CENTRAL BUCKS
SCHOOL DISTRICT

STEAM Robotics 1

The Technology and Engineering Education Department

Course Number: 6861

Course Level: High School

Grade: 9,10,11,12

Time/Credit: 45 Days (2 Marking Periods)/.5 Credit

Development Date: 2025 - 2026

School Board Approval: TBD

Central Bucks School District
20 Welden Drive
Doylestown, PA 18901

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Central Bucks School District
Teaching and Learning Principles

1. **Learning is Active and Experiential-** Students learn by doing, making, and reflecting. Hands-on, minds-on project based learning connects ideas to real contexts.
2. **Design and Problem-Solving Thinking Drives Learning-** Design challenges build creativity, critical thinking, and persistence. Students apply the engineering design and problem-solving process: identify, design, build, test, improve.
3. **Learning is Integrated (STEAM Approach)**- Real-world problems cross disciplines. Curriculum blends science, technology, engineering, art, and math with an emphasis on TECHNOLOGY and ENGINEERING.
4. **Creativity and Innovation are Important**- Students are creators, inventors, and problem solvers. Emphasis is on idea generation, iteration, and supervised risk-taking.
5. **Learning is Collaborative and Social**- Teamwork mirrors real engineering and design practice. Students share ideas, give feedback, and build together.
6. **Technological Literacy is achieved through tools** - Students develop technological literacy through authentic use and creation. Tools include traditional hand tools and human operated machines and modern tools including CAD, coding, robotics, 3D printing, CNC, and laser systems.
7. **Learning is Inclusive and Equitable-** All learners deserve meaningful access to STEAM experiences. Curriculum reflects diverse cultures, needs, and perspectives.
8. **Assessment is Authentic and Reflective**- Teachers will evaluate process, creativity, and growth—not just outcomes. Portfolios, journals, and exhibitions measure understanding.
9. **Environments are Safe, Flexible, and Future-Focused-** Space and culture support exploration and innovation. Safe, organized, and adaptable Fabrication shops and prototyping labs foster creative problem-solving.
10. **Reflection and Lifelong Learning are Essential**- Students learn through reflection and iteration. Reflection documents and portfolios reinforce growth.

Documents Considered:

1. Experiential and Constructivist Learning
- Bruner, J. (1966). *Toward a Theory of Instruction.* Harvard University Press.
- Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development.* Prentice-Hall.

2. Design Thinking and Engineering Design
- IDEO. (2012). *Design Thinking for Educators Toolkit.* IDEO.
- National Academy of Engineering. (2020). *Standards for Technological and Engineering Literacy: The Role of Technology and Engineering in STEM Education (STEL).* Washington, DC: National Academies Press.

3. Integrated STEAM Learning
- Honey, M., Pearson, G., & Schweingruber, H. (Eds.). (2014). *STEM Integration in K–12 Education: Status, Prospects, and an Agenda for Research.* National Academies Press.
- Yakman, G. (2008). *STEAM Education: An Overview of Creating a Model of Integrative Education.* In *PATT-19 Conference: Research on Technology Education.*

4. Creativity and Innovation in Education
- Robinson, K. (2011). *Out of Our Minds: Learning to Be Creative.* Capstone Publishing.
- International Technology and Engineering Educators Association (ITEEA). (2020). *Standards for Technological and Engineering Literacy: Defining the Role of Technology and Engineering in STEM Education.*

5. Collaborative and Social Learning
- Johnson, D. W., & Johnson, R. T. (2009). *An Educational Psychology Success Story: Social Interdependence Theory and Cooperative Learning. Educational Researcher*, 38(5), 365–379.
- Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes.* Harvard University Press.

