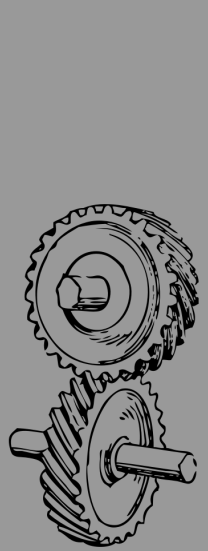


PROJECT LEAD THE WAY

PLTW

Why should you take a Project Lead the Way Engineering course?

- ★ PLTW courses offer students the opportunity to build a strong foundation for college and career paths.
- ★ Courses engage students in real-world challenges.
- ★ Students become better collaborators and thinkers.
- ★ Applied learning experiences allow students to gain skills to thrive in today's technology fields.
- ★ Students have the opportunity to earn college credit.

Each PLTW Engineering course engages students in interdisciplinary activities like working with a client to design a home, programming electronic devices or robotic arms, or exploring algae as a biofuel source. These activities not only build knowledge and skills in engineering, but also empower students to develop essential skills such as problem solving, critical and creative thinking, communication, collaboration, and perseverance.

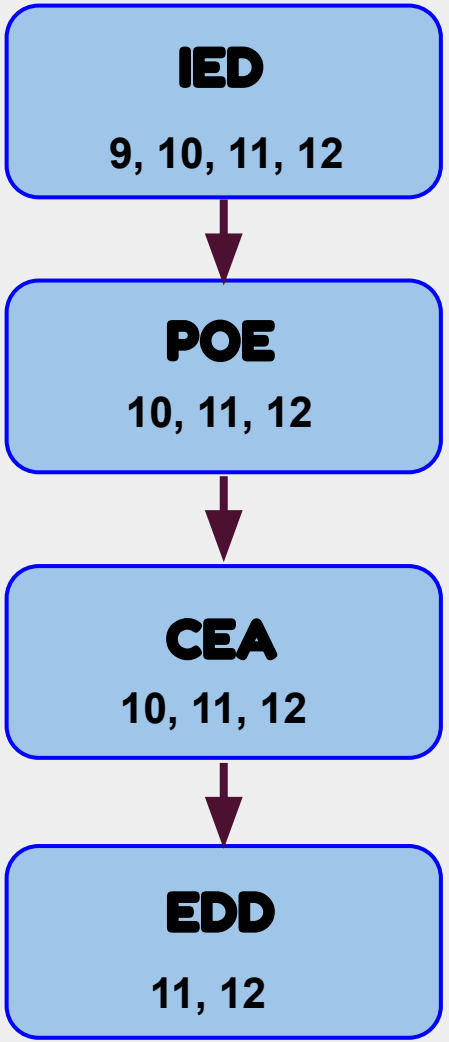
PROJECT LEAD THE WAY PLTW

https://www.pltw.org/our-programs/pltw-engineering

Jefferson City High School

Project Lead the Way - Engineering

- **Introductory Courses**
  - ➔ Introduction to Engineering Design (IED)
  - ➔ Principles of Engineering (POE)
- **Specialization Courses**
  - ➔ Civil Engineering and Architecture (CEA)
- **Capstone Course**
  - ➔ Engineering Design and Development (EDD)



Engineering Branch (JCHS)

- Introduction to Engineering Design
- Principles of Engineering
- Civil Engineering and Architecture
- Engineering Design and Development

Introduction to Engineering Design (IED)

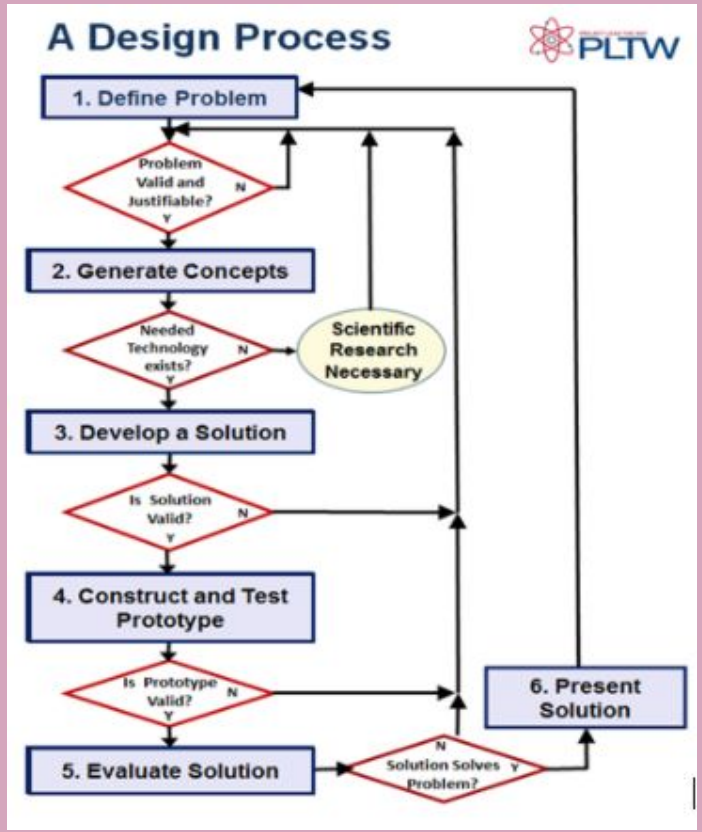
Students dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects. They work both individually and in teams to design solutions to a variety of problems using 3D modeling software, and use an engineering notebook to document their work.

Offered to students in grades 9, 10, 11, 12
Prerequisites: Successful completion of Algebra I or teacher recommendation.

https://www.pltw.org/our-programs/pltw-engineering

Introduction to Engineering Design (IED)

- The Design Process
- Technical Drawing Skills
- CAD Modeling Skills (Fusion 360)
- Computational and Analytical Skills
- Professional Skills
- Presentations
- Modeling in Engineering



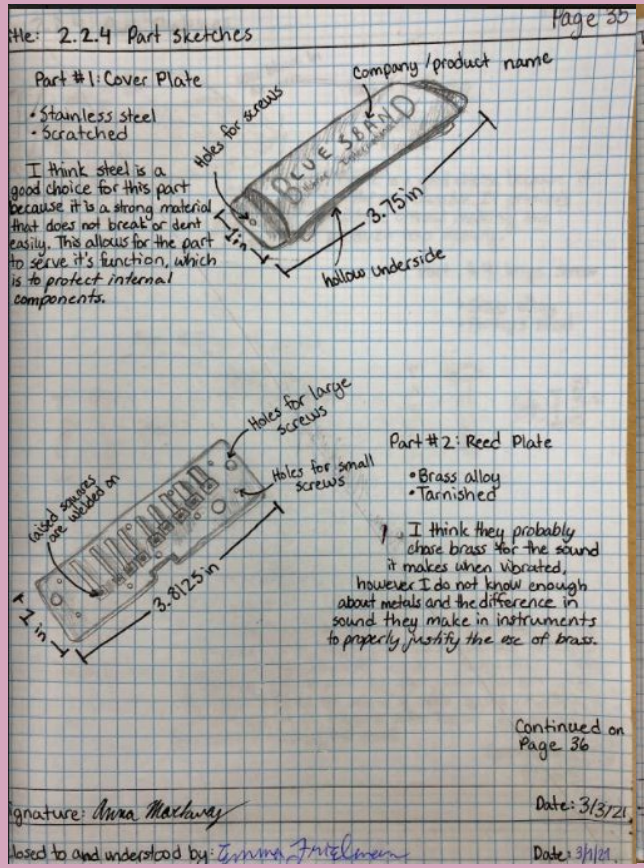
The Skyscraper Design Challenge

Key Chains

3D Printer Projects

The Automata Design Challenge

Technical Drawings in the Engineering Notebook



Title: 2.2.4 Part Sketches

Page 35

Part #1: Cover Plate

- Stainless steel
- Scratched

I think steel is a good choice for this part because it is a strong material that does not break or dent easily. This allows for the part to serve it's function, which is to protect internal components.

