QUEST

Course Level: Elementary

Grade: 5

Time/Credit: 40 minutes per week

Development Date: August 2026

School Board Approval:

Central Bucks School District
20 Welden Drive
Doylestown, PA 18901

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Central Bucks School District
Teaching and Learning Principles

1. QUEST is a process through which students discover how math, science, reading, writing, social studies, and the arts are a daily part of their lives.

Therefore, we will design lesson plans that require students to apply and integrate the content of our elementary curriculum to solve real world, unpredictable challenges.

2. **We are preparing students to be complex thinkers, self-directed learners, effective communicators, responsible citizens, collaborative workers, and quality producers.**

Therefore, we will design lesson plans that require students to use skills in critical and creative thinking, communication, and collaboration to explore questions about issues in their natural world and community.

3. **Learning takes place when new information is linked with existing knowledge in meaningful ways.**

Therefore, it is a priority to ensure students understand why they are learning the content. We will begin instruction with an anticipatory set that demonstrates relevancy to students' lives, scaffold instruction to build on existing knowledge, and close lessons with activities that reinforce the connection and relevancy of the material.

4. **Learning involves connecting to the present, the past, and the possibilities of the future.**

Therefore, we will make relevant connections to the real world and provide opportunities for students to understand how the present connects to the past and affects the future.

5. **The learning of complex subject matter is most effective when it is an intentional process of constructing meaning from information and experience.**

Therefore, we will help students activate prior knowledge, connect old and new information, and use what they have learned in authentic situations.

6. **Process and product are equally important in the learning process.**

Therefore, self-reflection and self-assessment will be modeled, and opportunities for self-evaluation and prompt, meaningful feedback will be provided. Our students will receive regular and specific feedback related to progress against standards and timely opportunities to use the feedback to re-do and improve.

7. **Technology should be an integral part of the student's experience, enhancing learning and the ability to express ideas.**

Therefore, we will model and encourage the use of technology as a tool for instruction, research, application, collaboration, and communication.

8. **Research shows active learning is essential.**

Therefore, we will design tasks that require students to research, analyze, investigate, solve problems, make decisions, and create products.

9. **Learning is social. Our learning is closely associated with our connection with others.**

Therefore, we will provide opportunities for students to build relationships with and among each other by facilitating discussions, building empathy, and fostering a climate of intrinsic motivation.

10. **Relevance is essential to teaching and learning.**

Therefore, learning will include real world exposure, cross-curricular connections, and high interest materials.

11. **Learning is most effective when differences in learners' prior knowledge, interests, and strengths are accommodated.**

Therefore, we will differentiate instruction and assessment to accommodate different learning styles and educational needs.

12. To maximize learning, students need multiple opportunities to practice and take risks.
Therefore, we will provide a supportive environment based on self-discovery and the respectful exchange of ideas.

13. Motivation influences learning.
Therefore, we will inspire students' curiosity with novel, rigorous, and relevant tasks that provide personal choice and control.

14. Formative assessment is vital for learning.
Therefore, we will create a variety of differentiated assessments that measure knowledge, application of skills, process and product, self-evaluation, and growth.

Central Bucks School District
Enduring Understandings

Students will understand that:

Critical Thinking

- Effective critical thinkers identify and ask significant questions that clarify various points of view and lead to better solutions.
- Effective critical thinkers effectively analyze and evaluate evidence, arguments, claims, and beliefs to make sensible decisions.
- Effective critical thinkers solve different kinds of unfamiliar problems in both conventional and innovative ways.
- Effective critical thinkers reflect critically on learning experiences and processes.
- Effective critical thinkers use digital tools to plan and conduct research, manage projects, solve problems, and make informed decisions.

Communication

- Effective communicators articulate thoughts and ideas using oral, written, and nonverbal communication skills in a variety of forms and contexts.
- Effective communicators understand that communication is an exchange between the sender and the receiver.
- Effective communicators adjust delivery skills to purpose, audience, and occasion.
- Effective communicators select appropriate media and technologies to enhance presentations.

