MassCAN Action Plans for Scaling K–12 Computer Science in Massachusetts

Submitted to: MassTech

October 2013

by:
Jim Stanton
Joyce Malyn-Smith
Sarita Pillai
Rebecca Lewis
Heather Carey

Education Development Center, Inc.
43 Foundry Avenue
Waltham, MA 02453
Funder Acknowledgment: Education Development Center, Inc. (EDC), is grateful to the Massachusetts Technology Collaborative (MassTech) for the financial support to research and develop this MassCAN Action Plans report and the accompanying Resource Briefs. Special thanks are extended to Patrick Larkin, Director of the Innovation Institute, and Sarah Rahman, Director of Strategic Initiatives, for their steady consultation and advice during the grant period.

Document Contributor/Reviewer Acknowledgments: The authors are grateful to the following for their important contributions, Steve Vinter, Ilene Kantrov, Sarah Rahman, Vivian Guilfoy, Deborah Boisvert, Rick Adrion, Renee Fall, JD Chesloff, Linda Noonan, Kelly Powers, Fred Martin, Karen Brennan, Eileen Lee, David Petty, Terry Dash, and Shay Pokress.

Special Acknowledgment: Josie Sullivan provided invaluable assistance, creating graphics and charts and managing all aspects of report production.
“In this report, the term ‘Computing’ is used with a very broad sense. Computing is concerned both with computers and computer systems—how they work and how they are designed, constructed, and used—and with the underlying science of information and computation. The influence of Computing in shaping the world in which we now live has been profound, and it is hard to imagine that Computing will become less important in the future. It is argued in this report that it is essential for all school pupils to gain some familiarity with aspects of Computing and for there to be opportunities for pupils to develop their aptitudes in the subject, for their individual benefit and for the future prosperity of the nation.”

—Shut down or restart? The way forward for computing in the U.K. schools
The Royal Society, January 2012
# Table of Contents

**Overview** .................................................................................................................................................................................................................. 1

**Introduction** ............................................................................................................................................................................................................... 5
- Background ............................................................................................................................................................................................... 6
- The MassCAN Initiative ......................................................................................................................................................................... 7
- Purpose of the Four Action Plans ........................................................................................................................................................ 8
- EDC's Role: Supporting the TFs ............................................................................................................................................................. 9
- TF Logistics ............................................................................................................................................................................................. 9
- Important Definitions ............................................................................................................................................................................. 10

**MassCAN Standards Task Force Action Plan** ................................................................................................................................. 11
- Purpose of the MassCAN Standards TF ........................................................................................................................................ 12
- Tasks, Activities, and Outcomes ....................................................................................................................................................... 13

**MassCAN Curriculum Task Force Action Plan** ............................................................................................................................... 27
- Purpose of the MassCAN Curriculum TF ...................................................................................................................................... 28
- Tasks, Activities, and Outcomes ....................................................................................................................................................... 29

**MassCAN Professional Development Task Force Action Plan** ...................................................................................................... 39
- Purpose of the MassCAN PD TF ....................................................................................................................................................... 40
- Building on Current Work ................................................................................................................................................................. 41
- Tasks, Activities, and Outcomes ....................................................................................................................................................... 42

**MassCAN Public Awareness Task Force Action Plan** ...................................................................................................................... 57
- Purpose of the MassCAN Public Awareness TF ............................................................................................................................... 58
- Goals ............................................................................................................................................................................................................. 58
- Key Metrics .................................................................................................................................................................................................. 59
- Tasks, Activities, and Outcomes ....................................................................................................................................................... 59
Overview
Overview

The Massachusetts Computing Attainment Network (MassCAN) has four goals:

1. Expand the computing education opportunities for all Massachusetts students beyond computer literacy (keyboarding, word processing, spreadsheets, etc.) to include computational thinking and the ability to develop computer technology based on nation-leading standards taught by inspired and qualified teachers.

2. Provide both computing education opportunities to students, especially female and underrepresented minorities, at an early age and a continual set of learning opportunities across a wide range of subjects throughout students’ K–12 learning experience.

3. Inform and inspire educators, administrators, parents, and students about the employment opportunities available in technology fields across all industries.

4. Mobilize, organize, and coordinate collaborators across Massachusetts in industry, education, nonprofits, and the public sector to enable them to engage effectively in achieving and sustaining all aspects of this mission, including standards definition, curriculum development, professional development, licensure, research, outcomes measurements, internships, externships, public awareness, and extracurricular programs.

The Action Plans that follow will enable MassCAN to help Massachusetts realize these goals by taking a long-term, comprehensive, sustained, and systemic approach to address a range of interrelated issues. The Action Plans focus on four key solution elements: K–12 Computer Science (CS) Standards supporting the development of a robust infrastructure to ensure broad access to and the equity and sustainability of the state’s CS initiative; a K–12 CS curriculum, providing access to educational resources to ensure the consistency and continuity of high-quality K–12 CS learning across the state; Professional Development (PD), providing community, education, and business leaders and teachers with the support and resources to ensure that Massachusetts fosters a cadre of highly qualified CS teachers; and Public Awareness, providing consistent messages to mobilize citizens across the state to support CS in schools. These Action Plans are intended to build on and complement the state’s new STEM (Science, Technology, Engineering, and Mathematics) Plan 2.0.

The Action Plans are also intended to provide a road map for four multi-sector Task Forces (TFs) to work over a two- to three-year time frame to achieve very specific outcomes. The TFs will be staffed, and the TF co-chairs will collaborate to ensure coordination among the four TFs, maximize synergies and expertise, and minimize redundancy. Both processes and outcomes for each TF will be documented and evaluated to provide opportunities for course correction and to serve as a resource for other states interested in pursuing a similar path.
This strategic approach is designed to yield three benefits:

1. Massachusetts students will have the basic computing skills necessary to understand technology developments in the 21st century.

2. Massachusetts students in every part of the state, including large numbers of young women and underrepresented minorities, will be prepared and inspired to lead and innovate in a future economy that will be dependent on and driven by computer technology.

3. Massachusetts will continue to grow and thrive as the nation’s leading knowledge- and information-based state economy.

Table 1 provides a high-level summary of each Action Plan. Note: The activities listed in the columns below are not intended to track across Plans.

**Table 1. Action Plans Summaries**

<table>
<thead>
<tr>
<th>CS Standards</th>
<th>Curriculum</th>
<th>Professional Development</th>
<th>Public Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advocate for Department of Elementary and Secondary Education (DESE) Board adoption of voluntary K–12 Standards</td>
<td>Catalogue and identify strengths of existing K–12 CS curricula and identify gaps</td>
<td>Develop and implement a series of workshops for school district, community, and business leaders to support implementation of CS in schools</td>
<td>Identify key messages that outline the importance of CS for students and the economy</td>
</tr>
<tr>
<td>Support DESE adoption of the CS Curriculum Framework</td>
<td>Identify emerging K–5 CS tools and curricula</td>
<td>Support development and expansion of the National Science Foundation (NSF)-funded CE211 and Code.org professional development (PD) hubs for teachers in grades 9–12 to teach new Exploring Computer Science (ECS) and CS Principles courses</td>
<td>Create an online tool box for districts interested in launching ECS in their schools and for general stakeholders to implement CS in their districts</td>
</tr>
<tr>
<td>Work with school districts to allow CS to count for math or science graduation course credit</td>
<td>Develop new K–5 model for CS inclusion across curricula</td>
<td>Collaborate with other leading PD providers in the state to build CS PD capacity</td>
<td>Develop and launch a “Got CS?” campaign in Massachusetts</td>
</tr>
</tbody>
</table>

1 Computing Education for the 21st Century.
<table>
<thead>
<tr>
<th>CS Standards</th>
<th>Curriculum</th>
<th>Professional Development</th>
<th>Public Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support DESE in allowing CS PD courses to count toward math or science teacher recertification</td>
<td>Promote formation of partnerships to develop curricula for a K–5 CS inclusion model</td>
<td>Support development of PD training hubs to teach <em>Introduction to Computer Science</em> modules and a range of CS tools and curricula for grades 6–8 teachers</td>
<td>Collaborate with local and national partners to increase awareness of CS, for example, by hosting or supporting CS-related events</td>
</tr>
<tr>
<td>Work with the Department of Higher Education (DHE) to develop acceptance by encouraging public universities to count CS courses as a math or science admission requirement</td>
<td>Implement new ECS and CS Principles courses for grades 9–12, and support CS College and Career Pathways</td>
<td>Support the development of PD training hubs to integrate CS concepts into K–5 curricula and offer PD on CS tools and curricula</td>
<td>Create a “speakers bureau” of business, academic, and other CS thought leaders able to deliver a pro-CS message across the state</td>
</tr>
<tr>
<td>Work with DESE to adopt CS licensure for middle and high school CS teachers</td>
<td>Create online CS Curriculum Resource Directory</td>
<td>Support and enrich existing CS Professional Learning Communities (PLCs) to support CS teachers, and explore the potential for Massive Open Online Courses (MOOCs) to provide PD</td>
<td>Educate superintendents and other administrators on the value of CS in their schools</td>
</tr>
<tr>
<td>Work with DHE and the state's teacher preparation institutions to prepare pre-service teachers to meet CS licensure requirements</td>
<td></td>
<td>Evaluate effectiveness and outcomes of CS PD programs provided through PD hubs</td>
<td>Identify speaking or advocacy opportunities for MassCAN partners</td>
</tr>
</tbody>
</table>
Introduction
Background

In January 2009, Governor Deval Patrick charged the Tech Hub Collaborative, organized by the Innovation Institute at the Massachusetts Technology Collaborative (MassTech), with the mission of creating collaboration among high-tech companies, education institutions, and the public sector to stimulate and grow Massachusetts' high-tech economy. A key challenge identified during the early stages of this work was the need to expand the pipeline of students feeding the growing computing technology workforce needs of the Massachusetts economy. In response, the Talent Working Group (TWG) was formed to convene educators, industry partners, the public sector, and students to understand the computing talent pipeline challenge and propose approaches to address it.