Part #2: Reed Plate

- Brass alloy
- Tarnished

I think they probably chose brass for the sound it makes when vibrated, however I do not know enough about metals and the difference in sound they make in instruments to properly justify the use of brass.

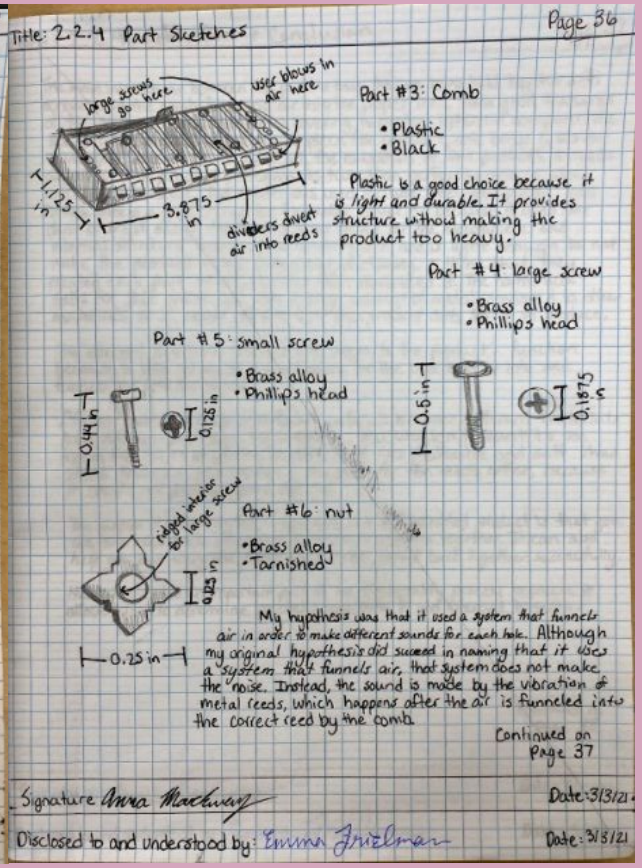
Continued on Page 36

Signature: Anna Markaway

Date: 3/3/21

Disclosed to and understood by: Emma Friedman

Date: 3/3/21



Title: 2.2.4 Part Sketches

Page 36

Part #3: Comb

- Plastic
- Black

Plastic is a good choice because it is light and durable. It provides structure without making the product too heavy.

Part #4: large screw

- Brass alloy
- Phillips head

Part #5: small screw

- Brass alloy
- Phillips head

Part #6: nut

- Brass alloy
- Tarnished

My hypothesis was that it used a system that funnels air in order to make different sounds for each hole. Although my original hypothesis did succeed in naming that it uses a system that funnels air, that system does not make the noise. Instead, the sound is made by the vibration of metal reeds, which happens after the air is funneled into the correct reed by the comb.

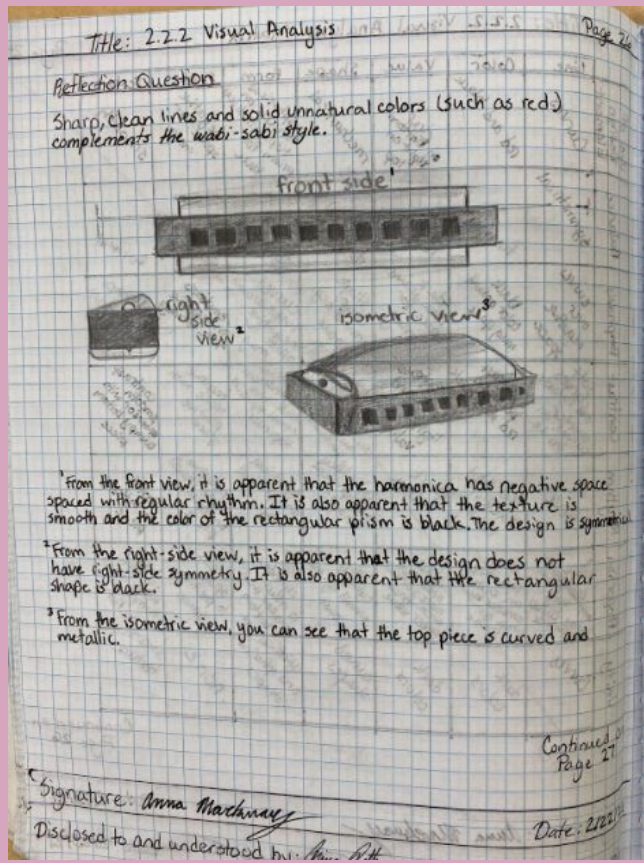
Continued on Page 37

Signature: Anna Markaway

Date: 3/3/21

Disclosed to and understood by: Emma Friedman

Date: 3/5/21



Title: 2.2.2 Visual Analysis

Page 26

Reflection Question

Sharp, clean lines and solid unnatural colors (such as red) complements the wabi-sabi style.

1 From the front view, it is apparent that the harmonica has negative space spaced with regular rhythm. It is also apparent that the texture is smooth and the color of the rectangular prism is black. The design is symmetric.

2 From the right-side view, it is apparent that the design does not have right-side symmetry. It is also apparent that the rectangular shape is black.

3 From the isometric view, you can see that the top piece is curved and metallic.

Continued Page 27

Signature: Anna Markaway

Date: 2/22

Disclosed to and understood by:

Principles of Engineering (POE)

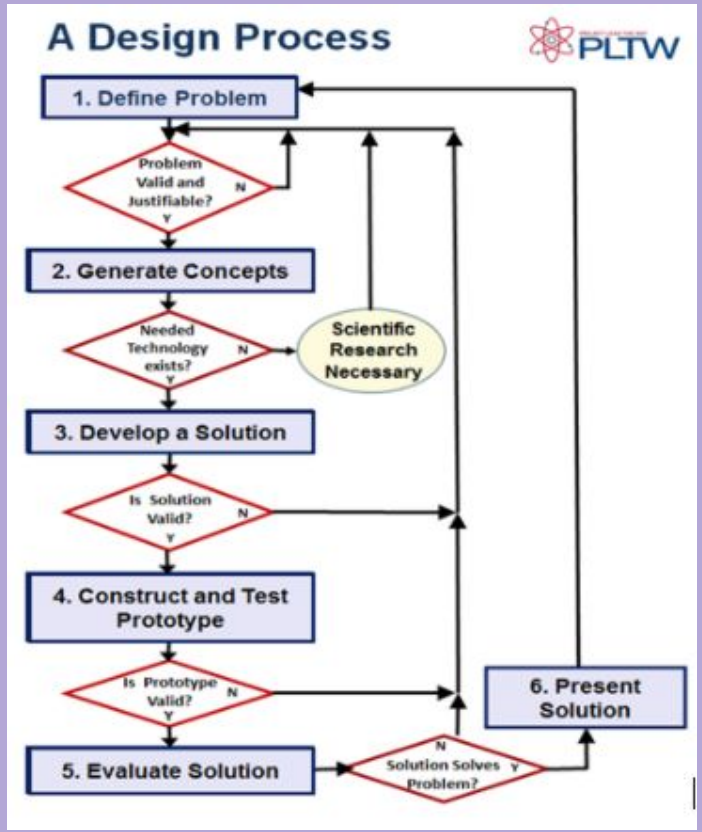
Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation.

