

What Has New York State Decided That Every K-12 Student Should Learn About Computer Science?

Poughkeepsie ACM Chapter
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**How many years of NY
public education did you
experience?**



My Background / Perspective

Upstate NY (Suburban) Public High School

Completed an undergraduate degree in Computer Science (2004)

Earned graduate degree in Secondary Education (2006)

Teaching at F.D.Roosevelt High School in Hyde Park (15th year)

- Middle School "Tech", Woodshop, Photography, Digital Logic Design, Computer Graphics, (*Guitar*), Residential Wiring, Computer Science

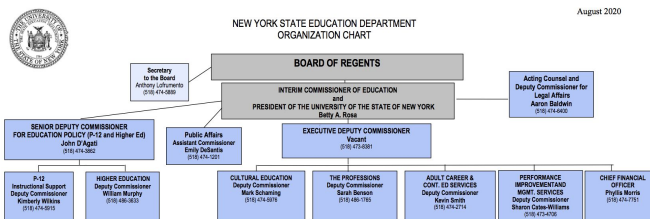
Who regulates “public education”?

Public Education

Federal Legislature, President's Secretary of Education

State Legislature, Board of Regents, Commissioner of Education, etc.

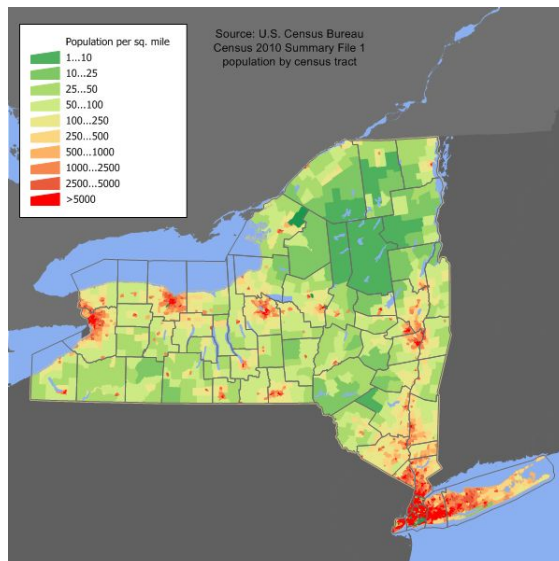
Local Board of Education



In what ways do the schools differ across New York?



Our Great State



What classes were taught in your school?

Math, Science, Reading/Writing (English L.A.),
History (Social Studies), World Languages, Gym



Which classes are required?

English	4
Social Studies	4
Science	3
Mathematics	3
Languages other than English (LOTE)	1
Visual Art, Music, Dance, and/or Theater	1
Physical Education	4 x 1/2
Health	1/2
Electives	3 1/2

What is being taught in classes?



What is being taught in classes? “Standards”

“Standards define what students should understand and be able to do.”

Example: [NYS Next Generation Mathematics Learning Standards](#)

Standards lead to curriculum

Standardized Exams: “Regents Exams” measure student success



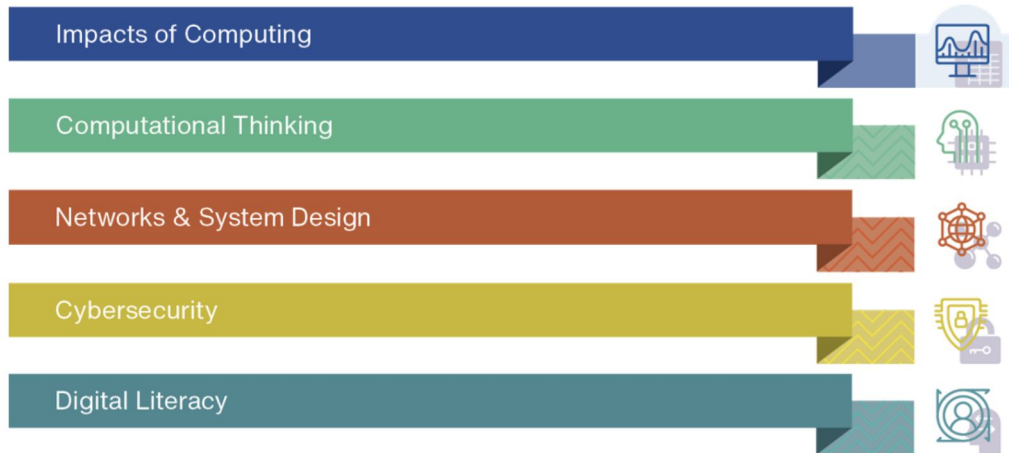
New York's P-12 Learning Standards

Arts	→	Languages Other than English	→
CDOS Standards	→	Mathematics	→
Computer Science and Digital Fluency	→	Physical Education	→
English Language Arts (ELA)	→	Science	→
Family and Consumer Sciences	→	Social Studies	→
Health	→	Technology Education	→

<http://www.nysed.gov/curriculum-instruction>

What are the Computer Science Standards?