6. Technological Literacy

- Mishra, P., & Koehler, M. J. (2006). *Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. Teachers College Record*, 108(6), 1017–1054.
- ITEEA (2020). *Standards for Technological and Engineering Literacy (STEL).*

7. Equity and Cultural Relevance in STEAM
   - Banks, J. A. (2008). *An Introduction to Multicultural Education.* Pearson Education.
   - Ladson-Billings, G. (1995). *Toward a Theory of Culturally Relevant Pedagogy. American Educational Research Journal*, 32(3), 465–491.
8. Assessment for Learning
   - Black, P., & Wiliam, D. (1998). *Assessment and Classroom Learning. Assessment in Education: Principles, Policy & Practice*, 5(1), 7–74.
   - Wiggins, G. (1998). *Educative Assessment: Designing Assessments to Inform and Improve Student Performance.* Jossey-Bass.
9. Learning Environments and Pedagogy
   - Dewey, J. (1938). *Experience and Education.* Macmillan.
   - Marzano, R. J. (2007). *The Art and Science of Teaching: A Comprehensive Framework for Effective Instruction.* ASCD.
10. Reflection and Lifelong Learning
   - Hattie, J. (2012). *Visible Learning for Teachers: Maximizing Impact on Learning.* Routledge.
   - Schön, D. A. (1983). *The Reflective Practitioner: How Professionals Think in Action.* Basic Books.

Central Bucks School District
Enduring Understandings

Students will understand that:

Applying, Maintaining, and Assessing Technological Products and Systems
- Engineering and design are human processes. The products and systems created by technology and engineering are meant to extend human capabilities to meet specific needs.
- All technological systems require maintenance. These systems must be monitored, maintained, and assessed to ensure they continue to operate as intended.
- Technological systems are interdependent. Technological products, processes, and systems do not exist in isolation; they are interconnected and interact with each other in complex ways.

Impacts of Technology
- All technology has intended and unintended consequences. The introduction of new technologies can create both positive and negative impacts on individuals, society, and the environment.
- Technology shapes society, and society shapes technology. Societal priorities, beliefs, and values influence which technologies are developed, and in turn, new technologies change human behavior and cultures.
- The total impact of a technology is not always foreseeable. A full evaluation of a technology's effects requires considering its social, cultural, environmental, and economic impacts over time.

Influence of Society on Technological Development
- Technological development is driven by a variety of factors. The needs and wants of a society, economic considerations, political forces, and ethical issues all influence which technological innovations are prioritized.
- Not all technological problems have a perfect solution. Decision-making in engineering involves trade-offs and considering a range of constraints, including cost, safety, reliability, and aesthetics.

Design in Technology and Engineering Education
- Design is a systematic and iterative process. Successful design follows a methodical process that includes defining the problem, developing models, testing, evaluating, and refining solutions.
- There is no single correct path for a design solution**.** The engineering design process allows for multiple approaches to solving a problem, and the best solution is often a combination of the strongest features from several ideas.
- Design solutions must account for various constraints. The success of a design is evaluated by how well it meets specific criteria while operating within constraints, such as available resources and potential environmental impact.

Integration of Knowledge, Technologies, and Practices
- Effective engineering draws on diverse knowledge. Solving complex problems requires integrating knowledge from science, mathematics, and other subjects.
- Collaboration is essential for effective innovation. Engineering and technological development are not solitary pursuits. They require teamwork, communication, and leadership skills to develop successful solutions.
- Systems thinking is critical for understanding complexity. Technology and engineering education should cultivate systems reasoning, allowing students to understand how different components interact within larger systems.

Central Bucks School District
Essential Questions

Applying, maintaining, and assessing technological products and systems

- How do technological systems work together to achieve a desired goal?
- What is the importance of maintaining and repairing a product, system, or process?
- How does the analysis of information aid in the evaluation of technological products and systems?
- Why is it important for people to be technologically literate?

Impacts of technology

- How has technology both created and solved problems throughout history?
- How does technology influence individuals, cultures, and the environment?
- Why is it important to consider ethical implications when developing and using technology?
- What are the trade-offs involved in using different kinds of technology?

Influence of society on technological development

- How do a society's values and beliefs influence its attitude toward technology?
- How do the needs and wants of a society shape new technological developments?
- How can societies sustainably manage resources related to technological creation and use?

