NEW MILFORD PUBLIC SCHOOLS

New Milford, Connecticut

Computer Science

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BOE Approved August 2020

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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

7th 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 seventh grade curriculum is Computing Systems, Impacts of Computing (benefits and risks of computer technology), and a project to code an application designed to solve a problem.

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
7th	Unit 1 Intro to Computer Science 7	6 classes
7th	Unit 2 Design Process	7 classes
7th	Unit 3 Programming an App	15/17 classes

UbD Template 2.0

7th Grade

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="6">Unit 1 - Intro to Computer Science

ESTABLISHED GOALS

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.

CSTA: 2-IC-20 Compare tradeoffs associated with computing technologies that affect people’s everyday activities and career options.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…

Develop a definition of Computer Science and its relevance to their lives
Understand their responsibilities as citizens of an increasingly digital world
Make informed decisions about the impacts of technologies that impact their lives.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Students will understand that…
Computer Science touches many aspects of modern life.
Programming as a team makes work go faster and helps avoid mistakes.
Actions a person takes online can have far reaching implications.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
Who is a computer scientist?
How does/will computer science relate to my life?
In what ways can a computer technology have positive and negative impacts?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
-Computers are devices that accept data (input), process the data using a program, and output information.
-A computer scientist is someone who has</td><td>Students will be skilled at…
Identifying the components of a computer.
Working as part of a team. (Paired Programming)
Considering the implications of the technologies</td></tr>
</table>

	moved from consuming (using) to creating. -Being a digital citizen means thinking about online actions before they are taken. -Any given technology can have conflicting implications. -Digital Citizenship includes respect for copyright and other ethical issues.	they choose to use.

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
		PERFORMANCE TASK(S): *Students will show that they really understand evidence of…*
M,T	Technology chosen is current, positive and negative impacts are related to the technology, writing follows standard grammar rules, and copyright is respected.	Writing as a tech blogger, write a post on your website discussing a particular computer technology and its risks and benefits.
M,A	Students collaborate to solve problems and follow pair programming guidelines.	Problem Solving - You are a team of coders-utilizing Paired Programming work together to solve a series of coding problems- ● Alternate being the Driver and the Navigator ● Work together to solve each problem step by step - tracing the action of the code
		OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…*
T,A		Create or edit/update a website (Google Sites) to be used as a digital portfolio for all classes following guidelines (professional, appropriate, relevant).
A		Quiz: Vocabulary ● Computer ● Computer Science ● input ● output ● algorithm ● data ● other terms as needed

M		Question-discussion: Positives and Negatives of technology.

Stage 3 – Learning Plan		
Code	***Pre-Assessment*** Pre-assess for parts of a computer, meaning of computer science, vocabulary.	
	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
A	● Class Discussion - what is computer science? Identify expectations for class	Encourage contributions from students who did not take the 6th grade CS class.
M	● Create/update their portfolio website	
A	● Discuss implications of a recent computer technology	
M,T	● In small group, students choose a technology and consider the positive and negative	Monitor groups for sharing/collaboration strategies
T	● Students write their blog post about the chosen technology	
A,M	● Review/Discuss Paired Programming and importance of collaboration (Pair students with similar attitudes toward collaboration and/or pair students new to pair programming together)	Initially encourage input from new CS students then seek reflective input from returning CS students
A,T	● Students work in pairs to solve a series of basic coding puzzles (such as these from Skylit.com or other coding	Monitor for pair programming and problem solving

A	problems)using pair strategy. ● Vocabulary Quiz	process

UbD Template 2.0

<table>
<tr><th colspan="3">Stage 1 Desired Results</th></tr>
<tr><td rowspan="6">Unit 2 Design Process

ESTABLISHED GOALS

CSTA 2-CS-02 Design projects that combine hardware and software components to collect and exchange data.

