Engineering and Technology Program Evaluation Report

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Program Scope and Highlights

The program evaluation began in the summer of 2018 and concluded in June of 2019.

The Engineering and Technology Department lays a foundation for students to become technologically literature through the use of hands-on learning experiences and the application of the engineering design loop. This foundation prepares students to become lifelong learners by exposing students to an array of topics including engineering, manufacturing, robotics, designing, programming, prototyping, and more. The Engineering and Technology Department produces students who are capable of problem solving, critical thinking, decision making, and innovating solutions which will best prepare them for wherever life takes them after high school. Throughout a student's time in the Engineering and Technology program, students will gain experiences working both individually and as part of a team to analyze problems and design, develop, and construct solutions to the challenge within the prepared constraints and parameters.

In preparing this report, the members of the Engineering and Technology Department focused on rebranding the program to better prepare students for the 21st century marketplace. New course development and laboratory improvement were explored to enhance the educational environment for the students.

All Engineering and Technology courses are aligned with New Jersey Student Learning Standards, specifically 8.2 Technology Education, Engineering, Design and Computational Thinking as well as the Standards for Technological Literacy prepared by the International Technology and Engineering Educators Association.

Program Mission Statement and Vision

Mission - The mission of Bernards Township Engineering and Technology Department is to provide students with knowledge, skills and experiences to become technologically literate and lifelong learners.

Vision: The Engineering and Technology Department will offer all students authentic learning experiences through the application of the engineering design process to prepare them to think critically in a real world context, make informed decisions and assess the impacts of those decisions, and design and create solutions to technological problems.

Analysis of Current Program

William Annin Middle School: The Engineering and Technology Department currently offers a comprehensive program with courses at all grade levels for all students, and in a variety of technological specialties:

Sixth Grade Courses:

Design and Problem Solving in Technology

The Design and Problem Solving cycle is the student's' first Technology Education offering at William Annin Middle School. Students design, model, and test solutions to technological problems while working through the engineering design process. Activities include experiences with structures, packaging design, and basic electric circuits.

Technology Education One (redeveloped for sixth grade 2013)

Technology Education I students will explore the technology we use through the study of simple machines, mechanisms and alternative energy systems. Through the activities in the course, students will learn and practice collaboration, problem solving, critical thinking, and creative thinking skills as they relate to technology. Emphasis will be placed on the integration of math and science concepts and practice throughout the activities of the course. Students will also gain knowledge in the ways we can save our natural resources through the use of alternative energy systems.

Seventh Grade Courses:

Technical Fabrication - In Technical Fabrication, students will design, build, and test a high-speed vehicle powered by compressed carbon dioxide. All students will learn about the technological design process and use CAD software to design the vehicle. Math and science concepts will also be incorporated. Following a prototyping phase, the vehicles will be fabricated from wood and other materials, using various tools and machines. The vehicles will be timed to

1/1000 sec. and results will be compared and discussed. The students will work individually and in pairs, and a strong emphasis will be placed on safety.

The students will have an opportunity to add personal finishing touches using an airbrush paint system. The vehicles will be timed to 1/1000 sec. and results will be compared and discussed. A portfolio will be submitted to sum up course activities. The students will work individually and in pairs, and a strong emphasis will be placed on safety.

Creative Engineering - The Creative Engineering cycle builds on the skills learned in both Technology Education One and Technical Fabrication. In this engineering and problem-solving course the students will work through the engineering design process to design, model, and test solutions to technical problems. The students will experience projects in green design and mechanical movement.

Eighth Grade Elective Courses:

Computer Programming - This course is designed to give students experiences using a variety programming languages. Students will explore computer programming through project based problem solving activities that develop applications that are either desktop or Internet based. The course is designed to give students a comprehensive experience in computer programming. Students will learn logic and data structures common to all programming languages. Skills will be taught through the use of mini-activities to teach each concept or group of concepts followed by major programming projects that integrate what has been learned.

