Curriculum Map: Technology Education 8: Intro to Engineering

Meadville Area Middle School

Technology Education

Course Description: This year long course is specifically designed for the student who plans to pursue a college education (or career). It will teach students about the basics of Engineering including 3D Parametric Modeling, Technical Drawing Interpretation, Robotics, Programming, Problem Solving, and Rapid Prototyping. The goal of this coarse is to create a real life experience and real life problems that students will experience in a career in Engineering.

Unit Title: 3D Parametric Modeling and Technical Drawings

Suggested time frame: _5_ weeks

Standards:

3.6.7.B - Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7.C - Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions

3.7.10.C - Apply basic computer operations and concepts.

3.7.10.E - Explain basic computer communications systems.

3.8.7.A - Explain how sciences and technologies are limited in their effects and influences on society.

3.8.7.B - Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7.C - Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

3.2.7.B - Apply process knowledge to make and interpret observations.

3.2.7.D - Know and use the technological design process to solve problems.

PA Math 2.3.A – Geometry – Radius and Diameter

Big Idea: Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories.

Essential Questions:
What methods of designing can we use to develop solutions?
How do we evaluate the impact of modifying a system to improve performance?
How can we use tools, machines, and systems to improve our needs and wants?

Competency	Vocabulary	Strategy	Resource
- SWBAT… - Analyze Technical Drawings - Design Parts based on Technical Drawings - Solve multi-step problems to build parts and models - Describe the impact of Technology on Society - Use Rapid Prototyping (3D Printing) to manufacture parts - Connect and share ideas and collaborate projects on the internet with other Engineers - Critique and use various steps and methods for solving problems in various software systems - Use basic computer concepts for storing and sharing digital files - Understand and apply Parametric Modeling software to build and create parts, assemblies, and drawings - Differentiate different methods for solving problems in Solidworks - Understand Radius and Diameter when analyzing dimensions in technical drawings	Engineering Ergonomics Information Technology Instructional Technology Scale Design Process Tool Radius Diameter Parametric Modeling Rapid Prototyping 2 Dimensional Drawing 3 Dimensional Drawing x, y, z coordinates Dimensions Closed Loop Sketch Fillets Extrusions Linear Pattern Mates Constraints Fully Defined Scenes and Appearances Design Tree	Online activity analyzing Technical Drawings Use Parametric Modeling strategies to complete the Robotic Arm project Use Solidworks to build parts Save parts correctly in a Robotic Arm folder Use parts to create an assembly using mates Create a Fully Defined sketch using dimensions Use best practices in Solidworks product development Use scenes and appearances to create realistic looking parts Use Photoview360 to render high quality images Edit and modify parts using the Design Tree Understand the difference between Radius and Diameter Use Sketch constraints Share Projects on Thingiverse.com	Solidworks Software SmartBoard/Projector Robotic Arm Packet Internet Access Thingiverse.com WiscOnline.com educational resources Computers 3D Printer

Unit Title: LEGO NXT Robotics and Programming

Suggested time frame: _4_ weeks

Standards:

3.6.7.B - Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7.C - Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions

3.7.10.C - Apply basic computer operations and concepts.

3.7.10.E - Explain basic computer communications systems.

3.8.7.A - Explain how sciences and technologies are limited in their effects and influences on society.

3.8.7.B - Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7.C - Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

3.2.7.B - Apply process knowledge to make and interpret observations.

3.2.7.D - Know and use the technological design process to solve problems.

Big Idea: Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories. Robotics engineering and programming puts students in a constant battle with creating effective programs through problem solving techniques. Students will be presented with a challenge and must create a creative solution to it.

Essential Questions:
What methods of programming can we use to develop specific solutions?
How do we evaluate the impact of modifying a system to improve performance?
How can we use tools, machines, and systems through Robotics to improve our needs and wants?
How does Robotics and Automation change our nation for the good and bad?

