( \frac{\partial \mathbf{v}}{\partial t} + \mathbf{v} \cdot \nabla \mathbf{v} \right) = -\nabla p + \nabla \cdot \mathbf{T} + \mathbf{f}$  C. Navier, G. Stokes, 1845
11. Maxwell's Equations  $\nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}$   $\nabla \cdot \mathbf{H} = 0$   $\nabla \times \mathbf{E} = -\frac{1}{c} \frac{\partial \mathbf{H}}{\partial t}$   $\nabla \times \mathbf{H} = \frac{1}{c} \frac{\partial \mathbf{E}}{\partial t}$  J.C. Maxwell, 1865
12. Second Law of Thermodynamics  $dS \geq 0$  L. Boltzmann, 1874
13. Relativity  $E = mc^2$  Einstein, 1905
14. Schrodinger's Equation  $i\hbar \frac{\partial}{\partial t} \Psi = H\Psi$  E. Schrodinger, 1927
15. Information Theory  $H = -\sum p(x) \log p(x)$  C. Shannon, 1949
16. Chaos Theory  $x_{t+1} = kx_t(1 - x_t)$  Robert May, 1975
17. Black-Scholes Equation  $\frac{1}{2} \sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} - rV = 0$  F. Black, M. Scholes, 1990





BS, MS, PhD Engineering  
Research and Design

BS, MS, PhD Engineering  
Operations &  
Management

BS Engineering Technology

AS Engineering Technology

AS Technology Career Studies

Skilled Technical Trades



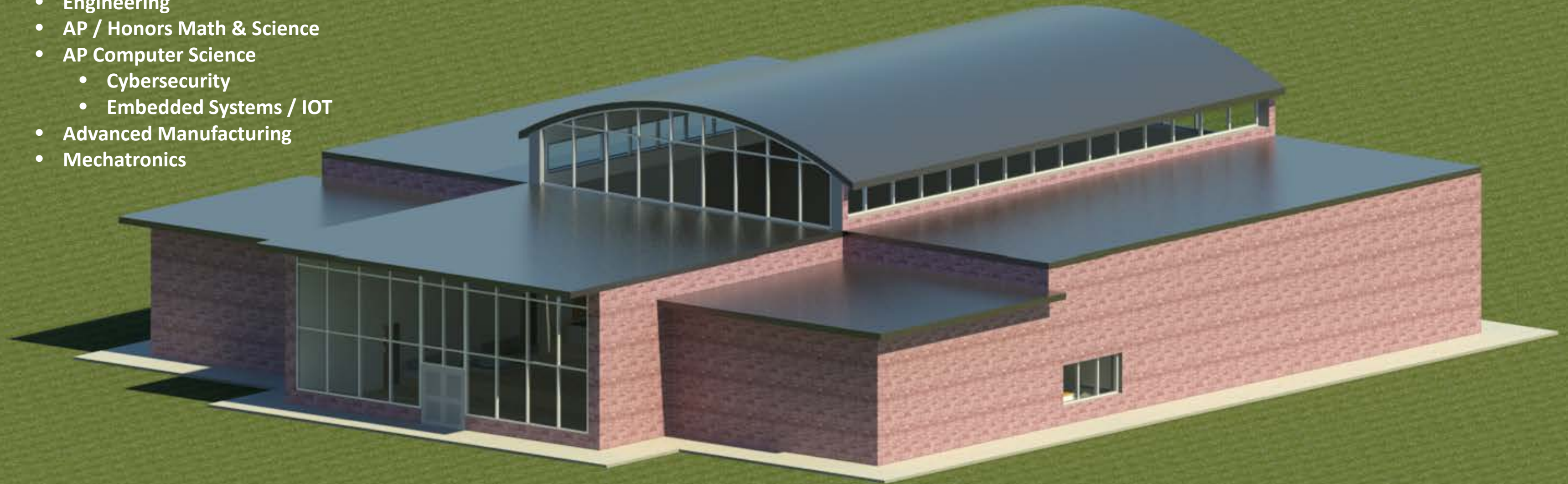
# High School STEM Gym

Oriented to develop students for:

- University level undergraduate and graduate institutions
- 2 to 4 year technical colleges, and other post-secondary programs

Academically Oriented – PLTW or equivalent foundation

- Engineering
- AP / Honors Math & Science
- AP Computer Science
  - Cybersecurity
  - Embedded Systems / IOT
- Advanced Manufacturing
- Mechatronics



Kell Robotics Student Design



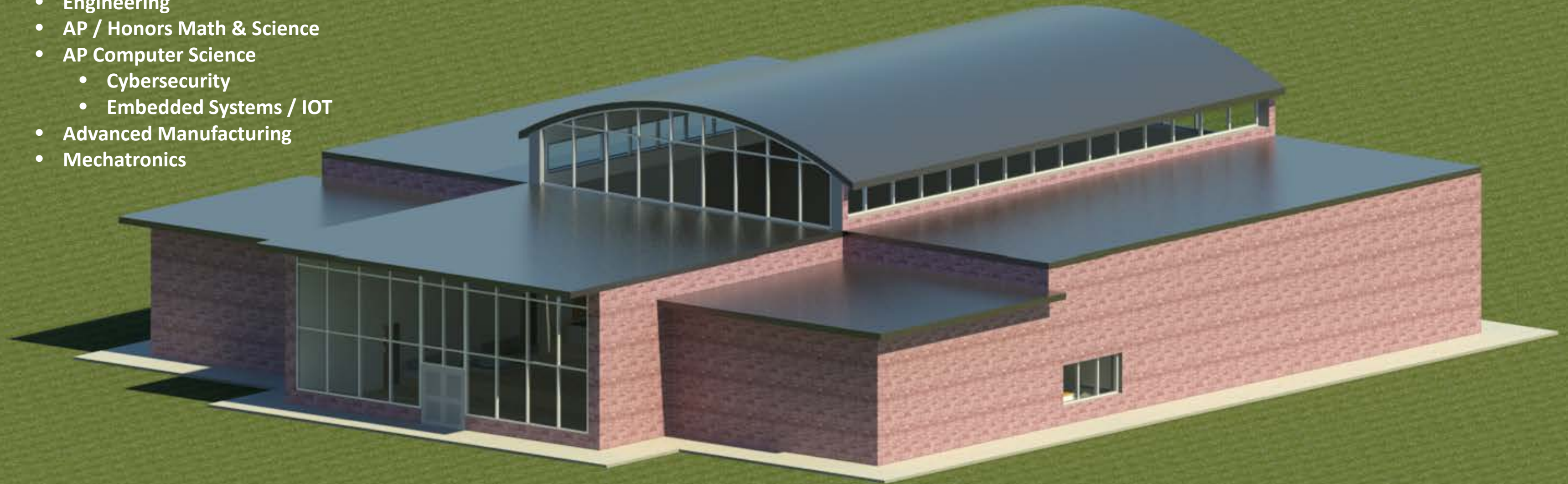
# High School STEM Gym – Engineering Magnet

Oriented to develop students for:

- University level undergraduate and graduate institutions
- 2 to 4 year technical colleges, and other post-secondary programs