Participants will engage in two distinct units. The first unit will cover Programming Windows based applications. Students will learn Object Oriented programming as they develop applications and games for the Windows environment. The second unit covers Programming for the World Wide Web, where students will learn a variety of languages intended for the Internet. In this unit, students will create a comprehensive interactive website.

Introduction to Technical Theater (transferred facility 2013) - Introduction to Technical Theater will allow the learner to explore what goes on “behind the scenes” in a theatrical production. Students will learn about the world of the scenic designer by utilizing scale modeling techniques, as well as have an opportunity to design an original set for a Broadway play. In addition, students will learn how to construct a costume that could be used in the spring musical through the costume and fashion designer segments of the course.

Introduction to Woodworking - In this semester course students will begin to explore the area of woodworking through a series of unit projects. Each project is designed by the students and then developed by the class. The students will be challenged to develop both design and problem solving skills in order to create a well-crafted high quality project.

Advanced Woodworking - This class is for the serious aspiring woodworker. Students will utilize more advanced machine and tool processes including the wood lathe. They will continue to acquire design skills that will lead to individual final project selection. A manufacturing enterprise will also be simulated where they will design and market a product.

Robotics - Is there a robot in your future? In this course students will learn about core computer programming logic and reasoning skills using both icon based and code based programming platforms to control LEGO EV3 robots . Working in small groups students will work through modules which culminate in mini and then major programming and robotics engineering challenges.

Technology Education II (transferred facility 2013)- In Technology Education you will learn to solve technological problems while applying skills you have learned in Science, Math, Computers and Communication Arts. Activities will include the design and building of model rockets, gliders and hot air balloons in the area of transportation technology. Construction technology will be explored through the design, construction and testing of a model bridge. Computers will be used extensively as a simulation and research tool.

Engineering Design and Prototyping (new course offering 2016) - In this course, students will have the opportunity to explore various prototyping methods used by product designers, engineers, and problem solvers on a daily basis. Following the design process, students will be able to create working models of our solution using several pieces of equipment which may include 3D Printers, Laser Cutters, Vinyl cutters, and standard shop equipment. Through experiences in following a STEM model, students will have an opportunity to explore problems in areas such as biomedical engineering, mechanical engineering, industrial design, and product design.

Stem 8 (new course offering 2016) - The STEM 8 course is designed to study both Earth Science and Engineering Design in a real world context. Students will take both the Earth Science course and the Engineering design course concurrently throughout the year allowing for a collaborative experience between the two courses. Through exposure to and practice of the engineering design process, students will be challenged to develop working solutions to problems richly rooted in scientific practices and principles. Each student will complete a capstone project before the conclusion of the course.

Ridge High School - The Technology and Engineering Department currently offers a comprehensive program with courses at all grade levels for all students, and in a variety of technological specialties:

Introduction to Engineering Design (IED) - (Formerly Engineering CAD 1) The major focus of the IED course is to expose students to a design process, professional communication and collaboration methods, design ethics, and technical documentation. IED gives students the opportunity to develop skills in research and analysis, teamwork, technical writing, engineering graphics, and problem solving through activity-, project-, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB-learning challenges students to continually hone their interpersonal skills and creative abilities while applying math, science, and technology knowledge learned in other courses to solve engineering design problems and communicate their solutions. IED also allows students to develop strategies to enable and direct their own learning, an ultimate goal of education. In addition, students will use industry standard 3D solid modeling software to facilitate the design and documentation of their solutions to design problems and challenges. Introduction to Engineering Design is one of the foundation courses in the Project Lead The Way high school pre-engineering program.

Principles of Engineering (POE) - (Formerly Engineering CAD 2) POE is a course designed to help students understand the fields of engineering and engineering technology and their career possibilities. Engineering areas such as hydraulics, pneumatics, gearing systems, pulleys and structural supporting such as bridge building units and many others are modeled to resemble real world applications. POE helps students learn how engineers and technicians use math, science and technology in an engineering problem-solving process to benefit people. Units of study include energy and power, materials and structures, control systems, statistics and kinematics. Principles of Engineering is the second course in the engineering series in the Project Lead the Way high school pre-engineering program.