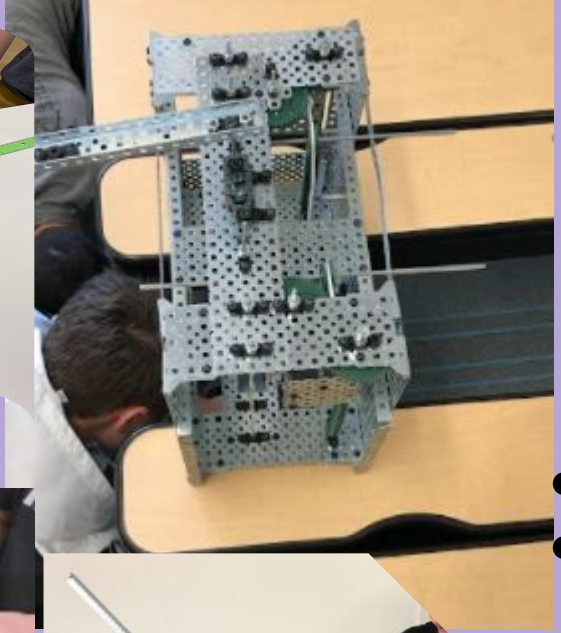
Offered to students in grades 10, 11, 12
Prerequisites: Successful completion of Algebra I.

https://www.pltw.org/our-programs/pltw-engineering

Principles of Engineering (POE)

- Mechanisms and simple machines
- Mechanical advantage
- Energy sources and applications
- Fluid Power
- Control Systems (Coding)
- Material properties
- Centroids
- Tensile testing
- Vectors, forces, and statics
- Trusses
- Presentations

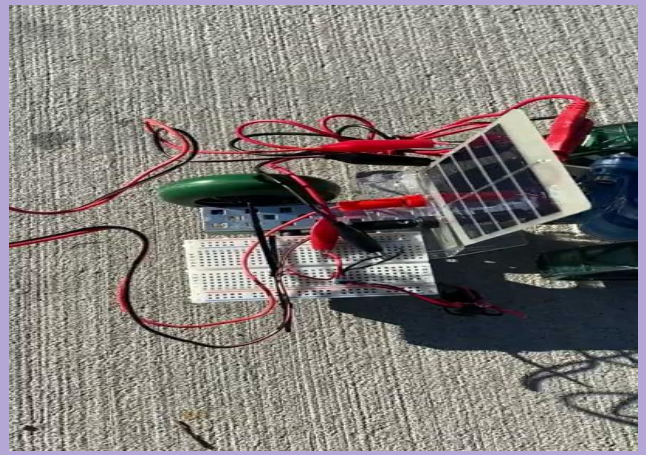




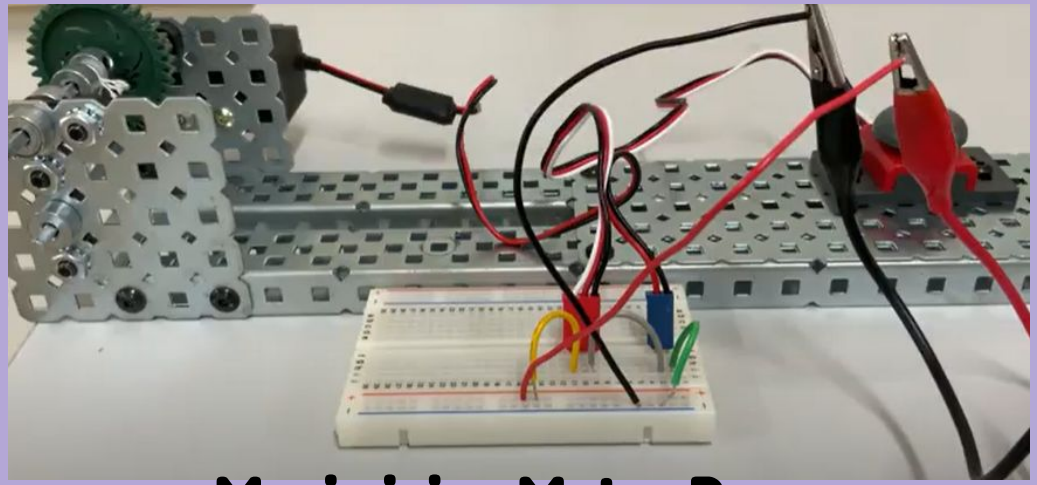
Compound Machine Design

- Maximum 2 base plates
- At least 3 simple machines
- Must lift a toolbox (weight varies each year) minimum 5 inches
- Only one human input force