An Overview of the CSDF Standards



CONCEPT	SUB-CONCEPTS	STANDARDS
IMPACTS OF COMPUTING	SOCIETY	1, 2
	ETHICS	3, 4, 5
	ACCESSIBILITY	6
	CAREER PATHS	7
COMPUTATIONAL THINKING	MODELING AND SIMULATION	1
	DATA ANALYSIS AND VISUALIZATION	2, 3
	ABSTRACTION AND DECOMPOSITION	4, 5
	ALGORITHMS AND PROGRAMMING	6, 7, 8, 9, 10
NETWORKS AND SYSTEMS DESIGN	HARDWARE AND SOFTWARE	1, 2, 3
	NETWORKS AND THE INTERNET	4, 5
CYBERSECURITY	RISKS	1
	SAFEGUARDS	2, 3, 4
	RESPONSE	5
DIGITAL LITERACY	DIGITAL USE	1, 2, 3, 4, 5
	DIGITAL CITIZENSHIP	6, 7



Concept Area: Impacts of Computing

Impacts of Computing explores the development of computing technologies as driven by human needs. Advances in computing technologies are both influences and influencers:

- Wide-ranging - personal, social, cultural, accessibility, legal, economic, and ethical
- Zones - local, national, and global
- Behaviors - cultural and social interactions and practices
- Perspectives - view of impact on society through many lenses



Concept Area: Computational Thinking

Computational Thinking is a transferable part of Computer Science. It is composed of five fundamental skills that can be applied to any type of problem:

- Decomposition - breaking a problem into smaller problems
- Generalization - comparing this problem to other problems
- Abstraction - deciding which details don't matter
- Pattern Recognition - deciding which parts repeat
- Algorithm Design - solving all the problems of one type



Concept Area: Networks & System Design

Networks and Systems Design focuses on basic functioning of computing systems and networks - fundamental tools in our personal and professional lives.

- Connectivity
- Input and output devices as part of a complex computing system
- Fast, secure communication
- Facilitating innovation



Concept Area: Cybersecurity

Cybersecurity focuses on the why, who, and how of data and computing resource protection.

- Actions: Physical, Digital, Behavioral
- Risks - Understanding and identifying
- Safeguards - Assessing need & implementation
- Response to potential attacks



Concept Area: Digital Literacy

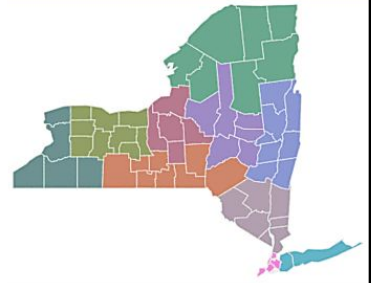
Digital Literacy skills, both cognitive and technical are applied to:

- appropriately access digital information
- create, share, & modify artifacts
- interact and collaborate

How were these decided?



Collaborative Development Process



Nov 2018: Open Call for Authoring Committee Members

Oct 2019: 1st Draft

Nov 2019: Over 800 responses

Dec 2019: Board of Regents sent back for revisions

Dec 2020: Approval

Over 120 individuals from all across NY directly participated in authoring. Link:
<http://www.nysed.gov/curriculum-instruction/2018-2020-computer-science-and-digital-fluency-standards-workgroups>

Who will take this class?



NYSED Vision

Every student will know how to live productively and safely in a technology-dominated world. This includes understanding the essential features of digital technologies, why and how they work, and how to communicate and create using those technologies.



New York State
EDUCATION DEPARTMENT
Knowledge > Skill > Opportunity

View the CSDF Standards



View the Standards

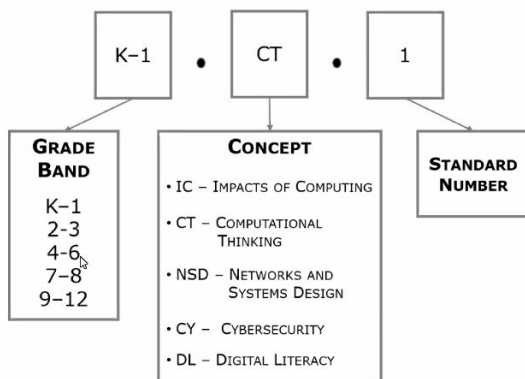
<http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/computer-science-digital-fluency-standards-k-12.pdf>

<https://docs.google.com/spreadsheets/d/1Ad4Y2lRNp0nid6GrM8RYiXXqKeqidAcOnzFCsFPDo1l/>

Standards at a Glance

- The standards are identified by grade band, followed by the concept area, and finally the standard number.

