

Department of Applied Engineering and Technology Needs Assessment

Applied Engineering and Technology
January 2023



Chartiers Valley School District



MISSION

The mission of the Chartiers Valley School District, a community dedicated to shared leadership, is to graduate students who achieve personal success by providing an exceptional academic foundation in a safe, nurturing environment that inspires creativity and innovation while embracing diversity.

VISION

The Chartiers Valley School District Vision is to inspire excellence in instruction, learning and innovation to prepare our students to achieve personal success.

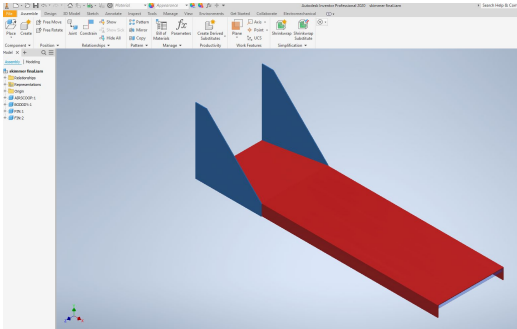
Teaching and Learning Style in AET

- Kinesthetic Learning
 - Blend of Visual and Auditory learning style. Often referred to as “Hands On Learning.”
 - AET department classes have traditionally catered to this learning style.
 - Provide students with a break from traditional classroom format.



Current Middle School Programming

- Current Middle School Technology class offerings.
 - 6th Grade- Design and Modeling (9 Week Course)
 - 7th Grade- Energy and the Environment (9 Week Course)
 - 8th Grade- Automation and Robotics (12 Week Course)
- Current courses are Gateway to Technology (GTT) curriculum, designed to provide a foundation for the Project Lead the Way pre-engineering curriculum offered at the High School.



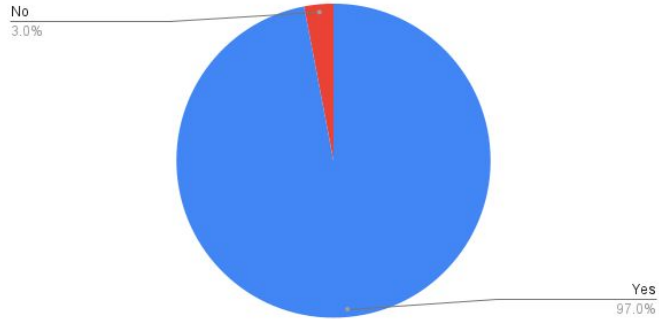
Current High School Programming

<u>Applied Engineering & Technology (AET)</u>					
6811	Engineering 1 <i>Intro to Engineering Design</i>	6601	Manufacturing Tech 1 <i>Materials & Construction</i>	6503	MMT 3A <i>Advanced Graphic Design & Photography</i>
6801	Engineering 2 <i>Principles of Engineering</i>	6602	Manufacturing Tech 2A <i>Mass Production</i>	6509	CiHS Advanced Video Broadcasting
6611	Engineering 3 <i>Computer Integrated Manufacturing</i>	6302	Manufacturing Tech 2B <i>Metals & More</i>	6800	MakerLab@AET
6815	Engineering 4 <i>Engineering Design & Development</i>	6605	Manufacturing Tech 3 <i>Product Factory</i>	6823	CiHS Computer Assisted Design 1 (CAD1)
6825	Environmental Sustainability	6606	MMT 1 <i>Multimedia Technology</i>	6824	CiHS Computer Assisted Design 2 (CAD2)
6802	Civil Engineering & Architecture	6502	MMT 2A <i>Graphic Design & Photography</i>	6301	Transportation Systems
6803	Introduction to Architecture*	6826	Applied Environmental Sustainability	6813	Robotics
		6607	Fabrication Art and Design*		

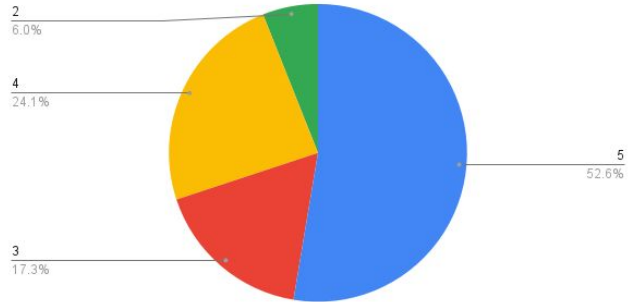
All accept 2 Current Offerings Are 1 Year in Length*