Collaboration

- Effective collaborators exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.
- Effective collaborators assume shared responsibility for collaborative work, and value the individual contributions made by each team member.
- Effective collaborators are active, critical, and responsible listeners.
- Effective collaborators recognize that communication is essential to understanding themselves and others.
- Effective collaborators use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

Creative Thinking

- Effective creative thinkers elaborate, refine, analyze, and evaluate original ideas to improve and maximize creative efforts.
- Effective creative thinkers demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas.
- Effective creative thinkers view failure as an opportunity to learn and understand that creativity and innovation are part of a long-tem, cyclical process of small successes and frequent mistakes.
- Effective creative thinkers act on creative ideas to make a tangible and useful contribution.
- Effective creative thinkers demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

Research

- Effective researchers begin with essential guiding questions.
- Effective researchers understand that the research process is inherently circular and includes the planning, gathering, analyzing, organizing, synthesizing, and evaluating of information.
- Effective researchers select appropriate resources and evaluate information based on accuracy, validity, authority, and relevance.
- Effective researchers draw conclusions, create meaning, and construct new knowledge.
- Effective researchers use information and technology ethically and responsibly to enhance their understanding and present their findings.
- Effective researchers apply research skills to authentic, real-world issues and contexts.
- Effective researchers apply digital tools to gather, evaluate, and use information.

Science and Engineering

- Science is the search for understanding the natural world, and facts, principles, theories and laws that have been verified by the scientific community and are used to explain and predict natural phenomena and events.
- Engineering is the application of science and mathematics to define real world problems and design solutions.
- Both effective scientists and engineers ask questions and define problems.
- Both effective scientists and engineers develop and use models.
- Both effective scientists and engineers plan and carry out investigations.
- Both effective scientists and engineers analyze and interpret data
- Both effective scientists and engineers use mathematics and computational thinking.
- Both effective scientists and engineers construct explanations and design solutions.
- Both effective scientists and engineers engage in argument from evidence.
- Both effective scientists and engineers obtain, evaluate, and communicate information.

Central Bucks School District
Essential Questions

Critical Thinking

- What does it mean to think critically?
- Why is it important to think critically?
- How do effective critical thinkers approach a problem?
- How do effective critical thinkers use conventional and innovative ways to solve unfamiliar problems?
- Why do effective critical thinkers reflect on their learning experiences and processes?
- How do effective critical thinkers use digital tools to plan and conduct research, manage projects, solve problems, and make informed decisions?

Communication

- What is communication?
- Why is effective communication important?
- How do effective communicators articulate thoughts and ideas using oral, written, and nonverbal communication skills in a variety of forms and contexts?
- How do effective communicators adjust delivery skills to purpose, audience, and occasion?
- Why is it important to use appropriate media and technologies to enhance presentations?

Collaboration

- What does it mean to collaborate?
- What are the characteristics of an effective collaborator?
- How do effective collaborators listen?
- How do effective collaborators communicate?
- How do effective collaborators use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others?

Creative Thinking

- What does it mean to think creatively?
- Why is it important to think creatively?
- Why is it important to consider real world limits when developing new ideas?
- How can failure be used as an opportunity to learn?
- How do effective creative thinkers demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology?

Research

- What is the value of research?
- What can be discovered or created through research?
- What makes an effective researcher?
- How do effective researchers apply research skills to authentic, real-world issues and contexts?
- How do effective researchers apply digital tools to gather, evaluate, and use information?

Science and Engineering

- What is the difference between science and engineering?
- What skills do scientists use to explore and understand our world?
- What skills do engineers use to define real world problems and design solutions?