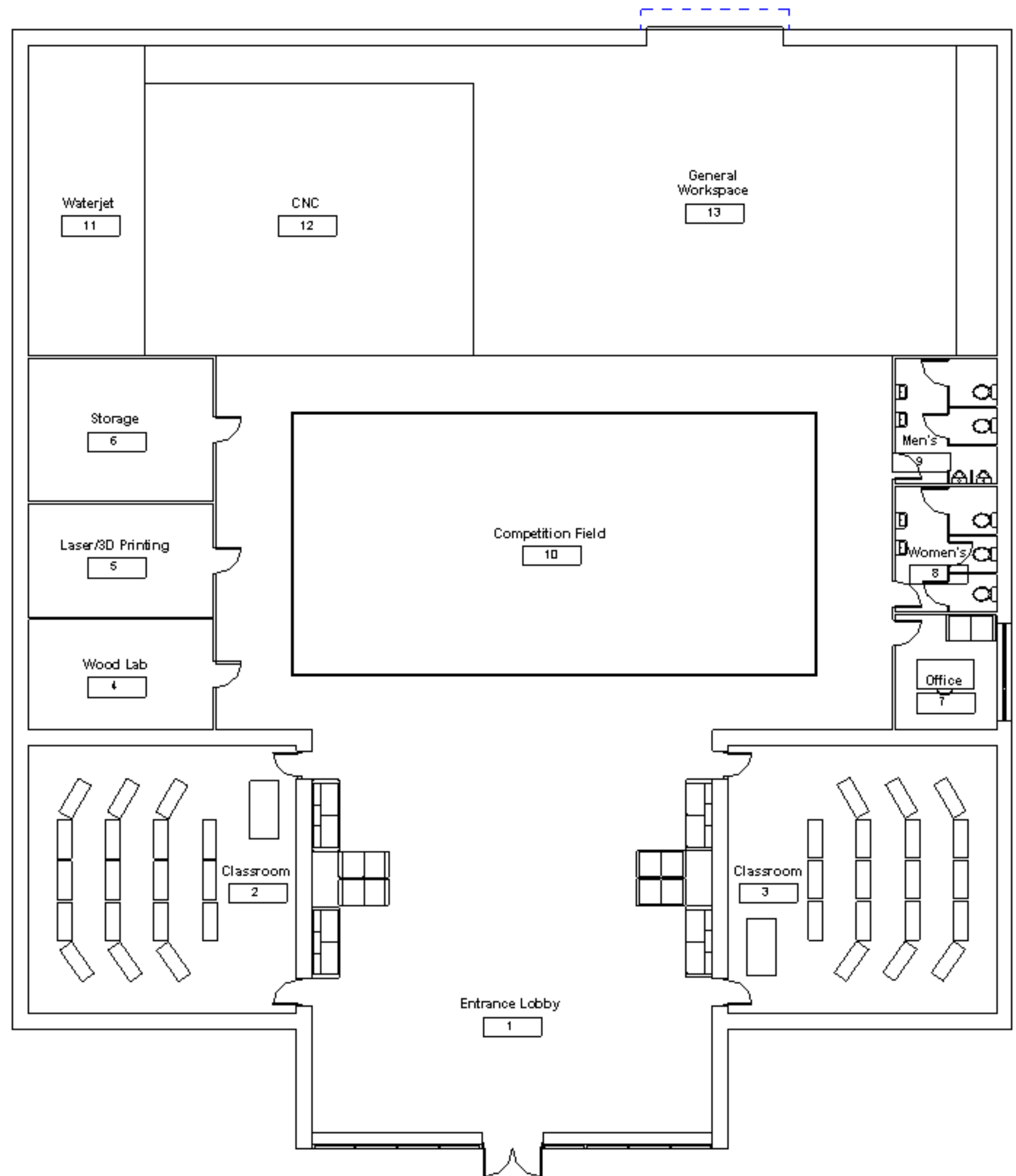
Academically Oriented – PLTW or equivalent foundation

- Engineering
- AP / Honors Math & Science
- AP Computer Science
  - Cybersecurity
  - Embedded Systems / IOT
- Advanced Manufacturing
- Mechatronics

