4-6 Computer Science and Digital Fluency Standard Concept Areas

Impacts of Computing	Computational Thinking	Networks and Systems Design	Cybersecurity	Digital Literacy

NYS K-12 Computer Science and Digital Fluency Standards
Grades 4-6
Glossary of Terms

Guiding Principles

1. **EQUITY AND ACCESS:** Equity and diversity should be attended to, allowing for engagement by all students and flexibility in how students may demonstrate proficiency. The standards support a cultural view of learning and human development in which multiple expressions of diversity are recognized and regarded as assets for teaching and learning—otherwise referred to as Culturally Responsive-Sustaining Education (CR-S).

2. **INTERDISCIPLINARY CONNECTIONS:** The standards will complement and promote learning across disciplines.

3. **COHERENCE:** The standards will be focused on the most important knowledge and skills that all students need to know. The standards will be clearly written, demonstrate vertical and horizontal alignment, and articulate a clear learning progression.

4. **RELEVANCE AND ENGAGEMENT:** The standards will motivate and empower students, allow for a focus on appropriate real-world challenges, and will prepare students to adapt and prosper in a world that is increasingly influenced and shaped by technological advancements.

Impacts of Computing

Society	Computing can change or reinforce cultural practices and equity within society. Human social structures that support education, work, and communities have been affected by the ease of communication facilitated by computing. Governments enact laws to influence the impact of computing technologies on society.
Ethics	Computing is not done in a vacuum. The question of ethics in computing is for both creators and users of technology. If computer scientists and end users do not take into account biases and ethics of what has been built, algorithms and programs may have unintended impacts on societies.
Accessibility	The development and design of computing systems needs to take into account the needs and wants of diverse end users and purposefully consider potential perspectives of users with different backgrounds and ability levels. Identifying potential personal bias during the design and implementation process maximizes accessibility in product design, and awareness of professionally accepted accessibility standards helps to evaluate computational artifacts for accessibility.
Career Paths	The increased connectivity between people in different cultures and in different career fields has impacted the variety and types of careers that are possible. There are also many possible career paths within computer science itself, as well as different specialties within each field, that make computer science a broad and encompassing opportunity.

Society.1	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
IC.1 Compare and contrast tradeoffs associated with computing technologies that affect individuals and society.		
Clarifying Statement The focus should be on how computing technologies both influence and are influenced by society and culture.		
Society.2	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
IC.2 Explain how laws impact the use of computing technologies and digital information.		
Clarifying Statement The focus is on how laws regulate the use of computing technologies and what might happen if those laws did not exist.		
Ethics.3	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics...
IC.3 Explain current events that involve computing technologies.		
Clarifying Statement Explanations should be grade level appropriate to ensure understanding of		

current events and the related computing technologies.		
Ethics.4	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics...
IC.4 Explain who has access to data in different digital spaces. **Clarifying Statement** The focus is on identifying different groups who might have access to data stored or posted in different places, including companies.		
Ethics.5	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
IC.5 Explain how computer systems play a role in human decision-making. **Clarifying Statement** The focus is on explaining a range of ways that humans interact with AI to make decisions.		
Accessibility.6	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
IC.6 Identify and explain ways to improve the accessibility and usability of a computing		

device or software application for the diverse needs and wants of users.		
Clarifying Statement The focus is on identifying the needs and wants of diverse end users and purposefully considering potential perspectives of users with different backgrounds, ability levels, points of view, and abilities.		
Career Paths.7	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
IC.7 Identify a diverse range of role models in computer science.		
Clarifying Statement The emphasis of this standard is the opportunity to personally identify with a range of diverse people in the field of computer science.		

Computational Thinking

Modeling and Simulation	Modeling is the process of representing a system to allow one to observe, understand, or simulate it. Models can be used to simulate real world phenomena that are not easy to observe or reproduce, and often generate simulated data that can further understanding of the system or make predictions.
Data Analysis and Visualization	Data analysis is the process of cleaning, transforming, organizing, clustering, and categorizing data to discover useful information, draw conclusions, and aid in making decisions. Data can be visualized in a variety of ways (including graphs and charts) to aid in and communicate the results of the analysis.
Abstraction and Decomposition	Abstraction is the process of reducing complexity by focusing on key elements. The study of a complicated system often starts by simplifying it and addressing just the most important parts. Complex computer programs also rely on abstraction to isolate particular routines or tasks, especially if those tasks are common. A programmer can then call on that routine, often written by others, without needing to understand its details. Decomposition is the process of strategically breaking complicated problems or tasks into smaller parts that are simpler to understand, program, and debug.
Algorithms and Programming	An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms can be translated into programs, or code, to provide instructions for computing devices. Algorithms are central to programming. Programming is the process of designing and developing code to perform a specific task. It includes the transformation of an algorithm into a specific language that a computer can read and execute, testing code under controlled conditions to ensure its accuracy, debugging the code to resolve errors, and producing documentation both for end users to understand how to use the program and for other developers to assist in following the logic within the program.