Central Bucks School District – Course of Study Overview
QUEST

Desired Results

Course Description:

QUEST is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real world challenges that allow students to apply 21st century skills to become informed citizens and life-long learners. Each unit of study is built around a real-world challenge that ties directly to classroom instruction and requires students to apply cross-curricular skills. Further, the curriculum is heavily focused on teaching students how to use and incorporate technology in new ways.

Grade 5 QUEST Course Description:

Fifth grade QUEST students will be given opportunities to explore the concepts of the engineering design process and 21st century skills. Units of study connect directly to the Grade 4 and Grade 5 curriculums in science, mathematics, social studies, reading, writing, health, and art. Units will continue to expand upon prior QUEST experiences by utilizing a variety of tools to solve real-life problems. Students will navigate Office 365 to collaborate virtually, utilize Excel for analyzing data, deepen their understanding of program code and its capabilities to create a final product, and explore materials, engineering, and circuitry.

Acceptable Evidence.

Assignments, Performance Tasks, Projects, Tests, etc.:

- Informal and Formal Critiques of 21st Century Skills, specifically critical thinking, creativity, collaboration, and communication
- Engineering products (solutions to real-world problems)
- Student Presentations

QUEST 5th Grade – Pacing Guide

Content	Days
Unit 1	
QUEST Introductory Lesson- Cantilevers Lesson 1- Introduce the concept of cantilevers in real world and man-made examples. Lesson 2- Imagine, plan, create, test, and improve cantilevers. Lesson 3- Reflect on the design process and the 4Cs. **Coding: Micro:bit and Make Code** Lesson 1- Micro:bit- The Micro:bit Is for Making Lesson 2- Introduction to Make Code Lessons 3- Micro:Pet Project Lesson 4- What's a Computer and What's Your Function? Lesson 5- Happy Face/Sad Face Game Lessons 6 (2 days)- Fidget Cube Lesson 7- Variables in Daily Life Lesson 8- Make a Game Scorekeeper Lessons 9 (2 days)- Everything Counts Lesson 10- Conditionals in Daily Life Lesson 11- Rock, Paper, Scissors Lessons 12 (2 days)- Board Game Challenge	18 days
Unit 2	
Catapults Lesson 1- Introduce Catapult Project Lesson 2- Design Process- Ask, Imagine, Plan Lesson 3- Introduce Excel & Review Measurement to nearest eighth inch Lessons 4 (3-4 days)- Fabrication Using Tinkercad and 3D Printing Lesson 5- Design Process- Create Lesson 6 (2-3 days)- Design Process- Test and Improve Lesson 7- Final Test Day and Class Launch Lesson 8- Design Process- Share	11-13 days
Unit 3	
Digital Literacy Lesson 1- **Digital Citizenship-** Creating Device-Free Moments- Recognize how constant device use can impact attention, memory and experiences. Lesson 2- **Digital Citizenship**- Dealing with Cyberbullying- Identify cyberbullying behaviors, reflect on their serious impact, and understand how to respond. Lesson 3- **AI Literacy-** How Do Machines Learn?- Experience how machine learning models are trained and tested using interactive, hands-on activities. Lesson 4- **AI Literacy**- Bias in Artificial Intelligence- Understand how machines learn from humans using data and patterns.	4 days

Enrichment	
Electric City Lesson 1- Civil Engineering- Identifying places in a town Lessons 2 (3 days)- Civil Engineering- Categorizing places in a town Lesson 3- Electrical Engineering- Creating series circuits Lesson 4- Electrical Engineering- Creating parallel circuits Lesson 5 (2-3 days)- Fabrication Lessons- Fab Maker Studio and Tinkercad Lesson 6- Plan circuits for electric city Lessons 7 (2-3 days)- Collaboratively create electrified city Lesson 8- Share electric city projects	12-14 days

NOTE: Additional remediation in standards/content from the grade level (or previous grade level) where the student completes this course will be provided for students when the teacher determines a student has not yet mastered that content. Enrichment opportunities will also be provided to meet the needs of students that acquire an understanding of the content faster than their class peers.

