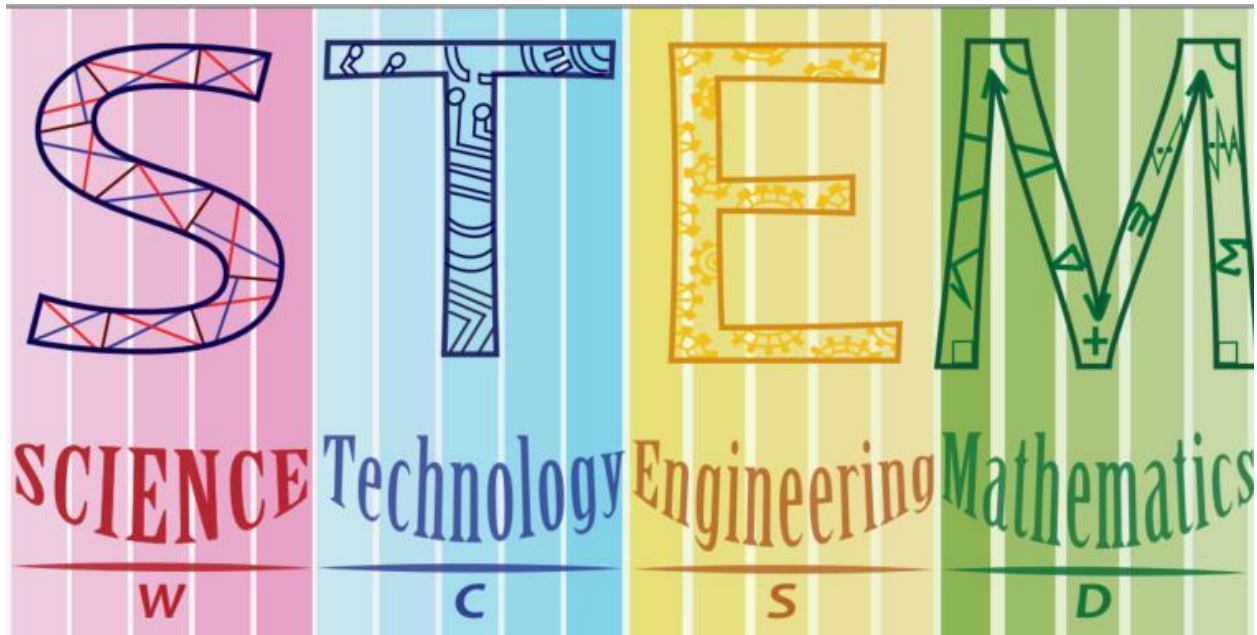


WARREN COUNTY SCHOOL DISTRICT
STEM INNOVATION ACADEMY



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2020-2021 PLANNING GUIDE

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Warren County School District STEM Pyramid

Elements of 21st Century (STEM) Skills

1. Critical Thinking & Problem Solving
2. Initiative and Self-Direction
3. Communication
4. Collaboration
5. Creativity and Innovation Skills
6. Productivity and Accountability
7. Managing Complexity
8. Social and Cross-Cultural Skills
9. Leadership and Responsibility
10. Prioritizing, Planning, & Managing for Results

Components of a Successful Project

1. Detailed proposal or plan
2. Collaboration
3. Written/Photographic/Video documentation of entire process
4. Individual engagement
5. Final Product
6. Presentation of final product to peers & instructor
7. Reflection

K – 5 Creative Learning Lab

Labs have a collaborative design using manipulatives to solve problems of increasing complexity.

6 – 8

Project Lead the Way

Classes have collaborative challenges with an emphasis on the scientific method process and the principals of math. Students are able to explore areas of interest with an introduction to STEM career pathways.

- Design & Modeling
- App Creators
- Medical Detectives
- Robotics

Grades 9 – 12

STEM Career Pathways

This program accomplishes hands-on learning through project-based activities, in which the STEM disciplines, along with art, communications and social sciences are seamlessly integrated. The personalized approach empowers students to shape their learning to meet their individual interests, abilities, and learning styles.

College and Career success also demands a robust set of 21st Century skills such as problem-solving, critical thinking, communication, collaboration, creativity, and the effective application of technology to develop critical workplace skills.