Energy Sources and Applications



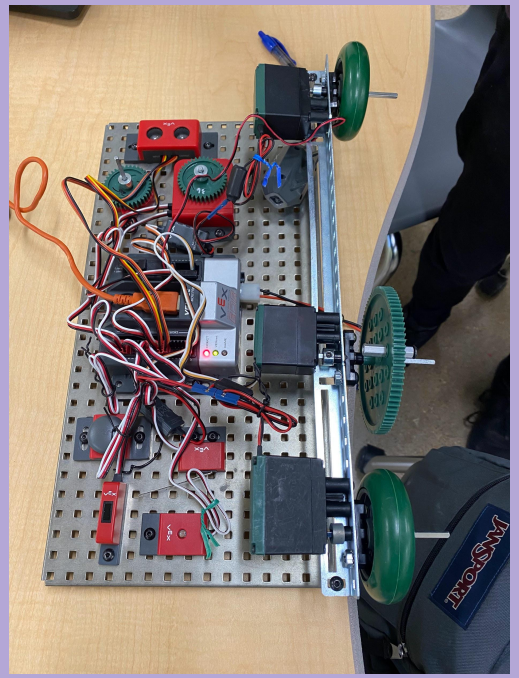
Solar Panel and Hydrogen Fuel Cells

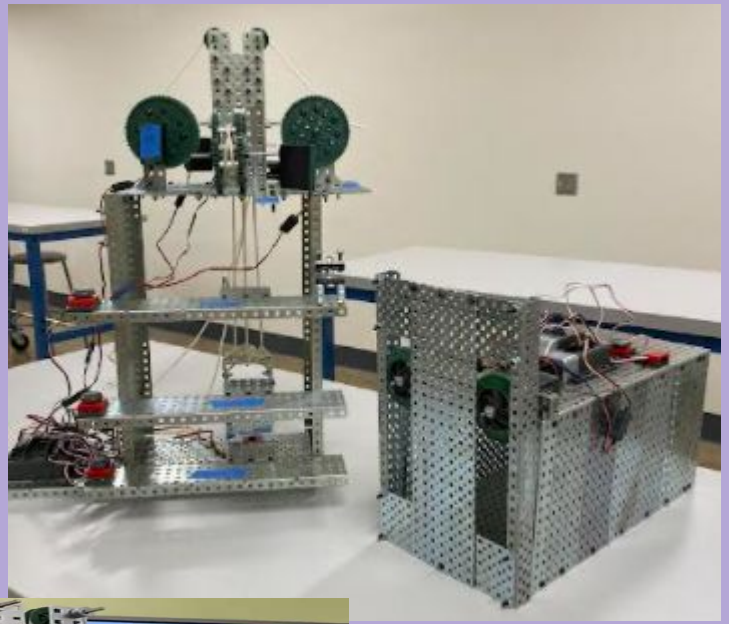


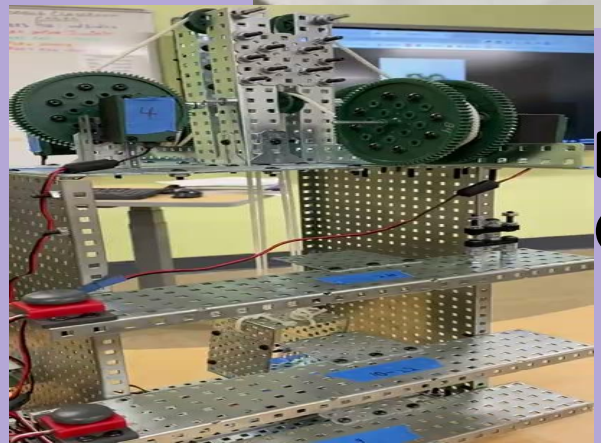
Maximizing Motor Power

Fluid Power

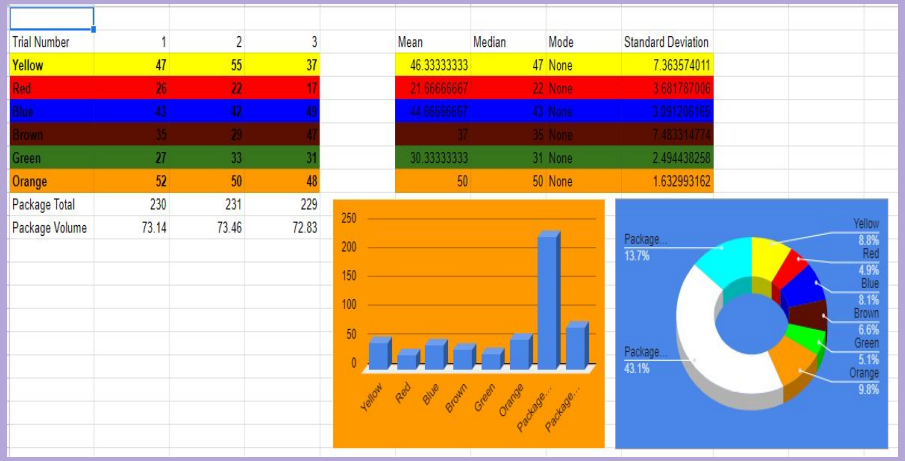
The Testbed



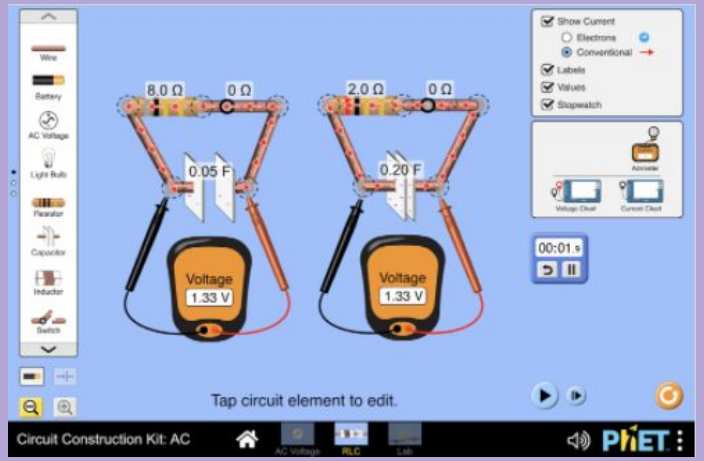




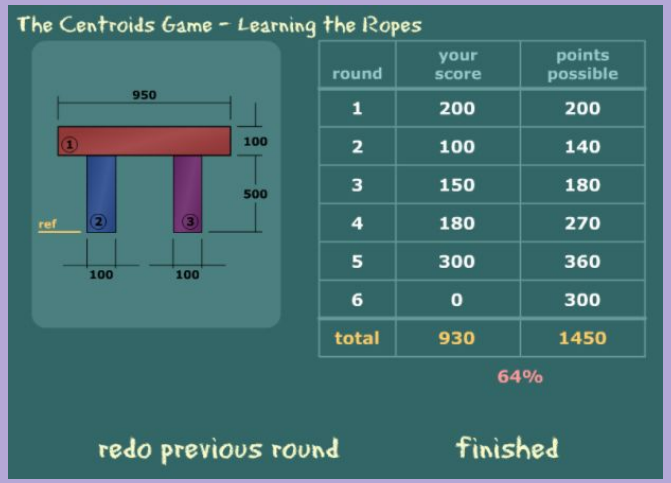
Machine Control Design

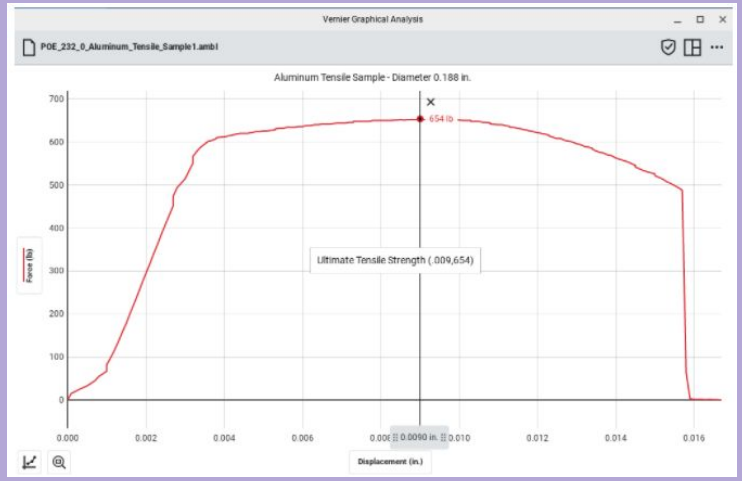


Trial Number	1	2	3	Mean	Median	Mode	Standard Deviation
Yellow	47	55	37	46.33333333	47	None	7.363574011
Red	26	22	17	21.66666667	22	None	3.681787006
Blue	43	42	49	44.66666667	43	None	3.091206165
Brown	35	29	42	37	35	None	7.48331477
Green	27	33	31	30.33333333	31	None	2.494438258
Orange	52	50	48	50	50	None	1.632993162
Package Total	230	231	229				
Package Volume	73.14	73.46	72.83				



Software and Simulation Applications





Civil Engineering and Architecture (CEA)

Students learn important aspects of building and site design and development. They apply math, science, and standard engineering practices to design both residential and commercial projects and document their work using 3D architecture design software.

