

NEW MILFORD PUBLIC SCHOOLS

New Milford, Connecticut



Computer Science

July, 2020

BOE Approved August 2020

New Milford Board of Ed

Angela C. Chastain, Chairperson

Joseph Failla, Vice Chairperson

Wendy Faulenbach, Secretary

Eileen Monaghan, Assistant Secretary

Pete Helmus

Brian McCauley

Tammy McInerney

Cynthia Nabozny

Olga I. Rella

Superintendent of Schools

Dr. Kerry Parker

Assistant Superintendent

Ms. Alisha DiCorpo

Authors of Course Guide

Jennifer Morrison

New Milford's Mission Statement

The mission of the New Milford Public Schools, a collaborative partnership of students, educators, family and community, is to prepare each and every student to compete and excel in an ever-changing world, embrace challenges with vigor, respect and appreciate the worth of every human being, and contribute to society by providing effective instruction and dynamic curriculum, offering a wide range of valuable experiences, and inspiring students to pursue their dreams and aspirations.

Computer Science

8th Grade

The Computer Science curriculum 6-8 of the New Milford Public Schools provides students with an introduction to computer science through the five concept areas; Computing Systems, Algorithms and Programming, Data and Analysis, Networks and the Internet, and Impacts of Computing. Aligned with CSTA (Computer Science Teachers Association) standards and supporting ISTE (International Society for Technology Education) standards and 21st Century Skills, the curriculum is designed to be non-sequential, allowing for students to choose to take the class without requiring prerequisites.

This program is designed to be as flexible as possible allowing for wide differences in student prior knowledge, students will spend at least half of their time working as a team, planning and coding a project. The class is part of the middle school unified arts program and will meet twice in a six day rotation for a semester (30—44 minute classes per semester). The focus of the eighth grade curriculum is Data and Analysis, Impacts of Computing (bias and accessibility), and an independent study project in coding.

The ultimate goal of this curriculum is to provide students with exposure to computer science skills which may increase interest in pursuing further computer science education. Additionally, the curriculum provides students with practice in Computational Thinking, problem solving processes that transfer to other disciplines.

Pacing Guide

Grade	Unit	Class Session Duration
8th	Unit 1 Intro to Computer Science 8	6 classes
8th	Unit 2 Data and Society	7 classes
8th	Unit 3 Independent Coding Project	15/17 classes

Stage 1 Desired Results		
<p>Unit 1 Computer Science 8 It's not just Coding.</p> <p>ESTABLISHED GOALS</p> <p>ISTE 2:a, b -Digital Citizen Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.</p> <p>CSTA-2-IC-21 Discuss issues of bias and accessibility in the design of existing technologies</p> <p><u>21st Century Skills</u> Collaboration</p>	Transfer	
	<p><i>Students will be able to independently use their learning to...</i></p> <p>Develop a definition of Computer Science and its relevance to their life Understand their responsibilities as citizens of an increasingly digital world Demonstrate awareness of bias and accessibility issues in current technologies</p>	
	Meaning	
	<p>UNDERSTANDINGS <i>Students will understand that...</i></p> <ul style="list-style-type: none"> -Computer Science touches many aspects of modern life. -Programming as a team makes work go faster and helps avoid mistakes. -While computers cannot have bias, the way they are programmed can lead to built in bias. -Computer hardware and software must be accessible to all. (POUR - perceivable, operable, understandable, robust) 	<p>ESSENTIAL QUESTIONS <i>Students will keep considering...</i></p> <ul style="list-style-type: none"> -Should access to the Internet be considered a human right? -Can a program have bias and still be considered a good program?
	Acquisition	
	<p><i>Students will know...</i></p> <ul style="list-style-type: none"> -Computers are devices that accept data (input), process the data using a program, and output information. 	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> -Identifying the components of a computer. -Working as part of a team. (Paired Programming)

	<ul style="list-style-type: none"> -A computer scientist is someone who has moved from consuming (using) to creating. -Being a digital citizen means thinking about online actions before they are taken. -Any given technology can have bias and programmers must test for bias in their programming process. -Programmers must consider accessibility when developing apps or software. -Digital Citizenship includes respect for copyright and other ethical issues. 	<ul style="list-style-type: none"> -Identifying examples of bias in today's technology -Identifying tools that increase accessibility. -Persisting when they encounter a challenge
--	--	---