CSTA 2-AP-12 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
-apply the design engineering cycle to app design
-apply the problem solving process to problems of others</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
Students will understand that…
-planning and testing are critical steps in the design of computer applications
-functionality of an app is more important than the appearance</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
-What are the needs of the user?
-What are the future implications of this technology?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
-the steps of the design process—identify the problem, plan a solution, develop/build the plan, test, improve, begin the cycle again.
-how the steps of the design process relate to the problem solving process (from 6th grade)—Define, Prepare, Try, Reflect
-how to link slides in a presentation to model the app navigation</td><td>Students will be skilled at…
-viewing a design from different perspectives
-generating multiple strategies for meeting user needs.
-analyzing and selecting the most appropriate strategies to meet user needs.
-critiquing a design
-developing a prototype</td></tr>
</table>

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
		PERFORMANCE TASK(S): *Students will show that they really understand evidence of…*
T,M	-worked through the design process appropriately with multiple ideas -need chosen has a clear connection to the chosen group - feature(s) chosen clearly address the need, description is clearly written with justification for the decisions made	User centered design Smart clothing design team—Choose a category of potential users from the class generated list. Create a list of needs that category of users may have. Pick one need to address in your smart clothing design. Work through the design process to come up with the best solution, create an advertisement for the product complete with illustrations, description of what it does and who the user would be.
T,M	-evident that user needs are understood -clear connections between user needs and project features -multiple screens and elements with a clear purpose -navigation of the app is clear -project shows evidence of iterative design related to needs -presentation contains properly linked slides. -professional writing	Working as part of an app development team—identify a problem that you can solve with technology. At this stage you can design a prototype app solution. Prototypes should include ● paper screens (drawings of what the user will see) ● a navigation diagram-how various inputs will change what the user sees—how the user moves through the app ● test design and make changes ● final prototype screens created in Slides with links to model functional navigation

A	-students collaborate -actively follow the directions	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* Using a paper prototype activity - observe students using a sample paper prototype (i.e. Code.org — Discoveries Unit 4 Lesson 4— ensuring students acting as computers are following the diagram and users are trying to accomplish the tasks and writing down the information.
T	-Includes user needs -constructive criticism -professional writing	Blog post - as a beta tester of a new chat app (paper prototype activity)

Stage 3 – Learning Plan		
Code	***Pre-Assessment*** Pre Assess -on ability to empathize with potential users— give students a "user profile" and have them make choices they believe their user would make. (i.e.Code.org - Discoveries-Unit 4 Lesson 2 or similar teacher created material)	
	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
A	-Class discussion usability vs aesthetics—provide examples of things that look good but might not function well -Reflect on pre-assessment—reacting as the user and not as the designer—empathising with the users needs	Participation
T	-Introduce user centered design activity—teams of 3 to 5 -Brainstorm categories of people who may use smart clothing -Groups choose one category and brainstorm types of needs they may have- choose one specific need that could be addressed by smart clothing -Brainstorm solutions and identify pros and cons of each -choose one solution to "design"	Observe groups to ensure students are brainstorming multiple ideas at each step and considering pros and cons
	-Write a description of the product and how it meets the user's needs—draw and label the product, identify "smart" components -present project	Student justification for the decisions they made.
A,M	-Introduce paper prototypes (Code.org - Unit 4 Lesson 4) with a class discussion on user interfaces -working in pairs (one student acting as the computer and one is the user) give each pair a set of paper prototypes and appropriate directions	Monitor to ensure students stay in role

T M A T	-Students follow the directions staying in their User/Computer Role. -Students write a review of the tested app on their blog -Discuss student reviews (or use the provided prototype feedback), which requests for changes could be done on the user interface? Can the criticisms(needs) be categorized? -Pairs of students discuss “apps for good”, brainstorm ideas for possible apps that might help someone-create a document with ideas, pros and cons -Write description of the user and the problem(need) -Demonstrate how to create functional prototype user interface screens using Slides. -Provide students with practice Slide deck to link screens -Students create interface screens for their prototype app -Students link screens into a functional prototype -Students beta test another group’s prototype	Monitor for brainstorming process Check for successful linking

UbD Template 2.0

Stage 1 Desired Results	
Unit 3 Programming an App ESTABLISHED GOALS CSTA-2-AP-12 Design and iteratively develop programs that combine control structures, including nested loops and	***Transfer***

compound conditionals.

