Catasauqua Area School District
Planned Course of Study

Course Title: STEAM

Grade Level(s): 3-4

Text: Code.org, Apple Everyone Can Create: Early Learners

Course Description

This curriculum incorporates elements of many subject areas including Science, Mathematics, the Arts and Computer Science. 3rd and 4th grade students continue their journey from kindergarten, considering the core elements of this curriculum; problem solving, creativity and design.

In 3rd and 4th grade, students will be introduced to ideas centered around Maker Education and work through the Design Thinking process of Stanford University's d.school. By going through these processes, students will gain an understanding of how good design solutions come about through a series of failures and iteration. They will also begin to see value in the process of coming to a solution, rather than simply focusing on the product. These skills will ultimately benefit students in any subject area by having the confidence to approach obstacles with the mentality of working through failures towards a solution.

The underlying goal of these practices is to have students understand that creativity is a skill that can be developed, honed and improved upon. How to use creativity to solve problems and communicate ideas effectively through language, design and visual imagery. The skills developed in this course will have a direct impact on a student's ability to work and communicate with others, and to identify and develop solutions to problems; essential skills that can lead to a successful career path.

Essential Questions & Competencies

Essential Questions:

- What role can technology and Computer Science play in solving real world problems?
- How has technology positively and negatively affected jobs, industry and our everyday lives?
- How do people interact with design?
- What skills are needed to be successful in a career?
- How do artists and designers create works of art or design that effectively communicate?

Competencies:

- Creativity is a skill that can be developed, honed and improved upon.
- Develop an informed understanding of the complex relationship between humans and technology.
- Apply knowledge of scientific investigation or technological design to make inferences and solve problems.
- Understand that good design surrounds our everyday lives and helps us interact with and understand our world.
- The process of developing computational artifacts embraces both creative expression and the exploration of ideas to create prototypes and solve computational problems. Examples of computational artifacts include programs, simulations, visualizations, digital animations, robotic systems, and apps.
- Collaboration requires individuals to navigate and incorporate diverse perspectives, conflicting ideas, disparate skills, and distinct personalities. Because it involves asking for the contributions and feedback of others, effective collaboration can lead to better outcomes than working independently.

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Course Syllabus

Course Content	Tentative Timeframe	National Standards	State Standards
Computer Science ● Code.org ● Scratch ● Microsoft MakeCode	Throughout School Year	CSTA: 1B-CS-01 1B-CS-02 1B-CS-03 1B-NI-04 1B-NI-05 1B-DA-06 1B-DA-07 1B-AP-08 1B-AP-09 1B-AP-10 1B-AP-11 1B-AP-12 1B-AP-13 1B-AP-14 1B-AP-15 1B-AP-16 1B-AP-17 1B-IC-18 1B-IC-19 1B-IC-20 1B-IC-21	Computer Science: 1B-CS-01 1B-CS-02 1B-CS-03 1B-NI-04 1B-NI-05 1B-DA-06 1B-DA-07 1B-AP-08 1B-AP-09 1B-AP-10 1B-AP-11 1B-AP-12 1B-AP-13 1B-AP-14 1B-AP-15 1B-AP-16 1B-AP-17 1B-IC-18 1B-IC-19 1B-IC-20 1B-IC-21
Google Suite of Applications ● Drive ● Slides ● Forms ● Sites ● Drawings	Throughout School Year	CSTA: 1B-NI-05 1B-DA-06 1B-IC-20 1B-IC-21	Computer Science: 1B-NI-05 1B-DA-06 1B-IC-20 1B-IC-21
Early Robotics II ● Dash & Dot ● Sphero ● LEGO WeDo	3 Lessons	CSTA: 1B-CS-01 1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15	Technology & Engineering: 1B-CS-01 1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15
Physical Computing ● Makey Makey ● MicroBit	6 Lessons	CSTA: 1B-CS-01 1B-AP-16	Technology & Engineering: 3.4.4.A2

● Hummingbird Bit ● LittleBits		1B-AP-17 1B-IC-21	3.4.4.A3 3.4.4.D1
Engineering and 3D Printing ● TinkerCad and 3D Printing ● KEVA Planks ● Design Challenges	6 Lessons	Assessment Anchor: Technology & Engineering: S5.A.1.1	Technology & Engineering: 3.4.4.C1 3.4.4.C2 3.4.4.C3
Digital Art II ● Apple Everyone Can Create	4 lessons	Visual Arts: Cr1.2.4a Cr2.1.4a Cr2.2.4a Re.7.2.4a	Visual Arts: 9.1.5.A 9.1.5.B 9.1.5.C 9.1.5.J 9.3.5.A 9.4.5.D

Teaching Strategies Utilized

- Direct Instruction
- Individualized Instruction
- Differentiated Instruction
- Class Discussion
- Cooperative Learning
- Online Learning
- Inquiry Based Learning
- Maker Centered Learning
- Design Thinking