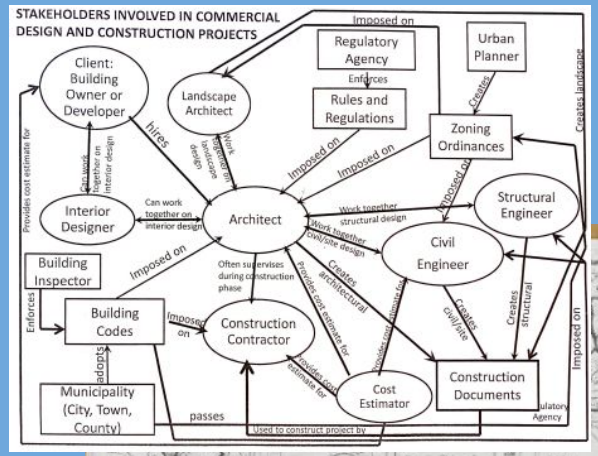
Offered to students in grades 10, 11, 12
Prerequisites: Other than concurrent enrollment in college preparatory mathematics and science courses, this course assumes no previous knowledge: However, students are encouraged to take the first two engineering courses in the PLTW sequence.

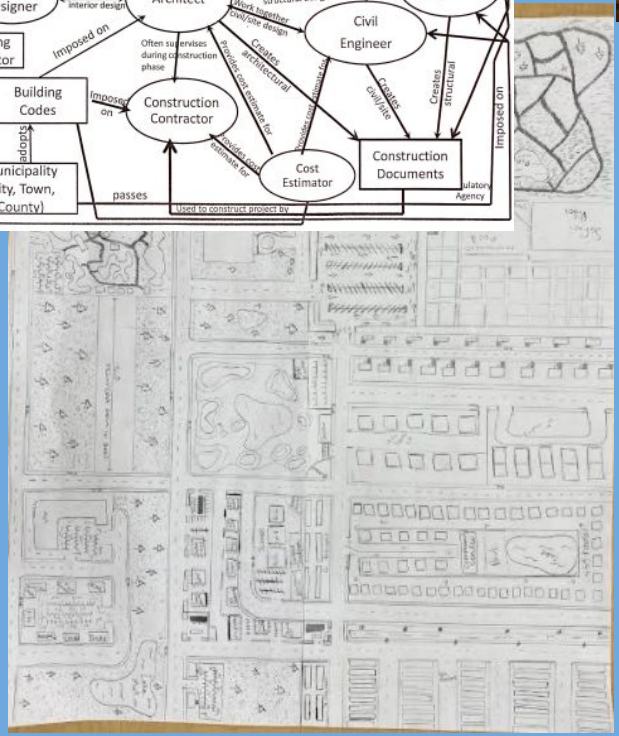
https://www.pltw.org/our-programs/pltw-engineering

Civil Engineering and Architecture (CEA)

- Residential Design:
  - Construction Costs
  - Planning and Development
  - REVIT software
  - Building Codes
  - Green and Sustainable Design
  - Site Planning
- Commercial Design:
  - Building Systems
  - Building Loads
  - Project Management
  - Land Surveying