Required Texts and Software

Trade Books used within the curriculum include but are not limited to:

Software

- Scratch
- Code.org
- Office 365
- Make Code
- Tinkercad
- Fab Maker Studio

Hardware

- Micro:bits
- Student laptops
- 3D printer
- Silhouette cutter
- Makey Makey circuit boards

Central Bucks School District – Course of Study – QUEST
Unit 1 – Coding with Micro:bit

Desired Results:

Essential Questions:

- How does language evolve?
- How do coded commands instruct a computer?
- Is there only one way to write code?
- Why do engineers make changes to their design?
- How can technology be used in a different way?

Enduring Understandings:

Students will understand that…

- Language evolves by adapting to technology and needs.
- Code is a language that helps people communicate with computers.
- Coded commands provide sequential directions for a task.
- Codes can be written in many ways depending on the technology and task.
- Using feedback from the machine, engineers change or improve their design.
- Technology can be used to create and communicate ideas.

Knowledge:

Students will know…

- Vocabulary: algorithm, array, binary, bits, Boolean, bytes, conditionals, constants, coordinates, functions, inputs, iteration, logic, memory, outputs, processor, spring, sprite, variables
- How to break down code into a specific sequence.
- Engineers utilize code to direct technology.
- Code is the language of computers.
- How to use technology to represent information.
- Feedback can be used to change or improve a design.
- The appropriate vocabulary to communicate ideas in a collaborative group.

Skills:

Students will be able to…

- Use computer science to program a Micro:bit to perform specific tasks.
- Use design thinking and coding by design to create an innovative toy or game.
- Create programs that use sequencing, loops, conditionals, and variables.
- Use the engineering design process to write code.
- Collaborate and communicate effectively with others.

Standards:

<u>Priority:</u>

<u>CSTA Standards</u>

- 1B-CS-01- Describe how internal and external parts of computing devices function to form a system.
- 1B-CS-02- Model how computer hardware and software work together as a system to accomplish tasks.
- 1B-AP-09- Create programs that use variables to store and modify data.

- 1B-AP-10- Create programs that include sequences, events, loops, and conditionals.
- 1B-AP-17- Describe choices made during program development using code comments, presentations, and demonstrations.
- 2-AP-10- Use flowcharts and/or pseudocode to address complex problems as algorithms.
- 2-AP-11- Create clearly named variables that represent different data types and perform operations on their values.
- 2-AP-12- Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.

STEELS Standards

- 3.5.6-8.J- Use tools, materials, and machines to safely diagnose, adjust, and repair systems.
- 3.5.6-8.K- Use devices to control technological systems.
- 3.5.6-8.Q- Apply a technology and engineering design thinking process.
- 3.5.6-8.U- Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.
- 3.5.6-8.V- Refine design solutions to address criteria and constraints.
- 3.5.6-8.EE- Differentiate between inputs, processes, outputs, and feedback in technological systems.

Acceptable Evidence:

Performance Tasks – Students will collaborate with classmates to create a game that uses a Micro:bit and a program that correctly and effectively uses conditionals.

Real-World Problem-
An ability to understand, participate and work in the digital world is vitally important to your life. By learning digital skills, you may choose STEM subjects as you progress through school and into your career. This, in turn, grows a diverse pipeline of talent, boosting social equity and contributing to the creation of better technology. The real-world challenge is- **"Can you work collaboratively with others to create a game using a Micro:bit and program that correctly and effectively uses conditionals?"**.

Acceptable evidence of learning other than Performance Tasks:
Teacher observation, anecdotal notes, student self-reflection (collaboration skills), journal entries/exit tickets.