Parent Survey Summary

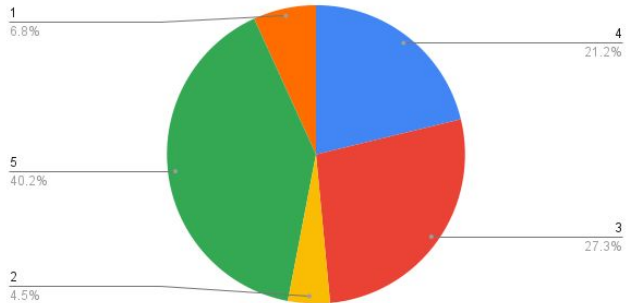
Do you feel applied engineering and technology classes are important offerings to your child?



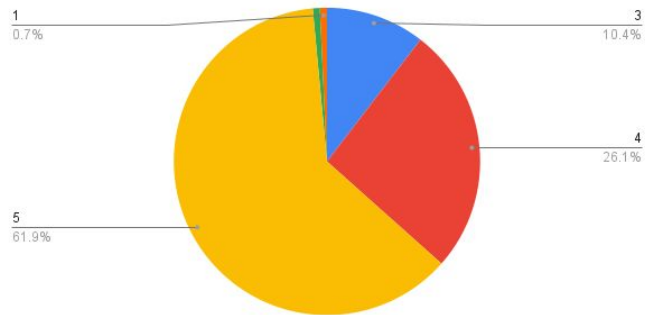
Do you feel advanced manufacturing courses are important? Ex: Waterjet, Laser CNC, CNC Milling, 3D Printing.



Is the ability to enroll in engineering based classes important to your child?



How important do you feel project based learning is pertaining to the use of tools and machines?



Survey Data Grades 6–12 “Takeaway”

Summary of survey data from community

- 97% feel applied engineering offerings are important to their children.
- Hands on learning is a “Must Have” in Chartiers Valley 90% support Project based opportunities.
- 60% felt engineering opportunities were important to them.
- Advanced manufacturing equipment was important by over 76% of those surveyed.

Program Strengths

Strengths of Current Programming

- Staff are comfortable, knowledgeable, and know their strengths in the department.
- Diverse course list (Something for everyone).
- MS- All students are required to have a Tech Ed class at least 1 time in MS experience.
- First class facility.
- Facility is well designed and enhances learning and use.
- Advanced manufacturing technology: Plasma, Router, laser.

Program Weaknesses

Weaknesses of Current Programming

- Low enrollment in higher level courses.
- Teacher assignments need to be more consistent with content year to year.
- Need to increase student awareness of offerings and the uniqueness of the facility/lab.

Middle School Program Offerings – Proposed

1. Expose students to a variety of content to spark their interest.
2. Inch deep, mile wide model at the middle school.
3. Supported by reflection, critical analysis and synthesis (Experiential learning).
4. Find your passion, and have somewhere to go with it.



Middle School Program Offerings - Proposed

Middle School Applied Engineering Technology			
6th Grade	Drawing and Design	3D Modeling	Hand Tools and Machine Safety
7th Grade	Sustainability	Video Production	Mass Production
8th Grade	Robotics	UAV (Drone Technology)	Manufacturing

This 3 and 4 week rotation will allow sections of approx 40-45 students to be divided into groups, and rotate through the above courses throughout their 9 or 12 week Middle School stay each year.

MS Goals

- Facility in current state meets all required goals.
- Furniture in current computer lab presents wire management difficulty and creates constant state of repair (trip hazard, and wire replacement a daily concern).
- Purchase additional 4 Vex V5 Robot kits. (currently 6 shared in classes of 19x2 students, class size increasing).
- Purchase Drone cart with Small indoor use drones (10) with camera to introduce UAV and aviation career opportunities.
- Purchase 10 Ipads to program and control Drones.
- Replace current 20 desks with proper lab desks with wire containment.
- 40 Desk Chairs (No Wheels).



