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 7-8
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 Topics that could be addressed include, but are not limited to, free speech, communication, and automation.		
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 Evaluate the impact of laws or regulations on the development and use of computing technologies and digital information.		
Clarifying Statement The focus is on the potential consequences of laws related to computing technologies.		
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 Identify and discuss issues of ethics surrounding computing technologies and current events.		
Clarifying Statement At this level, students may require teacher support to discuss the possible ethical implications of 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 Identify and discuss issues related to the collection and use of public and private data.		
Clarifying Statement The focus is on exploring the impacts of data collection, including biases in data collection, and its use by different stakeholders for a range of purposes.		
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 Analyze potential sources of bias that could be introduced to complex computer systems and the potential impact of these biases on individuals.		
Clarifying Statement The focus is on understanding different factors that introduce bias into an AI system and how those biases affect people.		

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 Assess the accessibility of a computing device or software application in terms of user needs.		
Clarifying Statement The focus is on testing and discussing the usability and accessibility of various technology tools (e.g., apps, games, and devices) with teacher guidance. The focus is on the features of computers and other devices, and the things that make them easier to use (i.e., drop-down menus, buttons, areas to type).		
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 Explore a range of computer science related career paths.		
Clarifying Statement At this level, the focus is on building awareness of the many different computer science-related careers.		

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 Compare the results of alternative models or simulations to determine and evaluate how the input data and		

assumptions change the results. **Clarifying Statement** The focus is on understanding that models or simulations are limited by the data that they use, rather than understanding specifically how they use that data. 		
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 and use digital data in a computational artifact. **Clarifying Statement** The emphasis is on designing and following collection protocols. Data sources include, but are not limited to sensors, surveys, and polls. 		
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 Refine and visualize a data set in order to persuade an audience. **Clarifying Statement** 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.		

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 Write a program using functions or procedures whose names or other documentation convey their purpose within the larger task.		
Clarifying Statement The focus is on identifying where there is potential to use a function or procedure to create a reusable computation.		
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 multiple similar concrete computations in a program, then create a function to generalize over them using parameters to accommodate their differences.		
Clarifying Statement The focus is on identifying similar expressions or sequences in code and abstracting them into functions that generalize over the similarities.		

Algorithms and Programming.6	This can be integrated into my content area(s) in the following ways...	This standard applies to the following transdisciplinary lessons/topics. ..
CT.6 Design, compare and refine algorithms for a specific task or within a program. **Clarifying Statement** Algorithms can be represented in a range of formats, including flowcharts, pseudocode, or written steps. Planning the output of a program, such as with a storyboard or wireframe, is not sufficient on its own.		
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 Design or remix a program that uses a variable to maintain the current value of a key piece of information. **Clarifying Statement** The focus is on understanding that variables can be used to track the value of a concept in a program as it changes over time.		

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 or remix a program that effectively combines one or more control structures for creative expression or to solve a problem.		
Clarifying Statement The focus is on having students combine control structures, such as conditionals and loops, in such a way that they work together to achieve an outcome that could not be achieved using only one of them.		
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 Programs can be debugged in numerous ways, including tracing and trying varying inputs. Perseverance is important in finding 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 Document the iterative design process of developing a computational artifact that incorporates user feedback and preferences.		
Clarifying Statement At this level, the emphasis is on using the iterative design process to create a solution or prototype with the end user in mind and to document the steps taken by the student to gather and incorporate information about the user into the computational artifact.		

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 Design a user interface for a computing technology that considers usability, accessibility, and desirability.		
Clarifying Statement The emphasis is on designing (but not necessarily creating) a user interface. Designs could include things like written descriptions, drawings, and/or 3D prototypes.		

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 Design a project that combines hardware and software components.		
Clarifying Statement The focus is on designing (but not necessarily creating) a system that involves collecting and exchanging data including input, output, storage, and processing.		
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 Identify and fix problems with computing devices and their components using a systematic troubleshooting method or guide.		
Clarifying Statement The focus is on identifying the source of a problem by using a structured process such as a checklist or flowchart to systematically try solutions that may fix the problem.		

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 Design a protocol for transmitting data through a multi-point network.		
Clarifying Statement The focus is on understanding how protocols enable communication and what additional data is necessary for transmission. Knowledge of the details of how specific protocols work is not expected.		
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 Summarize how remote data is stored and accessed in a network.		
Clarifying Statement The focus is on explaining where the data associated with different apps, devices, and embedded systems is stored, how the data is synchronized, and how to connect to it.		

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 Determine the types of personal information and digital resources that an individual may have access to that needs to be protected.		
Clarifying Statement The emphasis is on identifying personal information and devices that an individual may have access to and that adversaries may want to obtain or compromise. At this stage, students should focus on specific data and devices that they have access to.		

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 physical, digital, and behavioral safeguards that can be employed in different situations.		
Clarifying Statement The emphasis is on recommending different types of security measures including physical, digital, and behavioral, for a given situation.		
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 of implementing specific security safeguards.		
Clarifying Statement The focus is on thinking about how a specific safeguard impacts the confidentiality, integrity, and access of information. Additionally, there should be a focus on discussing whether strengthening one specific safeguard adversely affects another.		
SAFEGUARDS.4	This can be integrated into my content area(s) in the	This standard applies to the following

	following ways...	transdisciplinary lessons/topics. ..
CY.4 Describe the limitations of cryptographic methods. **Clarifying Statement** The focus is on recognizing that cryptography provides a level of security for data, and some types of encryption are weaker than others.		
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 Describe actions to be taken before and after an application or device reports a security problem or performs unexpectedly. **Clarifying Statement** The emphasis is on explaining appropriate actions to prevent and address common security issues for common situations.		

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, with increased speed and accuracy.		
Clarifying Statement The emphasis is on continuing to improve keyboarding skills, with a focus on increasing speed as well as 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 Communicate and collaborate with others using a variety of digital tools to create and revise a collaborative product.		
Clarifying Statement Students connect with others (students, teachers, families, the community, and/or experts) to further their learning for a specific purpose, give and receive feedback, and created a shared product.		
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 Compare types of search tools, choose a search tool for effectiveness and efficiency, and evaluate the quality of search tools based on returned results.		
Clarifying Statement Mastery of this standard implies an understanding of how different search tools work, why different search tools provide different results, and how and why some websites rise to the top of a search.		

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 Select and use digital tools to create, revise, and publish digital artifacts.		
Clarifying Statement Teachers should designate a school approved location for students to publish artifacts for an audience to view. Advanced digital tools may refer to the tool itself (i.e., the tool is more advanced) or to utilization of more advanced features on a tool.		
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 Transfer knowledge of technology in order to explore new technologies.		
Clarifying Statement New technologies could include different tools for collaboration, creation, etc. that the student has not used before.		
Digital Citizenship.6	This can be integrated into my content area(s) in the	This standard applies to the following transdisciplinary

	following ways...	lessons/topics. ..
DL.6 Explain the connection between the persistence of data on the Internet, personal online identity, and personal privacy.		
Clarifying Statement A focus should be on learning about privacy settings on social media accounts, exploring the concept of a positive online presence/identity, and identifying behaviors and information that could potentially affect them now and 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 Describe safe, appropriate, positive, and responsible online behavior and identify strategies to combat negative online behavior.		
Clarifying Statement Students are able to strategize ways to keep online spaces safe. Identify types of negative online behaviors including cyberbullying, harassment, trolling/flaming, excluding, outing, dissing, masquerading, and impersonation.		