Suggested Learning Experiences and Instruction

Learning Experiences:

- Students will understand the four components that make up a computer and their functions.
- Students will understand that the Micro:bit takes input, and after processing the input, produces output.
- Students will learn the variety of different types of information the Micro:bit takes in as input.
- Students will apply this knowledge by creating a Micro:bit program that takes input and produces an output.
- Students will learn to exercise creativity, engineering and resourcefulness by coming up with ideas for using simple household or classroom materials to accommodate the Micro:bit's size and weight as part of their Micro:pet project.
- Students will test and iterate using different materials and sizes in order to create an optimal design to house the Micro:bit and battery pack.
- Students will become familiar with the MakeCode programming environment.
- Students will learn how to download programs from the computer to the Micro:bit.

- Students will learn to exercise communication and collaboration and apply the design thinking process to develop an understanding of a problem or user need and iteratively design an optimal solution.
- Students will apply their understanding of the problem in a creative way by making a “Micro:pet” creature for their partner.
- Students will understand what variables are, why and when to use them in a program.
- Students will learn how to create a variable, set the variable to an initial value, and change the value of the variable within a Micro:bit program.
- Students will learn how to create meaningful and understandable variable names.
- Students will understand that a variable holds one value at a time.
- Students will understand that when you update or change the value held by a variable, the new value replaces the previous value.
- Students will learn how to use the basic mathematical blocks for adding, subtracting, multiplying, and dividing variable values.
- Students will apply the above knowledge and skills to create a unique program that uses variables as an integral part of the project.
- Students will understand what conditional statements are, and why and when to use them in a program.
- Students will learn how to use the Logic blocks ‘If…then’ and ‘If…then…else’.
- Students will practice using the Logic blocks so different conditions yield specified outcomes.
- Students will demonstrate understanding and apply skill by collaborating with classmates to create a game that uses a Micro:bit and a program that correctly and effectively uses conditionals.

Instructional Strategies:
Direct Instruction (.59), Class Discussion (.82), Cooperative vs. Individualistic Learning (.55), Problem Solving Teaching (.67)

Differentiation/Intervention/Enrichment Options:

- Assign specific roles and responsibilities during collaborative group work to draw upon students’ strengths.
- Use alternative materials to allow for differentiation.

For Language Development:

- Utilize picture cards and other visual supports to reinforce vocabulary.
- Use translation features when presenting information digitally.

Central Bucks School District – Course of Study – QUEST
Unit 2 – Catapults

Desired Results:

Essential Questions:

- How are catapults used to launch objects to reach a given distance?
- How does force affect the speed and distance of a projectile?
- Is there one "right" or best answer to an engineering problem? Why or why not?

Enduring Understandings:

Students will understand that…

- Catapults are a type of simple machine.
- Catapults use energy transfers to perform work.
- Force determines how fast and far an object travels.
- Engineers use a design process to construct solutions to problems.

Knowledge:

Students will know…

- Catapults are a type of simple machine (lever) used to launch objects.
- The lever of a catapult rests on the fulcrum, which allows force to launch the load (object).
- Catapults use energy transfers: elastic energy, motion energy, gravitational energy, etc.
- The optimal angle needed to hit target with a projectile.

Skills:

Students will be able to…

- Follow the scientific method to design an experiment.
- Design and construct a catapult with given materials.
- Communicate and collaborate with team.
- Measure to the nearest 1/8 inch.
- Create an Excel spreadsheet to gather data and calculate accuracy rate.
- Present experiment results to a group through the use of CB's educational technology.

Standards:

Priority:

STEELS Standards

- 3.5.3-5.I- Design solutions by safely using tools, materials, and skills.
- 3.5.3-5.L- Demonstrate how tools and machines extend human capabilities, such as holding, lifting, carrying, fastening, separating, and computing.
- 3.5.3-5.M- Demonstrate essential skills of the engineering design process.
- 3.5.3-5.N- Identify why a product or system is not working properly.
- 3.5.3-5.O- Describe requirements of designing or making a product or system.
- 3.5.3-5.P- Evaluate the strengths and weaknesses of existing design solutions, including their own solutions.
- 3.5.3-5.Q- Practice successful design skills.
- 3.5.3-5.R- Apply tools, techniques, and materials in a safe manner as part of the design process.
- 3.5.3-5.S- Illustrate that there are multiple approaches to design.