Modeling and Simulation.1	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
CT.1 Develop a computational model of a system that shows changes in output when there are changes in inputs.		
Clarifying Statement The emphasis is on understanding, at a conceptual level, that models or simulations can be created to respond to deliberate changes in inputs.		
Data Analysis and Visualization.2	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
CT.2 Collect digital data related to a real-life question or need.		
Clarifying Statement The emphasis is on using digital tools to collect and organize multiple data points.		
Data Analysis and Visualization.3	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
CT.3 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.		

Abstraction and Decomposition.4	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics…
CT.4 Decompose a problem into smaller named tasks, some of which can themselves be decomposed into smaller steps.		
Clarifying Statement 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.		

Abstraction and Decomposition.5	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CT.5 Identify and name a task within a problem that gets performed multiple times while solving that problem, but with slightly different concrete details each time.		
Clarifying Statement The focus is on recognizing that the same general steps are often repeated while solving a problem, even though some of the details may differ.		

Algorithms and Programming.6	This can be integrated into my content area(s) in the	This standard applies to the following transdisciplinary

	following ways...	lessons/topics. ..
CT.6 Compare two or more algorithms and discuss the advantages and disadvantages of each for a specific task. **Clarifying Statement** Tasks can be unplugged or related to a computer program and reflect a task with a specific result that can be checked.		
Algorithms and Programming.7	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CT.7 Identify pieces of information that might change as a program or process runs. **Clarifying Statement** The focus is on identifying information that needs to be updated as a computation progresses.		
Algorithms and Programming.8	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CT.8 Develop algorithms or programs that use repetition and conditionals for creative expression or to solve a problem. **Clarifying Statement** The focus is on having students work with		

each of conditionals and repetition (loops or iteration), but without having to use them in conjunction with one another.		
Algorithms and Programming.9	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CT.9 Read and interpret code to predict the outcome of various programs that involve conditionals and repetition for the purposes of debugging.		
Clarifying Statement Debugging frequently involves stepping or tracing through a program as if you were the computer to reveal errors.		
Algorithms and Programming.10	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CT.10 Describe the steps taken and choices made to design and develop a solution using an iterative design process.		
Clarifying Statement An iterative design process involves defining the problem or goal, developing a solution or prototype, testing the solution or prototype, and repeating the process until the problem is solved or desired result is achieved. Describing can include speaking or writing.		

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Networks & System Design

Hardware and Software	A computing system is composed of hardware, software, and the individuals who use them. Hardware refers to the physical components that make up a computing device. Software refers to the program instructions that operate on such hardware.
Networks and the Internet	Networks are formed by connecting individual devices in a variety of ways. Data is stored on one or more devices in a network and transferred between devices using a set of protocols or rules. The internet is an example of a global network that transmits data between many devices around the world.

Hardware and Software.1	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
NSD.1 Propose improvements to the design of a computing technology based on an analysis of user interactions with that technology.		
Clarifying Statement The emphasis is on thinking about how the user interface could be optimized for the purpose of the computing technology and user interactions.		

Hardware and Software.2	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
NSD.2 Model how computer hardware and software work together as a system to accomplish tasks.		
Clarifying Statement A model should only include the basic elements of a computer system, including input, output, processor, and storage.		

Hardware and Software.3	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
NSD.3 Determine potential solutions to solve hardware and software problems using common troubleshooting strategies.		
Clarifying Statement The focus is on trying multiple strategies to troubleshoot problems, including rebooting the device, checking for power, checking network availability, closing and reopening an application, try using a different browser, and checking settings within an application.		

