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PACE Programming the Acceleration of Computing Education

PROGRAMMING THE ACCELERATION OF COMPUTING EDUCATION

TOOLKIT

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Programming the Acceleration of Computing Education (PACE) was co-developed by Education Development Center (EDC) and the Massachusetts Department of Elementary and Secondary Education, and was funded by a grant from the U.S. Department of Education, Education Innovation and Research (EIR) Program.

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ACRONYM AND ABBREVIATION LIST

CS	computer science
CSS	cascading style sheets
DESE	Department of Elementary and Secondary Education
DLCS	Digital Literacy and Computer Science
DSC	District Stakeholder Council
EDC	Education Development Center
EIR	Education Innovation and Research [program]
HS	high school
MA DESE	Massachusetts Department of Elementary and Secondary Education
MCAS	Massachusetts Comprehensive Assessment System
MS	middle school
PACE	Programming the Acceleration of Computing Education
PD	professional development
WWC	What Works Clearinghouse

1 INTRODUCTION TO THIS TOOLKIT

ABOUT PACE

The Programming the Acceleration of Computing Education (PACE) model supports school districts in creating a middle school CS program to accomplish four priorities:

1. **Provide every middle school student with sequential exposure** to CS over each of two to three years
2. **Provide the highest-quality standards-based CS curriculum** to build student knowledge/experience and interest
3. **Create an educational success experience** that would motivate districts to provide an array of options for all students to continue their CS education in high school
4. **Create a Computer Science District Stakeholder Council (DSC)**, composed of district and school leaders/staff to participate in activities supporting the development of a sustainable middle school to high school CS pathway.

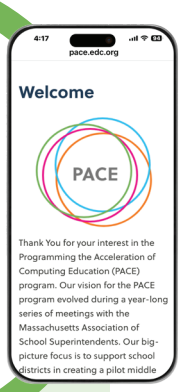
The PACE model ensures every middle school student receives high-quality, sequential computer science education

ABOUT THE TOOLKIT

The *Programming the Acceleration of Computing Education Toolkit (PACE Toolkit)* is designed to support districts and schools in successfully establishing and implementing the PACE program. It provides step-by-step guidance—from initial planning and setup to monitoring progress to fostering continuous improvement. The toolkit also includes real-world examples from districts and a variety of practical resources.

The primary goal of the *PACE Toolkit* is to help districts and schools effectively integrate CS as a key element of middle school education, ensuring that all students have access to meaningful and engaging learning opportunities in this critical subject area.

For additional information, go to the Programming the Acceleration of Computing Education website.



HOW TO USE THE TOOLKIT

The *PACE Toolkit* provides numerous access points to the PACE program. Following is a summary of the individual sections:

Section 1

Introduction provides information on the PACE program and toolkit.

Sections 2–5

History and Background through Examples of Districts, give an overview of the program and how it has already been implemented. We suggest you read these sections if you are interested in expanding access to CS in your district and are not familiar with this program.

Section 6

Implementing the PACE Program outlines steps and provides resources for setting up the PACE program in your district. This section includes:

- Detailed instructions for the District Stakeholder Councils, a key component of the program
- Suggestions for other professional development (PD)
- Tools for monitoring progress and continuous improvement

Section 7

PACE Planning and Implementation Structures section gives more information on three key elements for implementing the PACE program: District Stakeholder Council Meetings (DSCs), High Quality CS Curriculum, and Professional Learning.

Section 8

Key Levers for Leading District-Level Systems Change explores the key elements that contribute to sustainable district change, as well as actionable steps and cautions that can guide planning.

Section 9

Help is Available! describes how Education Development Center (EDC)[1] can provide support in all phases of your program implementation: from considering PACE to planning for, implementing, and evaluating PACE in your districts.

Appendices

The Appendices provide additional support during implementation.

- **Appendix A. Agendas for DSC Meetings** includes agendas for meetings in Years 1–3.
- **Appendix B. Surveys** contains surveys you can use to (1) gain an understanding of your infrastructure readiness for this system change and (2) gauge your students' interest in CS at pre-implementation, during implementation, and/or at post-implementation.
- **Appendix C. PACE Resources** provides extensive supplemental resources during your PACE implementation.
- **Appendix D. Computer Science Exhibitions Resources** has resources for hosting a CS exhibitions.
- **Appendix E. URLs for Linked Content** is for users with a printed version of the toolkit. It lists all of the URL links for sources and sites referenced in this toolkit.
- **Appendix F. Evaluation of the PACE Intervention** includes an introduction and a link to the executive summary of the evaluation of the PACE pilot program.
- **Appendix G. DSC Continuous Improvement Planning Template** to help DSCs monitor implementation.