Engineering & Industrial Technology

- In-Depth Systems of Technology
- Robotics & Control Technology
- Future Tech & 3D Design
- Fabrication
- Coding and Programming
- Drone Technology

Arts & Communications

- Digital Media Arts/Communications
- Computer Graphics
- Film/TV Production
- Film/TV Directing
- Film/TV Broadcasting
- Esports Marketing
- Audio Engineering
- Video Production
- Editing Digital Media

GOAL OF WCSD STEM INNOVATION ACADEMY

The goal of the STEM Innovation Academy program is to engage all learners in STEM. This goal is accomplished through a hands-on, project-based learning 'Creative Learning' system in which STEM disciplines, along with art, communications and social sciences are seamlessly integrated. It's a highly personalized approach that empowers students to shape their learning to meet their individual interests, abilities and learning styles.

PROGRAM DESCRIPTION OF STEM ACADEMY

The STEM Innovation Academy is richly-provisioned for advanced technology studies as well as general academics and career exploration. The STEM Innovation Academy has two career pathways: Engineering and Industrial Technology and Arts and Communications. The Engineering and Industrial Technology is organized around eight areas of core technological competency. These are: Circuitry, Computer Graphics, Digital Communications, Mechanics and Structures, Robotics and Control Technology, Scientific Data and Analysis, Software Engineering and Sustainability. While the Arts and Communication pathway focuses on Film and Television, Acting and Directing for the Screen, News Broadcasting, Esports Marketing, and Video Production. Students will learn filmmaking while becoming purposeful storytellers and they will master the techniques needed to create content that entertains. This pathway will also help young content creators leverage advertising, marketing, and social media. Students will use their newly learned skills to produce an experience, not just a product through the capstone project.

STEM LAB CONFIGURATION

There are three islands and two peninsulas that will make-up the Warren County School District STEM Academy Lab. Each island and peninsula has three computer stations and two chairs at each station. Students are paired up at each station as they work through the plethora of activities built within each station.

SCOPE AND SEQUENCING OF STEM INNOVATION ACADEMY

Engineering and Industrial Technology Pathway

The WCSD Engineering and Industrial Technology Pathway will explore the eight systems of technology. Students will then be provided an in-depth exploration of robotics and control technology. Students will utilize a variety of robotics systems to design, build, and program robots to solve relevant challenges. It will go also go beyond the scope and sequence of robotics and allow students to explore other engineering and industrial aspects such as 3D Design, fabrication, coding and programming, as well as drone technology. This pathway is specifically designed to build upon the skills developed in the SmartLab and to allow students to explore potential career interests.

Foundational STEM

(Approximately 180 hours)

Within the orientation and introductory piece of the STEM Academy, fifteen activities will be going on at one time. Students will rotate every ten days without repeating an engagement activity throughout all eight systems of technology. Each system of technology is listed below:

- Circuitry
- Computer Graphics
- Digital Communications
- Mechanics and Structures
- Robotics and Control Technology
- Scientific Data and Analysis
- Software Engineering
- Sustainability

These activities and engagements are built within the Level 1 curriculum in the Creative Learning Lab Launchpad.

SmartLab Systems of Technology (Portion 1)

(Approximately 90 hours)

This portion of the STEM Academy focuses on four systems of technology. With the STEM facilitator approval, students will choose the four areas of technology they wish to focus on during the duration of SmartLab 1. Once the four systems of technology are selected, students will work through a leveled curriculum within the Creative Learning Lab Launchpad enabling them to go in-depth within each system of technology. Each area has a Level 2 and Level 3 portion of curriculum that will challenge students at various stages of the course.

SmartLab Systems of Technology (Portion 2)

(Approximately 90 hours)

This portion of the STEM Academy focuses on the remaining four systems of technology that were not the focal point within Smart Lab2. Students will work through leveled curriculum within the Creative Learning Lab Launchpad enabling them to go in-depth within each system of technology. Each area has a Level 2 and Level 3 portion of curriculum that will challenge students at various stages of the course.

Exploring Future Technologies

(Approximately 180 hours)

Future generations will face social and global problems beyond what we can imagine. They will learn and engage with each other, with technology and with information in entirely new ways. Students will enter a workforce where job functions and roles will be dramatically different from today. Through their work in the STEM Innovation Academy, students will investigate technologies of the future. Some examples of these technologies will include, drone

technology, virtual reality, and 3D fabrication. Through this investigative work, students will learn how these technologies impact career paths.