Civil Engineering & Architecture (CEA) (Formerly Architecture Design & Engineering) Civil Engineering and Architecture is the study of the design and construction of residential and commercial building projects. The course includes an introduction to many of the varied factors involved in building design and construction including building components and systems, structural design, stormwater management, site design, utilities and services, cost estimation, energy efficiency, and careers in the design and construction industry. The major focus of the CEA course is to expose students to the design and construction of residential and commercial building projects, design teams and teamwork, communication methods, engineering standards, and technical documentation. Civil Engineering & Architecture is the third course in the engineering series in the Project Lead the Way pre-engineering curriculum.

Robotics 1- Robotics I will cover the historical as well as contemporary applications of computer-automated manufacturing technology. Concepts and principles of Robotics, how they work, where they are used, and their strengths and limitations will be studies and explored. Students will also learn basic electrical theory as well as applying it by wiring a variety of series

and parallel circuits. Robotic kits will also be assembled by students, which will reinforce their knowledge of sensors, the different parts of a robot, and circuit boards.

Robotics 2 - Robotics II includes a review of the basic technology concepts learned in Robotics I. In addition, this knowledge and skill will be expanded to allow students the opportunity for "hands-on" construction and programming of VEX Robotic kits. This course will also cover the study of electronic circuits that are used to process and control digital signals. Students will experience various activities, which will teach them the principles behind industrial robotic technology, with the ultimate goal of allowing these students to analyze and problem solve a variety of teacher assigned robotic challenges.

Introduction to Woodworking - Introduction to Woodworking provides experiences to develop the skills necessary for the proper, safe use and care of common hand tools and stationary power equipment used in Woodworking. These skills are introduced and acquired during the construction of teacher assigned projects. New and more advanced skills using basic portable and stationary power equipment will also be explored at this time. Emphasis will be placed on safety and problem solving.

Woodworking Processes - This course incorporates the exploration, application, and functionality of various types and uses of joinery. Hand and power tools are used in the development of furniture projects, with the focus on joinery methods. Students will design such projects using 3D CAD solids modeling, and produce material lists with project costs. Topics of discussion will include wood identification, manmade materials, eco-friendly materials and efficient material use. The proper, safe use of hand, portable and stationary tools continues to be stressed.

Contemporary Woodworking - This course gives students the opportunity to learn more sophisticated woodworking techniques and processes. This is an exploratory class exposing the students to advanced techniques such as: complex woodturning, lamination and bending, wood finishing, furniture construction, tool and shop maintenance, and sharpening techniques. Students are encouraged to problem solve, plan and produce projects which demonstrate an understanding of various advanced woodworking techniques and processes. The use of CAD is incorporated into this course of study. Students receive small group instruction at this level and safety is a priority.

Cabinetmaking - This course is devoted to the design and construction of fine pieces of furniture with instruction in the history and development of furniture design. The use of advanced joinery techniques, and composite materials will be incorporated into this course. Topics to be discussed will include shaper use, raised panel doors, cabinet construction, jigs and fixtures. The main emphasis is on fine cabinet- making techniques and construction. Students may use CAD during the planning and design stage of their projects. Woodshop safety will be revisited as well.

Technology: Design, Engineering, and Innovation - Students in Technology: Design, Engineering & Innovation will develop a working knowledge of the past, present, and future of technology. Through a series of design/ problem solving activities, students will use the design process to arrive at solutions to specific problems. As part of the process, students will construct and test their solutions to meet a set of criteria. Emphasis will be placed on critical

thinking and problem solving in a hands-on environment. Students will make use of computers, tools, and materials to arrive at problem solutions. Design activities will be drawn from the areas of communication, construction, electricity/electronics, transportation, energy/power, and new/emerging technologies.

Current Classroom and Laboratory Facilities: William Annin Middle School

Room 100: STEM Engineering and Technology Systems Laboratory *(established 2016)*
Room 100 is the newest instructional space in the Technology and Engineering Department. The room was designed with two courses in mind, Engineering Design and Prototyping and STEM 8: Technology and Engineering. The room is equipped with four 3D printers, an injection molder, vacuum former, and various hand tools and portable power equipment. There is student project work storage and a space dedicated to group collaborative work. Laptops are used for CAD and other engineering design work in this space.