Stage 2 – Evidence		
Code	Evaluative Criteria	Assessment Evidence
<p>A, M</p> <p>T</p> <p>A,M</p> <p>T</p> <p>T</p>	<ul style="list-style-type: none"> Accessibility post includes the 4 categories of accessibility, settings users can and cannot control, settings that may be most useful and settings the blogger feels are not available but would be helpful. Graphic that supports the accessibility post. Bias post shows an understanding of the implications of bias in technology. Writing is professional, avoiding text-speak. Posts include citation(s) for source material. 	<p>PERFORMANCE TASK(S):</p> <p><i>Students will show that they really understand evidence of...</i></p> <p>You are a tech blogger;</p> <ul style="list-style-type: none"> Plan and write a post about one of the following <ul style="list-style-type: none"> - Accessibility settings on mobile devices -Accessibility settings on a browser or computer -An exploration of the Google Sites editor and the ways a website developer can or cannot control accessibility post should use their selected issue as a focus for the post while including other accessibility settings. Create a graphic (diagram or annotated screenshots) to accompany the accessibility blog post. Research an example of bias in today's technology(apps, games, devices). Write a blog post that summarizes the issue and raises awareness. Posts must demonstrate good digital citizenship, respect copyright, and use professional writing.
<p>T,A</p> <p>A</p>	<ul style="list-style-type: none"> Website utilizes AltText where appropriate Navigation is understandable Students work as a team respecting each other's opinions. Students follow the pair programming 	<p>OTHER EVIDENCE:</p> <p><i>Students will show they have achieved Stage 1 goals by...</i></p> <p>Create or edit/update a website (Google Sites) to be used as a digital portfolio for all classes following guidelines (professional, appropriate, relevant).</p> <ul style="list-style-type: none"> Make changes necessary to improve accessibility - <p>Collaboration Practice - You are a team of coders-utilizing Paired Programming work together to solve a series of coding problems-</p> <ul style="list-style-type: none"> Alternate being the Driver and the Navigator Work together to solve each problem step by step

A	<p>protocol.</p> <ul style="list-style-type: none"> Teams demonstrate perseverance 	<ul style="list-style-type: none"> If you get stuck on a problem ask another team for a hint If a team asks your team for help, avoid giving the answer but do give hints Use the comment feature to note at least 3 problems that were challenging and how you worked out the solution.
T,M		Participation in class discussion of bias and accessibility.
A		Post assessment-similar to pre-assessment

Stage 3 – Learning Plan

Code	Pre-Assessment	
	Pre assessment should include scenarios asking if there is bias or not; questions about what needs a sample user might have regarding accessibility.	
	Summary of Key Learning Events and Instruction <i>Student success at transfer meaning and acquisition depends on...</i>	Progress Monitoring
M	<ul style="list-style-type: none"> Class Discussion - what is computer science? Identify expectations for class Review using Pair Programming to solve a series of computing puzzles (debugging challenges or other coding puzzles like these Skylit.com) Introduce essential question - -Should access to the Internet be considered a human right? Brainstorm accessibility issues/concerns Create/update their portfolio website-explore the options for accessibility, make changes where possible Students choose an accessibility issue to explore and use as an introduction in their blog post Plan the blog post, create a graphic—post should use their selected issue as a focus for the post while including other accessibility settings. Students define bias and brainstorm a list of examples of bias in the technology they use or examples they have heard of. Students choose one type of bias and research the cause and possible solutions. Group students by topic for discussion of implications and solutions. 	Encourage participation from students new to the CS classes.
T		Check for following the Pair Programming protocol
A		Check for successful solutions
A		
T		Monitor for participation
M		Check posts and graphics-rubric
T,M		
A		Monitor participation
A,M		Observation

	<ul style="list-style-type: none">• Students write their blog post.	Post rubric
--	---	-------------