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	National Stand.	PA Stand.
The student will be able to understand: *Computing Systems* ● *Devices* ● *Hardware and Software* ● *Troubleshooting* *Networks and the Internet* ● *Cybersecurity* *Data and Analysis* ● *Storage* ● *Collection, Visualization, & Transformation* ● *Inference & Models* *Algorithms and Programming* ● *Algorithms* ● *Variables* ● *Control* ● *Modularity* ● *Program Development* *Impacts of Computing* ● *Culture* ● *Social Interactions* ● *Safety, Law & Ethics*	AW K AP M	Lessons taken from Code.org 3rd Grade: Course D ● Graph Paper Programming ● Introduction to Online Puzzles ● Relay Programming ● Debugging with Laurel ● Events in Bounce ● Build a Star Wars Game ● Dance Party ● Loops in Ice Age ● Drawing Shapes with Loops ● Nested Loops in Maze ● Conditionals with Cards ● If/Else with Bee ● While Loops in Farmer ● Until Loops in Maze ● Harvesting with Conditionals ● Binary Images ● Binary Images with Artist ● Be A Super 4th Grade: Course E ● Sequencing in the Maze ● Drawing with Loops ● Conditionals in Minecraft: Voyage Aquatic ● Conditionals with the Farmer ● Simon Says ● Swimming Fish with Sprite Lab ● Alien Dance Party with Sprite Lab ● Private and Personal Information ● About Me with Sprite Lab ● Digital Sharing	Group Discussion Teacher Observation Student Self Assessment Rubrics Lesson completion in Code.org	CSTA: 1B-CS-01 1B-CS-02 1B-CS-03 1B-NI-04 1B-NI-05 1B-DA-06 1B-DA-07 1B-AP-08 1B-AP-09 1B-AP-10 1B-AP-11 1B-AP-12 1B-AP-13 1B-AP-14 1B-AP-15 1B-AP-16 1B-AP-17 1B-IC-18 1B-IC-19 1B-IC-20 1B-IC-21	Computer Science: 1B-CS-01 1B-CS-02 1B-CS-03 1B-NI-04 1B-NI-05 1B-DA-06 1B-DA-07 1B-AP-08 1B-AP-09 1B-AP-10 1B-AP-11 1B-AP-12 1B-AP-13 1B-AP-14 1B-AP-15 1B-AP-16 1B-AP-17 1B-IC-18 1B-IC-19 1B-IC-20 1B-IC-21

		● Nested Loops in Maze ● Fancy Shapes using Nested Loops ● Nested Loops with Frozen ● Songwriting ● Functions in Minecraft ● Functions with Harvester ● Functions with Artist ● Designing for Accessibility ● End of Course Project			

Resources/Materials

- Code.org
- Unplugged Activities
- Supporting online videos and content

Interdisciplinary Relationships

Next Generation Science Standards

- ETS - Engineering in the Sciences
    - ETS1 - Engineering Design
        - 3-5-ETS1-1 - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Common Core Math Standards

- MD - Measurement And Data
    - 4.MD.5.b - An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

Common Core English Language Arts Standards

- RI - Reading Informational
    - 4.RI.1 - Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
    - 4.RI.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text

Career Education and Work

- Career Awareness and Preparation
- Career Retention and Advancement
- Entrepreneurship

21st Century Skills

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration
- Flexibility and Adaptability
- Informations, Communications & Technology Literacy
- Initiative and Self-Direction
- Productivity and Accountability
- Leadership and Responsibility
- Environmental Literacy

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	National Stand.	PA Stand.
The student will be able to: *Utilize the Google Suite of Applications to:* ● *Save and organize files* ● *Share content with others* ● *Showcase work* ● *Collect data* ● *Create unique works of graphic design*	AW K AP M	3rd Grade: ● Saving and Sharing in Google Drive ● Take a Vote with Google Forms 4th Grade: ● Organize Files and Folders in Google Drive ● Create a Website with Google Sites ● Science Fair Slideshow with Google Slides	Group Discussion Teacher Observation Student Self Assessment Rubrics	CSTA: 1B-NI-05 1B-DA-06 1B-IC-20 1B-IC-21	Computer Science: 1B-NI-05 1B-DA-06 1B-IC-20 1B-IC-21

Resources/Materials

- Google Suite of Applications
- Student MacBooks and iPads

Interdisciplinary Relationships

- English Language Arts
  - Writing
  - Speaking and Listening
- Mathematics
  - Geometry
  - Measurement
- Career Education and Work
  - Career Awareness and Preparation
  - Career Retention and Advancement
  - Entrepreneurship
- 21st Century Skills
  - Creativity and Innovation
  - Critical Thinking and Problem Solving
  - Communication and Collaboration
  - Flexibility and Adaptability
  - Informations, Communications & Technology Literacy
  - Initiative and Self-Direction
  - Productivity and Accountability
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The student will be able to: *Utilize computer science skills developed in Code.org to control a robot. Challenges include navigating through mazes, developing algorithms, and developing more complex robots to perform specific tasks or challenges.* *Students will also discuss the interaction of humans and robotics in the real word. Beginning to understand how robotics has changed industry, commerce and the workforce.*	AW K AP M	3rd Grade: ● Dash & Dot ● LEGO WeDo 4th Grade: ● Sphero Robots ● LEGO WeDo	Group Discussion Teacher Observation Student Self Assessment Rubrics	CSTA: 1B-CS-01 1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15	Technology & Engineering 1B-CS-01 1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15