Room 102: Engineering and Design Laboratory *(established 2013)*
The facilities in the engineering and design laboratory include various machinery and tools for creation and fabrication of solutions to design problems. Some of the specific tools and machinery include a drill press, band saw, several scroll saws, electronics fabrication equipment, sewing machines, and various prototype testing devices. The facility is also equipped with chromebooks for research and investigation purposes.

Courses taught in Room 102 include Technical Theater, Technology Education Two, Creative Engineering, and Design and Problem Solving in Technology.

Room 104: Robotics and Mechanical Systems Laboratory
The facilities in the robotics and mechanical systems laboratory include desktop computers equipped with a variety of software packages. Included in the facility are microcontrollers and tools for constructing and testing robotics systems some of which use integrated BlueTooth and Arduino technology. Also included are Lego kits for designing and modeling with simple machines and other mechanical systems.

Course taught in room 104 include Robotics, Computer Programming, and Technology Education One. Creative engineering classes also use the space as needed for course project work.

Room108: Woodworking Processes Laboratory
Room 108 is a general materials processing laboratory with both portable and stationary power equipment. Dust collection is in place to remove large chips from the machinery and fine dust particles from the air. In 2015, a large Computer Controlled Router was added to do moe advanced fabrication work linking student designs to CAD applications.

Courses taught in room 108 include Introduction to Woodworking, Advanced Woodworking, and Technical Fabrication. The STEM Technology and Engineering classes also use the room at different times when working on final project solutions.

Current Classroom and Laboratory Facilities: Ridge High School

Room 618: Woodworking Processes Lab

Room 618 is a general materials processing laboratory with both portable and stationary power equipment. In 2015 a new six barrel dust collector was installed to remove large chips from the machinery and fine dust particles from the air are collected in three air filters. A SawStop Table Saw was purchased in 2015 to make for a safer working environment. This saw will stop if it senses a finger or hand, turning a potentially large injury into one that can be fixed with a band aid. In 2016 the room was updated with a new Grizzly Band Saw, a Powermatic Belt and Disc Sander, and a Powermatic Drill Press. In 2017 a Grizzly Downdraft table was added to collect the fine dust particles created from sanding. The downdraft table will collect the dust inside the machine instead of this dust becoming airborne making for both a safer work environment and an easier clean-up at the end of the work period.

Courses taught in room 618 include Introduction to Woodworking, Woodworking Processes, Contemporary Woodworking, and Cabinetmaking.

Room 623: Computer Aided Design Lab

The facilities in the CAD lab include 24 desktop computers with the latest AutoDesk computer drafting software and Lego Robotics software. The lab is equipped with an Epilog Laser Engraver, three MakerBot Replicator 3D printers, and a hydraulic press. Printing equipment includes a large scale plotter, scanner, and the HP 5225 color printer.

Courses taught in room 623 include Introduction to Engineering Design, Principles of Engineering, Civil Engineering & Architecture, Robotics 1, and Robotics 2.

Room 411: Innovations Lab

Room 411 is the newest lab facility at Ridge High School. This former media center computer lab was converted into a technology and engineering education lab during the 2017-2018 and 2018-2019 school years. The lab currently houses our Lego Robotic EV3 Kits, six desktop computers, four collaboration tables, a desktop bandsaw, desktop drill press and a desktop scroll saw.

Courses taught in room 411 include Technology: Design, Engineering, and Innovation, Robotics 1, and Robotics 2

Perception of Program

Areas of Strength:

William Annin Middle School
William Annin Middle School offers a comprehensive and cutting edge Engineering and Technology program that has been seen as a model for others in the state. Currently there are five full time teachers in the department with unique areas of speciality. Each teacher in the department is fully certified to teach K-12 Technology Education and can teach any course in the department if the need arises. As a department, the teachers constantly work with one another to develop new course content as well as experience the newest software and equipment to enhance the program we currently offer. Because of the vision of the staff we have been able to add new courses since the previous program evaluation was completed. As a department we created a sixth grade cycle, Design and Problem Solving in Technology and a seventh grade cycle, Creative Engineering, as well as added two eighth grade electives. These include Engineering Design and Prototyping and STEM 8: Technology and Engineering.

