Rhode Island K-12 Computer Science Education Standards Toolkit
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Introduction

*We’re at unique point in history where the things that we are building are going to significantly impact our social, political, economical, and personal lives.*

-- Anita Borg, Computer Scientist

In January 2017, the Rhode Island STEAM Center organized and convened a statewide Computer Science (CS) Education Advisory Committee funded by the van Beuren Charitable Foundation, with the goal of creating CS education standards for Rhode Island. The Rhode Island Council on Elementary and Secondary Education endorsed these standards in May 2018.

The development of the CS Education Standards represents a major shift in the teaching of computer science in K-12 with school districts initiating or revising CS pathways for all students. This toolkit has been created to assist educators with implementation. It provides resources and strategies that can be used as the standards are introduced to educators, students, parents/caregivers, community members, industry professionals, school committees and other stakeholders.

This toolkit includes user-friendly descriptions of the CS Education Standards that can be tailored to meet the specific needs of districts and schools for use with different audiences. The toolkit consists of materials that can be downloaded, modified, and easily distributed to stakeholders through online channels and/or in print form. It provides general information about the value of CS education, activities to use with various stakeholders, and strategies that will assist with the development of a CS education district plan. The materials are designed so that they may be modified to meet the particular needs of all districts whether they are just beginning to introduce computer science or they are further along in the process.

We developed the toolkit using the suggestions and recommendations from educators across the state. It is impossible to meet the individual needs of all but we have included many resources from multiple sources that will provide support. The online toolkit is designed to be a living document with materials and tools added as districts’ needs change. We hope that this toolkit proves to be useful.

The Rhode Island Computer Science Education Standards and its companion toolkit were developed with the belief that equity and broadening participation must be at the forefront of implementation of computer science pathways to ensure that all students benefit.

Thank you for being part of bringing computer science education to ALL students in Rhode Island!

Carol M. Giuriceo, Ph.D.
CS4RI Leadership Team
Director, Rhode Island STEAM Center @ Rhode Island College
This toolkit serves as a companion to the Rhode Island Computer Science Education (CS Ed) Standards. We created it for educators to use when introducing the CS Ed Standards to their districts. It includes materials, resources, and strategies that will help district teams develop computer science implementation plans that meet the needs and capacity of individual schools.

The toolkit has been designed for educators who teach at all grade levels and have different levels of computer science expertise.

It includes:

- An introduction to computer science and computational thinking;
- An overview of the core and sub-concepts, and practices of the Rhode Island Computer Science Education Standards;
- Activities that will assist educators in “unpacking” and understanding how the computer science education standards can be implemented;
- Strategies to gather feedback from multiple stakeholders.

The appendices at the end of the toolkit include:

- One-page descriptions that can be reproduced, distributed and used to assist in computer science education advocacy;
- Worksheets that provide activities that can be easily conducted during meetings or workshops to initiate discussions;
- Online and print resources.

This toolkit will be updated periodically to meet the needs of educators as they develop computer science education implementation plans.
Overview

- Computer Science
- Computational Thinking
- Elements of Computational Thinking
Computer Science: The study of computers and algorithmic processes, including their principles, their hardware and software designs, their implementation, and their impact on society [Association for Computing Machinery (ACM), 2006].
Computational Thinking (CT): The human ability to solve problems, design systems, and understand human behavior, by drawing on the concepts fundamental to computer science [Jeannette Wing, Communications of the ACM, 49(3), 33-35, March 2006]

- Computational thinking is a way humans solve problems; it is not trying to get humans to think like computers.
- Computational thinking complements and combines mathematical and engineering thinking.
- Computational thinking is about ideas, not just the software and hardware artifacts that are produced.
- Computational thinking is for everyone, everywhere.
Elements of CT

**Decomposition:** Breaking down a problem or system into smaller pieces.

**Pattern Recognition:** Finding similarities and regularities between things.

**Abstraction:** Reducing complexity by pulling out specific differences to make one solution work for multiple problems.

**Algorithm Design:** Developing step-by-step instructions to complete a task.

https://code.org/curriculum/course3/1/Teacher
Understanding the Standards

- CS Standards
- Core Concepts
- Sub-concepts
- Practices
- Reading the Standards
Represent pathways that are realistic expectation for all students.

Written to be aspirational

Identify the knowledge, practices, and skills in computer science that all students should know at each level in their education.
The six **core concepts** represent specific key areas of disciplinary importance in computer science. These are the overarching themes that provide an organizational structure for teaching and learning.