Over the next two-plus years, the TWG, supported by the Innovation Institute's Director Patrick Larkin and his staff, undertook a variety of efforts aimed at raising the profile of CS education and exciting and inspiring young people to pursue computing-related classes, activities, and career opportunities. During this time, among other accomplishments, TWG achieved the following:

- Contributed to the formation of the Boston chapter of the Computer Science Teachers Association (CSTA)
- Piloted a Web portal for identifying computing education resources (Computing Pathways)
- Developed white papers and presentations and conducted briefings with state policy leaders
- Convened several all-day youth workshops at Raytheon, Google, and iRobot (the Computing Connections series)
- Built connections with people in Massachusetts and at the national level who are passionate about this field

In fall 2012, Steve Vinter, Google Engineering and Site Director for Massachusetts and TWG chair, led an intense effort to synthesize the work of the TWG program teams. His efforts resulted in the presentation "STEM and Computing in Massachusetts: A Proposal to Change K–12 Mass. Computing Education," which was presented at the December 14, 2012, meeting of the Governor's STEM Advisory Council. The presentation was well-received, and Steve was asked to work with the TWG to develop an Action Plan for next steps to present to the Council in the future.
The MassCAN Initiative

Early in 2013, TWG leaders began discussing how to expand the effort and build a broad coalition willing to work on the next phase of activity. MassCAN is a partnership of organizations collaborating to inspire and educate Massachusetts students in computing and to prepare them to lead and innovate in a future economy that will be dependent on and driven by computer technology.

MassCAN established significant new capacity to create Action Plans and form multi-sector TFs to carry out the Action Plans. The plans focus on four solution elements identified in the presentation to the Governors STEM Advisory Council: Standards, Curriculum, PD, and Public Awareness. The goal of the Action Plans is to provide a systemic and comprehensive strategy for addressing the four solution elements in order to achieve a nation-leading K–12 CS program for all Massachusetts students. Specifically:

- The Standards Action Plan will charge the TF with proposing and advocating for the Mass. Board of Elementary and Secondary Education to adopt statewide voluntary K–12 CS standards that will identify high-level knowledge and skills to be taught at each grade.
- The Curriculum Action Plan will charge the TF with creating an online Guide to K–12 Computer Science Curriculum and Resources to enable teachers and school districts to draw on high-quality materials reviewed by the TF.
- The PD Action Plan will charge the TF with developing regional training hubs to create and implement training for superintendents and district leaders, teachers, guidance counselors, and parents.
- The Public Awareness Action Plan will charge the TF with developing both a statewide strategy for communications and mobilizing constituencies and an online “PA Tool Kit” of information, presentations, and research to support district-level activities to expand computing opportunities for students.

By spring 2013, Steve Vinter and Jim Stanton, an innovative STEM program director and state STEM activist, secured funding from Google, MassTech, and the Massachusetts Life Sciences Center to launch the Action Plans’ development and capacity-building efforts. Jim then moved to Education Development Center, Inc. (EDC), and, with the help of EDC Managing Project Director Joyce Malyn-Smith, assembled a team to initiate the Action Plans’ development, identified partner organizations, and met with a number of key constituencies. During this transition phase, as outreach to interested organizations and individuals gained momentum, the initiative took on the name MassCAN.

Also early in 2013, the Massachusetts Technology Leadership Council’s Education Foundation (MassTLC EF) determined that it would focus its efforts on expanding computing education in Massachusetts K–12 schools. The EF played a key role in helping form MassCAN and will continue to play a leadership role, particularly in mobilizing and engaging industry in this important effort. Heather Carey, MassTLC’s Senior Vice President, who has a strong background and experience in education, workforce development, and communications, agreed to become full-time President of the Foundation. Heather joined Steve and Jim in providing key early-stage leadership for MassCAN and shares their vision and passion for achieving MassCAN's goals.
Today, MassCAN is a partnership of organizations collaborating to inspire and educate Massachusetts students in the field of CS and to prepare them to lead and innovate in a future economy that will be dependent on and driven by computer technology.

**Purpose of the Four Action Plans**

Overall, the effort to develop and implement the four Action Plans is driven by a passion to ensure that Massachusetts plays a nation-leading role in providing all of its students with the opportunity to be inspired and prepared for many of the most extraordinary careers of the 21st century through broad and deep exposure to CS. Collectively, these four Action Plans represent a comprehensive, systemic approach to taking the actions necessary

---

**Creating Computer Science Pathways for College and Career**

**Statewide Standards, Curriculum, Professional Development, and Public Awareness**

**Grades**

**K–5**
- **Early Exposure**
  - Concepts Infused Into All Disciplines
  - **Tools and Curricula**:
    - Tynker
    - Scratch
    - Blockly

**6–8**
- **Exploration**
  - Introductory Courses/Modules
  - **Tools and Curricula**:
    - Scratch
    - Bootstrap
    - LEGO
    - Blockly
    - Kodu
    - Alice

**9–10**
- **Engagement and Skills Development**
  - **Tools and Curricula**:
    - Bootstrap
    - AgentSheets
    - Scratch

**11–12**
- **Sample Pathway Courses**
  - Programming/CS APA, e.g.:
    - C++
    - Python
  - Multimedia/Web Design, e.g.:
    - Graphic Design
    - Game Development
  - Certifications, e.g.:
    - Cisco
    - Microsoft
  - Life Sciences, e.g.:
    - Big Data
    - Bioinformatics

---

**Public Awareness**

**School District Community, Education, Business Leader Engagement**
for long-term implementation of exciting and engaging CS courses in schools throughout Massachusetts. Each plan is intended to be a guide that allows for each TF to review and modify remaining tasks as the members encounter new data and circumstances difficult to anticipate at the outset of their work.

**EDC’s Role: Supporting the TFs**

In order to make TF members’ commitment of time and effort as rewarding, productive, and satisfying as possible, EDC staff will provide an array of support to each TF. This support will broadly fall into two categories:

1. **Logistical support** will involve working closely with the co-chairs of each TF to organize agendas, assemble and distribute meeting materials, and record and distribute timely meeting minutes. Additionally, because we want to make it as convenient as possible for TF members from around the state to participate, EDC will host all meetings at its Waltham facility, where conference services are available to allow members to participate through video and voice connections.

2. **Professional support** will involve gathering and distilling research, preparing and developing materials, scanning the environment for new developments related to the work of each TF, arranging for meetings with key state and constituency group leaders, arranging for guest experts to speak at TF meetings, arranging for TF members to attend and present at regional and national meetings, gathering new information, building networks of supporters, and preparing monthly updates to circulate to MassCAN’s expanding group of partners and supporters.

Additionally, due to the widely respected work and substantial expertise and experience of MassCAN partners and TF members, EDC’s professional support will also focus on creating and supporting opportunities for partners to collaborate on proposals for funding to address critical standards, curriculum, PD, or public awareness gaps identified by the TFs.

**TF Logistics**

In order to carry out the Action Plans, MassCAN will recruit approximately 20 talented, experienced, and passionate volunteers from the higher education, K–12 education, business, and nonprofit sectors to serve on each of the four TFs. Each TF will have co-chairs who will lead meetings and guide the overall work of the members. Meeting schedules will be determined by the TFs, and each member will be asked to make a minimum one-year commitment. The co-chairs will work with EDC staff to ensure optimal support to maximize the very valuable volunteer contributions of TF members. All meetings will provide for face-to-face and online participation.
Important Definitions

**Computer Science** should be interpreted as referring to the scientific discipline of Computer Science, covering principles such as algorithms, data structures, programming, computational thinking, systems architecture, design, problem solving etc.

**Information Technology** should be understood to mean the assembly, deployment, and configuration of digital systems to meet user needs for particular purposes.

**Digital literacy** should be understood to mean the basic skill or ability to use a computer confidently, safely and effectively, including: the ability to use office software such as word processors, email and presentation software, the ability to create and edit images, audio and video, and the ability to use a web browser and internet search engines.

—*Shut down or restart? The way forward for computing in the U.K. schools*
  The Royal Society, January 2012 (p. 17)
Purpose of the MassCAN Standards TF

The Standards TF is charged with collaborating with the Massachusetts DESE and DHE to ensure that the necessary elements of an educational infrastructure (standards, Curriculum Framework, licensure, and in-service teacher training programs) are in place to support Massachusetts students as they develop essential CS skills.

The Standards TF activities will provide the infrastructure to support a range of educational options and pathways in CS for students. The TF will advocate that the DESE Board adopt voluntary statewide K–12 CS standards in 2014. Additionally, it will work with DHE to ensure that by 2015 AP CS courses count toward either math or science college admission requirements. (MassCAN will work with local school districts to include CS as a core course option to meet either math or science high school graduation requirements.)

To support these voluntary content standards, the TF will develop an assessment strategy that does not rely on required statewide assessments such as the Massachusetts Comprehensive Assessment System (MCAS). To ensure that high-quality CS education is delivered consistently across the state, the TF will work with DESE to create a CS licensing option/endorsement for middle and high school teachers who choose to teach CS courses. With few dedicated CS teachers currently in the state, we anticipate that many teachers who choose to teach CS courses will be specialists in other areas, such as math or science. To assist these teachers in developing their CS capacities, the TF will enlist EDC to identify and/or develop skill standards describing what successful CS educators know and are able to do, and share these with the PD and Curriculum TFs.

As standards drive assessment, curriculum, and PD, the Standards TF will work closely and collaboratively with the Curriculum and PD TFs and the MassCAN Leadership Team, engaging in an ongoing exchange of information to develop synergies that improve quality, reduce redundancy, and streamline work.
**Tasks, Activities, and Outcomes**

**TASK 1: Implement a strategy that results in the Mass. Board of Elementary and Secondary Education adopting voluntary statewide K–12 CS standards in 2014.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **1.1:** Review the Mass. DESE standards adoption process. | 1. Invite key leadership from the Mass. DESE to describe the state’s standards development process and advise the TF on collaborating with DESE during this process.  
2. Adapt the steps below as necessary based on guidance provided by DESE staff. |
| **1.2:** Identify the CS standards to be adopted. | 1. Research and provide a review of CSTA K–12 CS standards and other national and state CS standards; compare and contrast various CS standards and discuss other nationally relevant activities bearing on standards development.  
2. Work with TF co-chairs to explore opportunities for including Regional Technical High Schools in state CS standards.  
3. Collaborate with the TF co-chairs to structure a process for TF members to review CSTA K–12 and other CS standards, and adapt, refine, or draft CS standards for grades K–2, 3–5, 6–8, and 9–12 that incorporate what Massachusetts students need to know and be able to do to ignite an interest in CS and develop core competencies that enable them to pursue a CS pathway, CS majors, and CS-enabled careers.  
4. Document the TF’s process and any decisions made. |
| **1.3:** Identify a preferred educational model that will support the benefits of the CS standards recommended by the TF and will facilitate statewide implementation. | 1. Brief the TF on state and local CS education implementation models (e.g., Texas; Georgia; Washington (state); Marlboro, Mass.; Las Cruces, N.M.) and approaches to CS education currently used in Massachusetts.  
2. Brief the TF on strengths and weaknesses of state and local CS implementation model options and their potential impact on other aspects of MassCAN’s work (e.g., curriculum, PD, assessment, graduation requirements, and post-secondary admission requirements).  
3. Document any decisions made to identify the TF’s preferred educational model. |