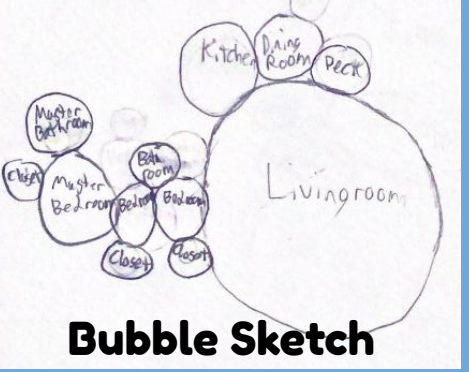
Design Charrette



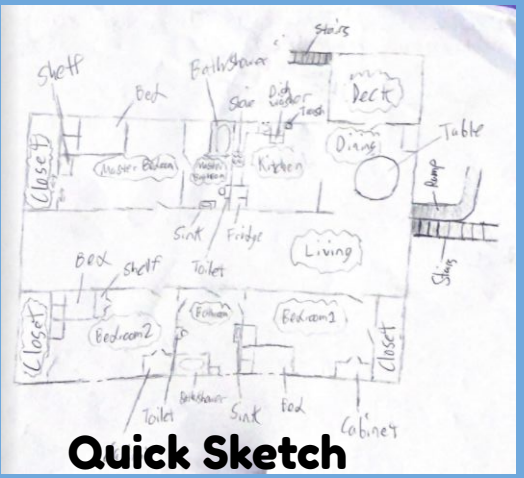


This is Your Career Videos

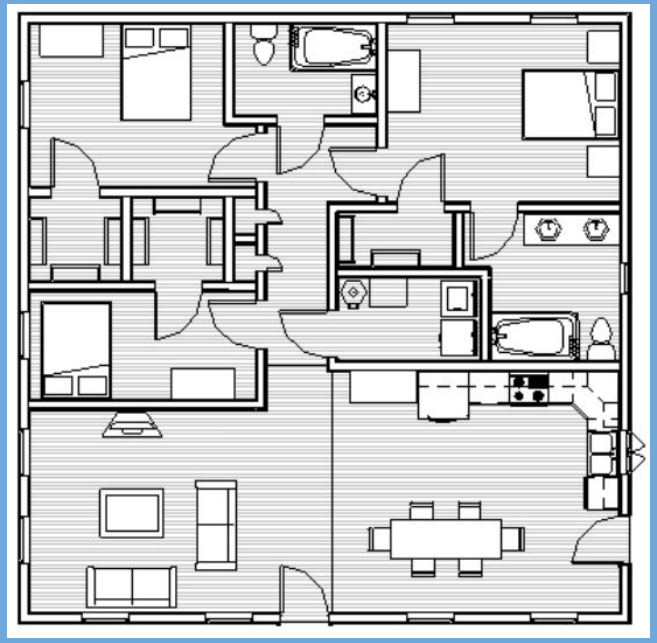
Architectural Style and Features



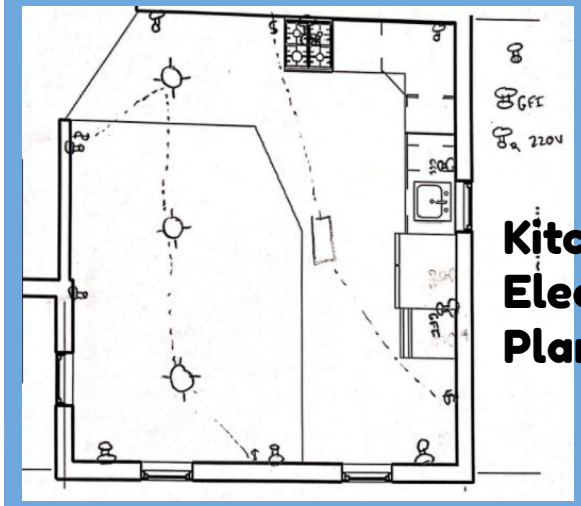
Bubble Sketch



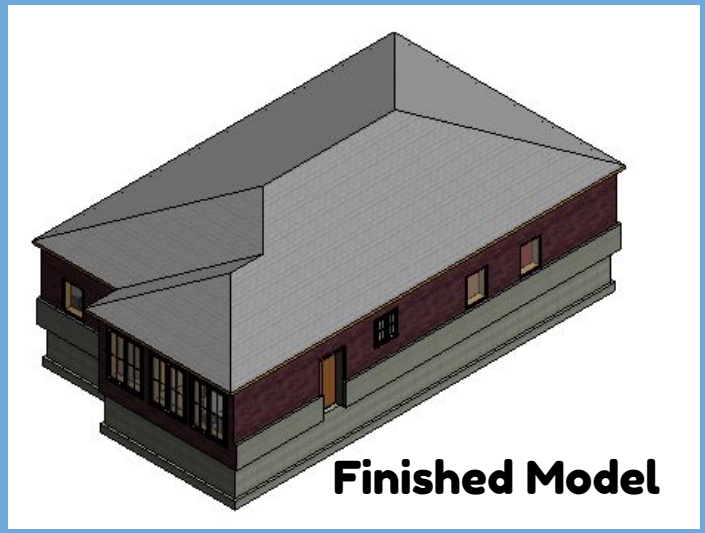
Quick Sketch



Floor Plan



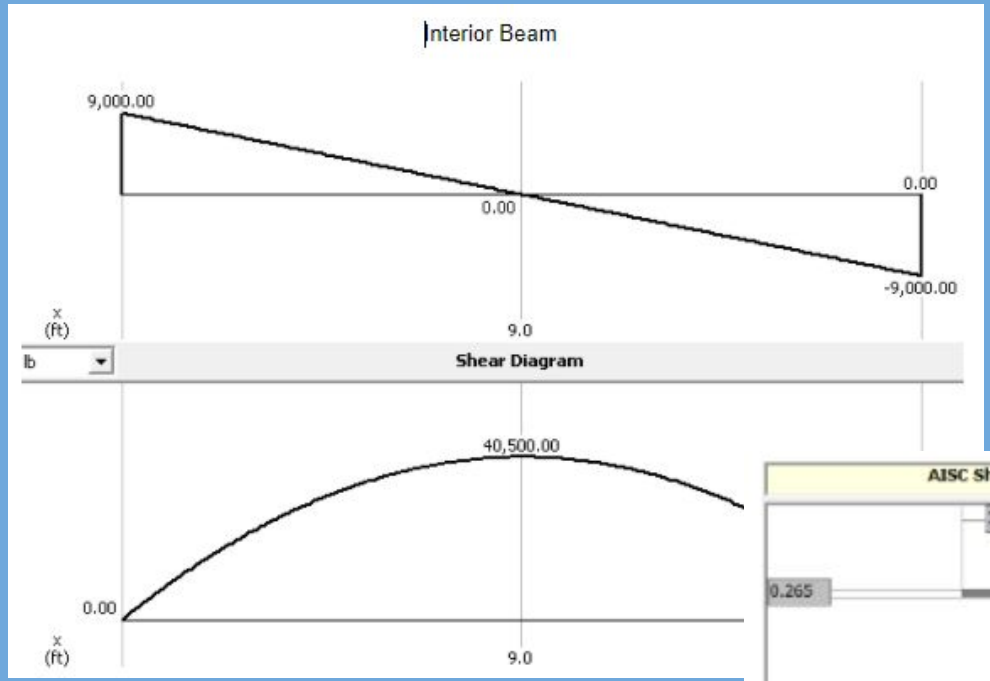
Kitchen Electrical Plan

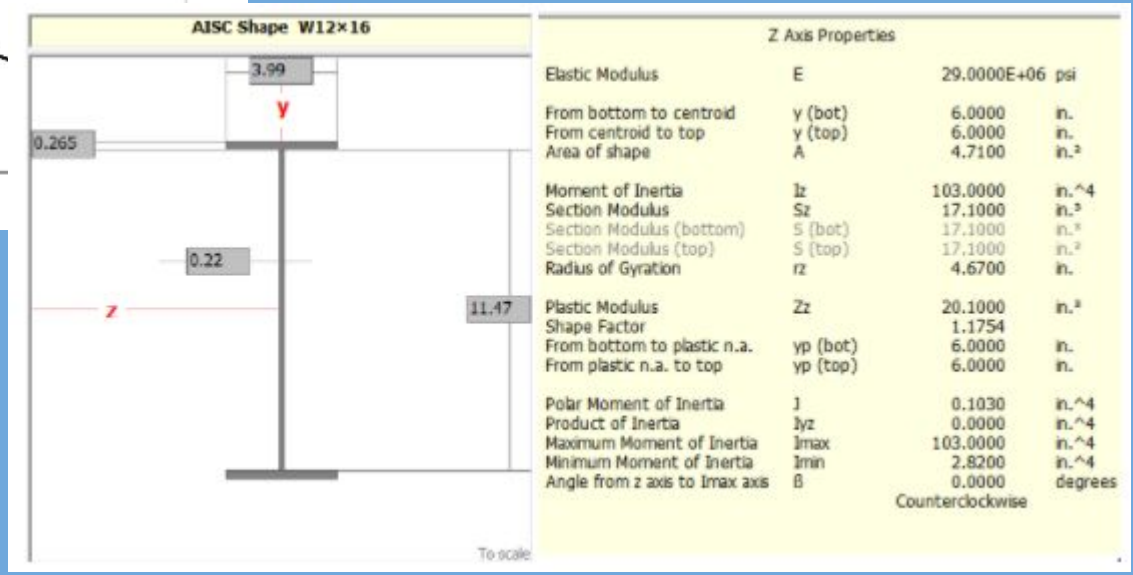


Finished Model

Residential Design

Software Generated Beam Design

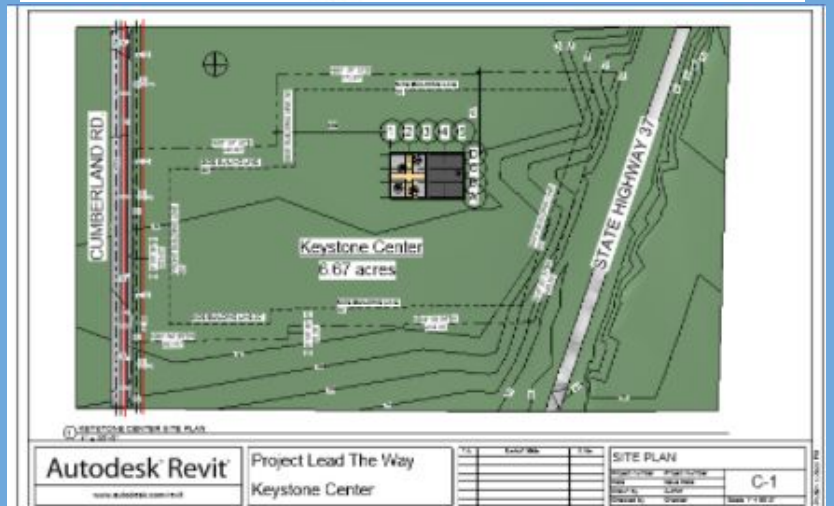


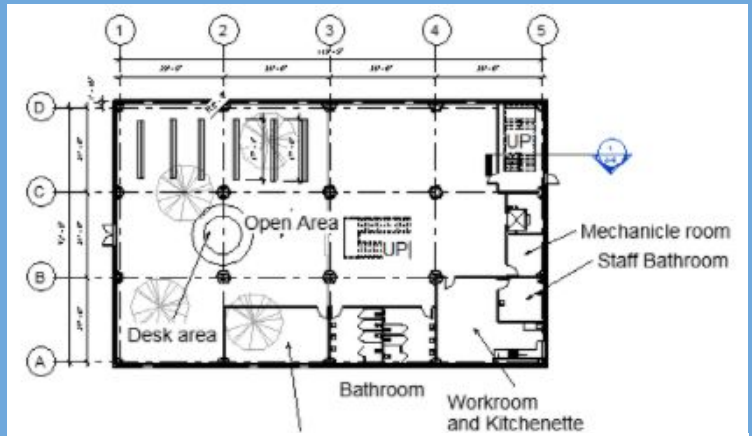


Z Axis Properties			
Elastic Modulus	E	29.0000E+06	psi
From bottom to centroid	y (bot)	6.0000	in.
From centroid to top	y (top)	6.0000	in.
Area of shape	A	4.7100	in.²
Moment of Inertia	Iz	103.0000	in.^4
Section Modulus	Sz	17.1000	in.³
Section Modulus (bottom)	S (bot)	17.1000	in.³
Section Modulus (top)	S (top)	17.1000	in.³
Radius of Gyration	rz	4.6700	in.
Plastic Modulus	Zz	20.1000	in.³
Shape Factor		1.1754	
From bottom to plastic n.a.	yp (bot)	6.0000	in.
From plastic n.a. to top	yp (top)	6.0000	in.
Polar Moment of Inertia	J	0.1030	in.^4
Product of Inertia	Iyz	0.0000	in.^4
Maximum Moment of Inertia	Imax	103.0000	in.^4
Minimum Moment of Inertia	Imin	2.8200	in.^4
Angle from z axis to Imax axis	ß	0.0000 Counterclockwise	degrees