- 3.5.3-5.T- Apply universal principles and elements of design.
- 3.5.3-5.U- Evaluate designs based on criteria, constraints, and standards.

Supporting:
Math Standards
- CC.2.4.5.A.1- Solve problems using conversions within a given measurement system.
- CC.2.4.5.A.2- Represent and interpret data using appropriate scale.

Acceptable Evidence:

Performance Tasks – Students will collaborate to design and create a catapult that launches a projectile five feet.

Real-World Challenge-
Catapults are machines that were originally used in medieval times but are still used in many ways today. The military occasionally uses catapults to launch airplanes from ships, and sometimes kids like to launch water balloons outside with their friends. "**Can you design and create a catapult that is able to launch an object and hit a target 5 feet away with 80% accuracy?".**

Acceptable evidence of learning other than Performance Tasks:
Teacher observation, anecdotal notes, student self-reflection (collaboration skills), journal entries/exit tickets.

Suggested Learning Experiences and Instruction

Learning Experiences:
- Students will become familiar with the catapult project expectations and design process.
- Students will complete ***Ask, Imagine****, and* ***Plan*** sections of the Engineering Design Process.
- Students will create an Excel worksheet for data collection.
- Students will review measuring to the nearest eighth of an inch.
- Students will learn how to design 3D structures using Tinkercad and the 3D printer.
- Students will work collaboratively to build catapults.
- Students will conduct unofficial tests with projectiles while building.
- Students will make improvements to their prototypes.
- Students will determine an official "testing" location.
- Each group will launch their catapult for the class.
- Students will present their Excel data.
- Students will compare results.
- Students will create an advertisement to market their catapult and share with the class.

Instructional Strategies:
Direct Instruction (.59), Class Discussion (.82), Cooperative vs. Individualistic Learning (.55), Problem Solving Teaching (.67)

Differentiation/Intervention/Enrichment Options:
- Assign specific roles and responsibilities during collaborative group work to draw upon students' strengths.
- Use alternative materials to allow for differentiation.

For Language Development:
- Utilize picture cards and other visual supports to reinforce vocabulary.
- Use translation features when presenting information digitally.

Central Bucks School District – QUEST – Grade 5
Unit 4– Digital Literacy

Desired Results:

Essential Questions:

- Why is it important to sometimes put our devices away and be fully present?
- How can technology affect what we notice, remember, and experience?
- When might a device-free moment help us enjoy an experience more deeply?
- How can we create a healthy balance between using technology and enjoying offline experiences?
- How can we recognize the difference between joking, being mean, bullying, and cyberbullying?
- What makes cyberbullying different from in-person bullying?
- How can cyberbullying affect the people involved, including targets and bystanders?
- What actions can we take to respond safely and responsibly when cyberbullying occurs?
- How do computers and AI systems learn to recognize patterns and make predictions?
- Why do machines need training data to learn new tasks?
- How does supervised learning help AI make decisions about new information?
- How can the quality and variety of data affect what a machine learns?
- Why can AI systems sometimes make unfair or inaccurate decisions?
- How do human choices and perspectives influence the data used to train AI?
- What is algorithmic bias, and how can it affect people and outcomes?
- How can we create fairer and more accurate AI systems?

Enduring Understandings:
Students will understand that…

- Making thoughtful choices about when and how to use technology helps us maintain a healthy balance in our lives.
- Using strategies such as the A.C.T. framework can help students take safe, positive action when faced with cyberbullying.
- AI systems learn by finding patterns in data provided by humans.
- The quality and diversity of training data directly affect AI performance.
- AI can make mistakes or produce biased outcomes when trained on incomplete or unbalanced data.
- Humans play an important role in designing, training, monitoring, and improving AI systems to make them fairer and more effective.