---

2 For example, a high school model would propose *Exploring Computer Science* in grades 9 or 10, followed by *CS Principles*, followed by electives or the CS AP A course.
### SUB-TASK

**1.4: Implement a strategy to effectively engage key constituencies to support adoption of statewide CS standards by the DESE Board.**

<table>
<thead>
<tr>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Work with the co-chairs and TF members to identify key constituencies and to support outreach roles for TF members with these key constituencies</td>
</tr>
<tr>
<td>2. Work with the co-chairs and MassCAN’s Executive Director to do the following:</td>
</tr>
<tr>
<td>a. Coordinate efforts with key DESE leaders</td>
</tr>
<tr>
<td>b. Prepare briefing and standards documents</td>
</tr>
<tr>
<td>c. Identify and gather input from key Mass. districts and schools, higher education institutions, and business associations and leaders</td>
</tr>
<tr>
<td>d. Assist in preparing testimony for TF co-chairs and other leaders to speak at the Board of Elementary and Secondary Education meeting where CS standards are proposed</td>
</tr>
<tr>
<td>e. Enlist support of key constituent groups (e.g., Mass. Association of School Superintendents) for proposed CS standards during the open comment period</td>
</tr>
<tr>
<td>f. After the comment period, work with DESE to review comments and remarks and finalize the standards</td>
</tr>
<tr>
<td>3. Document the process.</td>
</tr>
</tbody>
</table>

### OUTCOME

By June 2014, MassCAN-recommended statewide voluntary CS standards will be presented to and approved by the Mass Board of Elementary and Secondary Education.

---

3 Key constituencies are those who will have an interest in influencing the state’s decision to adopt (or not adopt) CS standards (e.g., teachers, superintendents, state policy-makers).
**TASK 2:** Collaborate with DESE in the development and adoption of the K–12 CS Curriculum Framework and development of an assessment strategy that relies on recommended statewide assessments.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **2.1:** Collaborate with key DESE leadership to develop an expedited process for developing and vetting a K–12 CS Curriculum Framework with essential input from key constituencies. | 1. Research and review with the TF the DESE process for development and vetting frameworks (structure, process, requirements).  
2. Work with the co-chairs to identify and engage key DESE leadership in partnering with them on development of the CS Curriculum Framework.  
3. Assist the TF co-chairs in developing strategies that best engage TF members to productively participate in meetings.  
4. Support co-chairs of the Standards and Curriculum TFs as they work with DESE and Massachusetts stakeholders to develop a Curriculum Framework for K–12 CS (e.g., prepare an action plan, identify participants, schedule and conduct meetings, provide input, document decisions, and prepare documents). |
| **2.2:** Collaborate with key DESE staff to recommend a state CS assessment strategy that (1) uses national assessments for some high school courses (e.g., AP CS A, CS Principles, and ECS) and (2) explores whether the state should adopt or develop voluntary assessments for individual CS courses taught at the elementary, middle, and high school levels. | 1. Research and share information on the current status of national, state, and vendor assessments of K–12 CS courses.  
2. Assist the TF in identifying the degree to which existing assessments address MassCAN-recommended CS standards.  
3. Prepare briefings and documents to assist co-chairs in guiding two key TF decisions:  
   a. If existing current assessments are worth adopting for voluntary use  
   b. If new voluntary assessments are needed and, if so, what should be assessed, how, and when |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **2.3:** If necessary, collaborate with DESE to address funding issues related to the need for new assessments. | 1. Research and review with the TF the DESE process for developing and funding state assessments.  
2. If necessary, identify the time frame and costs associated with developing assessments for CS standards where needed, as well as various recommended approaches to developing assessments (e.g., engaging a company to develop the assessments).  
3. If necessary, conduct research and brief co-chairs on funding opportunities to support the development of CS assessments. |
| **2.4:** Identify key constituencies and engage constituents and other advocates in supporting the development of assessments of voluntary CS standards. | 1. Develop talking points and materials to advocate for assessments of CS standards.  
2. Collaborate with the Public Awareness TF and MassCAN partners to advance the Standards TF Curriculum Framework and assessment activities (e.g., write Op-Ed pieces, participate in interviews, work with Code.org on petitions).  
3. Document the process. |

**OUTCOME**
By December 2014, the Massachusetts DESE will adopt a Curriculum Framework for K–12 CS and an assessment strategy that does not rely on required statewide assessments.
**TASK 3: Collaborate with DESE to allow CS PD courses to qualify as content courses for math or science recertification.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **T3.1: Share CS PD course content with DESE leaders to establish the legitimacy of courses counting for math and science credits for teacher recertification.** | 1. Prepare the TF for research on standards for PD courses to count for credit toward recertification.  
2. Develop a rationale for the content and rigor of CS PD courses to meet the same standard as existing math or science courses that count for credit toward recertification.  
3. Meet with key DESE staff to encourage them to support a policy of CS PD courses counting for credit toward recertification. |

**OUTCOME**

By September 2014, the DESE will allow approved CS PD courses to count toward math or science recertification.
**TASK 4:** Develop a rationale and implement a strategy for MassCAN to share with school districts and DESE leadership regarding the importance of allowing CS courses to qualify for high school graduation credit as math or science courses.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **T4.1:** Create a rationale to share with school districts as MassCAN develops partnerships to implement CS courses. | 1. Review with the TF the research by CSTA and others regarding the relationship of student choice to take CS courses and the courses counting for math or science graduation credit.  
2. Develop a draft rationale statement.  
3. Share the approved rationale statement with the MassCAN Executive Director to use in working with school districts.  
4. Document the process. |
| **T4.2:** In collaboration with the Public Awareness TF, implement a campaign to encourage school districts to award graduation credit for CS courses. | 1. Develop with the TF materials to share with teachers, parents, and school leaders on the benefits of awarding graduation credit to CS courses.  
2. Develop an outreach strategy to engage school district leaders and key constituencies in discussions on adopting this policy. |

**OUTCOMES**
- By June 2015, 40 school districts will grant math or science graduation credit for CS courses.  
- By June 2017, 150 school districts will grant math or science graduation credit for CS courses.
**TASK 5:** Ensure that the Board of Higher Education adopts a policy that all state colleges and universities accept at least one high school CS course as one of the courses necessary to meet their mathematics or science admission requirements.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **5.1:** Collaborate with DHE leadership and the public higher education community to develop a strategy for allowing designated high school CS courses to count as one of the courses that meet mathematics or science state college or university admission requirements. | 1. Engage TF co-chairs and members in continuing discussions with DHE leadership to do the following:  
   a. Define the process the TF will need to follow to make a policy recommendation on this topic to the Board of Higher Education.  
   b. Review with the TF the criteria universities use to determine which courses count to meet admissions requirements.  
   c. Identify a sampling of math courses that meet math or science admission requirements.  
   d. Identify the research and prepare the testimony necessary for the TF to present the policy recommendation to the Board of Higher Education.  
  
2. Initiate discussions with University of Massachusetts (UMASS) leadership to ensure that designated high school CS courses qualify as one of the math or science courses that count toward UMASS admission. |

| **5.2:** Implement the strategy through engagement with DHE leadership and the higher education community. | 1. Work with the co-chairs and TF members to identify and recruit university-level CS champions, business champions, and school district and high school leaders to advocate for high school CS courses to meet higher education admission requirements.  
  
2. Work with the co-chairs and the TF to implement the strategy (organize meetings and events, provide support and follow-up for meetings and events, draft materials to guide those providing testimony to the Board of Higher Education). |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| 5.3: Present policy recommendation to the Board of Higher Education. | 1. Support the co-chairs and TF members in preparing for and making the policy recommendation at the Board of Higher Education meeting.  
2. Prepare briefing materials and documents for the Board of Higher Education.  
3. Work with the co-chairs to draft testimony as needed.  
4. Work with the co-chairs, TF, and Public Awareness TF to ensure that there is a strong presence of supporters at the Board of Higher Education meeting.  
5. Prepare follow-up materials as necessary.  
6. Develop and disseminate correspondence as needed.  
7. Document the process. |

**OUTCOME**  
By December 2014, the Massachusetts Board of Higher Education will adopt a policy that allows designated high school CS courses to meet mathematics and/or lab-science admissions requirements to state universities.
**TASK 6: Ensure that DESE creates a CS licensure requirement (e.g., endorsement) identifying the teaching standards for middle and high school teachers choosing to teach CS courses, and ensure that the DHE supports the development and implementation of courses needed for CS licensure for middle and high school pre-service teachers at all teacher preparation colleges.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **6.1:** In collaboration with DESE leadership, decide on CS licensure requirements\(^4\) for middle and high school teachers to propose for adoption by the DESE Board. | 1. Work with the CSTA working group members on the CS licensure committee (who are also members of the Standards TF) to brief the TF on the committee’s work to date.  
2. Invite the DESE Director of Licensure to provide an overview of the process for state adoption of new licensure requirements.  
3. Research current requirements for Massachusetts teacher certification and/or licensure in various content areas (e.g., math, science, language arts).  
4. Collaborate with the CSTA licensure group and interested Curriculum TF members to share research and discuss recommendations.  
5. Arrange for discussions about licensure between the TF and the Mass. Teachers Association, the Mass. Federation of Teachers, and the Association of Teachers of Mathematics in Massachusetts.  
6. Assist co-chairs in leading licensure discussions with TF members and developing licensure requirement recommendations.  
7. Document the TF's decisions about the development and implementation of a CS licensure requirement. |