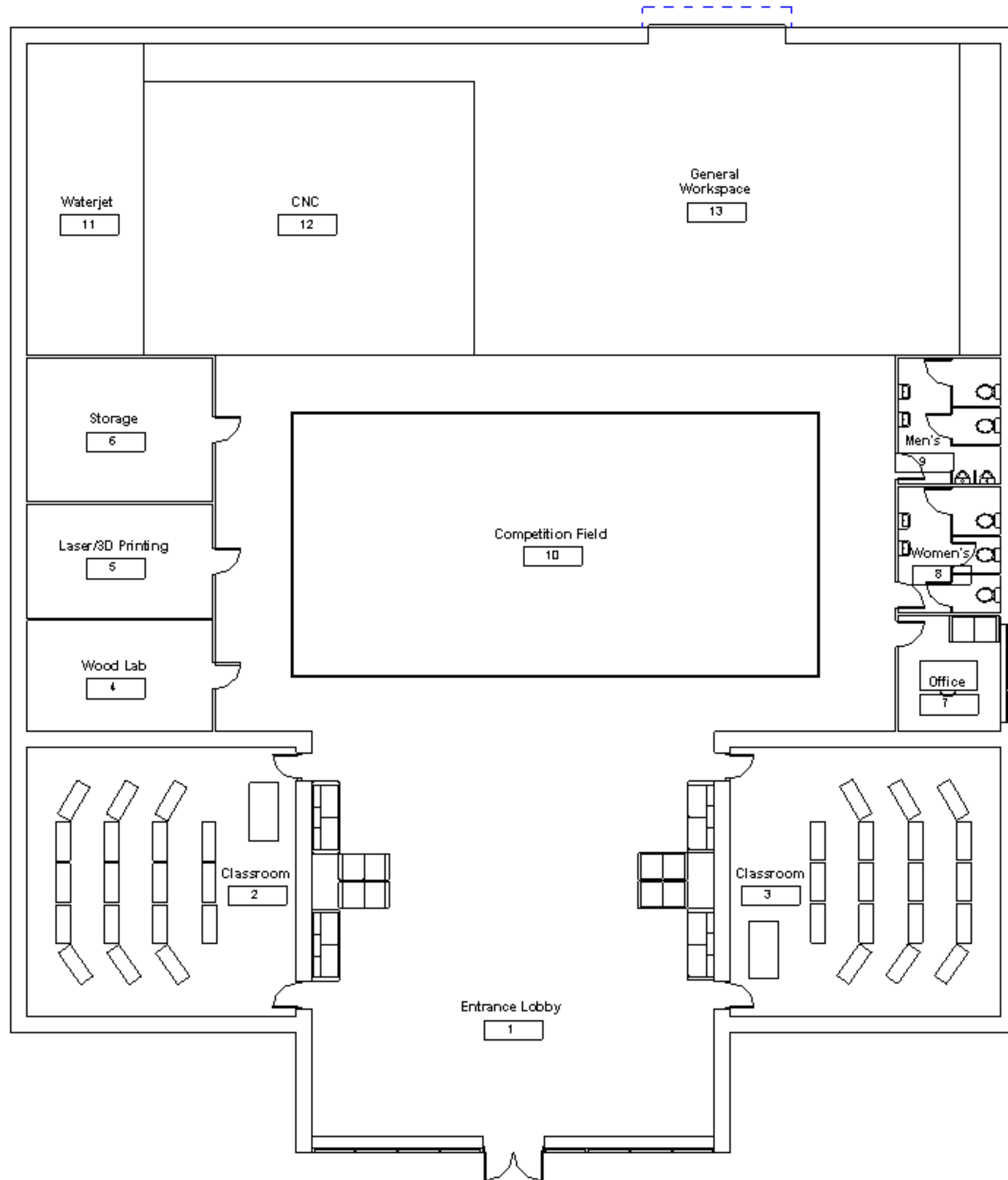


Kell Robotics Student Design













@YoUnGeStEr...  
@YOUNGESTER...