<table>
<thead>
<tr>
<th>Core Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computational Thinking &amp; Programming</td>
<td>Problem solving that requires the logical analysis of data.</td>
</tr>
<tr>
<td>Computing Systems &amp; Networks</td>
<td>Physical components (hardware) and instructions (software) that make up a computing system and the networks that provide connectivity.</td>
</tr>
<tr>
<td>Cybersecurity</td>
<td>Practices, processes, technologies, and other protective measures that are designed to protect against unwanted, unauthorized, or illegal access to or use of data, through onsite or remote devices, programs, and/or networks.</td>
</tr>
<tr>
<td>Data &amp; Analysis</td>
<td>Collection, analysis, and storage of digital data.</td>
</tr>
<tr>
<td>Digital Literacy</td>
<td>Ability to leverage software technology to create, share, and modify artifacts, as well as search digital information.</td>
</tr>
<tr>
<td>Responsible Computing in Society</td>
<td>Social implications of computing technology and the effect on many aspects of our world in both positive and negative ways, and at local and global scales.</td>
</tr>
</tbody>
</table>
The **sub-concepts** represent specific ideas or topics within each concept to organize each core concept and provide focus.

<table>
<thead>
<tr>
<th>Sub-Concepts</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Computational Thinking &amp; Programming</strong></td>
<td>- Algorithms&lt;br&gt;- Variables&lt;br&gt;- Data Structures &amp; Data Types&lt;br&gt;- Control Structures&lt;br&gt;- Modularity&lt;br&gt;- Computational Design</td>
</tr>
<tr>
<td><strong>Computing Systems &amp; Networks</strong></td>
<td>- Human-Computer Interaction&lt;br&gt;- Hardware &amp; Software&lt;br&gt;- Troubleshooting&lt;br&gt;- Networks &amp; the Internet</td>
</tr>
<tr>
<td><strong>Cybersecurity</strong></td>
<td>- Risks&lt;br&gt;- Safeguards&lt;br&gt;- Response</td>
</tr>
<tr>
<td><strong>Data &amp; Analysis</strong></td>
<td>- Collection, Visualization, &amp; Transformation&lt;br&gt;- Inference &amp; Models&lt;br&gt;- Storage</td>
</tr>
<tr>
<td><strong>Digital Literacy</strong></td>
<td>- Creation &amp; Use&lt;br&gt;- Searching Digital Information&lt;br&gt;- Understanding Software Tools</td>
</tr>
<tr>
<td><strong>Responsible Computing in Society</strong></td>
<td>- Culture&lt;br&gt;- Safety, Law, &amp; Ethics&lt;br&gt;- Social Interactions</td>
</tr>
</tbody>
</table>
The **Practices** describe the behavior and ways of thinking that computationally-literate students use to engage in the core and sub-concepts.

https://k12cs.org/
Reading the Standards

<table>
<thead>
<tr>
<th>GRADE LEVEL</th>
<th>CORE CONCEPT</th>
<th>SUB-CONCEPT</th>
<th>Numbering of standards in grade level in specific sub-concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Grades K-2</td>
<td>CT</td>
<td>Algorithms</td>
</tr>
<tr>
<td>1B</td>
<td>Grades 3-5</td>
<td>CT</td>
<td>Algorithms</td>
</tr>
<tr>
<td>2</td>
<td>Grades 6-8</td>
<td>Sub-Concept</td>
<td>Algorithms</td>
</tr>
<tr>
<td>3</td>
<td>Grades 9-12</td>
<td></td>
<td>Algorithms</td>
</tr>
</tbody>
</table>
Example:

<table>
<thead>
<tr>
<th>Grade Band</th>
<th>Identifier</th>
<th>Computer Science Education Standard</th>
<th>Core Concept</th>
<th>Sub-Concept</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-2</td>
<td>1A-CT-A-1</td>
<td>Model daily processes by creating and following algorithms to complete tasks.</td>
<td>Computational Thinking &amp; Programming</td>
<td>Algorithms</td>
<td>Developing &amp; Using Abstractions</td>
</tr>
</tbody>
</table>

Description and examples can be found in Appendix A in the Rhode Island K-12 Computer Science Education Standards Booklet.

**Grades K-2**

*Model daily processes by creating and following algorithms to complete tasks.*

An algorithm is a set of step-by-step instructions. Students should be able to break down simple actions into discrete components steps to achieve a goal. For example, students could create and follow algorithms for preparing a simple snack, brushing their teeth, getting ready for school, or contributing during clean-up time.
Sorting the Standards

- Sorting
- Existing Concepts
- Enhancing Concepts
- Extending Concepts
- Questions to Consider
**ACTIVITY**

Review the CS Education Standards and consider how the concepts fit into one of the categories below:

1. Concepts that already EXIST in the curriculum and can be called out or presented with examples on how it can also relate to computer science.

