



NYS K-12 Computer Science and Digital Fluency Learning Standards

December 2020

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.

Representation in Authoring, Review, and Revision

Individuals representing the following groups participated in authoring, review, and revision work:



- K-12 Teachers
 - Computer science, math, science, STEM
 - Educational technology, library and media specialists
 - Special Education
 - ELL/MLL Education
 - Early Learning, Elementary (Common Branch)
- K-12 Administrators, District Coordinators, and BOCES staff
- Higher Education
- Business and Industry
- Professional Organizations
- Community and Parent Organizations
- National Experts
- Urban, Suburban, Rural; Regional Representation



Conditional Approval

NYSED staff directed by the Board of Regents to

- Engage further with early learning experts to ensure the K-2 grade band standards are developmentally appropriate, and that both the clarifying statements and provided examples are helpful and relevant to K-2 teachers.
- Return to the Board of Regents for final adoption of the standards in Spring 2020.
- Begin to develop resources and guidance to aid the field in implementing the standards in accordance with the proposed implementation timeline.

EARLY LEARNING STANDARDS REVIEW AND REVISION

CONDITIONAL APPROVAL

The Board of Regents granted Conditional Approval of the Standards at the January 2020 Meeting of the Board of Regents.



Jan 2020

Feb - March 2020



EARLY LEARNING WORKGROUP

A group of Early Learning and CS Experts was formed to review and revise the Standards. They did an initial review and submitted feedback that was the basis of a set of recommendations for review.

PAUSE DUE TO COVID-19

Work on the standards was paused due to the COVID-19 pandemic, as the majority of the early learning experts assisting with the revision work were New York State teachers.



March - June 2020

July - Sept 2020



EARLY LEARNING WORKGROUP RESUMED

The Early Learning Workgroup met twice weekly for over two months to review and revise each EL standard.

FINAL REVIEW AND REVISION FOR COHERENCE

CS Experts and the Executive Standards Panel conducted a final review for coherence.



Nov 2020



Early Learning Standards Revision Workgroup

- Comprised of NYS teachers; subject matter experts in early childhood education, computer science, and instructional technology; and NYSUT Representatives
- Reviewed and revised standards, clarifying statements, and examples



| Priority for Revision, Defined by Stakeholder Feedback | Actions Taken by Revision Workgroup, Reflected in December 2020 Draft Standards |
|--|---|
| <p>More attention needed on the K-2 band</p> | <ul style="list-style-type: none"> Standards revised for developmental appropriateness, flexibility for meeting the standards, and to emphasize thinking, creativity, and problem solving Clarifying language and examples reviewed and revised for relevance |
| <p>Include third grade with K-2 grade band</p> | <ul style="list-style-type: none"> Third Grade included with K-2 under the umbrella of Early Learning The middle grade bands (3-5 and 6-8) adjusted to 4-6 and 7-8 Required new standards, clarifying statements, and examples to be written |
| <p>The K-3 band should be split to reflect developmental needs of young students</p> | <ul style="list-style-type: none"> Grade band (K-3) split into two (K-1 and 2-3) at the recommendation of Early Learning experts |
| <p>Ensure the guiding principle of coherence maintained</p> | <ul style="list-style-type: none"> A few adjustments made to the upper grade standards to ensure logical progression and vertical alignment |
| <p>Examples included with the standards too limiting</p> | <ul style="list-style-type: none"> Examples pulled out of the full standards document |

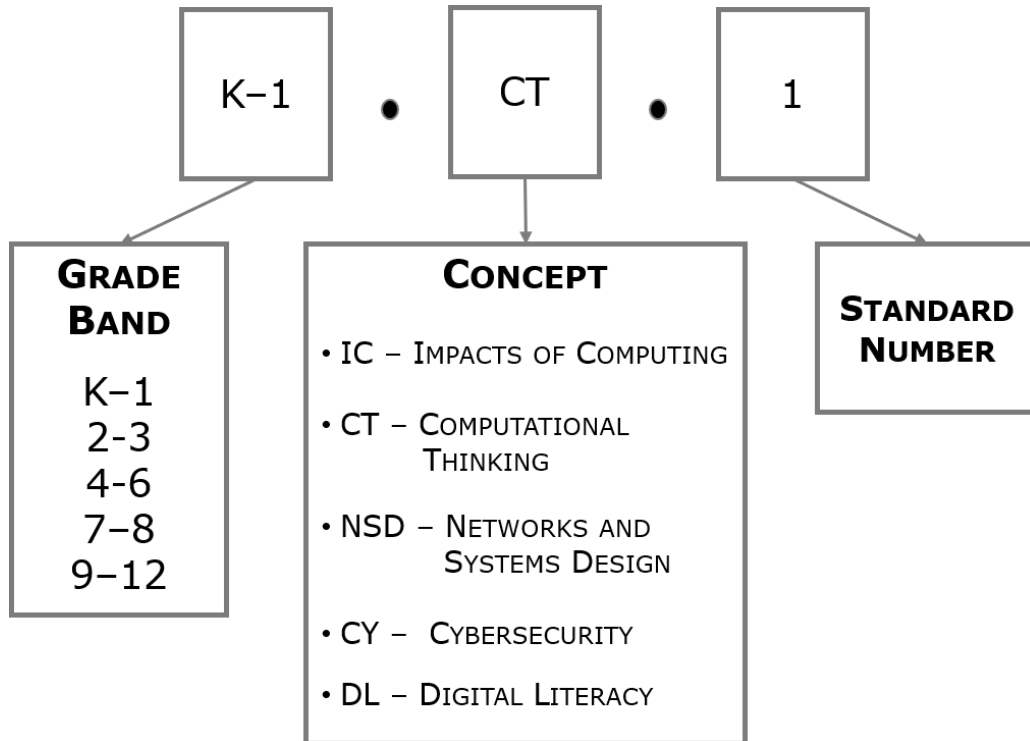
Overview of the Standards

| 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 |

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 Standard

Clarifying Statement

Sub-Concept

| | Grades K-1 | Grades 2-3 | Grades 4-6 | Grades 7-8 | Grades 9-12 |
|---------------------------------|---|--|---|---|---|
| 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> |
| 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> |

Timetable for Roll-Out and Implementation

| Dates | Phase | Activities |
|---------------------------------|-----------------------|--|
| Adoption – Aug 2021 | Awareness-Building | Roll-out and build 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 |



Next Steps

Upon Approval from the Board of Regents, NYSED Staff will

- Return to the Board of Regents in Fall 2021 with regulatory and policy recommendations related to embedding this new subject area into the K-12 program requirements.
- Engage with partners across the state to develop guidance materials and tools to aid schools in the implementation of the new standards.

Recommendation

Department staff recommend the Board of Regents adopts the revised NYS K-12 Computer Science and Digital Fluency Standards.





Discussion and Questions