1 EDC is a co-developer of PACE with the Massachusetts Department of Elementary and Secondary Education (MA DESE).

2
HISTORY AND BACKGROUND OF PACE

THE CHALLENGE

Despite the critical importance of developing computer science (CS) skills and knowledge for all students, many schools and districts lack the capacity, resources, and strategic planning to provide a robust CS learning program. Factors include:

- **Computer science (CS) skills are needed for the future of work:** Research shows an increase in jobs in all domains that require CS skills, and it is expected that this trend will continue. Those individuals with CS skills will have greater and more sustainable economic prospects.
- **Historic failure to reach all students in CS:** There are still significant gaps in students graduating with CS skills, especially students in under-resourced school systems, which often include those in rural and economically challenged communities.
- **Patterns of episodic CS course offerings in Massachusetts:** The likelihood of schools offering CS courses is often determined by individual teacher interest and not by systematic planning and progression.
- **Tipping point for career decision-making:** Middle school is a time of personal and career exploration when youth explore their own interests and skills and begin to align those with opportunities available in the world around them. Educational decisions made in middle school to select the type of high school and/or type of high school program have long-term implications for future careers. Ensuring that ALL students have a CS experience to help them explore their interest in a future CS career and integrating that knowledge into their career decision-making can help move the needle in developing a future workforce enabled with CS.

Many schools and districts lack the capacity, resources, and strategic planning to provide a robust computer science learning program.

THE RESPONSE

Via PACE, EDC has been building the capacity of school districts to create sustainable progress in improving all students' CS learning outcomes. The PACE model is designed to invest multiple stakeholders with agency and accountability to successfully support adoption of CS as an important component of middle school education. The approach provides access to high-quality, culturally responsive CS instruction and support for all students enrolled in middle schools in participating districts. PACE represents a districtwide systems change model with access-for-all strategies that better prepare all students to succeed.

By participating in the PACE pilot, a set of six districts in Massachusetts, the majority rural and/or high-needs districts, identified CS as a crucial area of focus for their students. To that end, they engaged in multiple years of systems-level change activities to install a new infrastructure so that all students had access to rigorous high-quality CS instruction.

PACE represents a districtwide systems change model with access-for-all strategies that better prepare all students to succeed.

The Difference with PACE: Teachers, Administrators, and Students in Participating Districts Weigh In

"Students need to see that they can do CS, and that it isn't really that hard. We can see a transformation in students in just three weeks, where they go from saying they can't do it to being the lead programmer for their group." *—PACE Teacher*

"At the high school, we've moved from having no classes three years ago to currently six sections of CS. We now see our students coming in with skills and understanding of CS that wasn't present before, and that makes a difference in what I can teach and what we can do." *—PACE High School CS Teacher*

"Kids see the results, and it helps them persevere: it's a really exciting time for kids. At first they're kind of really nervous, and they're like, 'I'm never going to learn this.' But then, when we're halfway through the unit, and they're making things. Now is the final week of the quarter so they're actually making games that work and the code's running, and students are, like, 'Wow! Look at what I did!', and just to hear the enthusiasm and excitement in their voice." — *PACE Teacher*

"I thought it was just like I'm stuck on a computer, and I get told what to do. But then when I got to do a project, and I saw that it was totally my idea, I got to use whatever programming I wanted, I could do whatever my mind was set to, that was very good..." *—PACE Student*

"I started to get more into editing things and a little bit more into coding, so I started to realize it's more applicable to real life stuff nowadays." *—PACE Student*

3
CENTRAL FEATURES OF THE PACE MODEL

The PACE module comprises five central components:

Computer Science access through districtwide middle school adoption: All seventh and eighth grade students have access to substantial CS instruction.

Curriculum scope, depth, and professional development: Districts provide training and support for CS teachers in a high quality CS curriculum.

Enhanced teacher and school staff support: Districts provide ongoing professional learning opportunities for teachers and school staff including coaching, supplemental trainings, and communities of practice.

Inclusive stakeholder partnerships: District Stakeholder Councils (DSCs) lead systemic change, champion CS, and embed district efforts within the state's educational policy infrastructure.

Continuous improvement through data-based decision-making: District staff and DSCs gather and use data to continually improve student interest and competence in CS education and create CS pathways through high school.