Design in Technology and Engineering Education

- What is the value of iteration (repetition) in the design process?
- Why is there no single, best solution to a design problem?
- How do criteria and constraints drive the optimization of a design?
- How are universal principles and elements of design used in the creation of a technological product or system?

Integration of knowledge, technologies, and practices

- How do advancements in technology influence other fields, such as science, environmental literacy, and sustainability?
- How do scientists and engineers use different types of tools, models, and practices to understand and innovate in the world?
- What happens when technologies from different disciplines are combined or integrated?

Central Bucks School District – Course of Study Overview
STEAM Robotics 1

Desired Results
Course Description: This introductory Science, Technology, ENGINEERING, Art and Mathematics (STEAM) Robotics, 9 Weeks course invites students to experience the foundations of Robotics. Students will explore mechanical design, basic electronics, and programming concepts while learning how to build, wire, and operate robots to complete tasks and challenges. Emphasis is placed on creativity, problem-solving, and teamwork as students apply STEAM principles to design innovative solutions using VEX and other smaller microcontrollers. This course provides a foundation in physical coding techniques and wiring while furthering students' technological literacy from robotics and coding in middle school within the expanded STEAM framework. Students who complete STEAM Robotics 1, 9 weeks with a C or better can take STEAM Robotics 2.

Prerequisite: None

Committee Members**: Corey Detweiler, Travis Jovais, Luke Drake, Jon Taylor**

Acceptable Evidence.
Common Summative Assessment 1 Title: STEAM Robotics Project

Common Summative Assessment 2 Title: STEAM Robotics Portfolio

Course Grading: 90 Percent Summative, 10 Percent Formative

STEAM Robotics 1 – Pacing Guide
(Add or delete units and the boxes under each as needed)

Content	Days
Unit 1 - Introduction to STEAM Robotics 1	**1**
Course Overview and Syllabus	.5
College and Career	.5
Unit 2 – Measuring, CAD and 3D Print	**7**
Measurement- Metric/Imperial	1
Ohm's Law	1
CAD Design for Robotic Components	4
Slicing for 3D Printing	1
Unit 3 – Robotics Kit Components Overview	**1**
Component Kit- Microcontroller and Kit Accessories Overview	.5
Integrated Development Environment	.5
Unit 4 – Robotics Kit Methods	**3**
LED's and Code	1
Sensors and Code	1
Motors and Code	1
Unit 5 -STEAM Engineering and Robotics Project Process	**30**
Engineering Robotics Project Loop- Ongoing throughout course	#
Plan- Read Kit Directions and gather components needed	5
Design and Build- Design, Print and Assemble Robotic Device	15
Code- Drag or Type Code into IDE	5
Troubleshoot- Execute Code and fix issues	5
Unit 6- STEAM Robotics Portfolio	**3**
Data/Photo Collection	1
Desktop Publishing	2
Total Days	45

Required Texts and Software-

The Ruler Game - Learn to Read a Ruler

Cad.onshape.com

Bambu Labs P2S

Bambu Labs Software

ELEGOO UNO R3 Project Most Complete Starter Kit with Tutorial Compatible with Arduino IDE (200+ Components) or comparable along with- Arduino Tutorial 1: Setting Up and Programming the Arduino for Absolute Beginners,

VEX Classroom V5 - VEX Robotics, kits and online coding software

Central Bucks School District – Course of Study – STEAM Robotics 1
Unit 1 – Introduction to STEAM Robotics 1

Desired Results:

- Essential Questions:
- How do a society's values and beliefs influence its attitude toward technology?
- How do the needs and wants of a society shape new technological developments?
- How can societies sustainably manage resources related to technological creation and use?
- How has technology both created and solved problems throughout history?
- How does technology influence individuals, cultures, and the environment?
- Why is it important to consider ethical implications when developing and using technology?
- What are the trade-offs involved in using different kinds of technology?
- Why is it important for people to be technologically literate?