The facilities are adequate for the courses we are offering. Currently there are four classrooms dedicated to teaching Technology and Engineering content. In general, each room is properly equipped. The district has been supportive in the past of satisfying equipment requests especially as programs have evolved.

Ridge High School
Ridge High School has a comprehensive Engineering and Technology program that offers coursework in Woodworking, Drafting, Robotics, and Technical Design. Currently there are three full time teachers in the departedepartmentment, each with their own areas of specialization. Each teacher in the department is fully certified to teach K-12 Technology Education and can teach any course in the department if the need arises. As a department, the teachers work together in collaboration to develop and improve course content and projects to be implemented in the various courses. Since the last program evaluation, the staff has worked to improve facilities and course work to keep students safe and learning the latest technologies in the given subject area.

Areas Needing Improvement:

Bernards Township does not currently have an elementary program in the area of Engineering and Technology. Early exposure to classes in engineering would provide students with skills to build from at the middle and high school level. Also early exposure would allow students to gain interest in careers in engineering that they may not have considered otherwise.

William Annin Middle School has several areas where the Engineering and Technology department has noted needing improvement. The names of the courses should be changed to reflect updates to the curriculum and facilities. Equipment needs to be continually updated to allow student access to the most current hardware and software used in industry. Room 100 should have a laser cutter installed. When the room was designed, space was allocated for this

equipment and all electrical requirements were addressed. The addition of this piece of equipment would allow students to design more innovative products. The daily maintenance of room 108 has deteriorated. Proper daily cleaning of the room is necessary to provide a clean and safe environment for the students and teachers.

Ridge High School has numerous areas where the Engineering and Technology department has noted improvements to maximize the effectiveness of students achieving objectives. In order to keep topics current with the latest technology, new equipment will need to be purchased and implemented into the curriculum to reflect the latest technologies available in industry. New courses should be added to give students advanced learning experiences and honors level offering should be available. New facilities will need to be developed in order to house these new courses. Discussions continue to turn the former RHS weight room into a new Engineering and Technology laboratory facility, a floor plan has been developed outlining what the room would look like and what machines and equipment it would offer. Finally, it is the feeling of the staff that our Technology and Engineering Education program would improve by eliminating Project Lead the Way coursework in favor of implementing an Engineering CAD program developed by our trained staff.

Prior Goals and Progress

Prior Goals:

1. To help all students make informed decisions as consumers of technology in all aspects of their lives.
2. To provide opportunities for students to become more technologically literate individuals.
3. To develop an understanding in students of the impact and consequences of technology on their lives.
4. To have students apply creative problem solving techniques to finding the solution of technical problems.
5. To have students apply the concepts of mathematics, science, social students, language arts, humanities and the arts in the context of technology.
6. To engage students from all sectors of the student population in meaningful first hand experiences in technology.
7. To use technology education as a catalyst for an interdisciplinary approach to general education.
8. To aid all students to begin making informed career choices.
9. To develop an attitude within students that encourages them to keep pace with a rapidly changing society and realize education is a lifelong process.

Progress:
In order to meet the goals, the technology department has added courses, rewritten curriculum, added new equipment and facilities, and monitored student achievement through the tracking of SGO's. The members of the Engineering and Technology department meet regularly to align their curricula and objectives.

Goals/ Recommendations

1. **Change course names to rebrand the Engineering and Technology department.**

Problem Statement: Course names are the first opportunity students have to be intrigued about a particular course. Students should gain a sense of what the course entails from the name provided. A name change can help attract varied populations of students and peak interested in curriculum in the Engineering and Technology Department. The addition of honors level courses at the high school level may encourage students to elect to take higher level courses that they would not otherwise.