Knowledge:
Students will know…

- Vocabulary: algorithm, algorithmic bias, bias, bullying, cyberbullying, device-free, perspective, supervised learning, target
- To recognize when technology enhances an experience and when putting devices away may help them be more present, focused, and engaged.
- Ways to identify cyberbullying and understand appropriate ways to respond when they encounter harmful online behavior.
- How to evaluate situations, consider consequences, and make thoughtful choices that support their well-being and the well-being of others.
- How machines learn from examples and data.
- Why the data used to train AI matters.

- How bias can affect AI and what people can do to make AI fairer.

Skills:

Students will be able to…

- Identify when a device-free moment may enhance an experience and explain how being fully present can help them notice, remember, and enjoy more of what is happening around them.
- Recognize cyberbullying and distinguish it from joking, being mean, and in-person bullying, using key characteristics to identify harmful online behavior.
- Apply appropriate strategies to respond to cyberbullying, including using the A.C.T. framework and seeking support from trusted adults when needed.
- Explain how AI uses data.
- Evaluate the accuracy of AI predictions.
- Identify and address bias in AI systems.

Standards:

Priority:

STEELS Standards

TE.3-5.3 Information and Communication Technologies
TE.3-5.4 Computational Thinking
TE.3-5.7: Analyze the effects of technology on people and society.
TE.3-5.8: Evaluate responsible and ethical uses of technology.
15.4.5.B: Demonstrate safe, ethical, and socially responsible online behavior.

Acceptable Evidence:

Performance Tasks – Students will create and explain a meaningful device-free experience demonstrating understanding of the value of being fully present. Students will apply the A.C.T. framework to a realistic cyberbullying situation and determine appropriate responses. Students will learn from training data and classify new images using supervised learning. Students will identify bias in a sorting algorithm and redesign the rules to create a fairer system.

Acceptable evidence of learning other than Performance Tasks:
Formative Assessment
Teacher observation, anecdotal notes, student self-reflection (collaboration skills), design planning sheets, rubrics, exit tickets.

Suggested Learning Experiences and Instruction

Learning Experiences:

- Students will participate in a memory challenge to see how well they observe things.
- Students will learn about the science of the brain and “cognitive offloading”.
- Students will engage in a discussion about the value of making time for device-free moments.
- Students will draw a picture of their ideal offline space.
- Students will participate in a discussion about the difference between being mean, bullying, and cyberbullying.
- Students will watch a video that will help them define the term cyberbullying.
- Students will learn a strategy for dealing with cyberbullying (A.C.T.- Ask for help from trusted adults, Collect evidence and report, Take care of yourself).
- Students will practice the steps of the A.C.T. strategy by analyzing a scenario.

- Students will review the definition of Artificial Intelligence and how machines learn.
- Students will imagine how to teach a machine the difference between alligators and crocodiles.
- Students will learn the definition of supervised learning.
- Students will practice supervised learning by pretending to be a robot.
- Students will use the Code.org AI for Oceans activity to experience machine learning.
- Students will engage in a discussion and watch a video to learn about the terms “perspective”, “bias”, and “algorithmic bias”.
- Students will pretend to be a robot and will sort animals according to the robot’s rules.

Instructional Strategies:
Direct Instruction (.59), Class Discussion (.82), Cooperative vs. Individualistic Learning (.55), Problem Solving Teaching (.67)

Differentiation/Intervention/Enrichment Options:

- Assign specific roles and responsibilities during collaborative group work to draw upon students’ strengths.
- Use alternative materials to allow for differentiation.

For Language Development:

- Utilize picture cards and other visual supports to reinforce vocabulary.
- Use translation features when presenting information digitally.

Central Bucks School District – Course of Study – QUEST
Enrichment – Electric City

Desired Results:

Essential Questions:

- What are important considerations when planning a town or city?
- How does electricity move?
- How do you create a circuit that turns on lights and motors?
- How do you create a circuit where some items are turned off while others continue to function?