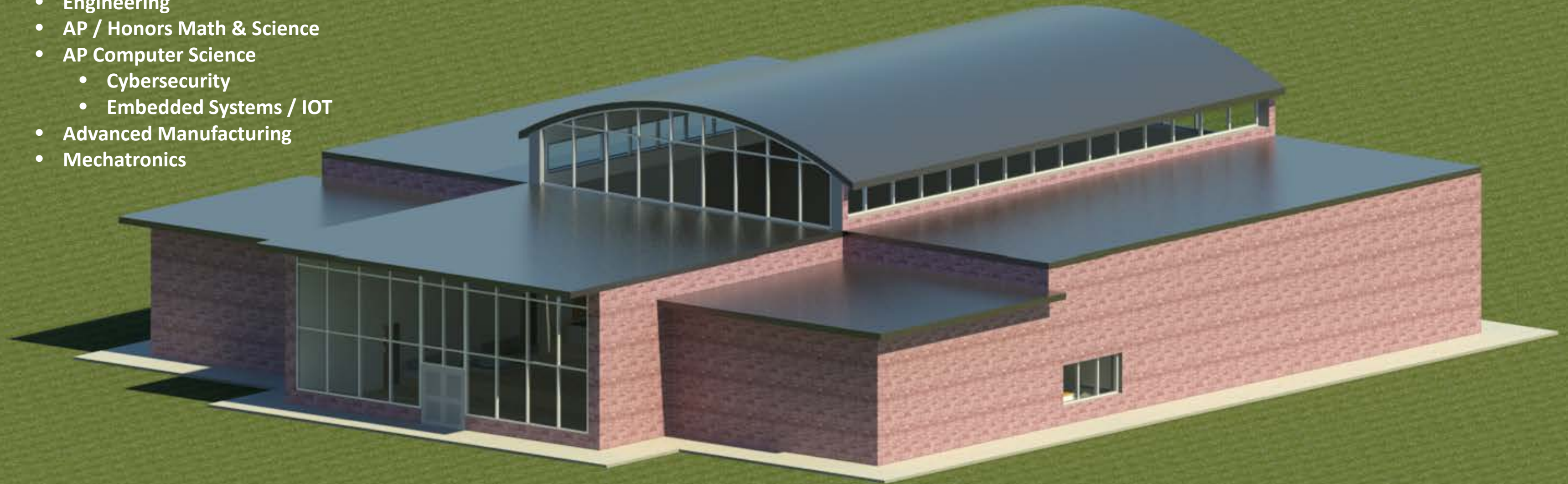
# High School STEM Gym – Engineering Magnet

Oriented to develop students for:

- University level undergraduate and graduate institutions
- 2 to 4 year technical colleges, and other post-secondary programs

Academically Oriented – PLTW or equivalent foundation

- Engineering
- AP / Honors Math & Science
- AP Computer Science
  - Cybersecurity
  - Embedded Systems / IOT
- Advanced Manufacturing
- Mechatronics



Kell Robotics Student Design



Always Remember:

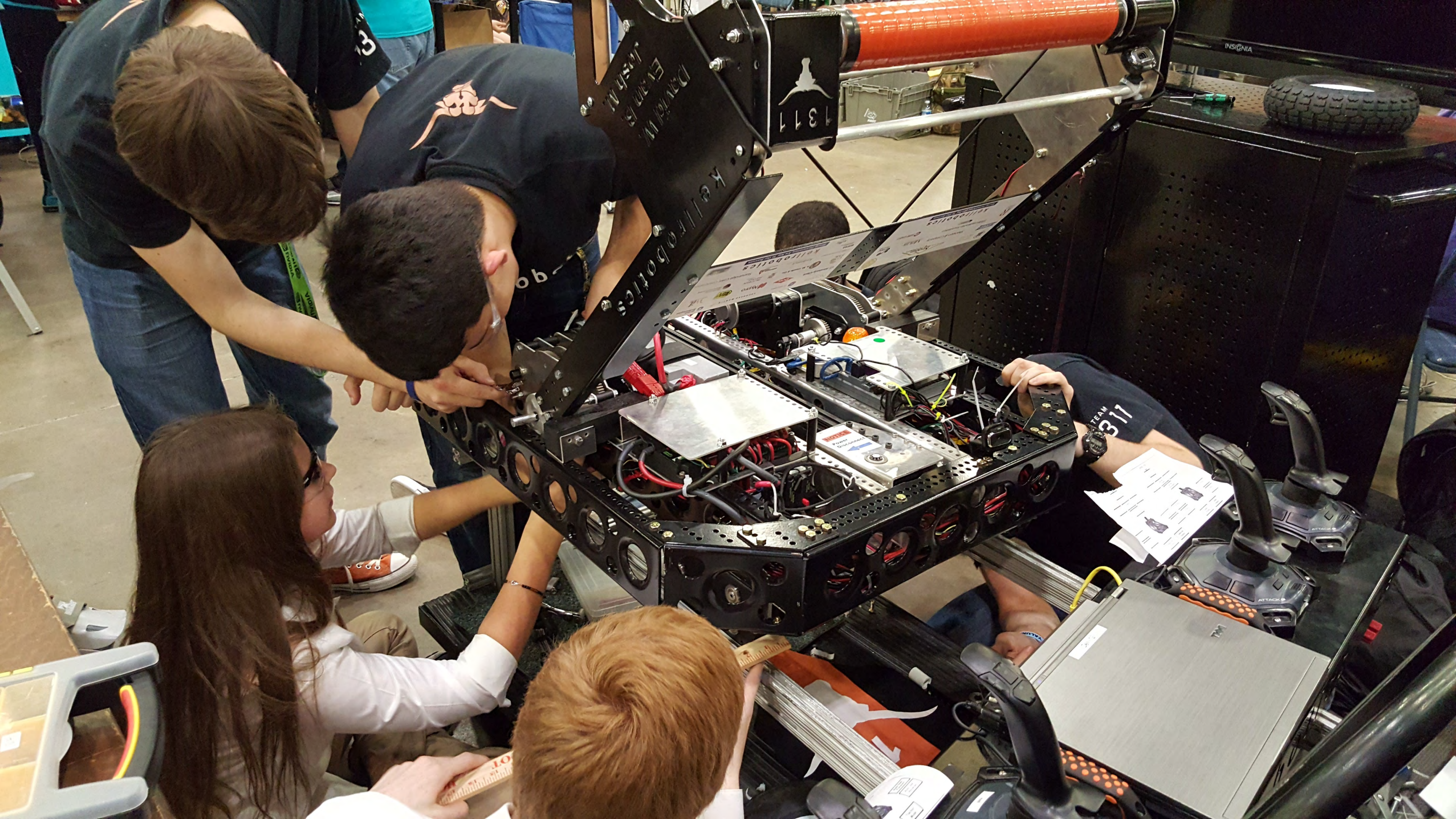
Educational Technology

And

Technology Education

Are NOT the same thing !!