---

\(^4\) The endorsement that CSTA and MassCAN are exploring is a four- to five-course Certificate program.
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **6.2:** Engage with necessary individuals, constituencies, and organizations to address concerns and build support for CS licensure requirements. | 1. Identify the process and timeline (e.g., three to five years) for currently employed middle and high school teachers who have chosen or may choose to teach a CS course to meet new licensure requirements.  
2. In consultation with the Curriculum and Public Awareness TFs, develop and review with the TF suggested talking points to engage MassCAN partners as champions of this effort.  
3. Organize and assist the co-chairs and TF in preparing for meetings, and provide follow-up to meetings with individual constituencies and organizations, as needed.  
4. Develop and disseminate correspondence as needed. |
| **6.3.1:** Obtain policy support from DHE for state universities to provide CS coursework for pre-service teachers to meet middle and/or high school licensure requirements for new educators, and for currently employed educators to be provided with a three- to five-year window to upgrade their certifications. | 1. Assist the TF in working with DHE leadership to gain both policy and programmatic support for this initiative from the public higher education teacher preparation programs and to gain support for MassCAN's ongoing role in this work.  
2. Assist the TF in working with DHE leadership to organize initial meetings with the leadership of the public higher education teacher preparation programs.  
3. Share the results of this DHE MassCAN policy and program collaboration with DESE leadership.  
4. Organize and assist the TF co-chairs in setting up a committee to work with DHE leadership and public university leaders to see licensure preparation programs through to a successful conclusion.  
5. Document this process. |
<p>| <strong>6.3.2:</strong> Obtain DHE support for MassCAN to collaborate with public higher education teacher preparation programs in developing CS licensure- and endorsement-related programs. | 1. |</p>
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **6.4:** Present the licensure recommendation for a CS endorsement to the DESE Board. | 1. Support the co-chairs and TF members in preparing for and making the licensure policy recommendation at a DESE Board meeting.  
2. Prepare briefing materials and documents for the DESE Board.  
3. Work with the co-chairs to draft testimony as needed.  
4. Work with the co-chairs, TF, and Public Awareness TF to ensure that there is a strong presence of supporters at the Board of Higher Education meeting.  
5. Prepare follow-up materials as necessary.  
6. Develop and disseminate correspondence as needed.  
7. Document the process. |
| **6.5:** Collaborate with the DHE to develop a process to “grandfather in” those teachers who have already taken up-to-date CS teacher preparation courses and/or have significant experience teaching CS. | 1. Research the practices recommended by national groups, such as CSTA, and the practices developed by other states, and brief the TF on results.  
2. Support the TF members working with DHE on this process.  
3. Support the co-chairs in holding discussions with the Mass. Teachers Association, the Mass. Federation of Teachers, and the Association of Teachers of Mathematics in Massachusetts to support "grandfather" criteria. |

**OUTCOME**  
By December 2015, the Massachusetts DESE will adopt new CS licensure requirements for middle and high school teachers choosing to teach CS.
**TASK 7: Support the state DHE in overseeing the timely implementation of CS licensure-related courses for in-service teachers.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **7.1:** Work with DHE to ensure that all public teacher preparation universities prepare pre-service teachers to meet licensure requirements within three years of licensure standards being adopted. | 1. Research and/or develop and validate a profile describing what successful CS teachers know and are able to do.  
2. Collaborate with DHE to work with the state's public and private teacher preparation universities to make them aware of the CS licensure requirements for middle and high school teachers choosing to teach CS courses.  
3. Develop a database of primary contacts at the state's public and private teacher preparation universities.  
4. Prepare a briefing package on new licensure requirements and talking points for co-chair review.  
5. Work with co-chairs to organize and prepare for meetings with the state's teacher preparation universities.  
6. Develop a work plan to engage with the state's teacher preparation universities in the actual development of the courses needed for pre-service teachers to meet licensure requirements. |

**OUTCOME**

By fall 2017, CS courses needed to fulfill new CS licensure requirements will be provided by all public teacher preparation universities to all pre-service teachers choosing to teach CS in Massachusetts.
### Standards TF Timeline Q1 2014–Q2 2016

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task 1:</strong> Implement a strategy that results in the Massachusetts DESE Board adopting voluntary statewide K–12 CS standards in 2014.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 2:</strong> Collaborate with DESE in the development and adoption of the K–12 CS Curriculum Framework and development of an assessment strategy that relies on recommended statewide assessments.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 3:</strong> Collaborate with DESE to allow CS PD courses to qualify as content courses for math or science recertification.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 4:</strong> Develop a rationale and implement a strategy for MassCAN to share with school districts and DESE leadership regarding the importance of allowing CS courses to qualify for high school graduation credit as math or science courses.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 5:</strong> Ensure that the Board of Higher Education adopts a policy that all state colleges and universities accept at least one high school CS course as one of the courses necessary to meet their mathematics or science admission requirements.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 6:</strong> Ensure that DESE creates a CS licensure requirement (e.g., endorsement) identifying the teaching standards for middle and high school teachers choosing to teach CS courses, and ensure that the DHE supports the development and implementation of courses needed for CS licensure for middle and high school pre-service teachers at all teacher preparation colleges.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 7:</strong> Support the state DHE in overseeing the timely implementation of CS licensure-related courses for in-service teachers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*MassCAN - www.masscan.net - ©2013 by Education Development Center, Inc. All rights reserved.*
Purpose of the MassCAN Curriculum TF

The Curriculum TF will collaborate with the Massachusetts DESE and DHE to make available to all Massachusetts school districts and teachers an online Guide to K–12 Computer Science Curriculum and Resources that align with the state CS standards and Curriculum Framework by the start of the 2015–2016 school year. The Guide will provide information regarding available and emerging K–12 CS curriculum offerings that teachers and districts can use to build two types of CS programs: (1) courses, tools, and resources at the elementary and middle school levels that support all students in developing the basic CS knowledge necessary to effectively function in an increasingly technological world, and (2) courses and pathways at the high school level that support students wishing to explore a variety of CS-related fields and/or courses preparing them to be CS majors at two- and four-year post-secondary levels. The curriculum materials and resources reviewed will include the following:

- **For elementary school**: Materials that reflect an inclusion approach to integrating key CS concepts into existing math and science curricula, and age-appropriate CS tools
- **For middle school**: Introductory CS courses or units and age-appropriate CS tools for students that encourage authentic, project-based learning experiences
- **For high school**: CS courses that provide students with a broad introduction to CS, including, but not limited to, the new ECS and CS Principles courses and the AP CS A course, and an array of courses offering students multiple pathways to CS majors and careers (for example, programming and applications, as well as certifications being offered by CISCO, CompTIA, Oracle, Adobem, and others)

Due to the complexity of issues within each grade band, the Curriculum TF will be divided into sub-groups to address each grade band and its related issues separately. EDC staff will work closely with the sub-groups to reduce redundancies and ensure synergy and alignment of activities across the sub-groups. EDC staff will also ensure that overarching issues (e.g., integration with Career and Technical Education) remain integrated into the work of the Curriculum TF as a whole. Additionally, EDC staff will monitor the work of the Standards, PD, and Public Awareness TFs to ensure alignment and prevention of conflicts and redundancy.

In order to ensure that all Massachusetts students have equal opportunities for engagement with CS curriculum and tools, MassCAN will recruit TF members that include administrators and teachers from public schools, charter schools, Catholic schools, independent schools, and Jewish day schools.
Tasks, Activities, and Outcomes

**TASK 1**: Review the Mass. CS standards and Curriculum Framework, conduct research to gather and catalogue existing and emerging CS curricula and tools that have been developed for grades K–12, and identify gaps where curricula are weak or do not exist.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **1.1**: Review the Mass. DESE CS standards and Curriculum Framework and MassCAN's preferred educational model and assessment strategy. | 1. Orient TF members to the overall goals and purpose of the TF, the types of activities they will be engaged in over time, and their related roles and responsibilities.  
2. Collaborate with the TF co-chairs to structure a process for TF members to review the work of the Standards TF and the DESE as it relates to the development of the *Guide to K–12 Computer Science Curriculum and Resources*.  
3. Provide a summary of key standards-related documents, including:  
   a. Draft Mass. K–5, 6–8, and 9–12 CS standards  
   b. Mass. K–12 CS Curriculum Framework (as it is developed)  
   c. MassCAN's preferred educational model for Mass. CS curriculum  
   d. MassCAN's CS assessment strategy (to not require state assessments, to use national assessments where available, and to encourage the use of state-recommended assessments aimed at gauging student mastery of standards)  
4. Document the process and outcomes of review, particularly implications for curriculum identification and development. |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **1.2: Review relevant research and reports on broad CS curriculum and tools and review and/or approve a brief annotated research bibliography to be developed by EDC.** | 1. Identify relevant research and reports for TF members to read to inform the development of the annotated research bibliography, for example:  
   a. CSTA/ACM Model K–12 CS Curriculum report  
   b. Research about what is developmentally appropriate for the three grade-span groups  
   c. Research on teacher preparation and background knowledge in CS  
   d. Research on strategies for engaging female and underrepresented students in CS (e.g., *Stuck in the Shallow End*)  
   e. Research on different pedagogical approaches and what it takes to engage all students (e.g., mobilizingcs.org)  
   f. Research on age-appropriate tools for use in K–12, such as, but not limited to, Scratch, Alice, Lego, Stencyl, and Kodu  
2. Create a brief annotated research bibliography of best materials reviewed.  
3. Document any decisions made and the process. |
| **1.3: Identify gaps in CS curricula where a particular grade or grade span is not well served by existing curricula.** | 1. Support the TF in identifying grade-level gaps in CS curriculum.  
2. Collaborate with MassCAN to develop a strategy to raise and award seed funding to two or more multi-partner teams to develop proposals for full funding of efforts to develop needed curricula.  
3. Document any decisions made and the process. |

**OUTCOMES**
- By September 2014, create a CS annotated research bibliography summarizing findings that will guide development of the *Guide to K–12 Computer Science Curriculum and Resources*.
- By June 2015, implement a strategy to provide seed funding to develop proposals for CS curricula needed to fill identified grade gaps.
**TASK 2: Create the K–5 section of the Guide to K–12 Computer Science Curriculum and Resources.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **2.1:** Review and agree on key CS concepts and tools for grades K–5, develop a rubric and matrix for evaluating tools, and create the K–5 section of the *Guide to K–12 Computer Science Curriculum and Resources.* | 1. Summarize the work of the Standards TF and DESE on the development and adoption of the Mass. K–5 CS Curriculum Framework.  
2. Identify the following materials for TF members to review and discuss:  
   a. Research on key CS concepts to be addressed in elementary school grades that align with the Mass. CS standards and Curriculum Framework  
   b. Current or prior NSF-funded grants focusing on inclusion of CS in existing K–8 curricula  
   c. Existing Mass. K–5 math and science and/or interdisciplinary topics or curricular units that may be appropriate for infusion of CS concepts  
   d. Existing online tools that are age-appropriate for introducing and familiarizing K–5 students with key CS concepts  
   e. Existing K–5 curricula from other states that have adopted CS standards  
3. Support the TF in creating a rubric for identifying strengths and weaknesses of existing and emerging CS tools for use in grades K–5.  
4. Support the TF in developing a matrix of CS tools and their ratings in each rubric category.  
5. Support the TF in creating the K–5 section of the Guide, including suggested concepts, tools, and strategies for the infusion of CS concepts into K–5 curriculum.  
6. Document the process and any decisions made. |