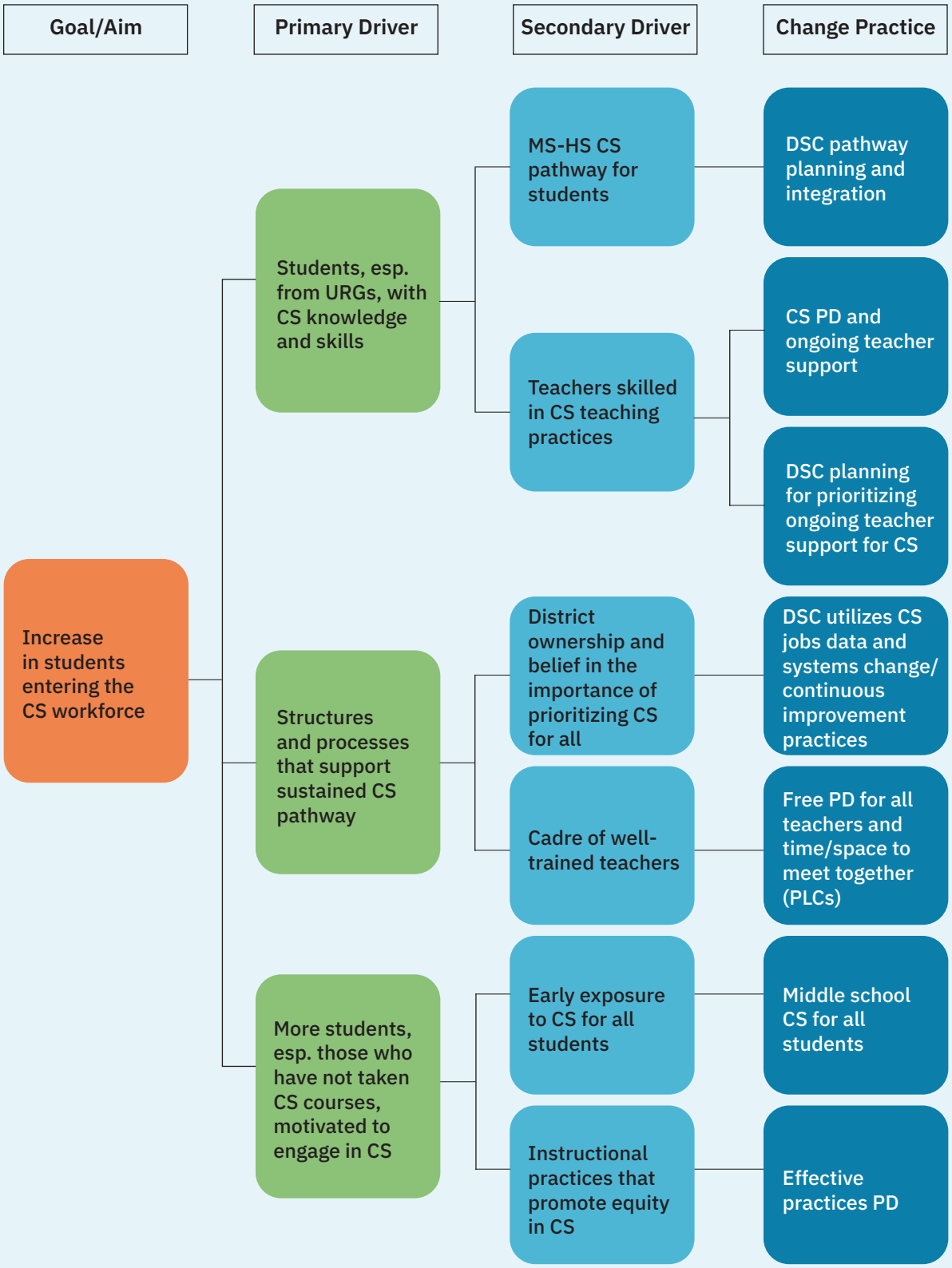
Districtwide collaboration, teacher support, and data-driven decisions make computer science accessible to every student.

4
PACE THEORY OF CHANGE

The PACE team developed the Theory of Change on the next page as the foundation of the PACE program. The diagram flows from left to right, starting with the goal of the program and then determining the elements needed to reach the goal.

The PACE Theory of Change connects program goals with the essential elements needed for success.

Figure 1. PACE Theory of Change



5 EXAMPLES OF DISTRICTS IMPLEMENTING PACE

Six districts actively participated in the PACE model from 2020 to 2025. The following sections highlight these districts' areas of focus during the project. Listen and watch as they describe how they are implementing PACE in their districts, and interact with some of the student projects.

BERLIN-BOYLSTON REGIONAL SCHOOL DISTRICT

Focus

The Berlin-Boylston Regional School District believes that a Digital Literacy and Computer Science (DLCS) curriculum is important because:

- They want their students to become informed citizens who understand how the technological world works, and who, as a result, are able to contribute productively to society.
- Being involved in creating technologies can build students' confidence in dealing with complex and open-ended problems and persistence in the face of challenges.
- DLCS promotes 21st century skills, such as creativity, collaboration, problem-solving, critical thinking, and communication, which will serve to define our students as contributing citizens of the 21st century.
- It piques students' interest toward careers in CS and the related fields and exposes students to these opportunities.
- To develop a diverse, productive workforce, they want all students to have access to CS.

Across Massachusetts, six districts brought PACE to life by creating new CS pathways and student innovations.

Sample Projects

Students at the district's Tahanto Regional Middle School completed a project using Code.org where they were tasked with creating an app that helps other students. Below are some examples:

- Friendship Radar
- Bully Busters
- Mental Health the Big Bad Stigma
- Baby Shark's Spelling

DENNIS-YARMOUTH REGIONAL SCHOOL DISTRICT

Focus

The Dennis-Yarmouth Regional School District is striving to provide access to CS education for all students and across all disciplines. They want their students to be informed digital global citizens who can persist in the face of creative and complex challenges; understand the basics of how the technological world works; and be ethical, active, and informed contributors to our increasingly technological society.

Dennis-Yarmouth's PACE Makerspace Initiative gives students hands-on opportunities with robots, circuits, and creative problem-solving.