Proposed Solution:
William Annin suggested name changes:
Technology Education 1 should be changed to Mechanical Systems.
Technical Fabrication should be changed to Engineering Design and Fabrication.
Introduction to Technical Theater should be changed to Theatrical Engineering and Design.
Technology Education 2 should be changed to Applied Engineering.

Ridge High School suggested name changes:
Contemporary Woodworking should be changed to Contemporary Furniture Design.

2. Improve equipment and facilities.

Problem Statement: The execution of Engineering and Technology course content requires a tremendous amount of capitol dedicated to very specific pieces of equipment. While the high school and middle school programs differ in scope, similarity in equipment availability should be present. These pieces of equipment need to be properly maintained to ensure student safety and to maximize efficiency.

With a growing department and possible additional course offerings additional space will need to be allocated for both instructional and storage space.

Proposed Solutions:

William Annin Middle School needs to acquire a laser cutter to use in the STEM 8 Technology and Engineering, Woodworking, and Engineering Design and Prototyping classes to align with the projects and curriculum already implemented at Ridge High School

Ridge High School needs to acquire a computer controlled machine for advanced level prototyping work similar to the one at William Annin. A Shop-Bot or Techno machine should be considered and budgeted for this purchase. The high school should be able to extend the experiences students had in the middle school with this type of machine.

In regards to facilities, most specifically at Ridge High School, new courses and hopefully additional staffing will require more laboratory space. It has been discussed that the old weight room be converted to a “Maker Space” or fabrication lab that would house different types of

equipment than is presently in the woodworking processing area. This would allow flexibility in process and material selection and also provide a means for students to pursue more advanced process work. This room is located in close proximity to the other Engineering and Technology classrooms allowing student work spaces to be fluid and also provide opportunities for better collaboration between classes and colleagues using the spaces. Power requirements, fume exhaust, ventilation, student work space, storage, and equipment placement and selection will need to be carefully researched and addressed. Currently the proposed instructional space is being used for general storage of paper and athletic supplies and equipment. An alternative for this function will have to be determined.

Currently room 411 is being utilized to teach Robotics and Technology: Design, Engineering, and Innovation. This room was formerly a computer lab for the media center. A typical section of Robotics can have as many as 20 students. The typical laboratory work requires computer access for each student in the class. Next year there will only be six desktop computers dedicated to this room. Laptops need to be considered to allow for more student computer access. For the students to achieve the objectives in the Robotics curriculum, each student will need to have access to their own computer. Chromebooks are not an option for this purpose as they will not run the required software.

The Design and Engineering class not only requires the computers but also student work space for equipment and hands-on practical work. The tables need to be durable to allow for typical tool use and basic processing of materials. Tables with wood tops or science style tables would be appropriate for this purpose. Seating is another area that needs to be addressed. The room should be flexible meaning at times the tables may need to be moved. A stackable type of seating should be considered. Traditional shop stools would provide an adequate type of seating that can be stacked when needed.

Storage of student work, classroom materials, robotics kits, and hand tools needs to be addressed. Locking cabinets can be installed on the perimeter of the room as well as upper cabinets over the locations of the outlets dedicated for computers.

A final concern which needs to be addressed is room security. Because there is going to be a large amount of tools, materials, and equipment in the room the room should be re-keyed to limit access. Power equipment needs to be prevented from re-starting in the event of a power loss and then power being restored. All the portable power equipment needs to be equipped with magnetic starters or safe start plugs. The power should be able to be turned off to the equipment when no teacher is present.

Equipment maintenance is a very large and very important task for teachers in order to keep the facility working smoothly and the students safe. A comprehensive plan for machine maintenance needs to be developed. A contractor should be considered to provide general maintenance at least once per year on the large equipment. Aramark needs to be better trained in the expectations of what is needed for general cleaning. This needs to be discussed with the classroom teacher and custodial supervisor at the start of the school year. Cleaning, at the minimum, requires the floor to be swept, paper towels filled, trash emptied, and machines blown off. Air compressors need to be maintained as well. The oil needs to be changed and moisture drained monthly. Filters also need to be changed in the dust cats monthly. The dust collector on the exterior of the building should be emptied weekly.