**OUTCOME**

By December 2014, complete the K–5 section of the *Guide to K–12 Computer Science Curriculum and Resources.*
**TASK 3:** If needed, create a strategy for the development and refinement of a CS concept inclusion model for grades K–5.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **3.1:** Create a partnership strategy to develop a CS concept inclusion model for grades K–5 mathematics and science curriculum. | 1. Support the TF in identifying partners with the skills necessary to support the following:  
   a. Identification of key introductory CS concepts for grades K–5  
   b. Mapping of CS concepts identified to complementary K–5 mathematics and science curricular units or topics  
   c. Identification of standards-based CS assessments or assessment elements that can be integrated into existing K–5 math and science assessments  
   d. Development and refinement of a K–5 CS concept inclusion model  
   e. Development of support materials (e.g., teacher handouts and supplementary information)  
2. Collaborate with MassCAN to develop a strategy for raising and awarding seed funding to two or more multi-partner teams to develop proposals for full funding to create a K–5 inclusion model.  
3. Arrange for review of the model with a sample of K–5 teachers already incorporating CS concepts into their teaching (or who have expressed strong interest in doing so). Ensure that teachers have opportunities to share their views on the model and its practical implications with TF members.  
4. Assist TF members in providing advice to funded partners.  
5. Arrange for the TF to review the K–5 CS concept inclusion model materials.  
6. Document the process and any decisions made. |

**OUTCOME**

By June 2015, complete the K–5 CS concept inclusion model.
## TASK 4: Create the 6–8 section of the *Guide to K–12 Computer Science Curriculum and Resources.*

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **4.1:** Review and discuss CS courses, key concepts, and tools for grades 6–8 and develop a rubric and matrix for evaluating tools and courses. | 1. Summarize the work of the Standards TF and DESE regarding the development and adoption of the Mass. CS Curriculum Framework for grades 6–8.  
2. Identify materials for the TF members to review and discuss:  
   a. Research on and examples of key CS concepts to be addressed in middle grades (e.g., mobilizingcs.org, cs4hs.com, bootstrapworld.com)  
   b. Common Core Standards, proposed Next Generation Science Standards (NGSS) for grades 6–8, and National CSTA K–12 CS standards  
   c. Curricula developed by other states with CS standards (e.g., Texas, N. M.)  
   d. Curricula developed by the Advanced Math and Science Academy Charter School (AMSA) in Marlborough, Mass.  
   e. A sample of *Introduction to Computers* courses independently developed and currently taught at some 30+ middle schools in Mass.  
3. Review AMSA’s *Introduction to Computer Science* course for grades 6–8, which has been identified as a national exemplar for curriculum aligned to national CSTA Level 2 standards, and determine if the course meets the Mass. standards and Curriculum Framework and should be considered for further development or refinement and recommended for use statewide. If so, recommend that MassCAN raise sufficient funds to support the further development and refinement of the AMSA curriculum as a modular grades 6–8 *Introduction to Computer Science* course, with appropriate assessment mapped to the Mass. standards.  
4. Support the TF in creating a rubric for identifying strengths and weaknesses of existing and emerging CS tools, identified in T1.2f above, which might be successfully used by teachers to engage students in meaningful experiences with CS concepts and hands-on learning in grades 6–8.  
5. Provide opportunities for grades 6–8 teachers using these tools to share their classroom experiences with the TF.  
6. Support the TF in developing a matrix of CS tools and ratings in each rubric category.  
7. Create the 6–8 section of the *Guide to K–12 Computer Science Curriculum and Resources* with room to include the introductory CS course under development.  
8. Document any decisions made and the process. |

### OUTCOME

By December 2015, complete the 6–8 section of the *Guide to K–12 Computer Science Curriculum and Resources.*
TASK 5: If the TF chooses this option, fully develop and refine the *Introduction to Computer Science* curriculum materials for grades 6–8, including a standards-based assessment.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **5.1:** Develop a partnership model to secure additional funding and to expedite development of an introductory CS curriculum, course materials, and assessment for grades 6–8. | If the TF determines that the best option is to fully develop AMSA curriculum:  
1. Help identify partners that can play key roles in doing the following:  
   a. Refining the grades 6–8 *Introduction to Computer Science* curriculum into a downloadable online format  
   b. Developing teacher and student materials  
   c. Developing standards-based assessments for each module and/or curriculum unit for grades 6–8  
   d. Working with partners to identify funding to support the above tasks  
2. Arrange for the TF to review and consider endorsement of the grades 6–8 *Introduction to Computer Science* curriculum modules and materials.  
3. Arrange for trial implementation by interested teachers and school districts.  
4. Document any decisions made and the process. |

**OUTCOMES**  
- By December 2015, complete development and refinement of the online *Introduction to Computer Science* curriculum for grades 6–8.  
- By June 2016, complete development of the introductory CS curriculum assessment for grades 6–8.
### TASK 6: Create the 9–12 section of the *Guide to K–12 Computer Science Curriculum and Resources.*

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **6.1:** Review existing courses and curricula for grades 9–12, develop a rubric and matrix for evaluating tools and courses, and create the 9–12 section of the *Guide to K–12 Computer Science Curriculum and Resources.* | 1. Summarize the work of the Standards TF and DESE regarding the development and adoption of the Mass. CS Curriculum Framework for grades 9–12.  
2. Support the TF in reviewing and discussing research and national assessments on recommended core courses for grades 9–12, such as, but not limited to, ECS, *CS Principles*, and AP CS A.  
3. Support the TF in reviewing research and national assessments on related, alternate models for CS instruction and skill development, such as, but not limited to, the Khan Academy Computer Science program and Bootstrap curriculum.  
4. Support the TF in reviewing research on alternate CS pathways, curricula, and courses available in other states or nationally as a basis for defining and supporting pathways in Mass., for example:  
   a. The Science pathway might include bioinformatics and applications of Big Data.  
   b. The Programming pathway might include C++, Java, and Python.  
   c. The CS Engineering/Modeling pathway might include CAD, Robotics, Mobile App Design, and Web Design.  
   d. The Certification pathway might include database certification, networking/Cisco Network Associate, and Adobe Digital Graphic Designer.  
5. Support the TF in reviewing and developing the following:  
   a. Available assessments for any courses included in the above pathways  
   b. A more unified approach to providing CS courses and pathways for comprehensive schools and Regional Technical Schools  
6. Support the TF in creating a rubric for identifying the strengths and weaknesses of existing pathway courses.  
7. Support the TF in developing a matrix of CS pathway courses and ratings in each rubric category.  
8. Support the TF in creating the 9–12 section of the *Guide to K–12 Computer Science Curriculum and Resources* and support the TF in unifying the complete K–12 Guide.  
9. Document the process and any decisions made. |

### OUTCOME
By June 2015, the TF will complete the 9–12 section of *Guide to K–12 Computer Science Curriculum Resources*, including core and pathway CS courses.
**TASK 7: Coordinate with the Standards, PD, and Public Awareness TFs.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **7.1:** Share work in progress, review relevant work of the other TFs, and attend joint TF meetings with state officials and other key constituencies as necessary. | 1. Identify areas of potential overlap with the Standards TF, bring those areas to the attention of the co-chairs, and coordinate those areas with EDC staff working on the Standards TF.  
2. Identify areas of potential overlap with the PD TF, bring those areas to the attention of the co-chairs, and coordinate those areas with EDC staff working on the PD TF.  
3. Identify areas of potential overlap with the Public Awareness TF, bring those areas to the attention of the co-chairs, and coordinate those areas with EDC staff working on the Public Awareness TF. |

**OUTCOME**

Close coordination with the other TFs will ensure maximum collaboration and effective development and implementation of the *Guide to K–12 Computer Science Curriculum and Resources.*
Curriculum TF Timeline Q1 2014–Q2 2016

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task 1:</strong> Review the Mass. CS standards and Curriculum Framework, conduct research to gather and catalogue existing and emerging CS curricula and tools that have been developed for grades K–12, and identify gaps where curricula are weak or do not exist.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 2:</strong> Create the K–5 section of the <em>Guide to K–12 Computer Science Curriculum and Resources.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 3:</strong> If needed, create a strategy for the development and refinement of the CS concept inclusion model for grades K–5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 4:</strong> Create the 6–8 section of the <em>Guide to K–12 Computer Science Curriculum and Resources.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 5:</strong> If the TF chooses this option, fully develop and refine the <em>Introduction to Computer Science</em> curriculum materials for grades 6–8, including a standards-based assessment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 6:</strong> Create the 9–12 section of the <em>Guide to K–12 Computer Science Curriculum and Resources.</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 7:</strong> Coordinate with the Standards, PD, and Public Awareness TFs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Purpose of the MassCAN PD TF

The PD TF is charged with researching, developing, and providing Massachusetts teachers and school districts with access to a range of state-of-the-art PD opportunities for teaching CS in grades K–12. In order to effectively support the significant changes required to introduce and expand CS courses in school environments, PD will focus on two audiences:

- School districts and communities—building interest in and support for this innovation at all levels of communities throughout the state, including school district, business, civic, and nonprofit leaders; families; and students.

- Teachers—building the capacity of educators to promote, inspire, and teach CS. For K–12 teachers, PD will focus on three areas: content, the underlying principles and main concepts of CS, and pedagogy (the approach to teaching and learning).

Additionally, PD will be provided for teachers in the three grade bands for which MassCAN is promoting different curriculum strategies (K–5, 6–8, and 9–12). All PD will engage stakeholders in considering issues of equity, specifically the importance of attracting and retaining women and underrepresented minorities. The PD will also stress the importance of making real-world connections to CS through the engagement of industry via a variety of means, including internships and externships, classroom visits by businesspeople, and site visits by students and teachers.

Due to the complexity of issues within each grade band, the PD TF will be divided into sub-groups to address each grade bands and its related issues separately. EDC staff, serving in a support capacity to MassCAN, will work with each sub-group to reduce redundancies and ensure synergy and alignment of activities across the sub-groups. EDC staff will also ensure that overarching issues (e.g., equity) remain integrated into the work of the PD TF as a whole. Additionally, EDC staff will monitor the work of the Standards, Curriculum, and Public Awareness TFs to ensure alignment and to minimize conflicts and redundancy.