Voice of the District

Watch the video to learn how Dennis-Yarmouth Regional School District participated in the PACE project to evaluate and strengthen their existing CS pathway. The video highlights the district's Middle School Makerspace Initiative, where students participate in Library Lunches and Make & Take Sessions using items such as robots and circuit playgrounds to build DLCS skills.

- Dennis-Yarmouth Spotlight Video

Sample Projects

- Two perspectives on vegetables. Bad for you, or good for you? (Grade 6 website)
- Don't touch the monsters (Grade 7 app)

HATFIELD PUBLIC SCHOOLS

Focus

Hatfield Public Schools' project-based, comprehensive CS initiative is applied across content areas to build problem-solving skills that will open the door to career opportunities for all students.

Voice of the District

Watch the video to learn how Hatfield Public Schools participated in the PACE project to create a CS pathway in the middle school grades.

- Hatfield Spotlight Video

Sample Projects

Students at Smith Academy Middle School in Hatfield used Code Studio from Code.org to create apps for good. You can view two exemplars below:

- Charity with Us
- Chill Pill

LEOMINSTER PUBLIC SCHOOLS

Focus

Leominster Public Schools will prepare students to be 21st century citizens by promoting universal access to high-quality education. A Digital Literacy/ Computer Science program will enable all students to have power and agency by bridging the gap between engagement in STEM fields and universal CS education, and giving all students 21st century skills in creativity, collaboration, communication, and personal agency.

MOHAWK TRAIL REGIONAL SCHOOL DISTRICT

Focus

The Mohawk Trail Regional School District's comprehensive CS initiative engages all students in building problem-solving and transferable skills that will open the door to career opportunities and an informed citizenry.

Voice of the District

Check out the district's short Spotlight video that features school librarian Emily Willis speaking on how the district is specifically connecting their CS curriculum to potential career pathways for students.

- Mohawk Trail Spotlight video

Through PACE, librarian Emily Willis helps students at Mohawk Trail connect computer science learning to real career pathways.

WARE PUBLIC SCHOOLS

Focus

The Ware Public Schools is promoting collaboration through project-based learning approaches with the following goals:

1. Enhance the educational experience of their students
2. Prepare students for the 21st Century world
3. Advance informed citizens who understand the basics of how the technological world works and can contribute productively to society.

Sample Projects

Students at Ware Junior Senior High School completed a project using Code.org on the *CS Discoveries* platform, where they were prompted to develop a website about a personal value or knowledge they would like to share with the world. The markup done by the students was not a modification of existing code—they started "from scratch." Take a look at some examples:

1. Animal Facts
2. Crystals
3. Cultural Foods
4. Hiking
5. Soccer Positions

COMPUTER SCIENCE EXHIBITIONS

Middle school and high school students from the six participating school districts showcased their CS talent and projects on February 5, 2025, at Worcester State University and on June 3, 2025, at the Northeastern University Innovation Campus in Burlington. Each student team presented their projects to CS industry representatives, event judges, and each other, and they received awards in a number of categories.

Projects varied, and all were highly creative. Just a few examples are listed below:

- Remote-controlled rovers, cars, trucks, helicopters, and a moving house!
- Twirling carousels
- Dr. Seuss's *The Lorax* and Disney's *Chip and Dale*
- A math machine
- A bunny whose ears twitched and eyes lit up to motivate young students
- Light-up greeting cards
- A Rube Goldberg machine
- App designs that help little kids decide what to wear in certain weather conditions

Students showcased creative CS projects like this twirling carousel at the 2025 PACE exhibitions in Worcester and Burlington.

6 IMPLEMENTING THE PACE PROGRAM

BASIC STEPS TO IMPLEMENT PACE

Year 1 – Planning and Setup

Assemble a District Stakeholder Council:

- Assemble a District Stakeholder Council, which should include a sufficient number of representatives to ensure support for the program at all levels, including high school.

Conduct a series of DSC meetings during Year 1 to:

- Determine a CS goal
- Identify potential challenges and issues
- Select a high-quality, evidence-based CS curriculum after a review of the standards and curriculum guidance relevant to your state and district
- Develop key metrics to assess the impact of your CS changes
- Develop a plan to address and monitor issues and implementation
- Plan for CS pathways into the high school curricula

  Note: See Appendix A for detailed agendas, including pre-, during-, and post-meeting activities and assignments.

Provide professional development:

- Equip teachers with professional development in the high-quality CS curriculum. Professional learning opportunities can also include training, coaching, and communities of practice.

Provide program supports:

- Set up structures to support teachers and administrators as they implement PACE. Examples include communities of practice, coaching, and technical assistance.

PACE invests in teachers through professional development, coaching, and communities of practice.

Plan for monitoring progress:

- Plan for collecting targeted data to monitor the identified key metrics for change and whether implementation is going as planned. These data will be used by the DSC to make improvements to better meet goals.

Years 2 and 3 – Implement, Evaluate, Adjust

In Years 2 and 3, PACE moves from planning to practice by engaging students, showcasing projects, and refining through continuous improvement.