Eight Systems of Technology

Circuitry

The study of circuitry is explored through electricity, pneumatics and microelectronics. Students develop an understanding of the scientific and technological principles underlying each of these systems. With this foundation, students design complex systems utilizing each technology.

SmartLab resources for the study of circuitry include:

- Advanced Circuitry Exploration System
- Makey Makey
- Conductivity Exploration Systems with Accessory Collection
- Snap circuit rover
- Snap Circuits Electricity Exploration Collection with Multimeter
- Snap Circuits Green Energy Collection
- Snap Circuits Extreme Microelectronics System
- Digital Sandbox Programmable Microelectronics Systems
- Arduino Programmable Microelectronics Systems
- Curriculum and/or additional learning resources for all above listed items

Computer Graphics

In Computer Graphics, students explore areas such as graphic arts, image capture, photo processing and manipulation, animation and special effects. They learn to distinguish between, and effectively use, bitmap graphics (digital "painting"), and object-oriented graphics (computer-aided "drawing" or "CAD") applications. As learners progress, they integrate computer graphics with other software applications to create advanced graphic and commercial art, websites and multimedia presentations. Computer graphics also serves as an important portfolio development tool for documenting projects and learning processes.

Examples of computer graphics tools included in the SmartLab are:

- 360 Degree Camera System
- 3D Printing System and TinkerCAD
- Adobe Photoshop Elements Software Packages - class license
- Digital Still Motion Cameras
- Digitizing Tablets
- Doodle for Google Art Contest
- Google Arts and Culture
- Google SketchUp Software

- Oculus Go VR headsets
- Photo Tripod
- Portable Lighting Studio
- Tech-4-Learning Introductory Graphics software packages
- Curriculum and/or additional learning resources for all above listed items

Digital Communications

Engagements in the Digital Communications system provides new experience and reinforces the ability to communicate effectively utilizing single, blended, and advanced media. Digital Communications encompasses the capture and production of content in any single media, such as print, sound or electronic media. It includes word processing, presentations, and graphic representation of data or processes in the form of flowcharts, tables and graphs. It also includes the capture, production and presentation of single-media content such as audio, video and digital still images. Learners quickly progress from developing core competencies in these areas to the regular application of these tools to document their learning throughout the SmartLab. Also, learners develop advanced communications skills through the integration of two or more media using technology-based tools. Students explore linear and interactive presentations and the applications for each. Digital communications resources include:

- Adobe Premiere Elements Software Packages (class license)
- Flexible Video Arm and Clamping System
- Tech-4-Learning Claymation Animation Kit and Refill Kits
- Frames Stop Motion Software Packages (class license)
- Comic Life Software (class license)
- Digital Cameras
- Digitizing Tablets
- Google Sites Software for ePortfolio Creation
- Microsoft Office Software Suite (class license)
- Padcaster
- Photo Tripod
- Portable Lighting Studio
- Sound engineering collection
- STEM Career Exploration
- USB Microphone and Stand
- Virtual Reality Viewing Systems
- Curriculum and/or additional learning resources for all above listed items

Mechanics and Structures

In Mechanical Systems, learners create and study structures and machines. Hands-on learning engagements foster an understanding of simple and complex machines and structural physics. Mechanics and structures construction sets include:

- Engino Architecture Collections
- Fischertechnik Mechanics and Statics Collections
- West Point Bridge Designer
- Zoob Construction System for Rapid Visualization and Prototyping
- Curriculum and/or additional learning resources for all above listed items

Robotics and Control Technology

In this area of study, mechanical processes are managed through automation control interfaces and learners design and program robotic systems to perform task-oriented challenges. Students explore logical programming and explore how sensors, electronic and computer controllers are used to manage complex mechanical processes. The concept of sense, decide, and act is introduced and students develop whole-systems perspectives. SmartLab robotics and control technology resources include:

- Lego EV3 Control System with Software
- Programmable drone systems
- Sensors to integrate with Lego EV3
- Curriculum and/or additional learning resources for all above listed items

Scientific Data and Analysis

In this system of technology, students collect experimental data using testing equipment and probe ware, typically linked with a computer controlled interface. Data is then analyzed to draw conclusions from experiments. Students engineer and test scale models and analyze materials and structure. Using chemical, physical and bioscience probe ware, students collect and analyze experimental data to explore principles of science through hands-on, inquiry-based projects. SmartLab scientific data and analysis tools include:

- Astronomy Experiences with MicroObservatory
- Extreme Weather and Monster Storms
- Fischertechnik Optics system
- Global Information Systems with ArcGIS
- Global Information Systems with Google Maps, Worldmapper, and the Welikia Project
- Vernier Materials Analyzer with accessories and bridge and truss collection
- Curriculum and/or additional learning resources for all above listed items

Software Engineering

In this area of study, students learn to create mobile and computer desktop applications. Initially in their experience, students create interactive online greeting cards, and computer animations. They simulate real systems and processes, and even create basic computer games. Later students have the opportunity to create real desktop and mobile app games that they can eventually publish and sell. Software engineering resources include:

- App Inventor Software
- Digital Sandbox Programmable Microelectronics Collections
- MIT Scratch Version 3 Software
- Stencyl Software
- Touch Develop Software
- Curriculum and/or additional learning resources for all above listed items

Sustainability

Now your SmartLab students can explore one of the most exciting areas of emerging technology- Sustainability. Alternative energy and power efficiency projects connect core academic content with 21st century skills through engaging, inquiry-based exploration. Students explore this exciting area technology with hands-on, minds-on activities connecting math, science, social studies and economics. Here are just some of the projects the students will explore:

Solar Energy Discovery Collection

- Understanding photovoltaic cells
- Solar Energy and High-Performance Homes
- Solar cooker design and testing
- Solar race car design and testing

Wind Energy Discovery Collection

- Understanding wind turbines
- Propeller blade design
- Wind farm design
- Storing Wind Power Hydrogen Fuel Cell Discovery Collection
- Electrolyzing water for hydrogen fuel
- Generating power from hydrogen fuel cells
- Design a hydrogen highway
- Hydrogen fuel cell race cars

WCSD Arts and Communications Pathway

The WCSD Arts and Communications Pathway is to provide an in-depth exploration of computer graphics, digital communications and TV studio hands-on experience. Within this pathway, students capture and create media in a variety of formats. Students will use a range of technology and software. This pathway is specifically designed to build upon the skills developed in the SmartLab and to allow students to explore potential career interests.

Creative Learning and Media Transformers Curriculum

- Introduction to Film and Television
- Film and Television Production I
- Film and Television Production II
- Acting and Directing for the Screen
- News Broadcasting
- Esports Marketing
- Video Production

Digital Media Arts

- Digital Cameras for Photography
- Tripods and other Camera Support Systems
- Audio Engineering Stations for full-class engagements
- GoPro Action Cameras
- Gimbal Camera Systems
- Professional Camcorder with Accessories
- VR Camera and Headsets
- Go bags for off -site recording
- Wacom Drawing Tablets
- Audio Engineering

Introduction to Film and Television Introduction

- Convey, Define and Interrupt a Director's Artistic Vision
- Create storyboards and screenplays
- Identify and create the shot types and camera movements
- Demonstrate Camera Composition
- Operate Digital Cameras
- Operate Audio Recording Devices

- Demonstrate a Novice Level of film editing using Adobe Editing Software
- Recognize and apply shot duration techniques
- Edit all forms of media in Adobe Software Program
- Using the server, create and set-up Media Editing/Adobe Projects
- Record/adapt to all video recording scenarios
- Audio record all audio scenarios
- Define, Convey and Interrupt the Director's Vision
- Perform all technical, creative, and executive staff positions
- Create props and costumes
- Identify/Apply tools of the actor
- Edit raw footage
- Mix multiple soundtracks
- Apply sound and special effects
- Operate all cameras while exhibiting shot duration and proper camera composition
- Edit raw footage into a narrative
- Mix sound and apply special effects
- Create a media project that reflects all skills and strategies associated with each phase of media production
- Tell a story with a coherent and concise narrative

Film Production

- Record/adapt to all video recording scenarios
- Audio record all audio scenarios
- Define, Convey and Interrupt the Director's Vision
- Perform all technical, creative, and executive staff positions
- Create Props and Costumes
- Identify/Apply Tools of the Actor
- Edit Raw Footage
- Mix multiple soundtracks
- Apply sound and special effects
- Operate all camera while exhibiting shot duration and proper camera composition
- Edit raw footage into a narrative
- Mix sound and apply special effects
- Create a media project that reflects all skills and strategies associated with each phase of media production
- Tell a story with a coherent and concise narrative
- Create a film and marketing campaign