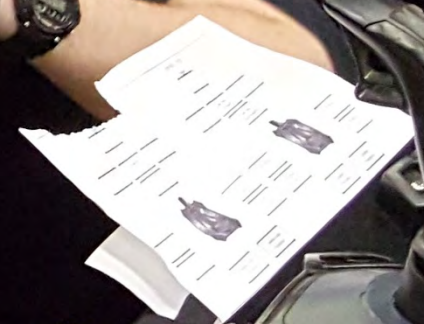
David W. EMMERSON  
K&L Robotics



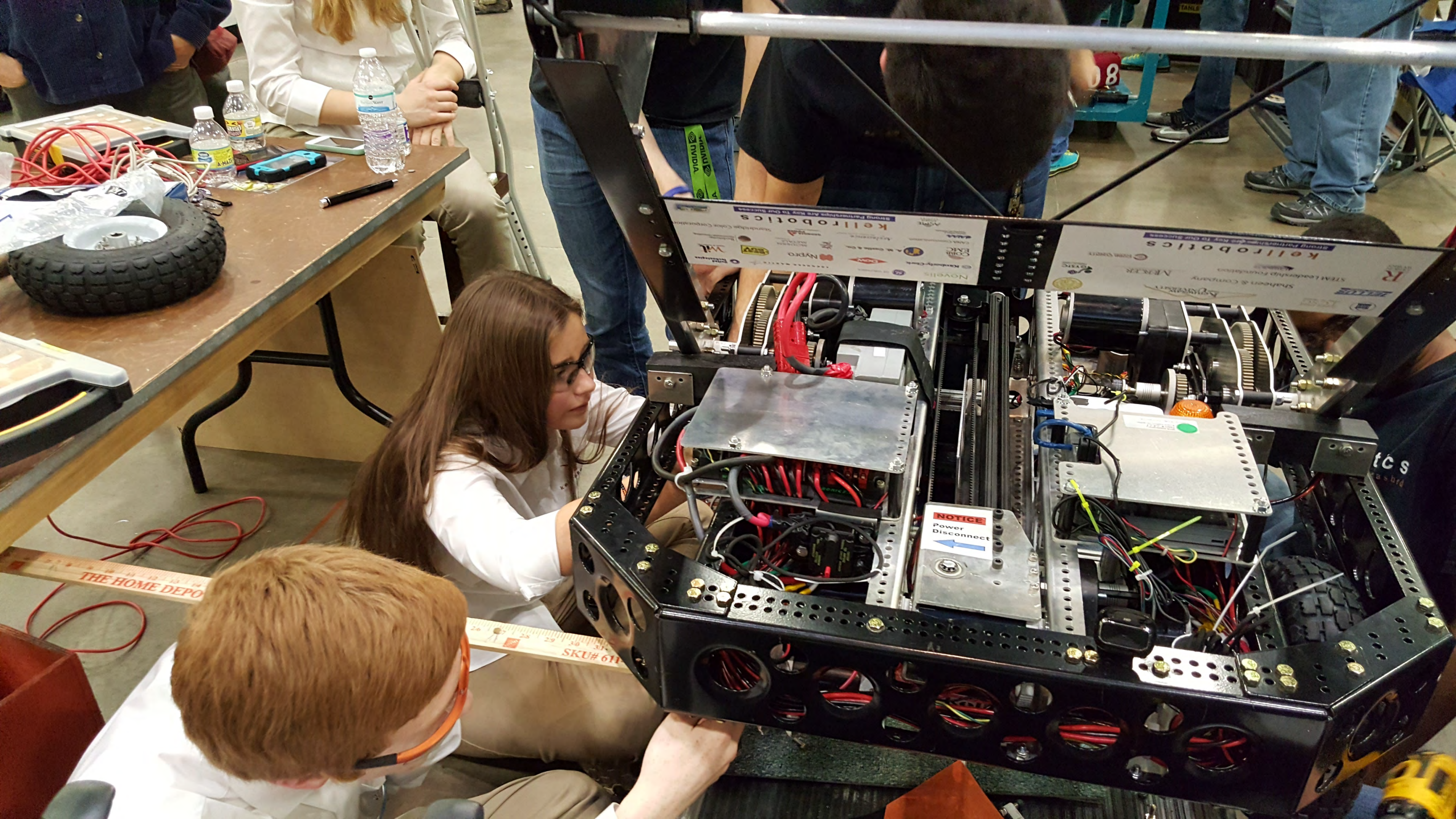
311

TEAM  
311

INSIGNIA







**Kell Robotics**  
Strong Partnerships Are Key to Our Success

Shahen & Company  
STEM Leadership Foundation  
NEXAR  
Kell Robotics

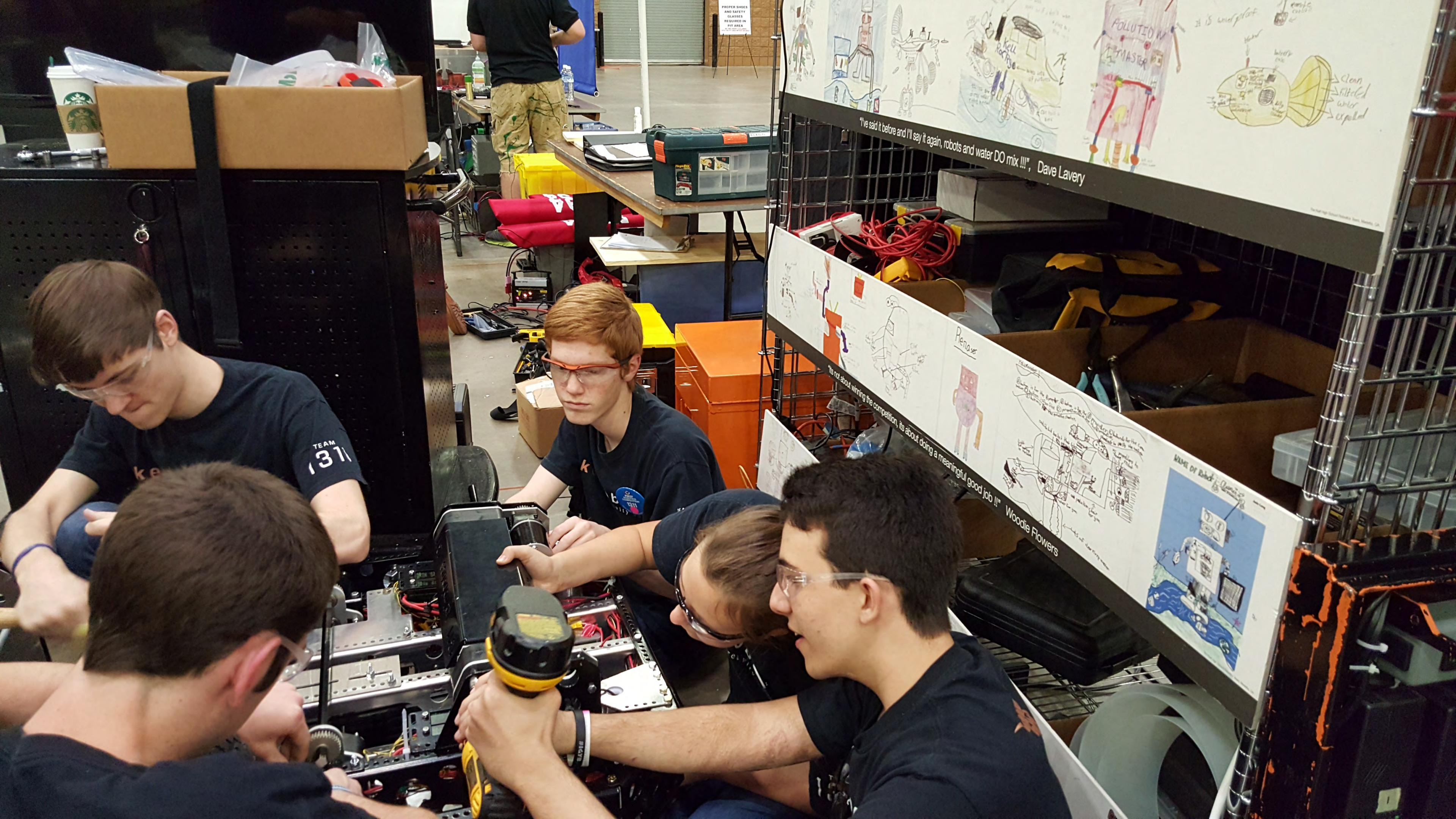
NOVELIS  
Keweenaw  
NYPRO  
WAL  
A.R. Coors  
COM-ENC  
Kell Robotics