Engage students in the high-quality CS curriculum selected in Year 1:

- This curriculum should guide teachers and students through CS instruction and activities, across content areas, for durations of a month to a full year.

Hold regular DSC meetings:

- Continue to hold regular DSC meetings to examine data and identify strategies for adjusting implementation and improving student achievement outcomes. (See Appendix A for detailed agendas for meetings in Years 2 and 3.)

Host CS exhibitions:

Provide students with opportunities to:

- Share and be recognized for their CS projects, especially with industry representatives.
- Explore educational and career opportunities in CS
  Note: See Appendix D for information on setting up student CS exhibitions.

Review progress using continuous improvement:

- Collect data on student achievement, implementation, and other factors aligned with the program goals.
- DSC representatives analyze collected data and identify strategies for adjusting implementation and improving student achievement outcomes.

Adjust the program:

- Adjust implementation or plan adjustments for future implementation cycles.

Figure 2. Basic Steps to Implement a PACE Program

	Year 1	Year 2	Year 3
PLANNING AND SETUP			
Set up a District Stakeholder Council (DSC)			
Assemble a DSC, which should include representatives sufficient to ensure support for the program at all levels.	•		
Go through the series of DSC meetings for Year 1 that includes:			
Creating a CS goal and key metrics of change	•		
Understanding the CS curriculum	•		
Identifying potential challenges/issues	•		
Developing key metrics to assess the impact of your CS changes	•		
Developing a plan to address and monitor issues and implementation	•		
Planning for CS pathways into the high school curricula	•		
Provide Professional Development on your CS curriculum			
Teachers go through professional development on the selected high-quality CS curriculum.	•		
Provide Program Supports			
Set up structures to support teachers and administrators as they implement PACE. These could include communities of practice, coaching, and other supports to sustain implementation.	•		
IMPLEMENT, EVALUATE, ADJUST			
Implement PACE Teachers and students engage in computer science curriculum.		•	•
Review Progress via Continuous Improvement Collect implementation data, both on student achievement and implementation.		•	•
Hold regular DSC meetings Examine data, and identify strategies for adjusting implementation and improving student achievement outcomes.		•	•
Adjust the program Adjust implementation or plan adjustments for future implementation cycles.		•	•

7 KEY IMPLEMENTATION STRUCTURES

These structures provide the backbone of the PACE program.

STRUCTURE: DISTRICT STAKEHOLDER COUNCILS

The PACE DSC oversees and leads the implementation of CS pathways in the district. Over the course of four planning meetings in year one, and additional sessions in subsequent years to review progress, DSC members:

- Build their capacity to develop a vision for their initiative through a deep understanding of what CS contributes to their community
- Identify implementation and sustainability challenges
- Determine how to address challenges through continuous improvement processes

This representative and inclusive stakeholder group is the main support for systemic change in the district. This group will work to accomplish the following:

- Lead CS efforts
- Engage in strategic planning
- Make recommendations to the superintendent
- Align systems and structures to support development of a CS pathway
- Engage in continuous improvement to test change practices and to readjust efforts when and if needed

The DSC has two overarching goals:

1.

Plan and manage implementation of a rigorous standards-aligned CS pathway

2.

Develop local capacity to lead systems-informed continuous improvement efforts to plan, manage, and scale CS for all

Table 1. DSC timeline

Year 1	Year 2	Year 3
• Building an understanding of the CS curriculum • Planning for implementation • Developing equity strategies • Aligning systems and structures	• Implementing CS courses • Engaging in data-based decision-making • Testing change practices for improvement	• Implementing CS courses • Engaging in data-based decision-making • Planning for scale

Representation: DSCs are made up of 10–15 members representing a variety of district roles and perspectives. These could include district and school administrators, teachers, counselors and advisors, and student representatives. The inclusion of educators from local high schools can inform CS curricula decisions and create a seamless DLCS transition from middle school to high school.

Working Meetings: DSC meetings will last approximately 2–3 hours. These meetings are collaborative in nature and are structured so members have protected time to think and plan. Go to Appendix A for detailed meeting agendas for Years 1–3.

Cross-district sharing: Working with other districts' DSCs could afford the opportunity to share questions, ideas, and strategies with others.

STRUCTURE: HIGH-QUALITY, EVIDENCE-BASED COMPUTER SCIENCE CURRICULUM

One of the positives of PACE is that it can be tailored to state and local education contexts. Districts could use any high-quality, evidence-based CS curriculum that aligns with relevant standards and curriculum guidance, is flexible to the allocated instructional time (e.g., one month to one year), and was selected after a dedicated review and with input and buy-in from educators, students, parents, and administrators.

- For example, Massachusetts educators and administrators can refer to the *MA DESE Digital Literacy and Computer Science Curriculum Framework* and the *2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts* as they do their research.

CS Discoveries curriculum

- Many (but not all) of the PACE program pilot districts used the Code.org *CS Discoveries* curriculum. Developed by Code.org, the *CS Discoveries* curriculum is a free, introductory computer science course for middle and early high school students (grades 6-10) that emphasizes creativity, problem-solving, and collaboration through hands-on projects like websites, apps, animations, and physical computing devices. It covers topics such as the problem-solving process, web development, programming, data analysis, and physical computing, and is designed to be flexible, fitting into various timeframes from a month to a full school year.