CSTA-2-AP-13 Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.

CSTA-2-AP-19 Document programs in order to make them easier to follow, test, and debug

21st Century Skills
- Critical thinking
- Creativity
- Collaboration
- Communication
- Technology literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Students will be able to independently use their learning to…

Working as part of a team—determine a need/problem
—design and program an application or code for a device that will assist with the problem

Meaning

UNDERSTANDINGS *Students will understand that…*	ESSENTIAL QUESTIONS *Students will keep considering…*
Coding is iterative. Function of an app is more important than the appearance of the app. Needs of the user are more important than the wants of the designer.	How can I improve my code? Is my code/program accessible ? Will my program meet the needs of my user?

Acquisition

Students will know…	*Students will be skilled at…*
Using proper code makes a program more efficient, results in fewer errors, and easier to debug, Design planning ensures the program will meet the end user's needs. Blockly style code is easier to use but written code can give the designer more control.	Using AppLab (Code.org) or another coding platform (Microbit, Scratch,etc). Planning/designing a program before beginning to code. Writing end user documentation

Stage 2 – Evidence		
Code	**Evaluative Criteria**	**Assessment Evidence**
T, M	Evidence that students considered several options for user/problem	PERFORMANCE TASK(S): *Students will show that they really understand evidence of…* Your development team is to design and program an app designed to solve a problem. ● Determine the end user/problem ● Design concept for app - flowchart or pseudocode ● Design prototype screens (paper or Slides) ● Explore AppLab (or other coding platform) to determine feasibility ● Modify design as needed ● Program the app using block and text code ● Beta test app ● Modify program as needed ● Write end user documentation ● Have another team beta test your app and test theirs ● Modify program, screens, documentation as needed
T	Completed flowchart or pseudocode showing planned process	
T	Prototype screens reflect flowchart /pseudocode	
A	Code uses control structures, conditionals and loops as appropriate	
T	User documentation uses proper grammar and spelling	
M, A	Testers confirm the app addresses the chosen problem and would be useful to the theoretical end user. Also that documentation is helpful and complete.	

M,T	Journal records stages of development and iteration of code.	OTHER EVIDENCE: *Students will show they have achieved Stage 1 goals by…* Maintain a coding journal with daily goals, text copies of code and screenshots.

Stage 3 – Learning Plan		
Code	***Pre-Assessment*** Pre-assess students to determine coding experience (languages, etc.) Include trouble shooting code from AppLab.	
	Summary of Key Learning Events and Instruction *Student success at transfer meaning and acquisition depends on…*	Progress Monitoring
T	Most learning is done through and while coding. Mini lessons on specific coding skills should be provided as need is observed. Students will be provided resources to learn what they need when they need-videos and text tutorials.	
		Check Journals
	Team brainstorms possible end users/problem	
A	Select the final problem	
	Document process in journal	Check flowchart
		Evaluate prototype
T,M	Design concept for app - flowchart or pseudocode	
	Design prototype screens (paper or Slides)	
		Discuss with group the goals and coding platform chosen
	Explore AppLab (or other coding platform) to determine	
T	feasibility for design	
	Modify design as needed	Observe beta test
A,M	Program the app using block and text code	
	Beta test app	
	Modify program as needed	Check documentation for completeness and professional writing
A,	Write end user documentation	
	Pair up with another team to beta test their app and	
M	documentation while they test yours	Meet with groups to discuss modifications
T,M	Modify program, screens, documentation as needed	Final project
M	Present final project	