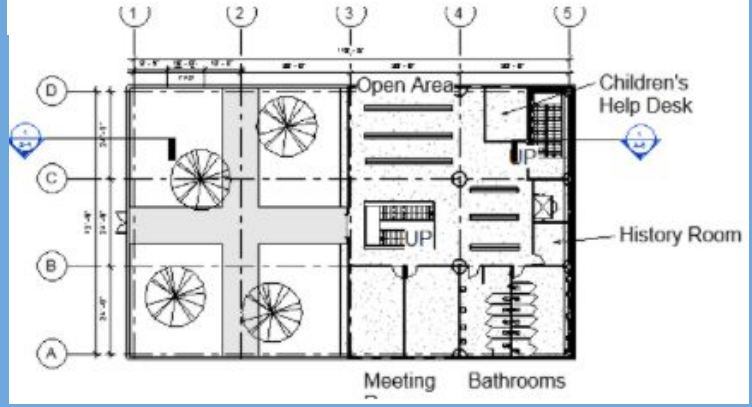
Commercial Design

Keystone Library Renovation





1st Floor



2nd Floor

Engineering Design and Development (EDD)

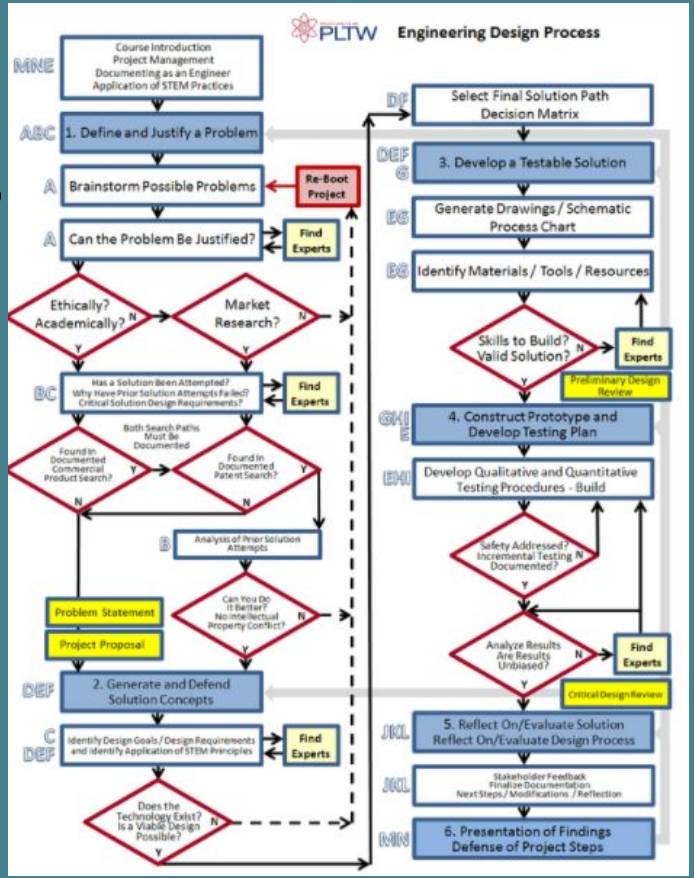
The knowledge and skills students acquire throughout PLTW Engineering come together in Engineering Design and Development as they identify an issue and then research, design, and test a solution, ultimately presenting their solution to a panel of engineers. Students apply the professional skills they have developed to document a design process to standards, completing Engineering Design and Development ready to take on any post-secondary program or career.

Offered to students in grades 11, 12
Prerequisites: Two of the three previous engineering PLTW courses.

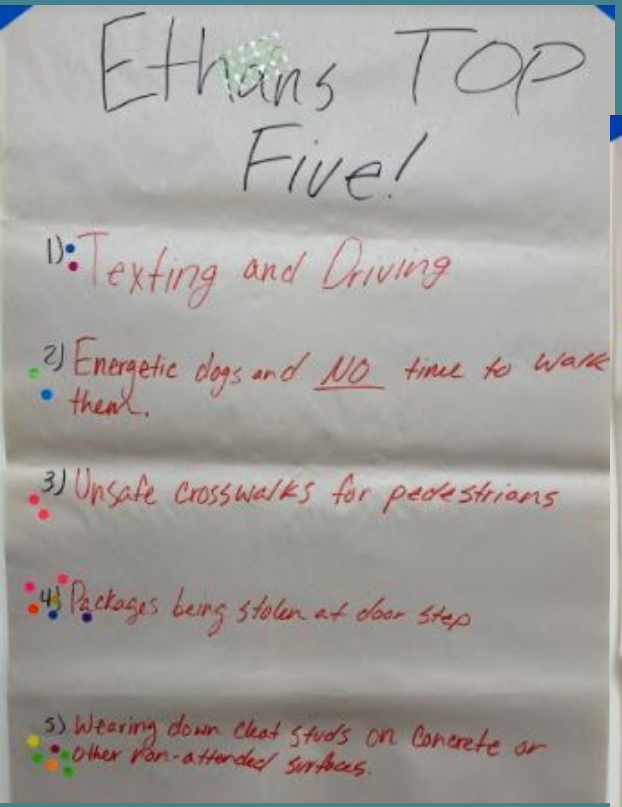
https://www.pltw.org/our-programs/pltw-engineering

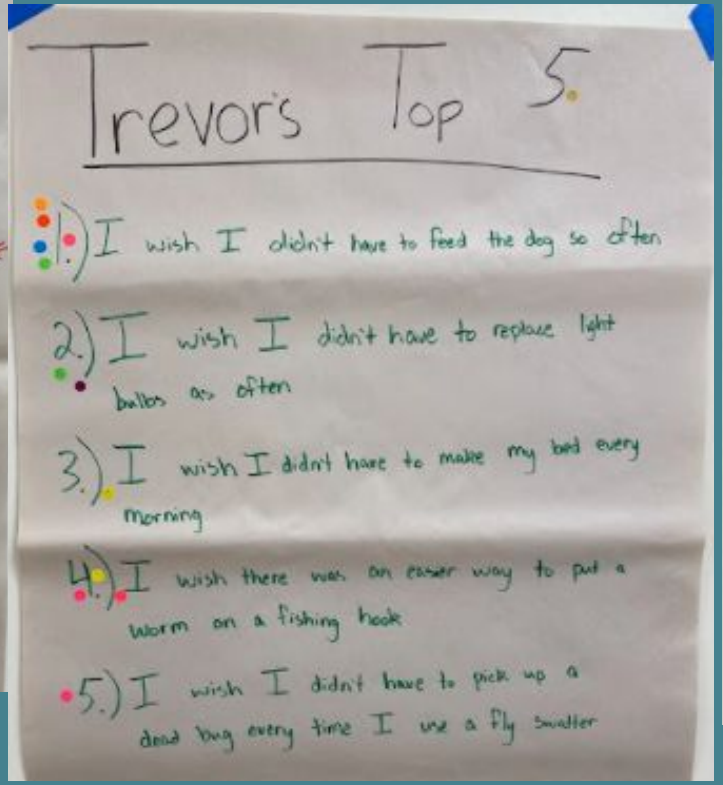
Engineering Design and Development (EDD)