Key Features:

Wide-range of topics: The curriculum takes a broad approach to computer science, exploring foundational concepts like problem-solving, programming, and the impact of technology.

Hands-on projects: Students learn by creating their own projects, including website, animations and games, and apps.

Beginner-friendly: It is designed for students and teachers with no prior computer science background.

Modular and Flexible: The course can be taught as a single semester, a full year, or in modular units, depending on the needs of the classroom.

Support for Teachers: Code.org provides detailed lesson plans, teaching resources, and a supportive community forum to help new-to-CS teachers feel confident.

STRUCTURE: PROFESSIONAL LEARNING

Professional learning is key to the successful implementation of PACE. Each high-quality curriculum offers professional learning opportunities; to equip teachers with the tools and knowledge they need, be sure to engage teachers in those activities. Professional learning activities can include:

- **Training on the curriculum, either in-person or online.** Curriculum training that includes teaching strategies and how to use them with the curriculum has been shown to be the most effective. In-person training usually occurs in the summer and may require travel and accommodation so plan ahead.
- **In-person coaching support.** Coaching supports teachers in implementing the curriculum as effectively as possible and helps teachers troubleshoot classroom issues. Coaching support is most effective when started early in implementing the curriculum. Regular coaching sessions help to address ongoing issues as well as new issues that arise.
- **Communities of Practice (CoPs).** CoPs offer an opportunity for teachers to share implementation challenges and solutions with other teachers. CoPs are often virtual and meet monthly or bimonthly.

The following are examples of professional learning opportunities offered by Code.org aligned to the *CS Discoveries* curriculum. See also the professional learning options suggested by other curricula, as well as Appendix C, for resources to supplement and guide your PACE instruction.

CS Discoveries Support

The *CS Discoveries* page offers curriculum resources as well as resources and workshops on teaching. Scroll down to *"Resources that support you every step of the way"* for lesson plans, videos, slides, assessments, and progress monitoring tools. Scroll further to *Preparing to Teach Computer Science Discoveries* for prep courses. (You may need to create a free account.)

In addition, the Teach section of Code.org offers other computer science professional learning sessions.

- Self-paced courses are offered online. Filtering by the middle grades and by the CS Discoveries curriculum brings up courses ideally suited to support PACE teachers. For example, see the *Teaching CS Discoveries* three-hour course covering Web Design, Physical Computing, and Data Programming.
- Facilitated workshops are delivered through regional partners. (E.g., CSforMA is the Massachusetts regional partner, and offers multi-day workshops in the summers.)
- The Teacher Community includes a CS Discoveries Forum where educators post resources and pose questions about the curriculum. You can access these, along with many other resources, through the Teach tab of the Code.org site.

From self-paced courses to summer workshops, Code.org offers flexible ways to strengthen CS teaching.

8
KEY LEVERS FOR LEADING DISTRICT-LEVEL SYSTEMS CHANGE

In 2025, members of the PACE research and evaluation team conducted interviews with school staff, leadership, and students of the six participating districts to gather guidance for other districts that seek to strengthen their own CS pathway. These interviews revealed that to see CS thrive in settings where it has not been before, the work must begin with establishing a shared vision for CS education and supporting students and staff. (The PACE initiative combined a set of strategies to guide districts toward building that vision and a supportive infrastructure for CS.)

Further, these interviews identified the key levers that contribute to sustainable district change, as well as actionable steps and cautions that can guide planning. These are provided here as *Key Levers*, with accompanying statements from those interviewed.

KEY LEVER 1: Leadership support is crucial, but District Stakeholder Councils make the work sustainable and scalable.

The PACE program included the establishment of District Stakeholder Councils (DSCs), a group of teachers, administrators, counselors, and community members who met at least four times a year to lead and oversee the implementation of a robust CS program. (See the section on DSCs above.) The DSCs helped maintain momentum during turnovers in the central offices of multiple districts.

Guidance from Practitioners

- It was helpful to have an external facilitator who served to keep the work moving forward and brought the group together. The facilitator took responsibility for arranging schedules, setting an agenda, and leading the discussion.
- Modest stipends provided to DSC participants helped some to overcome their hesitancy to take on leadership roles around CS and indicated that the DSC was a meaningful commitment that was important.
- It was important for the DSC to have tangible products and artifacts that marked its work. For example, the vision statement provided a clear purpose for what the group was going to do together.
- The DSC meetings provided a space to coordinate CS activities and make CS programming consistent across grades and courses.

KEY LEVER 2: Establish CS as a school and district priority on the course schedule.

Districts must be willing to create urgency and establish CS as a priority by getting it on the master schedule for all students. One PACE leader emphasized the importance of ensuring that each student is guaranteed exposure to CS.