2. Adding tasks or lessons to ENHANCE the concept and provide clear connection to computing concepts.

3. New lessons that EXTEND the underlying concept as a basis for CS exploration.

Adapted from: Massachusetts Department of Elementary & Secondary Education, Digital Literacy and Computer Science (DLCS) Standards Implementation, Anne DeMallie, Mathematics Statewide Program Coordinator
**ACTIVITY:**

What concepts of Computer Science connect directly with existing STEAM or other initiatives?

Concepts that already EXIST in the curriculum and can be called out or presented with examples on how it can also relate to computer science

- Think about the material you are already teaching.
- Read through the descriptions of the core and sub-concepts.
- Take a few minutes to pinpoint one of your covered topics within the core concepts.
**ACTIVITY:**

*What concepts of Computer Science connect indirectly with existing STEAM or other initiatives?*

Adding tasks or lessons to ENHANCE the concept and provide clear connection to computing concepts.

- Think about the material you are already teaching.
- Consider student work, past tasks, assessment, portfolios, etc. that can be enhanced to include computing concepts.
- Take a few minutes to identify the knowledge, skills, and expertise that can be augmented to include computing concepts.
**ACTIVITY:**

*What concepts of Computer Science connect with the curricula of the CS4RI content providers?*

New lessons that EXTEND the underlying concept as a basis for CS exploration.

- Think about the material you are already teaching.
- Identify what core and sub-concepts are not being covered in the curriculum.
- Use the Interactive Standards Table to find content providers whose curricula meet the standards that are not covered in your school.
Questions to Consider

What opportunities exist within current initiatives to include CS in a meaningful way?

What strategies work best in terms of achieving positive changes?

What strategies didn’t work or were less effective?
Community Outreach

- Stakeholders
- Stakeholder Outreach
- Stakeholder Feedback
Identify stakeholders whose feedback and input will enrich your district’s Computer Science Education Plan. Participants may include but are not limited to:

- K-12 teachers
- Parents/Caregivers
- Students
- School Administrators
- District Leadership
- Business Community
- School Boards/Committees
- Community Leaders

Organize informational meetings, review sessions, focus groups, or any type of online or in-person communication that will connect with your audience.

Distribute information (see Appendices) for appropriate material to send to participants beforehand.

Facilitate the activities on the following pages to gather feedback from stakeholders.
Community involvement serves as a valuable aspect of computer science education district implementation. Stakeholders represent a myriad of perspectives. Although it may be impossible to accommodate everyone, it is important that everyone’s voice is acknowledged.

At the beginning of the process, all stakeholders must understand the main objectives, the strategic imperatives, and the expected outcomes of the implementation as well as the challenges facing the district.

The following questions may be used to help facilitate discussions:

1. **What are the greatest challenges facing our students?**
2. **What challenges are we facing in implementing a computer science implementation plan?**
3. **What will happen if we don’t develop a computer science education implementation plan?**
4. **What do you see as a major critical issue facing the district?**
5. **What do you think has low priority?**
6. **What does success in computer science education look like?**
7. **What do you think is the most significant aspect that will make CS Ed implementation successful?**
8. **If we receive additional funding, what should we do with it?**
9. **What information do you need?**
10. **How often do you want to be informed about this implementation?**
✓ Compile a list of questions and concerns that must be addressed as the District Computer Science Education Implementation Plan moves forward.

✓ Consider how you will use the information you gather and how you will act and respond to that information.

✓ Contact CS4RI for additional resources when appropriate.

<table>
<thead>
<tr>
<th>STAKEHOLDER</th>
<th>QUES/CONCERNS</th>
<th>EVIDENCE/DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td></td>
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<tr>
<td>Parents/Caregivers</td>
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<td>Teachers</td>
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<tr>
<td>School Admins</td>
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<tr>
<td>District Staff</td>
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<tr>
<td>Business Community</td>
<td></td>
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<tr>
<td>School Committee</td>
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<tr>
<td>Community Leaders</td>
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</tbody>
</table>

Adapted from:
Next Generation Science Standards
District Implementation Workbook,
Achieve, May 2017
Appendices

➢ Resources
Computer Science Education Standards in Rhode Island

- The standards define the knowledge, practices, and skills students should possess at critical points in their educational career. They help frame realistic pathways for all students.