Enduring Understandings:
Students will understand that…

- All technology has intended and unintended consequences. The introduction of new technologies can create both positive and negative impacts on individuals, society, and the environment.
- Engineering and design are human processes. The products and systems created by technology and engineering are meant to extend human capabilities to meet specific needs.
- Technology shapes society, and society shapes technology. Societal priorities, beliefs, and values influence which technologies are developed, and in turn, new technologies change human behavior and cultures.
- Technological development is driven by a variety of factors. The needs and wants of a society, economic considerations, political forces, and ethical issues all influence which technological innovations are prioritized.

Knowledge:
Students will know…

- Vocabulary: Technological and Engineering Literacy, STEAM

Skills:

Students will be able to…

- learn about the expectations and structure of the course.
- learn about the importance of technological and engineering literacy and the different ways it affects the world and its citizens.
- explore different careers and college/trade school options.

Standards:

Priority:

3.5.9-12.H Evaluate ways that technology and engineering can impact individuals, society, and the environment.
3.5.9-12.E Evaluate how technology and engineering advancements alter human health and capabilities.
3.5.9-12.A Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
3.5.9-12.EE Connect technological and engineering progress to the advancement of other areas of knowledge and vice versa.

3.5.9-12.KK Relate how technological and engineering developments have been evolutionary, often the result of a series of refinements to basic inventions or technological knowledge.
3.5.9-12.OO Use project management tools, strategies, and processes in planning, organizing, and controlling work.

Supporting:
3.5.9-12.MM Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.
3.5.9-12.LL Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop.
3.5.9-12.HH Analyze how the Industrial Revolution resulted in the development of mass production, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.
3.5.9-12.FF Evaluate how technology enhances opportunities for new products and services through globalization.

Acceptable Evidence:
Performance Tasks – Introduce course, excite students about Robotics

History of Robotics- History of Industrial
Robots | Robots.com
Case Study- The World's Leading
Robotics Company | Boston Dynamics

Acceptable evidence of learning other than Performance Tasks:
Formative Assessment- Engineers' Notebook/Portfolio

Summative Assessment- N/A

Suggested Learning Experiences and Instruction
Learning Experiences:
- Learn about the history of robotics and explore robotics companies

Instructional Strategies:
- Direct instruction
- Teacher Demonstration
- Problem-Solving and Critical Thinking
- Self-check and evaluation

Differentiation/Intervention/Enrichment Options:
- Project Choice when appropriate
- One on One Instruction
- Time for extra project work when requested
- Lunch and Learn when needed

For Language Development:
- Encourage students to view videos in native language when needed

Desired Results:

Essential Questions:

- How do scientists and engineers use different types of tools, models, and practices to understand and innovate in the world?
- How are universal principles and elements of design used in the creation of a technological product or system?
- What happens when technologies from different disciplines are combined or integrated?
- What is the value of iteration (repetition) in the design process?

Enduring Understandings:

Students will understand that…

- Design is a systematic and iterative process. Successful design follows a methodical process that includes defining the problem, developing models, testing, evaluating, and refining solutions.
- There is no single correct path for a design solution**.** The engineering design process allows for multiple approaches to solving a problem, and the best solution is often a combination of the strongest features from several ideas.
- Design solutions must account for various constraints. The success of a design is evaluated by how well it meets specific criteria while operating within constraints, such as available resources and potential environmental impact.
- Effective engineering draws on diverse knowledge. Solving complex problems requires integrating knowledge from science, mathematics, and other subjects.
- Technological systems are interdependent. Technological products, processes, and systems do not exist in isolation; they are interconnected and interact with each other in complex ways.

Knowledge:

Students will know…

- Vocabulary: CAD- Computer Aided Drawing, English and Metric measuring systems, Ohm's Law, iteration, slicing

Skills:

Students will be able to…

- measure accurately
- complete simple Ohm's Law math problems
- draw objects accurately in Onshape CAD software using 2D and 3D tools to export a file and slice it on a 3D printing slicer

Standards:

Priority:

3.5.9-12.P Apply a broad range of design skills to a design thinking process.