MassCAN’s PD offerings will align with the CS standards and Curriculum Framework that MassCAN’s Standards TF will be working to have the Massachusetts DESE Board adopt, and will incorporate the K–12 curriculum pathways and materials advocated by the MassCAN Curriculum TF. Initial PD offerings will be offered during summer 2014 and will continue to be developed in conjunction with the curriculum guide from the MassCAN Curriculum TF, to be completed during the 2014–2015 school year.
Building on Current Work

Nationally, the most promising efforts to expand opportunities for students to take CS courses focus largely on the high school grades. This is not surprising, given the steady convergence of several factors: NSF and College Board funding for CS course development, growing interest among high school teachers in offering CS courses, and the steady flow of information about the increasing availability of highly interesting and well-paying CS jobs.

In Massachusetts, many of these same factors are also at work. While the following narrative highlights the convergence of opportunities emerging to support major expansion of CS PD at the high school level, the PD TF and EDC staff will maintain a broader focus that includes identifying and providing PD opportunities for teachers of grades K–5 and 6–8, building on the infrastructure developed to support the expansion of CS in high schools throughout the state.

In September 2013, EDC was awarded a three-year $1 million Computing Education for the 21st Century (CE21) grant by NSF. The focus of this grant is to develop and implement a train-the-trainer model for providing PD to prepare teachers to teach the new ECS high school course (also developed with NSF funding). The CE21 grant will support the establishment of three regional PD hubs based in Boston, the MetroWest area, and the western part of the state. EDC staff envision two expansions of the regional PD hubs, contingent on securing additional funding, that will help position the state for a leadership role in preparing teachers to teach several newly emerging and interrelated CS courses, which, in turn, will prepare a larger and more diverse group of students to pursue CS at the post-secondary level:

- The first proposed expansion of the regional hubs is to expand their capacity to implement train-the-trainer programs to teach the CS Principles high school course, which is in the final stages of being field-tested. This course is widely viewed as a broad-based, follow-on course to ECS. Additionally, MassCAN anticipates that the AMSA Charter School staff and partners will lead an effort to finalize a new modular middle school Introduction to Computer Science course for which there will be substantial training needs that could be met through the regional hubs. The Curriculum TF will offer guidance to the PD TF on this issue.

- The second proposed expansion of the regional hubs involves increasing their number so that there will be one to serve each of the state’s seven STEM Network regions, thus allowing for both increased ease of access to training and greater adaptability to regional circumstances.

Another opportunity to strengthen MassCAN’s PD efforts is through our partnership with Code.org, a 501(c)(3) nonprofit organization focused on bringing CS to every K–12 U.S. school, with whom MassCAN leaders have been collaborating since summer of 2013. In 2013–2014, Code.org is offering select school districts an opportunity to apply to a nationwide, four-year pilot program that will provide them with a package of nationally recognized CS courses, complete curriculum resources, and multi-year teacher PD, at virtually no cost to the district. The District Partnership Plan document, detailed on www.code.org, describes the responsibilities of and the relationship between the district, school, and Code.org in order to increase CS opportunities for all students.
Massachusetts has been chosen as one of eight states that will partner with Code.org to pilot this partnership model with approximately 10 school systems in the MetroWest STEM Network region. MassCAN will serve as the Code.org state partner, coordinating the District Partnership Plan for each participating school district. The Code.org District Partnership Plan schools will function as a second PD hub/Professional Community of Learners within the MetroWest STEM Network Region.

Additionally, MassCAN will collaborate with and draw on the deep expertise of NSF-funded CS projects at UMASS–Amherst (Expanding Computing Education Pathways [ECEP]) and UMASS–Boston (Broadening Advanced Technological Education Connections [BATEC]).

The AMSA Charter School in Marlborough and BATEC will serve as two of the regional training hubs under the NSF CE21 grant awarded to EDC, and it is expected that UMASS–Amherst/ECEP will serve at the third hub in Years 2 and 3 of the grant.

Tasks, Activities, and Outcomes

**TASK 1: Develop a working knowledge of the CS standards, Curriculum Framework, and assessments adopted and supported by the Mass. DESE and the curriculum model and materials promoted by the MassCAN Curriculum TF.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **1.1:** Review the Mass. DESE CS voluntary standards, preferred educational model, Curriculum Framework, and assessments. | 1. Collaborate with the TF co-chairs to structure a process for TF members to review the work of the Standards TF.  
2. Provide a review of key standards documents developed by the Standards TF, including the following:  
   a. Standards under consideration or recently adopted by the state (e.g., Common Core, Mass Science/Technology/Engineering, voluntary CS)  
   b. Preferred educational model for Mass. CS in grades K–12  
   d. Mass. CS assessment strategy and assessments, to the extent they are available  
4. Document the process and outcomes of this review, particularly the implications for the PD model. |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **1.2:** Review the Mass. K–12 CS curriculum sequence, model, and materials developed by the Curriculum TF. | 1. Identify relevant research and reports for TF members to read to inform the development of the annotated research bibliography, for example:  
   a. CSTA/ACM Model K–12 CS Curriculum report  
   b. Research about what is developmentally appropriate for the three grade-span groups  
   c. Research on teacher preparation and background knowledge in CS  
   d. Research on strategies for engaging female and underrepresented students in CS (e.g., *Stuck in the Shallow End*)  
   e. Research on different pedagogical approaches and what it takes to engage all students (e.g., mobilizingscs.org)  
   f. Research on age-appropriate tools for use in K–12, such as, but not limited to, Scratch, Alice, Lego, Stencyl, and Kodu  
2. Create a brief annotated research bibliography of best materials reviewed.  
3. Document any decisions made and the process. |

**OUTCOME**
By June 2014, the PD TF will complete its review of the baseline documents and research necessary to formulate an overall CS PD strategy.
**TASK 2:** Develop a series of workshops to promote local community, educator, and business leadership engagement in supporting high-quality, equitable K–12 CS education that builds on the understanding that innovation requires both widespread support and commitment and openness to change.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **2.1:** Develop an understanding of the rationale for broad engagement to support CS that includes community, education, and business leaders in school districts. | 1. Research and provide a review of scaled educational innovations and their underlying principles as evidenced by EDC's Ford/NGL (Next Generation Learning) experience.  
2. Invite Jake Foster from the Office of Math, Science, and Technology/Engineering at Mass. DESE to speak about the state's adoption of Innovative Engineering standards and courses, and John D'Auria, President of Teachers21, to talk about his experience with the state's adoption of the innovative new teacher evaluation system; ask both to advise the TF on the importance of broad district support for adopting significant innovations.  
3. Explore models for engaging school leaders in supporting innovation (e.g., Andover school district, Cambridge Innovation Center model).  
4. Support TF members in defining the benefits of this model and identifying key components of a series of workshops for community, education, and business leaders.  
5. Document the process and any decisions made. |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **2.2:** Identify and/or develop a scalable model to be used for a series of workshops to support community, education, and business leadership engagement in the implementation of CS courses in school districts. | 1. Coordinate TF outreach to the Mass. Association of School Superintendents and superintendent leaders, the Mass. Teachers Association, Computer Science Teachers Assn. (CSTA), and local parent and education nonprofits and community groups to build support for CS education.  
2. Coordinate TF outreach to business trade association leaders and leaders of innovation centers and government research centers to build support for engaging business leaders in these school-community leadership workshops that focus on adopting CS in the school district.  
3. Coordinate TF outreach to leading partners (e.g., WGBH), PD providers, and educational consultants to explore collaborating on the development of a scalable model for school-community leadership workshops by creating videos of these workshops for future use.  
4. Support the TF in finalizing a model and developing a fundraising strategy to support implementation of the leadership engagement workshops model.  
5. Collaborate with MassCAN and its partners to jointly seek funding to implement school-community leadership workshops.  
6. Document any decisions made and the process. |
| **2.3:** In collaboration with regional PD hubs established through the NSF CE21 grant and the Code.org District Partnership Plan Network, develop and implement a model for a year-long series of leadership engagement workshops with school districts participating in the grants. | 1. Work with the TF co-chairs and appropriate grade-span sub-groups, regional PD hub leaders, and MassCAN leaders to partner with school districts engaged in the CE21 grant and the Code.org District Partnership Plan to review EDC’s Ford/NGL model for leadership engagement workshops.  
2. With the TF co-chairs and appropriate sub-groups, regional PD hubs, and representatives of the partner districts, review and agree on the key components of the leadership engagement workshops.  
3. Determine with regional PD hubs what additional capacity MassCAN will need in order to coordinate the full program of leadership engagement workshops. (MassCAN will raise funds to vet and contract with high-quality PD providers to implement leadership engagement workshops.)  
4. Document the process and any decisions made. |
### EDC ACTIVITIES

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4: Develop a plan to evaluate the effectiveness of the community, education, and business leadership workshops.</td>
<td>1. Work with the co-chairs to identify appropriate existing models for the evaluation of similar workshop programs. &lt;br&gt; 2. Work with the TF to identify and vet consultants or contractors with skills appropriate to successfully implement leadership engagement program evaluation. &lt;br&gt; 3. Engage MassCAN to work with consulting or contracting partners to raise funds to evaluate the leadership engagement program. &lt;br&gt; 4. Document the process and any decisions made.</td>
</tr>
</tbody>
</table>