MS Equipment – Proposed



Purchase 10 Drones with Ipad to program missions



Purchase 4 additional Super Kits to facilitate a 2:1 ratio of students to robot.



VEX V5 Classroom Super Kit

\$1,499

Backordered. Ships Q4 2022

Compatible with **V5** products and accessories.

Super Kits

Super Bundles

The V5 Classroom Super Kit engages students by bringing math, engineering, and computer science classes to life. Through hands-on building and programming, students can explore these subjects while moving at their own pace through our STEM Labs, or the hardware can be easily integrated into existing curriculum.

- Contains (1) V5 System Bundle and (1) Vision Sensor
- Includes all required parts to build the V5 Clawbot
- Teach engineering concepts with the included motion kits
- Scalable programming software suite available with VEXcode
- Standards aligned STEM Labs help develop how students approach critical thinking & problem solving

Note: New Customers should consider VEX EXP

Proposed High School Program Changes

Engineering	Shop/ Trade Skills	Visual/ Multimedia	Make/Model/Move
Engineering 1 (Sem).	Wood Shop 1 (sem). Wood Shop 2 (sem). Construction Systems (sem).	Graphic Design 1 (Sem). Graphic Design 2 (Sem).	CAD 1 (Sem). CAD 2 (Sem). Architecture 1 (Sem). Architecture 2(Sem). Robotics 1 (Sem). Robotics 2 (Sem).
Engineering 2 (Sem).	Metal Shop 1 (Sem). Metal Shop 2 (Sem).	Video Production 1 (Sem). Video Production 2 (Sem).	Transportation Systems (Sem).
Engineering 3 (Year)	Wood Shop 3(sem). Wood Shop 4(sem). Metal Shop 3 (Sem). Metal Shop 4 (Sem).		(Possible Trans 2 in future)
Engineering 4 (Year)	Advanced Wood Shop-Wood 5. (Year). Advanced Metal Shop-Metals 5 (Year).	Advanced Video Broadcasting CiHS Point Park University (Year). Advanced Graphic Design (Year).	Fab Lab (Sem). (Possible FL 2)
Engineering 5 (Year)			Drone AV Tech (Sem).
Green Shaded courses can be scheduled concurrently with lower/higher level courses			
Red Shaded courses are introductory courses, and should not be combined with higher level courses as machine safety concerns with limited ability to supervise all machine operations.			
Blue Shaded Courses are full year courses and must be run homogeneously.			

- Many full year courses will be converted to 2 Semester courses that provide greater flexibility with scheduling for students.
- Addition of Aviation Technology UAV Course (UAV- Unmanned Aerial Vehicle)
- Implementation of FabLab and modify existing space with Video studio.

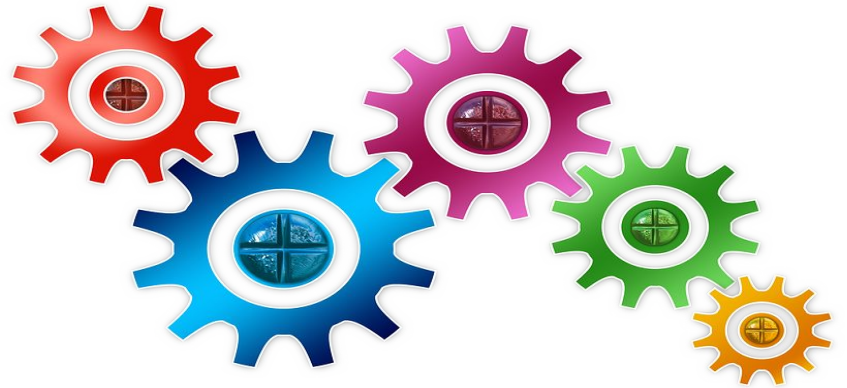
Aviation Technology (UAV) Course Addition

In this course students will learn the history and basic information of aviation and aerospace, including drones. Students will learn through hands-on experiences, including flying mini-drones and progressing to professional drones. This course will instruct students in UAV flight navigation, industry law and regulations, and safety regulations, as well as mission planning procedures, environmental factors, and human factors in the UAV industry. Students will have the option to take the FAA 107-Certified Remote Drone Pilot exam. Students must have a state or federal issued ID by April 1 of the year enrolled, per FAA guidelines.