3.5.9-12.N Analyze and use relevant and appropriate design thinking processes to solve technological and engineering problems.

3.5.9-12.U Evaluate and define the purpose of a design.

3.5.9-12.X Implement the best possible solution to a design using an explicit process.

Supporting:

3.5.9-12.OO Use project management tools, strategies, and processes in planning, organizing, and controlling work.

3.5.9-12.BB Assess how similarities and differences among scientific, technological, engineering, and mathematical knowledge and skills contributed to the design of a product or system.

Acceptable Evidence:
Performance Tasks – satisfactory score on ruler game, Ohm's Law math problems, Onshape tutorial completion, Robotic design, sliced file

Acceptable evidence of learning other than Performance Tasks:
Formative Assessment- Engineers' Notebook/Portfolio

Summative Assessment- Common Engineering Rubric

Suggested Learning Experiences and Instruction
Learning Experiences:

- Ruler game
- Ohm's Law
- Onshape tutorials
- Slicer

Instructional Strategies:

- Direct instruction
- Teacher Demonstration
- Problem-Solving and Critical Thinking
- Self-check and evaluation

Differentiation/Intervention/Enrichment Options:

- Project Choice when appropriate
- One on One Instruction
- Time for extra project work when requested
- Lunch and Learn when needed

For Language Development:

- Encourage students to view videos in native language when needed

Unit 3 – Robotics Kit Components Overview

Desired Results:

Essential Questions:

- How do scientists and engineers use different types of tools, models, and practices to understand and innovate in the world?
- What happens when technologies from different disciplines are combined or integrated?
- How does the analysis of information aid in the evaluation of technological products and systems?
- What happens when technologies from different disciplines are combined or integrated?

Enduring Understandings:

Students will understand that…

- Systems thinking is critical for understanding complexity. Technology and engineering education should cultivate systems reasoning, allowing students to understand how different components interact within larger systems.
- Technological systems are interdependent. Technological products, processes, and systems do not exist in isolation; they are interconnected and interact with each other in complex ways.
- Effective engineering draws on diverse knowledge. Solving complex problems requires integrating knowledge from science, mathematics, and other subjects.
- Collaboration is essential for effective innovation. Engineering and technological development are not solitary pursuits. They require teamwork, communication, and leadership skills to develop successful solutions.

Knowledge:

Students will know… the identity of the different components of the kits and the competition area

- Vocabulary: breadboard, LED, motor, resistor, gears, remote control, screws, spacers, sensors

Skills:

- Students will be able to identify the different parts of the Elegoo and VEX kits

Standards:

Priority:

3.5.9-12.A Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.

Supporting:

3.5.9-12.CC Analyze how technology transfer occurs when a user applies an existing innovation developed for one function for a different purpose.

Acceptable Evidence:

Performance Tasks – Parts Identification and function

Acceptable evidence of learning other than Performance Tasks:

Formative Assessment- Engineers' Notebook/Portfolio

Summative Assessment- Kit Identification Quiz

Suggested Learning Experiences and Instruction

Learning Experiences:

- Identify components and their uses in robotics systems

Instructional Strategies:

- Direct instruction
- Teacher Demonstration
- Problem-Solving and Critical Thinking
- Self-check and evaluation

Differentiation/Intervention/Enrichment Options:

- Project Choice when appropriate
- One on One Instruction
- Time for extra project work when requested
- Lunch and Learn when needed

For Language Development:

- Encourage students to view videos in native language when needed

Central Bucks School District – Course of Study – STEAM Robotics 1
Unit 4 – Robotics Kit Methods

Desired Results:
Essential Questions:
- How do technological systems work together to achieve a desired goal?
- How do scientists and engineers use different types of tools, models, and practices to understand and innovate in the world?
- What happens when technologies from different disciplines are combined or integrated?