Guidance from Practitioners

- Many districts faced logistical challenges to get CS on the schedule for all students, but in the end, all were successful. To create urgency, an important strategy was to highlight how CS aligns with state and local policies, such as the Massachusetts CS standards, and district strategic plans.
- Even if your goal is to improve CS across K–12, it's strategic to start with a focus on the middle grades, which can then be tied into the other grade spans. Also, practitioners noted that it's easier to get girls interested in CS in middle school than in high school.
- Teachers and administrators have a role to play in communicating to students that CS is a priority. Practitioners recommended taking the time to "sell" CS courses to students and to make course titles relevant and engaging as a way to increase enrollment—especially enrollment by girls specifically.

[You need to] build in consistent exposure for all students, because they don't know what they don't know. Get CS in front of them. We wouldn't have done this step without PACE but [adding CS to each student's schedule] is a very good way to get started as a district- and systems-strategy.—*PACE leader*

KEY LEVER 3: Make sure to have the building blocks needed to create a CS infrastructure—collaboration, coordination, and materials.

Creating a districtwide infrastructure for CS requires time, which needs to be used purposefully to create systemic levers. For example, librarians in one district had led units on programming through Scratch, but it wasn't until they joined PACE and worked with a liaison that it was done systematically and made available to all students to the same extent.

Guidance from Practitioners

- Think critically about the materials used in your CS curriculum. PACE participants found it valuable to have colleagues, either in their school, district, or community of practice, with whom they could review materials. These networks were especially valuable because PACE teachers noted that they benefited from collaborating with their colleagues to apply the new curricular materials in their classes.
- Coordination across grades and elementary, middle school, and high school grade spans is necessary. In PACE, the DSC meetings provided a dedicated time and process for these levels of coordination.
- Similarly, DSC meetings and CS-focused community events provided participants with valuable opportunities to learn collaboratively. These opportunities were not available prior to the PACE initiative, when many CS teachers worked in isolation.

KEY LEVER 4: Take steps to build staff confidence to get buy-in to CS.

PACE participants said that districts should expect to have to build CS capacity among staff, and that staff, like students, may not see themselves as CS experts and leaders. One PACE district administrator underscored the need to build trust among staff.

> **From the administrative perspective, it's about building relationships with teachers so that they're comfortable taking these academic risks—bringing in new curriculums, and sometimes it doesn't go well, or sometimes certain robotics aren't the right fit, and kids get crazy sometimes when they have these things in their hands. So, creating that atmosphere where there's an understanding that it's okay to take these academic risks, let's try it together. If you're a partner with these teachers, you're in it with them. You're willing to take these risks with them. So just developing those relationships is key.**—***PACE district administrator***

Guidance from Practitioners

- Ensure that your plan includes time for staff to get used to the CS materials and curriculum. Many staff were doubtful or uncomfortable when PACE began (even if they had a CS certification). However, over time and with support, they found that their comfort level with their roles in supporting CS instruction grew.
- Access to professional development (PD) was a major help to CS teachers. Multiple participants noted that the Code.org PD was a good match for them and provided a good foundation and entry into CS instruction.
- The use of stipends for participation in PD and the DSC helped several teachers overcome their initial hesitancy and served as motivation for entering into the work.
- Instruction in CS is different than instruction in other courses, as the teacher's role is more frequently facilitating rather than leading direct instruction. This was an adjustment for some teachers, and they needed time to adapt.

KEY LEVER 5: Don't just analyze data—look for warts. To create a stronger CS pathway, you need to have good data and be willing to look at it critically.

In one PACE district, an initial analysis of student enrollment in CS courses at the department level found no discrepancies. However, a closer examination revealed large gender differences at the class level, with many more boys than girls in a CS Advanced Placement class, and many more girls than boys in a digital literacy course. Through discussions facilitated by the PACE liaison, the DSC identified increasing the representation of girls in the AP class as an area of focus in their CS planning.

Guidance from Practitioners

- Key information about participation and achievement in CS can be hidden in some datasets. For example, practitioners noted that gender discrepancies were only apparent when looking at the most rigorous CS courses and were not apparent when looking at CS enrollment across all courses.
- It's important to distinguish between digital literacy and CS courses when looking at enrollment, as CS courses tended to focus more squarely on CS skills and knowledge and had gender discrepancies in enrollment.

MIDDLE SCHOOL STUDENT PERSPECTIVES ON COMPUTER SCIENCE TEACHING AND LEARNING IN PACE

PACE researchers conducted a series of focus groups with middle school students at PACE schools. Here, we present themes from the focus groups to highlight student perspectives of their CS courses, including:

- Aspects of CS courses that helped them learn or made it harder for them to learn
- Advice to school leaders and teachers for creating engaging CS courses
- Factors that influenced their decisions for continuing with CS courses in high school

What students viewed as key aspects of CS instruction that contributed to their learning.