Networks and the Internet.4	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
NSD.4 Model how data is structured to transmit through a network.		
Clarifying Statement The focus is on understanding that data is broken down into smaller pieces and labeled to travel through a network and reassembled.		
Networks and the Internet.5	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
NSD.5 Describe that data can be stored locally or remotely in a network.		
Clarifying Statement The focus is on describing that data must be stored on a physical device. Access to remotely stored data is restricted by the networks, and to access non-local data a connection to the network is required.		

Cybersecurity

Risk	Risk is a combination of a vulnerability, the likelihood that the vulnerability will be exploited, and the severity of consequences if the vulnerability is exploited. It is important to understand why data and resources need to be protected and how they might be compromised so the correct safeguards can be put into place
Safeguards	Programmers and individuals must know how to protect their data and computing resources with common safety measures. When combined, various physical, digital, and behavioral precautions can create a level of digital security.
Response	When a security breach occurs, individuals must decide what actions to take. This takes into account what type of breach occurred and how to improve security moving forward.

RISKS.1	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CY.1 Explain why different types of information might need to be protected.		
Clarifying Statement The emphasis is on discussing different reasons that adversaries may want to obtain, compromise, or leverage different types of information. At this stage, students should be focused on general concepts.		

SAFEGUARDS.2	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CY.2 Describe common safeguards for protecting personal information. **Clarifying Statement** The emphasis is on describing common safeguards such as protecting devices and accounts with strong passwords, keeping software updated, and not sending sensitive information over SMS.		

SAFEGUARDS.3	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CY.3 Describe trade-offs between allowing information to be public and keeping information private and secure. **Clarifying Statement** The focus is on considering the trade-offs of data sharing in different contexts.		

SAFEGUARDS.4	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CY.4 Model and explain the purpose of simple cryptographic methods.		
Clarifying Statement The focus is on using ciphers to encrypt and decrypt messages as a means of safeguarding data.		
RESPONSE.5	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CY.5 Explain suspicious activity of applications and devices.		
Clarifying Statement The emphasis is on describing simple forms of suspicious behavior in common applications and devices, including suspicious data/links, viruses and malware.		

Digital Literacy

Digital Use	Computers are a part of everyday life. A variety of digital tools exist to create, revise, and publish digital artifacts, as well as communicate and collaborate with others.
Digital Citizenship	Digital citizenship focuses on empowering learners to use online resources, applications, and spaces to improve communities, make their voice heard, and curate a positive and effective digital footprint. It encourages students to engage respectfully online with people with different beliefs and better determining the validity of online sources of information.

Digital Use.1	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
DL.1 Type on a keyboard while demonstrating proper keyboarding technique.		
Clarifying Statement The focus is on direct instruction in keyboarding. Instruction should focus on form over speed and accuracy.		

Digital Use.2	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
DL.2 Select appropriate digital tools to communicate and collaborate while learning with others.		
Clarifying Statement Students' progress from understanding *that* people use digital tools to communicate and collaborate to *how* they use the tools. Communication and collaboration should be purposeful and, when possible and appropriate, with an authentic audience.		

Digital Use.3	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
DL.3 Conduct and refine advanced multicriteria digital searches to locate content relevant to varied learning goals.		
Clarifying Statement Focus should be on the quality of results a search generates, and how to improve search results based on the task or purpose by defining multiple search criteria and using filters.		

Digital Use.4	This can be integrated into my content area(s) in the following ways...?	This standard applies to the following transdisciplinary lessons/topics. ..
DL.4 Use a variety of digital tools and resources to create and revise digital artifacts.		
Clarifying Statement The focus is on understanding the editing process when creating digital artifacts on multiple platforms.		

Digital Use.5	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
DL.5 Identify common features of digital technologies.		
Clarifying Statement Many digital technologies have similar features and functionalities. The focus is on identifying the similarities between different programs or applications, such as word processing tools on different platforms.		

Digital Citizenship.6	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
DL.6 Describe persistence of digital information and explain how actions in online spaces can have consequences.		
Clarifying Statement In order for students to be able to effectively manage their digital identities, it should be understood that online information doesn't "go away," and that information posted online can affect their real lives, even years in the future.		
Digital Citizenship.7	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
DL.7 Identify and describe actions in online spaces that could potentially be unsafe or harmful.		
Clarifying Statement The focus is on identifying and describing potentially unsafe behaviors, and actions to take if they are witnessed or experienced, including cyberbullying.		