Enduring Understandings:
Students will understand that…
- Technological systems are interdependent. Technological products, processes, and systems do not exist in isolation; they are interconnected and interact with each other in complex ways.
- Design is a systematic and iterative process. Successful design follows a methodical process that includes defining the problem, developing models, testing, evaluating, and refining solutions.
- There is no single correct path for a design solution. The engineering design process allows for multiple approaches to solving a problem, and the best solution is often a combination of the strongest features from several ideas.
- Design solutions must account for various constraints. The success of a design is evaluated by how well it meets specific criteria while operating within constraints, such as available resources and potential environmental impact.
- Effective engineering draws on diverse knowledge. Solving complex problems requires integrating knowledge from science, mathematics, and other subjects.
- Collaboration is essential for effective innovation. Engineering and technological development are not solitary pursuits. They require teamwork, communication, and leadership skills to develop successful solutions.
- Systems thinking is critical for understanding complexity. Technology and engineering education should cultivate systems reasoning, allowing students to understand how different components interact within larger systems.

Knowledge:
Students will know…
- how to use kit components to create a circuit (Arduino) or a structure (VEX) and use the Integrated Development Environment (IDE) to upload code to a controller
- Vocabulary: IDE, Arduino, VEX, problem-solving design and engineering loop

Skills:
Students will be able to use kit components to create a circuit (Arduino) or a structure (VEX) and use the Integrated Development Environment (IDE) to upload code to a controller.

Standards:
<u>Priority:</u>
3.5.9-12.O Apply appropriate design thinking processes to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.
3.5.9-12.N Analyze and use relevant and appropriate design thinking processes to solve technological and engineering problems.
3.5.9-12.LL Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop.
3.5.9-12.AA Safely apply an appropriate range of making skills to a design thinking process.
3.5.9-12.Y (ETS) Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Supporting:
3.5.9-12.EE Connect technological and engineering progress to the advancement of other areas of knowledge and vice versa.
3.5.9-12.MM Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.

Acceptable Evidence:
Performance Tasks – breadboard circuit (Arduino) and/or created structure with brain (VEX) upload code to perform a task

Acceptable evidence of learning other than Performance Tasks:
Formative Assessment- Engineers' Notebook/Portfolio

Summative Assessment- Common Engineering Project Rubric

Suggested Learning Experiences and Instruction
Learning Experiences:
- VEX kit and Arduino Kit performance tasks taken from online resources

Instructional Strategies:
- Direct instruction
- Teacher Demonstration
- Problem-Solving and Critical Thinking
- Self-check and evaluation

Differentiation/Intervention/Enrichment Options:
- Project Choice when appropriate
- One on One Instruction
- Time for extra project work when requested
- Lunch and Learn when needed

For Language Development:
- Encourage students to view videos in native language when needed

Central Bucks School District – Course of Study – STEAM Robotics 1
Unit 5 – STEAM Engineering and Robotics Project Process

Desired Results:

Essential Questions:

- How do technological systems work together to achieve a desired goal?
- What is the importance of maintaining and repairing a product, system, or process?
- How does the analysis of information aid in the evaluation of technological products and systems?
- What is the value of iteration (repetition) in the design process?
- Why is there no single, best solution to a design problem?
- How do criteria and constraints drive the optimization of a design?
- How are universal principles and elements of design used in the creation of a technological product or system?

Enduring Understandings:
Students will understand that…

- All technological systems require maintenance. These systems must be monitored, maintained, and assessed to ensure they continue to operate as intended.
- Technological systems are interdependent. Technological products, processes, and systems do not exist in isolation; they are interconnected and interact with each other in complex ways.
- Not all technological problems have a perfect solution. Decision-making in engineering involves trade-offs and considering a range of constraints, including cost, safety, reliability, and aesthetics.
- Effective engineering draws on diverse knowledge. Solving complex problems requires integrating knowledge from science, mathematics, and other subjects.
- Collaboration is essential for effective innovation. Engineering and technological development are not solitary pursuits. They require teamwork, communication, and leadership skills to develop successful solutions.
- Systems thinking is critical for understanding complexity. Technology and engineering education should cultivate systems reasoning, allowing students to understand how different components interact within larger systems.
- Design solutions must account for various constraints. The success of a design is evaluated by how well it meets specific criteria while operating within constraints, such as available resources and potential environmental impact.

