NYS K-12 Computer Science and Digital Fluency Learning Standards

March 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.
Parallel Efforts: Computer Science and Digital Fluency

Digital Fluency

- USNY Statewide Learning Technology Plan (2010)
  - Technology is a path for teaching and learning, but it is also a body of practices, skill, and knowledge to be learned. All New York State learners will develop technological literacy to enter college, become productive members of the workforce, and succeed as citizens.

- Spring 2017 Survey on Technology Literacy
  - 3375 responses, 70% New York State teachers
  - 93% of respondents agreed that a need existed for a common statewide understanding of student technology literacy

- NYS ESSA Plan, Part IV.A.3
  - The Department will continue its work with stakeholder groups to create guidance on digital literacy for students. (p. 190)

Computer Science

- Computer Science Certification
  - In March 2018, NYS Board of Regents adopted regulations that created a classroom teaching certificate in computer science and a corresponding tenure area

- Part R, Chapter 56, Laws of 2018
  - Required the Education Department to work with stakeholders to review existing recognized computer science frameworks and develop draft model New York State Computer Science Standards for Kindergarten through Grade 12.
Initial Stakeholder Meeting

September 2018: Meeting of experts in computer science and educational technology from across New York State

- Recommended the separate but related areas of Computer Science and Digital Fluency should be combined under one “umbrella,” as has been done in several other states.
- Developed the Guiding Principles
- Began identifying existing recognized computer science frameworks to utilize in standards authoring efforts
Guiding Principles

• **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).

• **Interdisciplinary Connections**
  The standards will complement and promote learning across disciplines.

• **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.

• **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.
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

- National Experts
  - Dr. Leigh Ann DeLyser, CSforAll
  - Dr. Kathi Fisler, Brown University

- Higher Education
- Business and Industry
- Professional Organizations
- Community and Parent Organizations
- National Experts in Computer Science Standards
- Urban, Suburban, Rural; Regional Representation
NYSED received 410 survey responses representing 839 individuals and members of organizations across New York, with 564 leaving specific comments.

STAKEHOLDER FEEDBACK SURVEY

NYSED convened a workgroup on December 4 and 5, 2019, to address the stakeholder feedback priorities and revise the standards.

SECOND REVISION

NYSED staff and a consultant revised the standards to address the Review Panel feedback and Department policy and expectations.

FIRST REVISION

Review Panel members completed both a high-level review of all standards, and an in-depth review through a specific “lens” (perspective)

REVIEW PANEL

Workgroup members, divided into small groups by concept area, met virtually to create a first draft of the standards.

AUTHORING WORKGROUPS

Oct 2018 – May 2019

Oct – Nov 2019

Dec 2019

July – Aug 2019

June 2019

AUTHORING WORKGROUPS

FIRST REVISION

SECOND REVISION

STANDARDS AUTHORING, REVIEW, AND REVISION

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Stakeholder Feedback and Actions Taken

Approximately 60% of respondents to the Stakeholder Feedback Survey indicated that they either moderately or strongly supported the standards overall; however, several themes clearly emerged as priorities for immediate revision.

<table>
<thead>
<tr>
<th>Priority for Revision</th>
<th>Actions Taken</th>
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</thead>
<tbody>
<tr>
<td><strong>Number of Standards</strong></td>
<td>• Reduced number of standards from 45 to 35 by combining redundant standards and focusing on the most important knowledge and skills</td>
</tr>
<tr>
<td><strong>K-2 Grade Band</strong></td>
<td>• Revised K-2 grade band to focus on thinking, creativity and problem solving, and ensure almost all standards can be met without the use of a device.</td>
</tr>
<tr>
<td><strong>References to Specific Technologies</strong></td>
<td>• Standards, clarifying language, and examples were revised to eliminate references to specific technologies.</td>
</tr>
<tr>
<td><strong>Interdisciplinary Connections</strong></td>
<td>• Examples were revised to include more interdisciplinary connections, and an additional Appendix was created to highlight additional examples.</td>
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</tbody>
</table>
| **Computational Thinking**            | • The standards were reorganized and revised; Computational Thinking was elevated to its own concept area.  
• Standards in abstraction and modeling were added. |
## Overview of the Standards

<table>
<thead>
<tr>
<th>Concept</th>
<th>Sub-Concepts</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impacts of Computing</strong></td>
<td><strong>Society</strong></td>
<td>1, 2</td>
</tr>
<tr>
<td></td>
<td><strong>Ethics</strong></td>
<td>3, 4, 5</td>
</tr>
<tr>
<td></td>
<td><strong>Accessibility</strong></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>Career Paths</strong></td>
<td>7</td>
</tr>
<tr>
<td><strong>Computational Thinking</strong></td>
<td><strong>Modeling and Simulation</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Data Analysis and Visualization</strong></td>
<td>2, 3</td>
</tr>
<tr>
<td></td>
<td><strong>Abstraction and Decomposition</strong></td>
<td>4, 5</td>
</tr>
<tr>
<td></td>
<td><strong>Algorithms</strong></td>
<td>6, 7, 8</td>
</tr>
<tr>
<td></td>
<td><strong>Programming</strong></td>
<td>9, 10, 11, 12</td>
</tr>
<tr>
<td><strong>Networks and Systems Design</strong></td>
<td><strong>Hardware and Software</strong></td>
<td>1, 2, 3</td>
</tr>
<tr>
<td></td>
<td><strong>Networks and the Internet</strong></td>
<td>4, 5</td>
</tr>
<tr>
<td><strong>Cybersecurity</strong></td>
<td><strong>Risks</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Safeguards</strong></td>
<td>2, 3, 4</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Digital Literacy</strong></td>
<td><strong>Digital Use</strong></td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td></td>
<td><strong>Digital Citizenship</strong></td>
<td>5, 6</td>
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CONDITIONAL APPROVAL
The Board of Regents conditionally approved the standards and related timeline.
Immediate Next Steps

To ensure the new standards meet the needs of all students, NYSED staff have identified the following next steps:

• 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.

• Begin to develop resources and guidance to aid the field in implementing the standards in accordance with the proposed implementation timeline.
Upon approval by the Board of Regents, the projected timeline for implementation of the new Computer Science and Digital Fluency Standards is as follows:

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

As required by a 2018 law, NYSED engaged with workgroups of stakeholders, including teachers, administrators, parents, and business/industry professionals to develop computer science standards that will prepare all NY students to live and work in our dynamic, technology-driven 21st-century world. New York State has developed five specific concept areas for the Computer Science and Digital Fluency Learning Standards.

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

Each Concept contains two or more Sub-Concepts. Within the Sub-Concepts are a number of standards. The draft standards are currently grouped into four grade bands: K-2, 3-5, 6-8, and 9-12. Students will be expected to master the standards by the end of the last year of the grade band.

- Draft New York State K-12 Computer Science and Digital Fluency Learning Standards
Questions?

Contact Information:
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