- The standards align with the K-12 CS Framework and the CSTA CS Standards which were developed through a rigorous process and are based on a history of professional research and practice in computer science education.

BUSINESS/INDUSTRY INVOLVEMENT

Business and industry strongly supported the development of the computer science education standards through direct participation on committees and through other formal and informal channels.

We created standards that reflect those topics deemed important to business and industry.

- Focus on economic development
- Value of diverse workforce
- Knowledge of analytics
- Importance of cybersecurity

- Workforce development identified as a guiding principle
- Equity embedded in standards
- Strong emphasis on data science
- Identification of cybersecurity as a separate core concept

CORE CONCEPTS

- Computation Thinking & Programming
- Computing Systems & Networking
- Cybersecurity
- Data & Analysis
- Digital Literacy
- Responsible Computing in Society

PRACTICES

- Fostering an Inclusive Computing Culture
- Collaborating Around Computing
- Recognizing & Defining Computational Problems
- Developing & Using Abstractions
- Creating Computational Artifacts
- Testing & Refining Computational Artifacts
- Communicating About Computing
- Using Technology Appropriately

OUR VISION

Our students, including those historically underrepresented, understand the value, influence, and relevance of computer science education. We believe that increased use and mastery of computational thinking through the grade levels builds human capacity, and allows students to become informed users as well as active creators of technology. Students shall thoughtfully and ethically approach personal and societal challenges and participate in finding solutions to local, regional, and global issues.

Our educators collaborate within communities of professional practice as computer science becomes the multi-disciplinary bridge across school districts. We believe that an engaged citizenry emerges from a strong focus on essential life and career skills, problem-solving abilities, and lifelong commitment to learning, which positions Rhode Island as a leader in technology and a premier innovative center in the United States.

GUIDING PRINCIPLES

- Broadening Participation & Equity
- Stimulating Learning & Curiosity
- Building Connections across Disciplines
- Encouraging Workforce/Economic Development
- Supporting Teachers
- Informing with Current Research

SELECTED TIMELINE

January 2016 — Brookings’ Report identifies low student engagement with computer science in RI.

March 2016 — Governor Raimondo announces CS4RI initiative to bring CS learning opportunities to all schools.

Fall 2016 — Rhode Island becomes one of 5 new states to join the NSF-funded Expanding Computing Education Pathways (ECEP) Alliance.

January 2017 — Rhode Island STEAM Center awarded funding from the van Beuren Charitable Foundation for standards development.

March 2017 — Computer Science Education Advisory Standards Committee meets for the first time.

May 2018 — Standards endorsed by the Rhode Island Council on Elementary & Secondary Education.
COMPUTER SCIENCE EDUCATION STANDARDS ADVISORY COMMITTEE

- Chris Allen, NBCT, Fourth Grade Teacher, Greenbush Elementary School, West Warwick Public Schools
- Jenny Chan-Remka, Ed.D., Assistant Superintendent, Woonsocket Education Department
- Michelle Conary, Computer Literacy Instructor, Chariho Middle School, Chariho Regional School District
- Jane L. Daly, Assistant Superintendent of Schools, Chariho Regional School District
- Vic Fay-Wolfe, Professor, Computer Science, University of Rhode Island
- Kathi Fisler, Ph.D., Research Professor, Computer Science, Brown University/Co-Director, Bootstrap
- Carol M. Giuriceo, Ph.D., Director, Rhode Island STEAM Center @ Rhode Island College (Committee Chair)
- Lenora E. Goodwin, Consulting Teacher, Teacher Retention and Induction network (T.R.A.I.N.), Providence Public Schools
- Timothy Henry, Ph.D., Professor, IT Graduate Director, New England Institute of Technology
- Dominic Herard, Mathematics & Computer Science Teacher, Times Squared STEM Academy, Providence
- Verda Jones, Business & Technology Instructor, Shea Senior High School, Pawtucket School District
- Ramarao Koppaka, Staff Vice President, Principal Enterprise Architect, FM Global
- Linda Larsen, Director of Education Outreach & Workforce Development, Southeastern New England Defense Industry Alliance (SENEDIA)
- Bryan Lucas, Computer Science/Literacy Teacher, Chariho Middle School, Chariho Regional School District
- Joe Mazzone, Secretary, CSTA-RI, Career and Technical Education Instructor, William M. Davies Jr. Career and Technical High School, Lincoln
- Ilona Miko, Ph.D., MikoArtScience Consulting
- Ryan Mullen, Coordinator of Teaching & Learning, Warwick Public Schools
- Elizabeth (Liz) Patterson, Computer Science Teacher, Portsmouth High School, Portsmouth School Department
- Janet Prichard, Ph.D., Professor, Information Systems and Analytics, Bryant University
- Cmdr. Joseph E. Santos, Military Professor, U.S. Naval War College, Newport