**NOTICE**  
Power Disconnect  
←

THE HOME DEPOT

SKU# 611





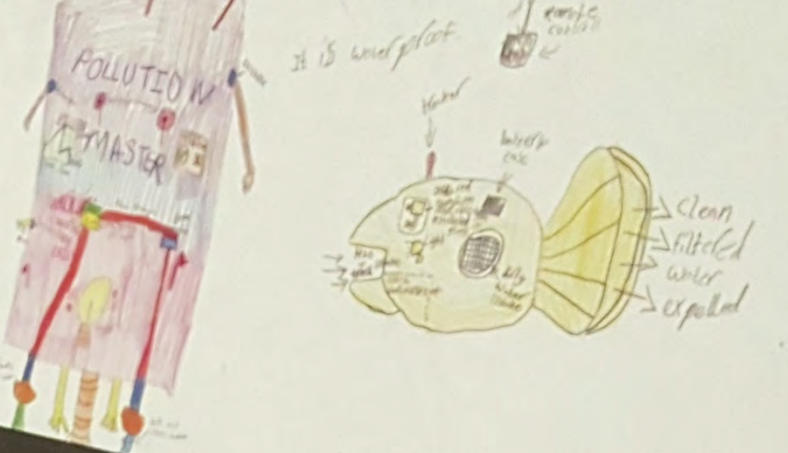
PROPER SHOES  
AND SAFETY  
GLASSES  
REQUIRED IN  
FIT AREA

"I've said it before and I'll say it again, robots and water DO mix !!!", Dave Lavery

Penoser

"It's not about winning the competition, it's about doing a meaningful good job !!"  
Woodie Flowers

NAME OF Robot: Quantis



TEAM  
131