Resources/Materials

- Dash & Dot Robots
- LEGO WeDo
- Sphero Robots
- Student MacBooks and iPads

Interdisciplinary Relationships

- English Language Arts
  - Writing
  - Speaking and Listening
- Mathematics
  - Geometry
  - Measurement
- Science
  - Physics (Energy)
- Social Studies
  - Markets and Economic Systems
- Career Education and Work
  - Career Awareness and Preparation
  - Career Retention and Advancement
  - Entrepreneurship
- 21st Century Skills
  - Creativity and Innovation
  - Critical Thinking and Problem Solving
  - Communication and Collaboration
  - Flexibility and Adaptability
  - Informations, Communications & Technology Literacy
  - Initiative and Self-Direction
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The student will be able to: *Physical Computing is another way for students to bring their Computer Science knowledge to the real world.* *Students will use block coding to program microcontrollers that perform tasks and control robotics.* *Students will develop a knowledge of simple circuits.* *Students will explore the philosophies of Maker Education to construct unique objects of design.*	AW K AP M	3rd Grade: ● Makey Makey ● MicroBit 4th Grade: ● Hummingbird Bit ● LittleBits	Group Discussion Teacher Observation Student Self Assessment Rubrics	CSTA: 1B-CS-01 1B-AP-16 1B-AP-17 1B-IC-21	Technology & Engineering 3.4.4.A2 3.4.4.A3 3.4.4.D1

Resources/Materials

- Makey Makey
- MicroBit
- Humminbird Bit
- LittleBits
- Scratch programming
- Birdblox programming
- Microsoft MakeCode programming
- Student MacBooks and iPads
- Various construction materials (cardboard, paper, glue, tape, etc)

Interdisciplinary Relationships

- English Language Arts
  - Writing
  - Speaking and Listening
- Mathematics
  - Geometry
  - Measurement
- Science
  - Physics (Energy, Circuits)
- Career Education and Work
  - Career Awareness and Preparation
  - Career Retention and Advancement
  - Entrepreneurship
- 21st Century Skills
  - Creativity and Innovation
  - Critical Thinking and Problem Solving
  - Communication and Collaboration
  - Flexibility and Adaptability
  - Informations, Communications & Technology Literacy
  - Initiative and Self-Direction
  - Productivity and Accountability
  - Leadership and Responsibility
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The student will be able to: *Within engineering lessons in 3rd and 4th grade, students will continue to develop spatial reasoning and collaboration skills.* *Students will explore the design strategies of Maker Education and the Design Thinking process of Stanford University's d.school.*	AW K AP M	3rd Grade: ● KEVA Plank Challenges ● STEM Challenges ● Design with TinkerCad 4th Grade: ● KEVA Plank Challenges ● STEM Challenges ● Coded Geometric Designs ● Design Thinking Activities	Group Discussion Teacher Observation Student Self Assessment Rubrics	Technology & Engineering: S5.A.1.1	Technology & Engineering: 3.4.4.C1 3.4.4.C2 3.4.4.C3

Resources/Materials

- KEVA Planks
- Various household materials (STEM Challenges)
- MakerBot 3D printer and filament
- TinkerCad.com
- Code.org

Interdisciplinary Relationships

- English Language Arts
  - Writing
  - Speaking and Listening
- Mathematics
  - Geometry
  - Measurement
- Science
  - Physics (Energy)
- Career Education and Work
  - Career Awareness and Preparation
  - Career Retention and Advancement
  - Entrepreneurship
- 21st Century Skills
  - Creativity and Innovation
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The student will be able to: *Utilize applications and online tools to create unique forms of digital Art & Design.* *Understand the role of technology in Contemporary Art.* *Explore how Art can serve as a form of self expression and discovery.* *Discover connections between the Arts and other subject areas. How Science, History, Math and Language Arts can inform the Arts; and vice versa.*	AW K AP M	3rd Grade: ● Keith Haring Figures with Tayasui Sketches ● iPad Stop Motion Animation with iMotion ● iPad Photography 4th Grade: ● Logo Design in Google Drawings ● Self Portraits with Tayasui Sketches ● iPad Video with Green Screen	Group Discussion Teacher Observation Student Self Assessment Rubrics	Visual Arts: Cr1.2.4a Cr2.1.4a Cr2.2.4a Re.7.2.4a	Visual Arts: 9.1.5.A 9.1.5.B 9.1.5.C 9.1.5.J 9.3.5.A 9.4.5.D

Resources/Materials

- Apple Everyone Can Create: Early Learners Curriculum
- Student MacBooks and iPads

Interdisciplinary Relationships

- English Language Arts
  - Writing
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- Mathematics
  - Geometry
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  - Leadership and Responsibility
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