REVIEW TEAM

- Amanda Bagley, Second Grade Education Teacher, Greenbush Elementary School, West Warwick Public Schools
- John Bilotta, Executive Director, Rhode Island Society of Technology Educators (RISTE)
- Joe Devine, Partner & CTO, Bridge Technical Talent, LLC
- Howard L. Dooley, Jr., Project Manager, Rhode Island Technology Enhanced Sciences and Computing (RITES +C), University of Rhode Island
- Donald Gregory, Education Specialist, Providence Public Library
- Linda A. Jzyk, Grant Specialist, Rhode Island College Foundation, Former Science and Technology Specialist, Rhode Island Department of Education
- Tom Kowalczyk, Founder, KMRM, LLC
- Theresa Moore, President, T-Time Productions
- Diane Sanna, Assistant Superintendent, Bristol Warren Regional School District
- John Smithers, CEO, Tech Collective
- Holly Walsh, Digital Learning Specialist, Office of College and Career Readiness, Rhode Island Department of Education (RIDE)

CYBERSECURITY EXPERTS

- Jason Albuquerque, C/CISO, CGCIO, Chief Information Security Officer, Carousel Industries
- Brig Gen Kimberly A. Baumann, Ph.D., Assistant Adjutant General, Rhode Island National Guard
- Simon A Cousins, Principal Client Specialist, FM Global
- Richard Siedzik, Director of Information Security and Planning/ISO, Bryant University

DIGITAL LITERACY SPECIALISTS

- Renee Hobbs, Ph.D., Professor, Department of Communication Studies; Co-Director, Graduate Certificate in Digital Literacy, Harrington School of Communication and Media, University of Rhode Island
- Mary H. Moen, Ph.D. Assistant Professor, Graduate School of Library and Information Studies, University of Rhode Island
- Zoey (Xuezhao) Wang, Graduate Assistant, Rhode Island STEAM Center @ Rhode Island College
What are the new Rhode Island Computer Science Education Standards?

The Rhode Island Computer Science Education Standards identify the knowledge, practices, and skills in computer science (CS) that all students should know and be able to do at each level in their education. They inform, encourage, and drive a sustainable computer science education program by creating realistic pathways and expectations for all students.

**WHY WERE THEY DEVELOPED?**

The impetus for this work was the current momentum surrounding the implementation of CS education in K-12 through the Computer Science for Rhode Island (CS4RI) initiative and the recent national emphasis on computer science education. Conversations with educators during the first months of CS4RI implementation indicated that educators and administrators would welcome guidelines that assist in the development of computer science pathways. Identifying achievement outcomes for students in different grades would allow educators to feel confident that they were teaching what students need to know.

**WHO DEVELOPED THE STANDARDS?**

The CS Education Standards Advisory Committee composed of Rhode Islanders from across the state, represented a broad range of expertise and included elementary, middle, and high school teachers, district coordinators and administrators, higher education faculty, and industry professionals. Some members had computer science expertise; others were pedagogy experts and understood the value and use of academic standards.

The Advisory Committee was charged with developing and aligning with the nationally-recognized K-12 Computer Science Framework, the Computer Science Teachers Association (CSTA) Computer Science Standards, and CS standards work in other states.

**GUIDING PRINCIPLES**

* Broadening Participation & Equity  
* Stimulating Learning & Curiosity  
* Building Connections across Disciplines  
* Encouraging Workforce/Economic Development  
* Supporting Teachers  
* Informing with Current Research

**HOW WERE THEY DEVELOPED?**

- **March-December 2017** Monthly all-day Saturday meetings with Advisory Committee
- **November 2017** Meetings with external specialists/experts in digital literacy and cybersecurity for specific input.
- **January 2018** Smaller working teams focused on specific concepts.
- **February-March 2018** Review of draft standards by Review Team and public
- **April 2018** Presentation to Council on Elementary & Secondary Education
## WHAT IS INCLUDED IN THE STANDARDS?