Knowledge:
Students will know how to use the Engineering Design and Problem Solving Loop to make STEAM Robotics projects to solve a problem.

Vocabulary: Structure, Motion, Control

Skills:

Students will be able to use the kits and components to make STEAM Robotics projects to use with or without the competition area.

Standards:
Priority:
3.5.9-12.O Apply appropriate design thinking processes to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality.
3.5.9-12.N Analyze and use relevant and appropriate design thinking processes to solve technological and engineering problems.
3.5.9-12.LL Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop.
3.5.9-12.AA Safely apply an appropriate range of making skills to a design thinking process.

3.5.9-12.Y (ETS) Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Supporting:
3.5.9-12.EE Connect technological and engineering progress to the advancement of other areas of knowledge and vice versa.
3.5.9-12.MM Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.

Acceptable Evidence:
Performance Tasks – Completed and functional circuit (Arduino) and/or completed and functional robot (VEX)

Acceptable evidence of learning other than Performance Tasks:
Formative Assessment- Engineers' Notebook/Portfolio

Summative Assessment- Common Engineering Project Rubric

Suggested Learning Experiences and Instruction
Learning Experiences:
- VEX kit and Arduino Kit performance tasks taken from online resources
- IDE
- Competition area

Instructional Strategies:
- Direct instruction
- Teacher Demonstration
- Problem-Solving and Critical Thinking
- Self-check and evaluation

Differentiation/Intervention/Enrichment Options:
- Project Choice when appropriate
- One on One Instruction
- Time for extra project work when requested
- Lunch and Learn when needed

For Language Development:
- Encourage students to view videos in native language when needed

Desired Results:

Essential Questions:

- How do technological systems work together to achieve a desired goal?
- What is the importance of maintaining and repairing a product, system, or process?
- How does the analysis of information aid in the evaluation of technological products and systems?
- Why is it important for people to be technologically literate?

Enduring Understandings:

Students will understand that…

- Technology shapes society, and society shapes technology. Societal priorities, beliefs, and values influence which technologies are developed, and in turn, new technologies change human behavior and cultures.
- The total impact of a technology is not always foreseeable. A full evaluation of a technology's effects requires considering its social, cultural, environmental, and economic impacts over time.

Knowledge:

Students will know… how to document and organize all of their classwork and projects through the creation of a project portfolio.

- Vocabulary: Engineers' Notebook/Portfolio

Skills:

Students will be able to select classwork and projects to create a portfolio that highlights what they have learned within the course.

Standards:

<u>Priority:</u>

3.5.9-12.A Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.

3.5.9-12.N Analyze and use relevant and appropriate design thinking processes to solve technological and engineering problems.

3.5.9-12.OO Use project management tools, strategies, and processes in planning, organizing, and controlling work.

<u>Supporting</u>:

3.5.9-12.NN Analyze the rate of technological and engineering development and predict future diffusion and adoption of new innovations and technologies.

3.5.9-12.LL Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop.

Acceptable Evidence:

Performance Tasks – Engineers' Notebook/Portfolio

Summative Assessment- Project Portfolio Rubric

Suggested Learning Experiences and Instruction

Learning Experiences:

- PowerPoint or another district approved technology to create a portfolio of work

Instructional Strategies:

- Direct instruction

- Teacher Demonstration
- Problem-Solving and Critical Thinking
- Self-check and evaluation

Differentiation/Intervention/Enrichment Options:

- Project Choice when appropriate
- One on One Instruction
- Time for extra project work when requested
- Lunch and Learn when needed

For Language Development:

- Encourage students to view videos in native language when needed