Creation of a HS Fab Lab

Fab Lab is a globally recognized initiative where people come together to design and build in a digital foundry setting. Students will find themselves in creative DIY spaces where they will create, invent, and learn. Students will be able to use 3D printers, lasers, routers, vinyl cutters, and associated softwares. Students will learn the process of sketching, designing, and digitally creating while performing processes and duties of light manufacturing. This is a great opportunity for any student interested in hands-on learning and closing the skills-gap. <https://fabfoundation.org/>

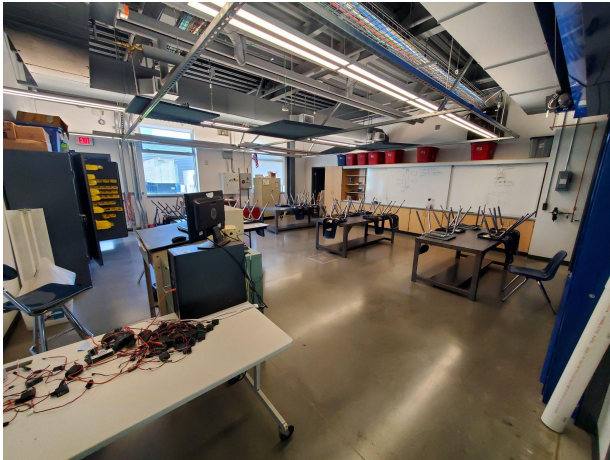


HS Fab Lab Goals

Robotics Room > Change to **Fab Lab** space

No additional cost, will require relocating furniture & equipment.

Room underutilized and in a central location in the lab to allow for easier monitoring of student's in the lab.



Large, open room. Currently used 1 period per day



Oversize door, perfect for moving in materials, and viewing classes in session in the labs.



Central to dust collector and outside wall for venting of machines.

HS Equipment and Facility Goals

Maker Space > Change to **TV Studio** after equipment moved to **Fab Lab**



Long, open room, Tools used frequently separated from lab and hard to manage. Length would be perfect for a TV Studio.



With the CNC Router removed, A wall could be put in place and Control room could be placed on window side.



Excellent visibility to main hallway and already equipped with TV.

HS Recommendations

- 10 Additional computers in G1712.
- Update control software for Torchmate Plasma to Flashcut CNC.
- Additional CNC Router to support aging Velux router currently in place.
- Add large format plotter/printer to Graphics Lab.
- Room modification/sharing into Fab Lab space.
- Acquire retensionable screens for graphics lab.
- Add power feed drum-sander to AET Lab.
- Additional Laser Engraver to minimize bottleneck. (potential grant opportunity)
- Add Waterjet and 3D Printers to Fab Lab space.

Summary of Recommendations & Cost

Summary of Recommendations:

- Grade 6-8 remove PLTW partnership and replace with new rotation sequence.
- Add 4 Vex kits to improve ratio of robots:students.
- Replace Computer Lab furniture to improve safety and equipment longevity.
- Drone and Ipad installation for UAV course at Middle School.
- HS UAV course training to support implementation of program.
- Provide Middle school experiences that have vertical pathways at the high school level.
- HS course revision to support Semester options with full year opportunity.
- Minor space modifications to improve supervision and visibility (Fablab).
- HS Advance manufacturing equipment upgrades to support.

\$ 24,944.00	Capital Equipment, Replace lab desks, CNC Router.
\$ 20,491.00	Supply HS Curriculum
\$ 36,033.00	Capital Equipment, Fablab:Laser, Router,(2) 3D Printers
\$ 81,468.00	

Considerations:

- Anticipate a \$5000 grant for CNC Router & Laser Cutter
- Fab Lab- relocation of mostly existing equipment & furniture

Questions?

- Thank you for your attention and consideration.
Any questions or comments will be taken at this time