### CORE AND SUB-CONCEPTS

<table>
<thead>
<tr>
<th>Computational Thinking &amp; Programming</th>
<th>Computing Systems &amp; Networks</th>
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</thead>
<tbody>
<tr>
<td>• Algorithms</td>
<td>• Human-Computer Interaction</td>
</tr>
<tr>
<td>• Variables</td>
<td>• Hardware &amp; Software</td>
</tr>
<tr>
<td>• Data Structures &amp; Data Types</td>
<td>• Troubleshooting</td>
</tr>
<tr>
<td>• Control Structures</td>
<td>• Networks &amp; the Internet</td>
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<td>• Modularity</td>
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<td>• Computational Design</td>
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<table>
<thead>
<tr>
<th>Cybersecurity</th>
<th>Data &amp; Analysis</th>
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<tbody>
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<td>• Risks</td>
<td>• Collection, Visualization,</td>
</tr>
<tr>
<td>• Safeguards</td>
<td>&amp; Transformation</td>
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<tr>
<td>• Response</td>
<td>• Inference &amp; Models</td>
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<td>• Storage</td>
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<td>• Safety, Law, &amp; Ethics</td>
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<tr>
<td>• Understanding Software Tools</td>
<td>• Social Interactions</td>
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</table>

### PRACTICES

- Fostering an Inclusive Computing Culture
- Collaborating Around Computing
- Recognizing & Defining Computational Problems
- Developing & Using Abstractions
- Creating Computational Artifacts
- Testing & Refining Computational Artifacts
- Communicating About Computing
- Using Technology Appropriately
**Broadening Participation Rubric: Professional Development**

**Emerging**: Evidence suggests no serious effort has been applied to this goal.  
**Approaching**: Evidence suggests some effort has been applied toward this goal.  
**Developing**: Evidence suggests appropriate or adequate meeting of goal.  
**Mature**: Strong evidence of meeting or exceeding goal.

<table>
<thead>
<tr>
<th>Culturally Responsive Professional Development</th>
<th>Emerging</th>
<th>Approaching</th>
<th>Developing</th>
<th>Mature</th>
<th>Specific Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators learn how to recruit URG students into computer science courses.</td>
<td></td>
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<tr>
<td>Educators learn how to create an inclusive physical environment.</td>
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<tr>
<td>Educators learn how to create an inclusive social classroom atmosphere.</td>
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<tr>
<td>Educators learn about implicit (unconscious) bias and how that can negatively impact URG learners.</td>
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<tr>
<td>Educators learn about how to promote a growth mindset among students and to emphasize how abilities are expandable.</td>
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<tr>
<td>Educators learn how to teach without necessarily being an expert.</td>
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<tr>
<td>Educators learn instructional methods that inspire interest and engagement for in computer science for all students.</td>
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<tr>
<td>Educators learn to create inclusive assignments and assessments.</td>
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</tbody>
</table>

Broadening Participation Rubric Curriculum

**Emerging**: Evidence suggests no serious effort has been applied to this goal.  
**Approaching**: Evidence suggests some effort has been applied toward this goal.  
**Developing**: Evidence suggests appropriate or adequate meeting of goal.  
**Mature**: Strong evidence of meeting or exceeding goal.

<table>
<thead>
<tr>
<th>Culturally Responsive Curriculum</th>
<th>Emerging</th>
<th>Approaching</th>
<th>Developing</th>
<th>Mature</th>
<th>Specific Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students see themselves represented in curricular materials.</td>
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<tr>
<td>Curriculum is relevant to students’ community and culture.</td>
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<td>Curriculum is accessible so that all students can participate.</td>
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<tr>
<td>Curriculum promotes active, inquiry-based learning.</td>
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<tr>
<td>Curriculum promotes small group learning.</td>
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<tr>
<td>Curriculum demonstrates that individuals from diverse backgrounds can achieve in CS careers</td>
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<tr>
<td>There are frequent opportunities for dialogue and problem-solving.</td>
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<tr>
<td>Assessment provide multiple opportunities to demonstrate understanding.</td>
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</tbody>
</table>

Adapted from: STEM Education Needs All Children: A Critical Examination of Equity Issues, Resource Materials. Great Lakes Equity Center 2013
Support K-12 Computer Science Education in Rhode Island

Computer science drives job growth and innovation throughout our economy and society. Computing occupations are the number 1 source of all new wages in the U.S. and make up over half of all projected new jobs in STEM fields, making Computer Science one of the most in-demand college degrees. And computing is used all around us and in virtually every field. It’s foundational knowledge that all students need. But computer science is marginalized throughout education. Only 35% of U.S. high schools teach any computer science courses and only 8% of STEM graduates study it. We need to improve access for all students, including groups who have traditionally been underrepresented.

Rhode Island currently has 1,511 open computing jobs (3.0 times the average demand rate in Rhode Island).