Stage 1 Desired Results		
Unit 2 Data and Society ESTABLISHED GOALS CSTA-2-DA-07 Represent data using multiple encoding schemes CSTA 2-DA-08 Collect data using computational tools and transform the data to make it more useful and reliable	Transfer	
	<i>Students will be able to independently use their learning to...</i> Encode data as binary (ASCII, numeric, image), RGB and hex Clean data to remove errors and organize it to show relationships. Question the reliability of data (statistics) presented as fact.	
	Meaning	
	UNDERSTANDINGS <i>Students will understand that...</i> Regardless of input format computers actually process in binary. Humans to remove errors, reduce noise and consistently format data before the computer can effectively process the data. Relationships shown in data are not necessarily cause and effect.	ESSENTIAL QUESTIONS <i>Students will keep considering...</i> What is the true value (in data) of my social media use? Should the government have the right to access data on a personal device?
	Acquisition	
	<i>Students will know...</i> -The difference between different data encoding schemes and when each would be	<i>Students will be skilled at...</i> Encoding simple data into binary, RGB, and hex, using resource tables.

	<p>used.</p> <p>-The types of errors that might be found in collected data.</p> <p>-How data can be organized to show relationships</p>	<p>Cleaning collected data to remove non-answers, formatting data for consistency (capitalization, spelling).</p> <p>Organizing the data to show simple relationships.</p>
--	---	--

Stage 2 – Evidence		
Code	Evaluative Criteria	Assessment Evidence
T T,A M A T,M	<ul style="list-style-type: none"> - Form (survey) created follows the guidelines - Collected data is cleaned and organized - Relationships in the data are explored - Yearbook page mock-up shows the data and relationships in graphic format. - Explanation of relationships includes information about the survey design and additional questions. 	<p>PERFORMANCE TASK(S): <i>Students will show that they really understand evidence of...</i></p> <p>You are working on the class yearbook. You and your partner have been asked to create a class favorites page. Create a survey for your classmates asking about 3 of their favorites—music, app, lunch, color, etc. Include one text response question where you provide a list of choices for the respondent to choose from. Collect the responses and create a table to determine if there are any relationships between the data. Using Slides, create a mockup of the yearbook page. Add the page to your portfolio and write an explanation of the relationships you discovered. Explanation must include basic information about the survey design (sample size etc.) and questions that may require further research.</p> <p>(To avoid survey overload, combine the student created Forms into one Form and collect data from a limited number of sections)</p>
T,A A A M	<ul style="list-style-type: none"> -Uses the correct resource and correctly decodes the data. -Binary version matches the LED image. -Conversion is accurate -explanation shows the student understands 	<p>OTHER EVIDENCE: <i>Students will show they have achieved Stage 1 goals by...</i></p> <p>Using binary resources (ASCII table, binary number table) decode simple binary data.</p> <p>Encode a simple image in binary (create image on grid or using a Microbit LED display and encode) Add image and binary to portfolio.</p> <p>Convert binary → RGB and RGB→ binary. Write an explanation of why Hex is a better choice</p>

A	Hex is used in CSS for website design and features comparatively smaller file size over straight binary or RGB.	Vocabulary Quiz- <ul style="list-style-type: none"> • Bit • Byte • Encode • Decode • Pixel • ASCII • Binary • Resolution
---	---	--

Stage 3 – Learning Plan

Code	<i>Pre-Assessment</i>	
	<u>Pre-assess on vocabulary and data concepts</u>	
	Summary of Key Learning Events and Instruction <i>Student success at transfer meaning and acquisition depends on...</i>	Progress Monitoring
A	- Introduce concept of binary as the basis of all code regardless of language	
T,A	- Practice decoding - encoding binary (ASCII and Numeric) data	Assess on decoding sample data
A	- Create a simple binary image	Verify proper encoding (all bits must be either 1 or 0)
A,M	- Investigate how color can be encoded RGB and hex	Check for accuracy
A	- Practice converting between RGB and binary	
T,M	- Add image to portfolio and write paragraph about use of hex code.	
	- Brainstorm types of data —data voluntarily provided and data collected without our explicit knowledge/permission	Participation
A	- Presented with a Sheet containing sample data (i.e. a list of pizza toppings collected when students were asked to write down their preference (from a list of possible toppings) for a pizza party) students attempt to chart the data.	
M	- Discuss difficulties, types of responses that caused the computer problems	Monitor for questions
	- Students clean the data and chart	
M	- Small groups (2 or 3) choose the topics for their yearbook survey	Check for accuracy of chart
A,T	- Write the form questions	
A	- Pair groups to check each other's questions — are the	