Enduring Understandings:
Students will understand that…

- Electricity moves in a path called a circuit.
- There are different kinds of circuits (parallel, series, etc.)
- A completed circuit is necessary to operate electrical devices.
- Towns' electrical grids consist of parallel circuits.

Knowledge:
Students will know…

- Electricity must move in a circuit.
- Electricity passes through conductors and is "blocked" or slowed by an insulator.
- Engineers plan cities.
- Parallel circuits are created to allow some electrical devices to be turned off while others continue to function.

Skills:

Students will be able to…

- Create and demonstrate different aspects of circuits.
- Collaborate with a group to compromise, plan, and create.
- Utilize critical thinking to apply understanding of circuits to create the final product.

Standards:
<u>Priority:</u>
<u>STEELS Standards</u>
3.2.4.B- Make and communicate observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
3.5.3-5.I- Design solutions by safely using tools, materials, and skills.
3.5.3-5.M- Demonstrate essential skills of the engineering design process.
3.5.3-5.N- Identify why a product or system is not working properly.
3.5.3-5.O- Describe requirements of designing or making a product or system.
3.5.3-5.P -Evaluate the strengths and weaknesses of existing design solutions, including their own solutions.
3.5.3-5.Q- Practice successful design skills.
3.5.3-5.R- Apply tools, techniques, and materials in a safe manner as part of the design process.
3.5.3-5.S- Illustrate that there are multiple approaches to design.
3.5.3-5.T- Apply universal principles and elements of design.
3.5.3-5.U -Evaluate designs based on criteria, constraints, and standards.
3.5.3-5.BB- Illustrate how, when parts of a system are missing, it may not work as planned.
3.5.3-5.DD- Demonstrate how simple technologies are often combined to form more complex systems.

<u>Supporting</u>:

Social Studies Standards
7.1.4.B - Describe and locate places and regions as defined by physical and human features.
7.2.4.A-Identify the physical characteristics of places and regions.

Acceptable Evidence:

Performance Tasks- Students will design a town grid and create series and parallel circuits to electrify the town.

Real-World Challenge-
We live in an amazingly high-tech world, surrounded by electronic gizmos and gadgets. Because our lives are so infused with electronics, *everyone* – engineers, entrepreneurs, students, and artists alike – can greatly benefit from learning more about them. In this unit we will study civil engineering, review series circuits, explore and create parallel circuits. As civil engineers, your real-world challenge is- **"Can you collaborate to create a parallel or series circuit to electrify a town of your design?"**.

Acceptable evidence of learning other than Performance Tasks:
Teacher observation, anecdotal notes, student self-reflection, and/or journal entries/exit tickets.

Suggested Learning Experiences and Instruction

Learning Experiences:

- Students create a "bird's eye view" sketch of a town.
- Students categorize buildings and develop a shared list of required features.
- Students collaborate to create a town map which includes all required features.
- Students review fourth-grade electrical circuits skills.
- Students will create a simple series circuit using a battery, wire, and light bulb.
- Students will create a parallel circuit.
- Students will explore Fab Maker Studio and Tinkercad as options for designing and fabricating 3D objects for their electric city project.
- Students will collaborate to plan their electrical grid using the rough draft of their town grid.
- Students will plan the creation of electrical circuits in their town.
- Students will implement their plans to electrify their town grids.
- Students will present their electrified town grid to the class.

Instructional Strategies:
Direct Instruction (.59), Class Discussion (.82), Cooperative vs. Individualistic Learning (.55), Problem Solving Teaching (.67)

Differentiation/Intervention/Enrichment Options:

- Assign specific roles and responsibilities during collaborative group work to draw upon students' strengths.
- Use alternative materials to allow for differentiation.

For Language Development:

- Utilize picture cards and other visual supports to reinforce vocabulary.
- Use translation features when presenting information digitally.