- The average salary for a computing occupation in RI is $90,293, which is significantly higher than the average salary in the state ($53,110). The existing open jobs alone represent a $136,432,632 opportunity in terms of annual salaries.
- Rhode Island had only 348 computer science graduates in 2015; only 17% were female. In Rhode Island, only 78% of all public high schools teach computer science.
- Only 528 exams were taken in AP Computer Science by high school students in Rhode Island in 2018 (169 took AP CS A and 359 took AP CSP).
- Only 28% were female (24% for AP CS A and 30% for AP CSP); only 60 exams were taken by Hispanic or Latino students (6 took AP CS A and 54 took AP CSP); only 19 exams were taken by Black students (2 took AP CS A and 17 took AP CSP); no exams were taken by American Indian or Alaska Native students; only 1 exam was taken by Native Hawaiian or Pacific Islander students (1 took AP CS A and 0 took AP CSP).
- Only 32 schools in RI (46% of RI schools with AP programs) offered an AP Computer Science course in 2017-2018 (23% offered AP CS A and 37% offered AP CSP), which is 3 more than the previous year.
- Universities in Rhode Island did not graduate a single new teacher prepared to teach computer science in 2016.
What can you do to improve K-12 CS education?

1. Call on your school to expand computer science offerings at every grade level.
2. Ask your local school district to allow computer science courses to satisfy a core math or science requirement.
3. Visit www.code.org/educate/3rdparty to find out about courses and curriculum from a variety of third parties, including Code.org.
4. Visit www.code.org/promote/RI to learn more about supporting computer science in your state.
5. Sign the petition at www.change.org/computerscience to join 100,000 Americans asking Congress to support computer science.

Fact sheet can be found at https://code.org/advocacy/state-facts/RI.pdf

Code.org's Impact in Rhode Island

- In Rhode Island, Code.org’s curriculum is used in:
  - 39% of elementary schools
  - 26% of middle schools
  - 18% of high schools
- There are 2,964 teacher accounts and 113,166 student accounts on Code.org in Rhode Island.
- Of students in Rhode Island using Code.org curriculum last school year,
  - 41% attend high needs schools
  - 18% are in rural schools
  - 47% are female students
  - 45% are underrepresented minority students (Black/African American, Hispanic/Latino, American Indian, or Hawaiian)
- Code.org, its regional partner(s) University of Rhode Island, and 9 facilitators have provided professional learning in Rhode Island for:
  - 968 teachers in CS Fundamentals (K-5)
  - 18 teachers in Exploring Computer Science or Computer Science Discoveries
  - 21 teachers in Computer Science Principles

Code.org has a partnership with the State of Rhode Island to help spread K-5 computer science to its schools.

“Computer Science is a liberal art: it’s something that everybody should be exposed to and everyone should have a mastery of to some extent.” — Steve Jobs

Data is from the Conference Board for job demand, the Bureau of Labor Statistics for state salary and national job projections data, the College Board for AP exam data, the National Center for Education Statistics for university graduate data, the Gallup and Google research study Education Trends in the State of Computer Science in U.S. K-12 Schools for schools that offer computer science and parent demand, and Code.org for its own courses, professional learning programs, and participation data.
The table below lists examples of career in computer science. For additional information, please visit [https://www.computerscience.org/careers/](https://www.computerscience.org/careers/)

<table>
<thead>
<tr>
<th>Computer Programmer</th>
<th>Database Administrator</th>
<th>Hardware Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write code to generate programs</td>
<td>Store, order, and protect company data</td>
<td>Create, implement, &amp; test physical computer components</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Information Researcher</th>
<th>IT Architect</th>
<th>Network Administrator</th>
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</thead>
<tbody>
<tr>
<td>Create cutting-edge technology</td>
<td>Design data communication networks</td>
<td>Maintain the daily operations of computer networks</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Security Analyst</th>
<th>Software Developer</th>
<th>Systems Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protect networks from cyber attacks</td>
<td>Manage the creation of computer programs</td>
<td>Design &amp; unify software creation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Systems Analyst</th>
<th>Systems Manager</th>
<th>Web Developer</th>
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</thead>
<tbody>
<tr>
<td>Streamline existing IT infrastructures</td>
<td>Oversee &amp; coordinate IT operations</td>
<td>Plan &amp; produce websites</td>
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</table>