### OUTCOMES
- By December 2014, develop at least the first in a series of community, education, and business leadership workshops for district partners in CE21 and Code.org programs.
- By September 2015, begin to launch a full-scale effort to conduct a series of leadership engagement workshops with at least 30 MassCAN partner districts.
**TASK 3:** Support the development or expansion of regional CS PD training hubs, in collaboration with CE21 and Code.org projects, to provide a range of scalable CS PD courses and one- to two-day workshops for teachers in grades 9–12.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **3.1:** Support the development and expansion of regional PD hubs to support teachers interested in teaching high school CS courses, including ECS, CS Principles, AP CS A, and Bootstrap. | 1. Provide the TF with a detailed overview of CS PD courses for grades 9–12 offered by CE21 and Code.org hubs that provide both deep course content knowledge and modeling of highly effective pedagogy.  
2. Provide the TF with CE21 and Code.org District Partnership Plan Network documents for guidance on expanding the scope of PD provided through existing hubs and for use in considering qualifications of partners (e.g., Regional STEM Networks) interested in becoming additional hubs.  
3. Engage MassCAN in fundraising to support PD hubs expanding their services.  
4. Document the process and any decisions made. |
| **3.2:** Collaborate with the Mass. Life Sciences Center (MLSC) to identify and, if necessary, develop PD courses on bioinformatics and Big Data that can be taught through the PD hubs. | 1. Arrange for TF discussions with MLSC, area life-science leaders, and the Mass. Association of Science Teachers to understand the career pathways available to students taking courses in bioinformatics and Big Data.  
2. Complete a national scan to identify existing bioinformatics and Big Data courses and/or ask MassCAN to raise funds to develop these courses for high school students and make them available to PD hubs.  
3. Engage MassCAN in collaborating with MLSC and area life-science leaders to raise the necessary funds to support the train-the-trainer model for course dissemination.  
4. Document the process and any decisions made. |
<table>
<thead>
<tr>
<th><strong>SUB-TASK</strong></th>
<th><strong>EDC ACTIVITIES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.3:</strong> Collaborate with Mass. DESE to determine PD needs for grades 9–12</td>
<td>1. Brief the TF on the NGSS Science, Engineering, and Computer Science Practice Standards.</td>
</tr>
<tr>
<td>science teachers interested in using the NGSS Science, Engineering, and</td>
<td>2. Arrange for a discussion with DESE, MLSC, area life-science leaders, and the Mass. Association of Science Teachers to outline the development of a PD</td>
</tr>
<tr>
<td>Computer Science Practice Standards.⁵</td>
<td>program to address the Practice Standards.</td>
</tr>
<tr>
<td></td>
<td>3. Engage MassCAN in collaborating with MLSC and area life-science leaders to raise funds to develop and disseminate a Practice Standards PD program.</td>
</tr>
<tr>
<td></td>
<td>4. Document the process and any decisions made.</td>
</tr>
<tr>
<td><strong>3.4:</strong> Create a series of four or five one- to two-day PD workshops with</td>
<td>1. Engage the TF in determining the topics essential for all CS teachers to effectively introduce or expand CS education in their school—for example:</td>
</tr>
<tr>
<td>half-day follow-ups, focusing on areas such as equity, CS careers of the</td>
<td>a. Understanding research about barriers to CS for girls and underrepresented minorities</td>
</tr>
<tr>
<td>future, and effective engagement of local business resources, to enable</td>
<td>b. Understanding CS labor market information in order to talk knowledgably about CS careers</td>
</tr>
<tr>
<td>teachers to make their CS teaching experience highly effective and engaging</td>
<td>c. Mastery learning and project-based learning</td>
</tr>
<tr>
<td>for students.</td>
<td>d. Engaging local businesses in supporting CS classes</td>
</tr>
<tr>
<td></td>
<td>2. Work with the TF to identify and vet contractors capable of designing such workshops (e.g., Tapestry workshop developed by the National Center for</td>
</tr>
<tr>
<td></td>
<td>Women and Information Technology to address equity issues).</td>
</tr>
<tr>
<td></td>
<td>3. Engage MassCAN to raise funds in collaboration with the selected contractor to support workshop implementation.</td>
</tr>
<tr>
<td></td>
<td>4. Document the process and any decisions made.</td>
</tr>
</tbody>
</table>

⁵ When the Partnership for Assessment of Readiness for College and Careers released the NGSS, it contained an Appendix F: Science and Engineering Practice Standards. MassCAN has amended those standards to more deeply include CS practices and is recommending their adoption by DESE.
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **3.5:** Explore the research on MOOCs used for PD and determine if and how a MOOC might be used by MassCAN as part of the program to support ongoing PD for CS teachers. | 1. Provide TF co-chairs with available research on MOOCs used for PD.  
2. Invite leading providers of MOOCs for PD, such as the Friday Institute at North Carolina State University, to meet with the TF and share their experience.  
3. Assist the TF in evaluating whether to ask MassCAN to partner with an experienced provider to raise funds to support developing a MOOC.  
4. Document any decisions made and the process. |
| **3.6:** Consider how to expand the evaluation process developed for the CE21 grant to include evaluation for one- to two-day workshops for scaling to all PD hubs. | 1. Review with the TF the evaluation model for the CE21 grant CS PD programs and workshops.  
2. Work with the TF to identify and vet consultants and contractors with skills appropriate to successfully implement expanded PD program evaluation.  
3. Engage MassCAN to work with consulting or contracting partners to raise funds to evaluate the CS PD program for grades 9–12.  
4. Document the process and any decisions made. |

**OUTCOMES**
- By August 2014, Mass. PD hubs will begin offering ECS PD courses that address both course content and recommended pedagogy and one- to two-day workshops that address equity, CS careers, and other key aspects of CS education.  
- By August 2015, Mass. PD hubs will begin offering PD for *CS Principles* and for the bioinformatics and Big Data courses.
**TASK 4**: Support the development or expansion of CS PD training hubs, in collaboration with CE21 and Code.org projects, to provide a CS PD course and workshops on CS curriculum tools for teachers in grades 6–8.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **4.1:** Develop a program to expand the services of each regional PD hub to provide middle school teachers with PD to teach the new *Introduction to Computer Science* modules or other similar introductory middle school CS curriculum units. | 1. Provide the TF with a detailed overview of the *Introduction to Computer Science* course for grades 6–8 developed by AMSA.  
2. Work with the TF to identify partners capable of providing PD on the *Introduction to Computer Science* course modules and assessments.  
3. Engage MassCAN to seek funding to support PD on the *Introduction to Computer Science* course modules and assessments.  
4. Document the process and any decisions made. |
| **4.2:** Develop a program to expand the services of each regional PD hub to provide PD workshops and follow-ups for middle school teachers on CS curriculum tools (e.g., Scratch, Blockly) that can be integrated into math and science curricula. | 1. Provide the TF with a detailed overview of CS curriculum tools for grades 6–8.  
2. Work with the TF to identify vendors or partners capable of providing PD on the use of appropriate curriculum tools.  
3. Engage MassCAN to seek funding in collaboration with the chosen vendor or partner to support providing PD on the use of curriculum tools at each hub.  
4. Document the process and any decisions made. |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| 4.3: Develop a plan to evaluate the effectiveness of the CS PD course or workshops for teachers in grades 6–8. | 1. Work with the TF to identify appropriate existing models for the evaluation of similar CS PD courses or workshops for teachers in grades 6–8.  
2. Work with the TF to identify and vet consultants or contractors with the skills appropriate to successfully implement PD program evaluation for PD vendors who do not have their own evaluation protocols.  
3. Engage MassCAN to work with the chosen consulting or contractor partner to raise funds to evaluate the grades 6–8 CS PD program.  
4. Document the process and any decisions made. |

**OUTCOMES**
- By June 2014, vendors will provide PD workshops on appropriate CS curriculum tools for grades 6–8 and Introduction to CS modules for grades 6–8 at two or more regional CS PD hubs.
- By June 2015, vendors will provide PD on the *Introduction to Computer Science* modules for grades 6–8.
TASK 5: Support the development or expansion of CS PD training hubs, in collaboration with CE21 and Code.org projects, to provide PD courses for teachers in grades K–5 that integrate basic CS concepts into all subjects, and offer PD workshops and follow-ups on introductory CS curricula and tools.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **5.1:** Expand the services of each PD hub to provide support for elementary school teachers of all subjects to incorporate grade-appropriate CS concepts into their existing curricula and/or to use a range of introductory CS curricula and tools. | 1. Provide the TF with an overview of introductory CS curricula and tools appropriate for grades K–5 as well as courses that integrate CS concepts into K–5 subjects.  
2. Work with the TF to identify vendors or partners capable of delivering PD workshops for these curricula and tools.  
3. Engage MassCAN to seek funding to support the development of courses that incorporate grade-appropriate CS concepts into the spectrum of elementary school subjects.  
4. Document the process and any decisions made. |

**OUTCOME**

By June 2015, regional CS PD hubs will be able to provide courses and workshops that support K–5 teachers in introducing CS to their students.
**TASK 6:** Promote the use of existing CS PLCs by all teachers participating in CS PD offered through MassCAN and its partners, and explore the development of PLCs to support PD where appropriate PLCs don’t exist.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **6.1:** Determine the extent to which existing PLCs (such as the national cs10kcommunity.org) and collaboration links on websites such as Scratch can meet the needs of Mass. teachers participating in CS PD, and promote the use of PLCs. | 1. Research and provide a review of relevant PLCs, focusing on what would be required to establish and successfully maintain a Mass. section or component of the cs10kcommunity.org to support all PD hubs in Mass.  
2. Invite PLC leaders and leading CS teachers and/or trainers to define the functionality of a PLC to serve Mass. CS teachers, both as part of cs10kcommunity.org and as a stand-alone PLC if that is deemed necessary.  
3. Support the TF in working with MassCAN to raise the funds necessary to support high-quality PLCs.  
4. Document the process and any decisions made. |
| **6.2:** Support all CS PD hubs in encouraging PD participants to use PLCs for ongoing support and resources. | 1. Support the TF in working with regional PD hubs to determine how to best support PLC use by teachers.  
2. Support the TF in working with MassCAN to develop a fundraising strategy to support PLCs at all three grade-span levels.  
3. Collaborate with MassCAN partners to jointly seek funding if necessary to establish a Mass.-specific PLC.  
4. Document the process and any decisions made. |

**OUTCOME**
By January 2015, teachers participating in CS PD will be supported in participating in PLCs at all Mass. regional PD hubs, and the infrastructure to support and maintain PLCs will be established.
## TASK 7: Coordinate with the Standards, Curriculum, and Public Awareness TFs.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>EDC ACTIVITIES</th>
</tr>
</thead>
</table>
| **7.1:** Share work in progress and review relevant work of the other TFs. | 1. Identify areas of potential overlap with the Standards TF, bring those areas to the attention of the co-chair, and coordinate with EDC staff working on the Standards TF.  
2. Identify areas of potential overlap with the Curriculum TF, bring those areas to the attention of the co-chairs, and coordinate with EDC staff working on the Curriculum TF.  
3. Identify areas of potential overlap with the Public Awareness TF, bring those areas to the attention of the co-chairs, and coordinate with EDC staff working on the Public Awareness TF.  
4. Document any decisions made and the process. |
| **7.2:** Provide PD expertise to other TFs as needed in order to accomplish MassCAN goals (e.g., in discussions with state officials about licensure and recertification, it will be essential to engage members of the PD TF). | 1. Ensure continual communication among staff working with each TF; advise the TF co-chairs of when drawing on the expertise of another TF will best advance MassCAN's goals. |

**OUTCOME**

Close coordination with other TFs will ensure maximum collaboration and effective development and implementation of the MassCAN PD model and shared goals.
### PD TF Timeline Q1 2014–Q2 2016