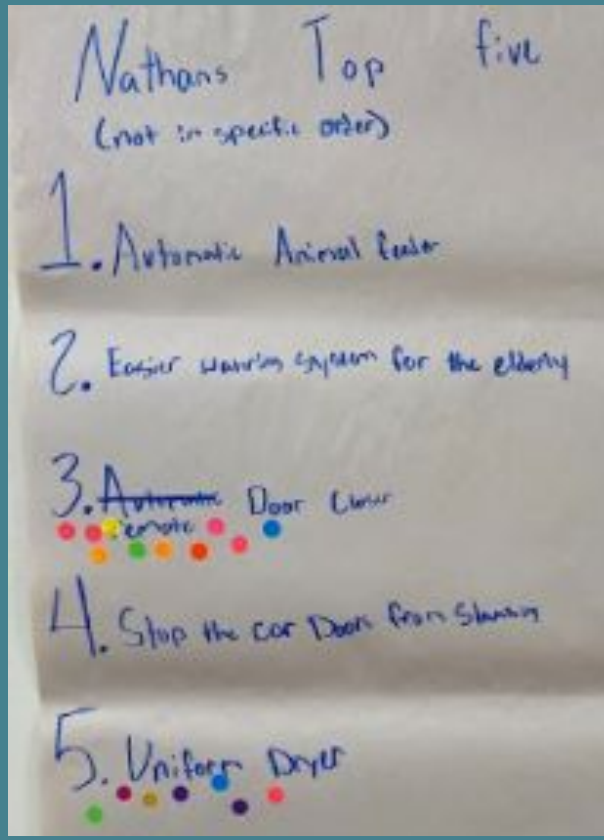
- Engineering Design Processes
- Project Management
- Documenting an Engineering Design Process
- Teamwork and Professional Skills
- Problem Identification and Justification
- Research
- Intellectual Property
- Project Proposals- Design
- Preliminary Design Reviews
- Prototyping
- Testing a Prototype
- Presenting the Process and Results

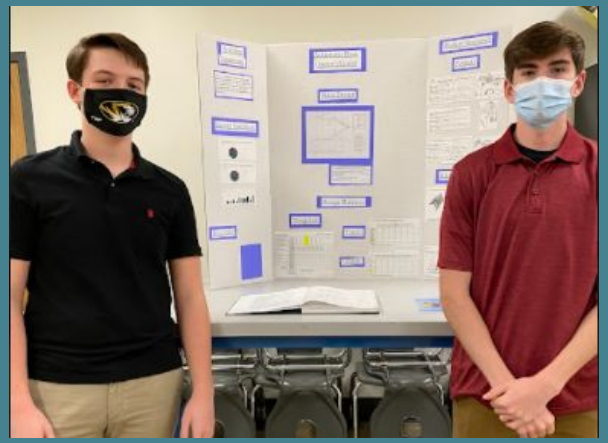


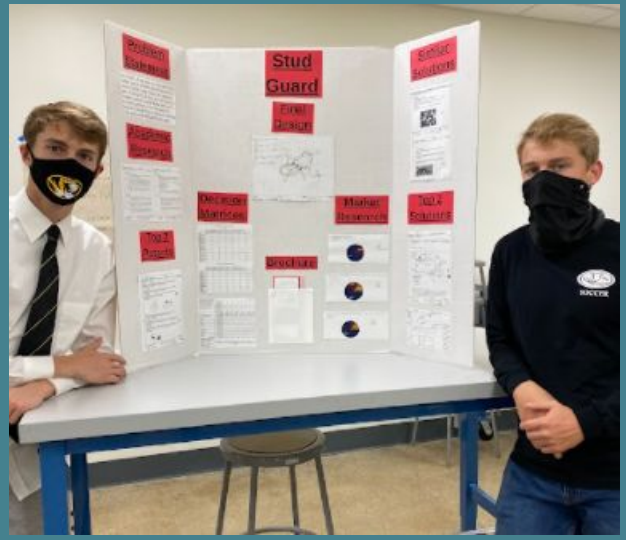
Narrowing Down the Project Choices



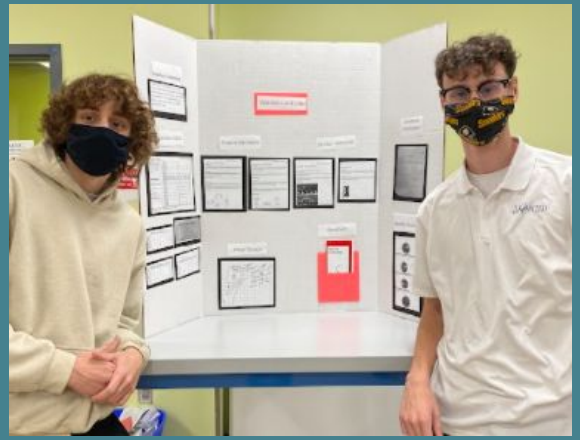




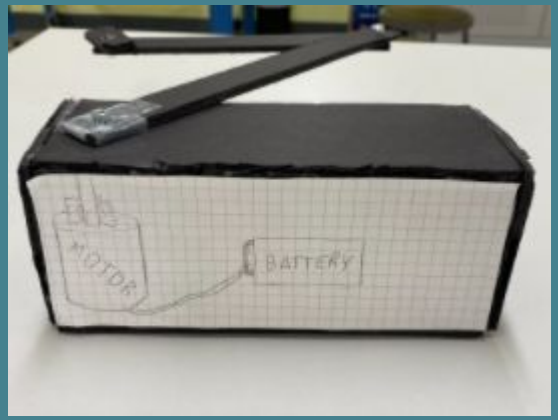




Project Proposals

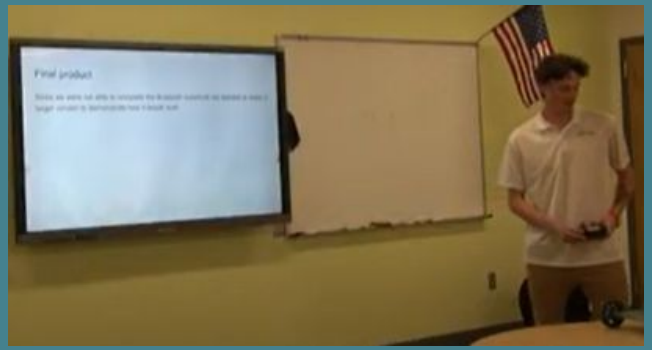


Mock-ups



Prototypes

Final Presentations



References

Course descriptions :

https://www.pltw.org/our-programs/pltw-engineering

Questions?
contact Becky Turner
becky.turner@jcschools.us