CS Careers
<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Core Concept</th>
<th>Sub-Concept</th>
<th>Identifier</th>
<th>CS Education Standard</th>
<th><strong>Existing Instruction</strong>&lt;br&gt;(identify standard or instruction in other disciplines that include CS standard with minor modifications such as adding new vocabulary)</th>
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<tbody>
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<td>Current Instruction</td>
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Rhode Island K-12 Computer Science Education Standards

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Core Concept</th>
<th>Sub-Concept</th>
<th>Identifier</th>
<th>CS Education Standard</th>
<th><strong>Enhanced Instruction</strong> (identify additional material that can be added to current instruction)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Current Instruction</td>
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</tbody>
</table>


<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Core Concept</th>
<th>Sub-Concept</th>
<th>Identifier</th>
<th>CS Education Standard</th>
<th><strong>Extended Instruction</strong></th>
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</thead>
<tbody>
<tr>
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<td></td>
<td>(identify matrix content provider whose curriculum covers the standard – see interactive standards table)</td>
</tr>
</tbody>
</table>
## Rhode Island K-12 Computer Science Education Standards

<table>
<thead>
<tr>
<th>STAKEHOLDER</th>
<th>QUESTIONS/CONCERNS</th>
<th>EVIDENCE/DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td></td>
<td></td>
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<tr>
<td>Parents/Caregivers</td>
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<tr>
<td>Teachers</td>
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<tr>
<td>School Admins</td>
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<tr>
<td>District Staff</td>
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<tr>
<td>Business Community</td>
<td></td>
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<tr>
<td>School Committee</td>
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<tr>
<td>Community Leaders</td>
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</tbody>
</table>
International Society for Technology in Education

The ISTE Standards are a framework for students, educators, administrators, coaches and computer science educators to rethink education and create innovative learning environments. The standards are helping educators and education leaders worldwide re-engineer schools and classrooms for digital age learning, no matter where they are on the journey to effective ed tech integration.

The ISTE Standards for Computer Science Educators describe what computer science teachers must know and be able to do to help students effectively integrate these essential concepts.

**ISTE COMPUTATIONAL THINKING (CT) COMPETENCIES**

Integrate CT across disciplines, with all students: CT competencies for educators

ISTE’s goal is to help all learners become computational thinkers who can harness the power of computing to innovate and solve problems. These competencies are intended to help educators build those skills by integrating computational thinking (CT) across all disciplines and with students of all ages.

CT Competences for Educators

- Computational Thinking
- Equity Leader
- Collaborating Around Computing
- Creativity & Design
- Integrating Computational Thinking

In 2019, ISTE will release educator standards specifically for computer science discipline teachers in collaboration with the Computer Science Teachers Association. The Computational Thinking Competencies, however focus on the educator knowledge, skills and mindsets to integrate computational thinking (CT) across the K-12 content areas and with students of every age. The CT Competencies augment and hone in on the competencies embedded in the ISTE Standards for Students and the ISTE Standards for Educators.

ISTE Standards – Computer Science Educators 2011
National Center for Women & Information Technology

The National Center for Women & Information Technology (NCWIT) is the only national non-profit focused on women's participation in computing across the entire ecosystem, helping more than 1,100 organizations recruit, retain, and advance women from K-12 and higher education through industry and entrepreneurial careers by providing support, evidence, and action.

More than 160 NCWIT research-based resources raise awareness, increase knowledge, and build capacity for individuals and organizations to reach out to critical populations and implement systemic change. NCWIT provides resources for reform at every level — K-12, postsecondary, industry — that are attractive, easy-to-use, free, and available in both electronic and print formats.

- Computer Science is for Everyone: A Toolkit for middle and high schools to increase diversity in computer science education
- Computer Science is for Everyone (PowerPoint)
- Top 10 Ways Families Can Encourage Girls' Interest in Computing
- Top 10 Ways to Engage Underrepresented Students in Computing
Additional Resources

Computer Science for Rhode Island (CS4RI)
- Rhode Island K-12 Computer Science Education Standards
- Rhode Island K-12 Computer Science Education Standards Interactive Table

K12 Computer Science Framework
- Frequently Asked Questions
- A Vision for K-12 Computer Science

Computer Science Teachers Association – CSTA
(CSTA) is a membership organization that supports and promotes the teaching of computer science. CSTA provides opportunities for K–12 teachers and their students to better understand computer science and to more successfully prepare themselves to teach and learn.
- CSTA K-12 Computer Science Standards

Computer Science Teachers Association – Rhode Island (CSTA-RI)

Other Associations
- Association for Computing Machinery
- IEEE (Institute of Electrical and Electronics Engineers) Computer Society
Rhode Island
STEAM Center
At Rhode Island College