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task 1:</strong> Develop a working knowledge of the CS standards, Curriculum Framework, and assessments adopted and supported by the Mass. DESE and the curriculum model and materials promoted by the MassCAN Curriculum TF.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 2:</strong> Develop a series of workshops to promote local community, educator, and business leadership engagement in supporting high-quality, equitable K–12 CS education that builds on the understanding that innovation requires both widespread support and commitment and openness to change.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 3:</strong> Support the development or expansion of regional CS PD Training hubs, in collaboration with CE21 and Code.org projects, to provide a range of scalable CS PD courses and one- to two-day workshops for teachers in grades 9–12.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 4:</strong> Support the development or expansion of CS PD training hubs, in collaboration with CE21 and Code.org projects, to provide a CS PD course and workshops on CS curriculum tools for teachers in grades 6–8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 5:</strong> Support the development or expansion of CS PD training hubs, in collaboration with CE21 and Code.org projects, to provide PD courses for teachers in grades K–5 that integrate basic CS concepts into all subjects, and offer PD workshops and follow-ups on introductory CS curricula and tools.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 6:</strong> Promote the use of existing CS PLCs by all teachers participating in CS PD offered through MassCAN and its partners, and explore the development of PLCs to support PD where appropriate PLCs don’t exist.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 7:</strong> Coordinate with the Standards, Curriculum, and Public Awareness TFs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Purpose of the MassCAN Public Awareness TF

The Public Awareness TF is working to inspire, educate, and motivate individuals and communities to get engaged in driving the adoption of computing education in Massachusetts schools. The Public Awareness TF will create broad awareness through social, traditional, and online media that educates students, parents, teachers, administrators, and policy and industry leaders across the state on the importance of K–12 computing education. Content to be developed will include the following:

- What *computing education* is and why it's important for all students to have these skills
- National and local research on current and future jobs and careers that are dependent on computing knowledge in fields such as life sciences, health care, financial services, entertainment, and manufacturing
- National and local statistics on CS courses offered in K–12 and the numbers of students taking and demonstrating proficiency in these courses
- Economic data on the projected number of CS jobs to be available in Massachusetts and the nation as well as their projected pay scales
- How CS course offerings and student recruitment are beginning to address issues of equity, race, and gender
- How to help school districts with few if any CS courses foster local interest and train their teachers to lead new CS courses

Goals

- Increase awareness of CS that results in increased numbers of students taking CS courses and numbers of districts offering CS courses
- Provide stakeholders with materials that will help them successfully advocate for computing education in their district
- Create content that provides a common voice for all MassCAN stakeholders
- Mobilize CS advocates
- Create meaningful, easy-to-understand content that can be used by any interested party to help drive expansion of computing education across Massachusetts
Key Metrics

- Increased number of school districts and independent, charter, and Catholic and Jewish day schools offering CS courses
- Increased number of CS courses being taught in Massachusetts at all K–12 grade levels
- Increased number and diversity of students taking CS courses
- Increased number of students prepared and motivated to pursue post-secondary majors in CS

Tasks, Activities, and Outcomes

**TASK 1: Identify key messages that convey the importance of CS for all students and our economy, and implement a messaging campaign.**

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>MassTLC EF ACTIVITIES</th>
</tr>
</thead>
</table>
| 1.1: Research polls, surveys, articles, and books and talk to professionals in the field of messaging to create compelling messages, and explore a “Got CS?” campaign. | 1. Work with the TF and national leaders of the CS in K-12 schools movement to do the following:  
   a. Research and identify specific messages for targeted audiences.  
   b. Gather compelling statistics on CS, including current and future jobs and careers that are dependent on computing knowledge, and national and local statistics on CS education.  
   c. Identify how CS course offerings are beginning to address issues of equity, race, and gender.  
   d. Brainstorm with TF members, national CS leaders and PR professionals the feasibility of a “Got CS?” campaign |
| 1.2: Determine the best media to convey the messaging campaign, and implement the campaign. | 1. Identify appropriate media for all targeted audiences.  
   2. Identify aspects of the messaging campaign that can be implemented with available resources.  
   3. Identify the funds needed to implement the balance of the campaign, and develop a strategy to raise those funds. |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>MassTLC EF ACTIVITIES</th>
</tr>
</thead>
</table>
| **1.3:** Develop a plan for annually updating key messages to celebrate progress made in terms of growth in the number of CS courses offered, growth in the number of students taking courses, students’ demonstrated proficiency in CS courses, and school district success in achieving equity in student participation in CS courses. | 1. Assist the TF in gathering data from DESE and school districts on progress made from year to year.  
2. Assist the TF in updating messaging to reflect annual progress.  
3. Assist the TF in creating events to celebrate annual progress. |

**OUTCOMES**
- By June 2014, the first phase of the messaging campaign will be distributed to multiple stakeholders and used in online, print, and social media.
- By June 2015 (and each succeeding June), an updated messaging campaign will be distributed to multiple stakeholders and used in online, print, and social media.
**TASK 2:** Create an online “PA Tool Box” of resources to enable and support local school district activists in expanding opportunities for students to take CS courses in their schools.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>MassTLC EF ACTIVITIES</th>
</tr>
</thead>
</table>
| **2.1:** Identify the key elements and organization of the online “PA Tool Box.” | 1. Assist the TF in working with knowledgeable representatives from each constituency the “PA Tool Box” is designed to serve in order to best understand which resources will be most helpful.  
2. Work with PR volunteers and consultants to sharpen messages and content and to create visuals, including video and slides.  
3. Determine the essential components of the “PA Tool Box,” for example:  
   a. Roadmaps:  
      • The “big picture”—what is happening on the national level to support state and local actions  
      • A high-level overview of MassCAN TF goals and outcomes  
      • Questions to ask and whom to ask as you get started  
   b. E-mail templates for administrators, teachers, students, parents, business leaders, and local press  
   c. Audiovisuals:  
      • Slide presentation that can be tailored for your district  
      • Videos provided by (MassCAN and Code.org)  
   d. Other resources, for example:  
      • Links to PD opportunities  
      • Links to curriculum resources  
      • Alignment of CSTA standards to the Mass. standards for math or science (possibly in collaboration with the Curriculum or Standards TFs)  
      • Suggestions for funding CS in your school  
      • Suggestions for involving industry leaders and employees with backgrounds in CS in your community’s efforts |
<table>
<thead>
<tr>
<th><strong>SUB-TASK</strong></th>
<th><strong>MassTLC EF ACTIVITIES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.2:</strong> Work with website staff to review the organization, display, and functionality of the “PA Tool Box” content.</td>
<td>1. Support the TF in working with website staff to finalize the organization, display, and functionality of the “PA Tool Box” content.</td>
</tr>
<tr>
<td><strong>2.3:</strong> Develop a plan to support ongoing refinement and updating of the “PA Tool Box” content.</td>
<td>1. Support the TF to raise funds to support staff needed to keep the website current, troubleshoot problems, and support outreach efforts.</td>
</tr>
</tbody>
</table>

**OUTCOMES**
- By September 2014, the “PA Tool Box” will be available online, and target audiences will be notified of its availability.
- By September 2015 (and every September thereafter), the “PA Tool Box” will be updated.
**TASK 3:** Collaborate with local and national partners to increase awareness of CS by coordinating, hosting, and/or participating in one-time and annual events.

<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>MassTLC EF ACTIVITIES</th>
</tr>
</thead>
</table>
| **3.1:** Work with CSTA, its state chapter, and MassCAN partners to coordinate Computer Science Education Week activities in December 2013, and continue to do so annually. | 1. Work with the TF to mobilize schools and industry and public figures in the “Hour of Code” and other activities that support CS awareness during Computer Science Education Week (December 9–13, 2013):  
   a. Work with MassCAN partners and CSTA teachers to implement an Hour of Code in their schools  
   b. Create online resources aggregating all Hour of Code activities in the state  
   c. Reach out to the governor, New England Patriots, Tech Hub Collaborative, and Legislative Tech Hub caucus to get them engaged in the Hour of Code  
   d. Create a press plan and outreach for events  
   e. Release the MassTLC Workforce study highlighting the importance of CS (December 11, 2013)  
   f. Incorporate a CS component into the Robotics Summit (scheduled for December 13, 2013)  
   g. Begin developing plans for 2014 events |
| **3.2:** Collaborate with sponsors of major education events and conferences to create opportunities for MassCAN to present information on its work and successes in growing student participation in CS courses. | 1. Work with the TF to identify and solicit opportunities to make CS presentations at the following:  
   a. Annual state STEM Summit  
   d. Annual Mass. Teachers Association and Mass. Federation of Teachers conferences  
   e. Annual conference of the Association of Teachers of Math in Massachusetts  
   f. Monthly Regional Superintendents Roundtables  
   g. Quarterly Regional STEM Network meetings and Regional Readiness Center meetings |
<table>
<thead>
<tr>
<th>SUB-TASK</th>
<th>MassTLC EF ACTIVITIES</th>
</tr>
</thead>
</table>
| **3.3:** Create opportunities for superintendents and district leaders to attend events where they can learn about the central role of innovation in our economy, the role of CS in Innovation Economies, and the importance of preparing all students with CS skills. | 1. Work with the TF to collaborate with local district leaders, activists, and business or trade associations by providing the following:  
   a. Frequent seminars for business and education leaders on “The Role of CS in Innovation Economies”  
   b. Field trips to the Cambridge Innovation Center and MassChallenge  
   c. Field trips to Massachusetts companies employing large numbers of computer scientists |
| **3.4:** Create a speakers bureau of industry, academic, and other CS thought leaders who are able to deliver pro-CS messages across the state and country. | 1. Create, modify, or build an easily searchable database of industry speakers willing to educate people on CS, the role of CS in Innovation Economies, and CS careers.  

**OUTCOMES**
- Starting with Computer Science Education Week December 2013 and for annual Computer Science Education Weeks thereafter, events will be sponsored across the state to engage students and the general public.
- By spring 2014, MassCAN speakers and panelists will be scheduled at important CS-related conferences in the state.
- By September 2014, conferences and meetings for superintendents and district leaders will be scheduled.
- By September 2014, the CS speakers bureau will be launched.
<table>
<thead>
<tr>
<th>Public Awareness TF Goals</th>
<th>Task 1: Identify key messages that convey the importance of CS for all students and our economy, and implement a messaging campaign.</th>
<th>Task 2: Create an online “PA Tool Box” of resources to enable and support local school district activists in expanding opportunities for students to take CS courses in their schools.</th>
<th>Task 3: Collaborate with local and national partners to increase awareness of CS by coordinating, hosting, and/or participating in one-time and annual events.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2 2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3 2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4 2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2 2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3 2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4 2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2 2016</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For more information, please contact:

Jim Stanton
jstanton@edc.org

Joyce Malyn-Smith
jmsmith@edc.org

Sarita Pillai
spillai@edc.org

Rebecca Lewis
rlewis@edc.org

Heather Carey
heather@masstlc.org