<p>T,M T</p>	<p>questions confusing or misleading; will they elicit the data you are seeking.</p> <ul style="list-style-type: none"> - Merge class Forms into one Form — some questions may need to be combined - Complete surveys - Teams clean and organize their data - Complete design of yearbook page mockup 	<p>Observe discussions</p> <p>Use rubric to evaluate</p>
------------------	---	--

Stage 1 Desired Results		
<p>Unit 3 Independent Coding Project</p> <p>ESTABLISHED GOALS</p> <p>2-AP-12 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.</p> <p>2-AP-18 Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.</p> <p>ISTE - 1-Empowered Learner Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.</p> <p>ISTE 2:a, b -Digital Citizen Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.</p>	Transfer	
	<p><i>Students will be able to independently use their learning to...</i></p> <p>Work as a team to design and create a coding project of their choice.</p>	
	Meaning	
	<p>UNDERSTANDINGS <i>Students will understand that...</i></p> <p>Collaboration includes working as a team as well as using the larger coding community</p> <p>In the rapidly changing tech world being an independent learner is essential.</p> <p>Planning, organization and communication are critical to success in team projects.</p>	<p>ESSENTIAL QUESTIONS <i>Students will keep considering...</i></p> <p>What is collaboration?</p> <p>How can I find resources to help me learn something new?</p> <p>What are some resources I can use when I get stuck?</p>
	Acquisition	
	<p><i>Students will know...</i></p> <p>How to create a project proposal.</p> <p>How to create a project timeline.</p>	<p><i>Students will be skilled at...</i></p> <p>Working as a team.</p> <p>Using the computer language they have chosen.</p>

	Basic types of code for the language they are using for their project.	Providing attribution for code they borrow from other coders or libraries
--	--	---

Stage 2 – Evidence		
Code	Evaluative Criteria	Assessment Evidence
T A A T M M,A A	<ul style="list-style-type: none"> - Students work as a team using pair programming or breaking project into different tasks - If parts of other coders work is used attribution is provided - If code libraries are used attribution is provided - Project follows the steps of iterative design and programming - Progress toward goal is documented and ongoing - Learning resources used are documented (journal) - Code follows accepted rules for the particular language 	<p>PERFORMANCE TASK(S): <i>Students will show that they really understand evidence of...</i></p> <p>Working as a project team you will design, develop, and code a project. Projects can be—</p> <ul style="list-style-type: none"> - coding a website using HTML and CSS - building and programming a VEX robot using Robot C - designing and coding a project using Microbit - Javascript drawing and animation (Khan Academy or Code.org) - other projects/languages dependent on availability <p>Your team will develop a project proposal, a timeline, a shared journal for record keeping, a system to allow project continuity.</p>
A,M A M A		<p>OTHER EVIDENCE: <i>Students will show they have achieved Stage 1 goals by...</i></p> <p>Quiz on benefits of the team approach to coding</p> <p>Periodic meetings with teacher</p> <p>Pseudocode or flowchart</p> <p>Journal entries</p>

Stage 3 – Learning Plan

Code	Pre-Assessment	
	Pre-assess for prior experience and or interest in working with the software and hardware available for projects.	
<p>T,A</p> <p>A</p> <p>A</p> <p>M</p> <p>A</p> <p>T,A</p> <p>T</p> <p>M,A</p> <p>T</p>	<p>Summary of Key Learning Events and Instruction <i>Student success at transfer meaning and acquisition depends on...</i></p> <ul style="list-style-type: none"> - Present resources available for independent study —software and hardware - Group students by interest—form teams of 2 or 3 within interest area - Brainstorm possible projects - Teams submit project proposal - Create task assignments and timeline - Class meeting - teams present project plan—question/critique each other's projects - Revise project proposal, timeline - Project work—maintain journal - Team/teacher meeting periodically - Final presentation of projects 	<p>Progress Monitoring</p> <p>Teacher observation</p> <p>Check proposals</p> <p>Monitor participation</p> <p>Teacher/team meeting</p> <p>Teacher/team meeting - journal checks</p>