Competency	Vocabulary	Strategy	Resource
- SWBAT… - Analyze Programming Dilemmas - Design Programs based on various challenges - Solve multi-step programs to complete advanced challenges - Describe the impact of Automation on Society - Utilize sensors and motors to complete tasks - Connect and share ideas and collaborate projects on the internet with other Engineers - Critique and use various steps and methods for solving problems in various programs - Use basic computer concepts for storing and sharing digital files - Understand and Drag and Drop programming to complete Robotic Programs - Differentiate different methods and styles of programming	Robotic Engineering Automation Drag and Drag Programming Sensors Motors Light Threshold Sound Threshold Averages Ultrasonic Sensor Light Sensor Sound Sensor Loops Program Switch Loops	Students will perform on board programming Use sensors and motors to complete a series of challenges Use programming to complete a comprehensive obstacle course using Robotics Save programs correctly in a Robotics folder Use drag and drop programming Create programs that complete challenges effectively Use light sensors, ultrasonic sensors, touch sensors, and sound sensors Use loops and switches to create complex programs Calculate various thresholds for light and sound sensors	Computers NXT Programming Software LEGO NXT Robot Kits USB Cables SmartBoard/Projector NXT Spare Parts NXT Video Tutorials

		Edit and modify programs to increase speed and efficiency of robots Compete against other students in the class to create the fastest program for the summative obstacle course assessment	

Unit Title: Thingiverse Challenge

Suggested time frame: _2_ weeks

Standards:

3.6.7.B - Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7.C - Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions

3.7.10.C - Apply basic computer operations and concepts.

3.7.10.E - Explain basic computer communications systems.

3.8.7.A - Explain how sciences and technologies are limited in their effects and influences on society.

3.8.7.B - Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7.C - Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

3.2.7.B - Apply process knowledge to make and interpret observations.

3.2.7.D - Know and use the technological design process to solve problems.

Big Idea: Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories. The Thingiverse Challenge provides students with an opportunity to interact on the web with other designers and creators. Students will either invent or innovate a product that will be marketed online where people can download and 3D Print their product.

Essential Questions:
What methods of designing can we use to develop solutions?
How do we evaluate the impact of modifying a system to improve performance?
How can we use tools, machines, and systems to improve our needs and wants?
How do we design products which have a public appeal?
How do we market products to maximize profit?
How do we evaluate markets, social media, and trends, to determine the public needs and wants?

Competency	Vocabulary	Strategy	Resource
- SWBAT… - Analyze what makes a successful product - Design a product based on human need, markets, popularity, and social media impact - Solve multi-step problems to build parts and models to be downloaded by users online - Describe the difference between an innovation and an invention - Use Rapid Prototyping (3D Printing) to prototype parts which will be placed online for download - Connect and share ideas withothers online to help build a product that will not only be useful, but will be popular and successful - Critique and use various steps and methods for finding solutions to building a product - Use basic computer concepts for storing and sharing digital files	Engineering Innovation Invention Upload/Download STL File Prototyping Marketing Product Enhancement Interpersonal Marketing Social Media Marketing Ergonomics Forecasting Market Research Branding Advertising Agency Market Distribution Demographic	-Differentiate between Invention and Innovation -Use Parametric Modeling strategies to build a product to be marketed -Convert SLDW parts to an STL format -Use Assembly tools if necessary for products - Assess the market to determine what products will likely succeed -Design, create, prototype, and test products before bringing them to market -Use best practices in Solidworks for product development -Use scenes and appearances to create realistic looking parts -Use Photoview360 to render high quality images to help market product	Solidworks Software SmartBoard/Projector Internet Access Thingiverse.com Computers 3D Printer/PLA Plastic

• Use online computer concepts to share and download files with other users • Understand and apply Parametric Modeling software to create a product that will be marketed online • Differentiate different methods for creating a product in Solidworks • Understand market demand and how to properly market a part for maximum success and popularity • Convert a SLDW part file to an STL file to be uploaded online		- Upload parts online to Thingiverse	