- Each standard is presented with an additional clarifying statement



Grade Band	Grades-4-6
Standard Identifier	4-6.CT.3
Standard	Visualize a simple data set in order to highlight relationships and persuade an audience.
Clarifying Statement	The emphasis is on identifying and organizing relevant data to emphasize particular parts of the data in support of a claim.

Reading the Standards

NYS K-12 Computer Science and Digital Fluency Standards

Concept		Computational Thinking				
Standard Identifier		Grades K-1	Grades 2-3	Grades 4-6	Grades 7-8	Grades 9-12
Standard	Data Analysis and Visualization	K-1.CT.3 Identify ways to visualize data, and collaboratively create a visualization of data.	2-3.CT.3 Present the same data in multiple visual formats in order to tell a story about the data.	4-6.CT.3 Visualize a simple data set in order to highlight relationships and persuade an audience.	7-8.CT.3 Refine and visualize a data set in order to persuade an audience.	9-12.CT.3 Refine and visualize complex data sets to tell different stories with the same data set.
		<i>Ways to visualize data include tables, graphs, and charts.</i>	<i>The emphasis is on using the visual representation to make the data meaningful. Options for presenting data visually include tables, graphs, and charts.</i>	<i>The emphasis is on identifying and organizing relevant data to emphasize particular parts of the data in support of a claim.</i>	<i>Refining includes, but is not limited to, identifying relevant subsets of a data set, deleting unneeded data, and sorting and organizing data to highlight trends.</i>	<i>The emphasis is on refining large data sets to create multiple narratives depending upon the audience. Large data sets require use of a software tool or app to cross-reference, analyze, refine, and visualize subsets of the data.</i>
Sub-Concept	Abstraction and Decomposition	K-1.CT.4 Identify a problem or task and discuss ways to break it into multiple smaller steps.	2-3.CT.4 Identify multiple ways that the same problem could be decomposed into smaller steps.	4-6.CT.4 Decompose a problem into smaller named tasks, some of which can themselves be decomposed into smaller steps.	7-8.CT.4 Write a program using functions or procedures whose names or other documentation convey their purpose within the larger task.	9-12.CT.4 Implement a program using a combination of student-defined and third-party functions to organize the computation.
		<i>The focus is on identifying a complex (for the age group) task or problem to break apart into smaller steps. The focus should be on understanding why this process is helpful.</i>	<i>The focus is on identifying how to break apart a problem into smaller steps, while understanding that there can be multiple valid sequences of steps that solve the same problem.</i>	<i>The focus is on identifying smaller steps that solve a larger problem, recognizing that some of those steps must be broken down further until each step is manageable.</i>	<i>The focus is on identifying where there is potential to use a function or procedure to create a reusable computation.</i>	<i>The focus is on having students think about how to decompose a programming problem into functions and procedures, including working around the constraints imposed by specific functions or features provided in a library.</i>

How will these be taught?

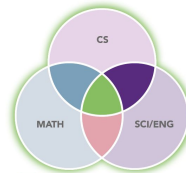


How will these be taught?

(Remember: Standards vs Curriculum, "Local Control")

"*INTERDISCIPLINARY CONNECTIONS: The [CSDF] standards will complement and promote learning across disciplines.*"

"*All [CSDF] standards in the early grades can be taught either with or without a computing device, to allow teachers the freedom to choose the most appropriate means to teach a specific concept or skill.*"



<https://k12cs.org/navigating-the-practices/>

Why teach this?



**How will industry/society
be impacted by *all*
students learning these?**



**How will this impact
schools?**

Timetable for Roll-Out and Implementation

Dates	Phase	Activities
Adoption – Aug 2021	Awareness-Building	Roll-out and building awareness of the new standards and timeline for implementation
Sept 2021 – Aug 2023	Capacity-Building	Focus on curriculum development, resource acquisition, professional development
Sept 2023 – Aug 2024	Year 1 Implementation	All credit-bearing Computer Science courses will be aligned with NYS CS&DF Standards
September 2024	Full Implementation	CS&DF Standards implemented in all grade bands K-12

Who will teach it?





Thank You!

Connect with me: davidczechowski@hpcsd.org

Connect with local CS Teachers: <https://midhudson.csteachers.org/>

Code.org CS Professional Volunteer Database: <https://code.org/volunteer/local>