Advanced Film Production

- Staff peers into production team members
- Define and understand 3 Phases of Production.
- Create a shooting Screenplay
- Create a Storyboard
- Pitch a film and budget
- Scout and secure shooting locations
- Create a Shooting Schedule
- Create a Production Design
- Direct and Produce during Phase I
- Record/Adapt to all video recording scenarios
- Audio record all audio scenarios
- Define, convey and interrupt the director's vision
- Perform all technical, creative, and executive staff positions
- Create props and costumes
- Identify/Apply tools of the actor
- Identify any need "pick-ups" for additional footage necessary to fill and plot holes
- Meet and adhere to a budget and shooting schedule
- Use Adobe Editing software
- Make editing decisions
- Cut/Edit action and dialogue
- Set appropriate shot lengths
- Mix multiple sound tracks
- Redub audio
- Utilize and apply sound and special effects during postproduction
- Utilize and apply appropriate style/design of titles/credits
- Utilize and apply editing strategies/techniques
- Devise a full marketing and promotional campaign

News Broadcasting

- Working understanding of all segment types.
- Script writing that serves a storytelling purpose.
- Mastery of Camera Operation
- Mastery of Audio Recordings
- Mastery of footage Editing (Adobe)

- Mastery of effective Voiceover recording
- Placement of segment within news broadcast
- Operate each piece of technology/equipment associated with each control room position
- Demonstrate a mastery of each position's technological expectations, associated with each control room position
- Demonstrate an ability to collaborate in the control room during a broadcast
- Recognize the impact of technology upon reporting while understanding its application

Screen Directing and Acting

- Screen acting strategies
- Working understanding of technology's expectations and limitations
- Working understanding of set restrictions
- Use of acting tools
- Collaboration with crew and director
- Student will demonstrate a working understanding of storyboards, scripts and screenplays.
- Students will understand and demonstrate an ability to adjust acting performance based upon the angle and shot magnification of a scene
- Work collaboratively to create believable screen performances built upon original screenplays and/or storyboards
- Recognize how the director and editor's roles impact the final outcome of their screen performance.

Esports Marketing

- Built upon the industry standards
- Creating content that is interesting to watch with multi camera and broadcasters within esports competition
- Marketing through social media, film, and television to promote players and competition
- Teaches them how to market the players for scholarships and industry
- Investigate the roots of gaming
- Learn how to effectively shoutcast
- Digital citizenship and accountability
- Master the techniques needed to create content that entertains
- Leverage advertising, marketing, and social media by the content created

Innovation Capstone Project(s)

(Approximately 180 hours)

The Innovation Capstone Project prepares students for College and Careers. It is a rigorous curriculum for 11th and 12th grade students aligned to various CTE Standards. The Innovation Capstone Project is a powerful new program to prepare your students for college and career success. Fully integrated with a high school SmartLab, Innovation Capstone Project curriculum guides students through a rigorous, standards-aligned approach to planning, execution and presentation of projects relevant to their own interests and academic focus. Students dig deeper into topics of personal interest, apply technology to academic content and make career connections. The Innovation Capstone Project program focuses on and further develops critical workplace skills like project planning, time management, collaboration, communication, problem-solving, and critical thinking. With the Innovation Capstone Project curriculum, students will develop project-based solutions to real-world problems and use a wide range of applied technologies.

- *Rigorous Project-Based Curriculum*

Curriculum is flexible, standards-based, and supports capstone projects in a wide range of academic subjects. Students learn to identify and define real-world problems, design, plan and execute solutions, and create e-portfolios to document and present their work.

- *Critical Workplace Skills Development*

Projects are designed to encourage students to think critically, solve challenging problems, and develop critical workplace skills, such as oral communication, public speaking, research skills, teamwork, goal setting, and more.

With Innovation Capstone Project, students will:

- Explore various STEM disciplines and career paths
- Take ownership of their education and future career
- Develop critical workplace skills, such as effective oral communication, critical thinking, & more
- Produce Capstone Projects that align with any course
- Develop a professional portfolio of projects and outcomes
- Apply knowledge from coursework to conduct a school or community-based project

The Innovation Capstone Project Framework is provided in the Creative Learning Lab and Media Transformers curriculum. Consumables, kits and various materials will be available to assist students.