3. Add additional courses in the area of Engineering and Technology.

Problem Statement: Bernards Township does not currently have an elementary program in the area of technology education. Early exposure to classes in engineering would provide students with skills to build from in the middle and high school level. Additionally, further courses are needed at the high school level to encompass all of the areas of Engineering and Technology and expose students to further career choices.

Proposed Solution: Develop elementary level courses and curriculum in the area of Engineering and Technology. At the high school level, develop advanced levels of Introduction to Design and Engineering and Robotics. Additional courses and honors level courses at the high school level should be proposed.

4. Reconsider Project Lead the Way courses as an effective method of delivering Engineering and Technology high school requirements.

Problem Statement: In 2016 courses in the Engineering and Technology department that covered topics such as drafting, engineering, architecture, 3D printing, and small gas engines were replaced with a curriculum purchased by the district from the Project Lead the Way company. Since 2016 the course feedback from the students, alumni, parents, and staff has not been positive. The students do not report having a positive experience with the rigid theoretical coursework that gives little experience in actual project work using real materials and processes. The large emphasis on lengthy calculations has a purpose in the engineering realm but needs to be reinforced through project work to show true understanding and application of the course content.

Project Lead the Way is a program designed to train students in a career path related directly to engineering and does not provide enough exposure to multiple disciplines within the areas of design, technology, and hands-on work. It is important to recognize that Engineering and Technology education should be for all students. Project Lead the Way does not provide for differentiation for every learner to have success. During the program evaluation process, comparable high schools in Northern and Central New Jersey were examined and none of these schools utilized Project Lead the Way but rather had their engineering and technology curriculum developed by department staff.

Proposed Solution: Develop a committee that includes teachers, administrators, and board of education members, that will review the Project Lead the Way curriculum and the pros and cons of offering these courses. If PLTW is discontinued, the previous curriculums will need to be revisited to ensure they reflect the latest technologies and projects.

Appendix

Program Comparisons and Best Practices: Program of Studies were reviewed from the following districts: Chatham, Westfield, Freehold, Livingston, Madison, Millburn, Montgomery, and West Morris Mendham. Our course offerings compared favorably to other districts in both breadth and depth. The areas that are not addressed in our program that are addressed in other districts are the inclusion of courses at the elementary level, inclusion of honors classes at the highschool, more variety of subjects at the highschool level, and more opportunities for upper level courses at the high school.

William Annin Middle School

	Chatham	Westfield	Freehold	Livingston	Madison	Milburn	Montgomery	William Annin
Design and Problem Solving	C	C	F	C	C(MP)	C	C	C
Technology Education 1				C			S	C
Creative Engineering	C		F	C		C	S	C
Technical Fabrication				C	S	C		C
Computer Science	C				S			S
Introduction to Technical Theater							S	S
Introduction to Woodworking								S
Advanced Woodworking								S
Robotics	C				S	C		S
Technology Education 2								S
Engineering Design and Prototyping	C				S			S
Stem 8	C		F					S

Stem: K-6						C		

Ridge High School:

	Chatham	Freehold	Livingston	Madison	Milburn	Montgomery	North Valley Regional	Westfield	West Morris Mendham	Princeton	West Windsor	Watchung	Hillsborough	Hopewell	Bridgewater	Ridge High
Intro to Woodworking		F	F	S		S	F						S	F	F	S
Woodworking Processes			F	S		S	F						F	F	F	S
Contemporary Woodworking				S			F						F	F	F	F
Cabinetmaking		F		S		F							S	F		F
Honors Cabinetmaking		F														
Home Survival(repair)														S	F	
Engineering CAD 1	F	F	*	S		S			F	F	F		S		F	
Engineering CAD 2	F	F	*	S		F					F		F		F	
Eng 3													S			
Prototyp	*	*	*						*	S	F					S

ing/Fabrication Integration/Lab																
Architecture 1		F	F	S	S	S			F	F		F	F	F		
Architecture 2		F	F		S	F				F			F	F		
Architecture 3					S									F		
Architecture 4					S											
Technical & Architectural Design 1	F	F					F		F						*	
Technical & Architectural Design 2		F					F									
Technical & Architectural Design 3		F					F									
Technical & Architectural Design 4		F														
Robotics 1	S		F		S				S			F				S
Robotics 2	F				F				F							S
Tech		F	*F				F		S							S