The Innovation Capstone Project provides a project framework for students to complete long-term, in-depth projects with their peers. Students can focus on the systems of technology that

they explored previously, community project, business plan, drone business; advanced projects, capstone projects. The opportunities are endless!

Three Phases

Phase 1: Plan

1. Project Ideas
2. Project Planning
3. Goal Setting
4. Time Management
5. Research
6. Find an Expert Mentor
7. Building a Business Plan

Phase 2: Do/Reflect

1. Collect and Organize Data
2. Analyze Data
3. Citations

Phase 3: Share

1. Business Writing
2. Scientific Writing
3. Presentation Skills

If students accelerate through the various STEM Innovation Academy coursework, they will be permitted to work on another Capstone Project or revamp an existing project with the understanding of the three phases needing a completion satisfactory mark based on facilitator rubric(s).

Examples of Innovation Projects from the past have included:

ART

- Commission a sculpture, painting, or other art installation somewhere in your community (use your art to bring awareness to an issue, tell a story, or inspire others)
- Coordinate a large scale community project with students, senior citizens, or an after school program to create a mural or another large scale art project in a public space
- Start a community gallery to showcase local amateur artists
- Create a business that will allow you to commission your art for clients
- Create a business to sell t-shirts with your art
- Design a website for a non-profit

MUSIC

- Coordinate a community music festival
- Start a program to provide refurbished instruments to students in the community interested in learning to play music
- Record, produce, market, and sell your music or the music of a client

PUBLIC SERVICE

- Create a PSA to bring awareness to a critical issue in your community like drug and alcohol abuse, domestic violence, social justice, or water/land pollution
- Create a donation center to provide clothing and toiletries to the homeless

HEALTH AND EDUCATION

- Create a community garden to provide work opportunities and food to populations in need
- Start a tutoring non-profit to support local students
- Start a food bank, recycling program, or another service for your community

SCIENCE AND ENVIRONMENT

- Install birdhouses or bug hotels in a local park to support critical animal populations like bees
- Organize a monthly cleanup group to clean your community
- Collect data about your community's water, air, and land health and present it to the city council with suggestions on ways to improve it

FILM

- Create a drone video for a local farmer or real estate agent
- Produce a radio or tv program to share information with your community

ENGINEERING

- Design a play environment, run a fundraiser, and build an inclusive playground for your school
- Invent a device to help people improve their quality of life like a water purifier or a bike-powered washing machine

WCSD SAMPLE STUDENT SEQUENCING (10th-12th Grade)

- **ENGINEERING and INDUSTRIAL TECHNOLOGY PATHWAY**
 - a. Foundational STEM
 - b. SmartLab 1
 - c. SmartLab 2
 - d. Exploring Future Technologies
 - i. Drone Tech
 - ii. Virtual Reality
 - iii. 3D Fabrication
 - e. Innovation Capstone Project
- **ARTS AND COMMUNICATION PATHWAY**
 - a. Digital Media Arts/Communications
 - b. Computer Graphics
 - c. Film/TV Production, Directing, and Broadcasting
 - d. Esports Marketing
 - e. Audio Engineering
 - f. Video Production
 - g. Editing Digital Media
 - h. Innovation Capstone Project

MARKETING AND ADVERTISING OF WCSD STEM ACADEMY

During the scheduling meetings within all the schools, key stakeholders will go and present STEM Academy information to the students of each class separately. Information will be distributed to interested students. For any interested students, key stakeholders will meet with them and make sure all students' questions are answered. Applications will be given to those students for completion. The two tracks within the STEM Innovation Academy will be in the district's scheduling sheets.

MIDDLE LEVEL AND 9TH GRADE VISITATIONS TO STEM ACADEMY

All district freshman will visit the STEM Innovation Academy to be able to interact with hands-on activities. The time visiting, students will group up with current students and shadow them to understand the daily activities within the Academy. Students will be able to spend quality time during the day and experience both tracks.

Warren Area High School students have the ability to shadow the program by coming out of the 9th grade required courses: Computer 9 or Pre-STEM and visiting the program. The other attendance area schools will need to be bused into the Central Attendance Area. Freshman class numbers for 2020-21 are as follows.

- EMHS – 55 students
- SAMHS – 36 students
- WAHS – 158 students
- YMHS – 58 students