Design 1	S			S												
Tech Design 2		F	*F				F									
Tech Design 3			F													
Electronics 1		F	F									F			F	
Electronics 2		F	F												F	
PLTW - Intro to Engineering Design												F		F		F
PLTW - Principles of Engineering												F		F		F
PLTW - Civil Engineering & Architecture												F				F
TV Production	F			S					S		F			F		
Graphic Communication 1	S		F	S		S				F			S	S	*	
Graphic Communication 2			F			F							F	S	*	
Graphic Communication 3			F										F			

Computer Science 1	S	F			F		F		F				S	S		
Computer Science 2	S				F		F	F	F				S	S		
Computer Science 3					F		F	F						F		
Computer Science 4					F											
Advanced Placement Computer Science	F		F		F		F		F							
Automotive 1		F	F											F		
Automotive 2		F	F											F		
Automotive 3			F													
Small Gas Engines														F		
Energy, Power, Transportation			F										S			
Intro to STEM									S				S			
Stage Craft 1			F								F					
Stage Craft 2			F													

STEM Capstone	F						F									
Intro to Tech			S						F							
Honors Innovations and Design		F							F							

Resources:
Current course offerings
https://docs.google.com/document/d/1nfZnKU1BuzsvQfJSqGrNPiXMcxL9gANWzmPLekkFBU4/edit

Millburn Course Offerings
https://drive.google.com/file/d/1hs81eMkvLzsDx2YRQ7kLo1J4nXTQM91j/view

Madison Course Offerings
https://www.madisonpublicschools.org/Page/259
https://www.madisonpublicschools.org/domain/604

Freehold Course Offerings
https://www.frhsd.com/Page/361

Westfield Course Offerings:
http://ris.westfieldnjk12.org/pages/Roosevelt_Intermediate/Classes/tech

Northern Valley Regional Course Offering
https://nvd.nvnet.org/academics/technology_and_engineering

West Morris Mendham Course Offerings
http://www.wmmhs.org/academics/academic_departments/technology_and_engineering/semester_courses/

Montgomery Township School District Course Offerings

https://www.mtsd.k12.nj.us/cms/lib/NJ01000127/Centricity/Domain/79/18_19%20POS%20for%20website.pdf

Montgomery Township Upper Middle School Course Offerings

https://www.mtsd.k12.nj.us/Domain/398

Montgomery Township Lower Middle School Course Offerings

https://www.mtsd.k12.nj.us/Domain/816

Chatham School District Offerings

https://www.chatham-nj.org/Page/15021

Survey questions for Students:

Middle School:

1. What is your current grade level?
2. How often do you apply the skills that you learned in technology class outside of school?
3. How often do you apply the skills that you learned in technology class to other school projects?
4. Do you feel that your experiences in technology in the elementary school have prepared you for success in the middle school?
5. How likely are you to take Engineering and Technology classes at the high school level?

Ridge High School:

1. What is your current grade level?

2. How often do you use the skills in technology and engineering education outside of the classroom?

3. If a course in Basic Home Repairs and Life Skills was offered, how likely would you be to register?

4. How likely are you to pursue a college or technical training program in engineering or technology after high school?

5. Would you be more likely to take Engineering and Technology courses at Ridge if they carried Honors level credit?

Parents:

1. What is the current grade level of your child?
2. How well do you feel informed about the course offerings in our district?
3. How well do you feel our school is doing in preparing students in Engineering and Technology?
4. How well do you feel our school offers courses that satisfy state requirements and are of interest to your child?
5. How interested are you in having your child take more than the required graduation requirement in Engineering and Technology?
6. How important do you feel computers and other cutting edge equipment are in an Engineering and Technology classroom?
7. How much emphasis do you place on honors level classes as part of your child's transcripts?