- Students appreciated that their CS courses allowed them to learn from their mistakes by giving them opportunities to revise and improve their work. They contrasted this with other classes where mistakes often carry penalties, highlighting CS as a safe environment for experimentation and exploration.
  - "I can make something, and then I can see, I can say, that didn't work, and then I can go back, and I can fix it again and again until it's perfection..."
- Students appreciated how CS class promoted problem-solving and critical thinking through open-ended challenges.
  - "We started from nothing and ended up making a project."
  - "I liked having a problem to solve and the freedom to figure it out."
- However, some students also noted that some CS classes had a lot of structure and limited opportunities for flexibility, and this had a negative impact on their interest in the class.
  - "It didn't really feel like I was making something. It felt like I was filling in a worksheet."
  - "Felt like I wasn't doing it on my own...it was guided."
  - "We didn't really make a website...it was just Code.org, so it didn't feel real."
- Students valued the opportunity to do work with student partners and to share and develop ideas together in their CS classes. This collaboration helped them approach problems from multiple angles.
  - "You get to work with partners, so that's like fun."
  - "Definitely the groups [is something good about CS class]. I feel like the group should play a big role on it."
- CS stood out as more engaging than other classes because it features more hands-on and real-world applications than other subjects, such as building, designing, coding, and using physical tools (e.g., robots).
  - "I think, in 6th grade you just did basic coding, but, in 7th and 8th, we got to do more of the projects and everything which made [it better]."
  - "We started to realize it's more applicable to real life stuff."

Insight from students on their decision-making for continuing on a CS pathway.

- Students' decisions about continuing with CS in high schools weren't only based on their interest in CS. It also reflects their interest in taking other, newer, and engaging electives that were not offered previously. Even if they enjoy and see value in CS courses, they may opt for another class that reflects a different interest.
  - "I feel like [computer science] is interesting, and I wouldn't mind taking a class like learning more about it, but at the same time, I'm open to more new things."
  - "Wouldn't mind doing it again, but I'd rather do more new things."
  - "I'm kind of interested more in the building aspect and like plumbing and putting things together to solve problems."
- Students evaluated their interest in CS through their perception of its relevance to their career aspirations. However, students will likely need support in assessing if the connection to CS exists. They may miss its relevance to their long-term goals and see CS as only about "coding" or "making web pages" and not as a broader discipline that contributes to many fields.
  - I want to be a psychologist... CS and psychology don't really go together."
  - "I want to go into cosmetology...it has nothing to do with coding."
  - "Maybe a pilot...doesn't seem like it connects to CS."
  - "Not sure if I'd need [CS] in medicine."

Advice gleaned from students for teachers and school leaders creating a CS pathway.

- Students value engaging in active project-based work over doing repetitive exercises. They want to apply their learning in meaningful and creative ways.
  - "I liked having a problem to solve and the freedom to figure it out."
  - "I prefer physical projects where you can build stuff and code with it..."
- Students see opportunities for teachers to provide them with the chance to explore, take risks, and learn from mistakes.
  - "Give students freedom to work on what interests them."
  - "Include students' personal interests in the projects."
  - "Poll the students to see what they think sounds fun and try to teach those things throughout."
- A CS curriculum that includes a range of CS topics keeps students interested and supports different passions—beyond just games or coding drills.
  - "Make it diverse—not just web design all year, but include game making."
  - "Include web design, and graphic art, too."
- Peer interaction and working in teams matter—social dynamics can enhance the classroom experience.
  - "We can bounce ideas off each other, and then we can come up with a big idea. And that's unlike our other classes."
  - "It's good that we, like, do it in partners because...if I was stuck, my navigator would help me."

9
HELP IS AVAILABLE!

The PACE program is designed as a framework, to guide districts as they implement practices for opportunity and achievement in CS education. **EDC can help you at any stage of this process, from planning to evaluating.**

Support could include a package of PACE Continuous Engagement Support, which includes monthly meetings and summer summits that bring together various CS, technology, and research change agents and participating districts. The goal of these events is to ensure districts recognize and address engaging pedagogies, as well as encourage and support students to explore, choose, plan, and complete CS pathways as part of their educational journeys. Activities could focus on working with:

DSC chairs and district administrators to change system structures to embrace CS and technology access and promote both student and educator development. EDC could work with you to in planning for systems change, monitoring through targeted data collection and analysis, and performing continuous improvement guided by the data.

Teachers to deepen teachers' knowledge and skills toward more engaging teaching practices within their classrooms and to build their capacity to motivate students from all backgrounds in CS education.

School counselors on strategies for engaging ALL students in CS.

Please contact the PACE support team to see how we can help!

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APPENDIX A – AGENDAS FOR DSC MEETINGS

This appendix contains DSC meeting agendas for Years 1–3 of the PACE program. They may be followed as is or adapted for your specific context.

YEAR 1

Meeting 1 – Readiness and Goal Setting

DSC members will develop a shared understanding of the PACE project including understanding the project's purpose approach and requirements and clarity on DSC district leadership roles for CS, and establish a common vision for a district CS pathway.

Pre-Work

- Read the *CS Landscape Overview* and be prepared to share both:
  - One fact that resonated with you/stood out to you
  - One fact that raises questions for you
- Review the CS Visioning Activity Cards, and select your top five reasons for a strong CS pathway in your district.

Handouts for the meeting: *CS Landscape*, *PACE Overview*, and *CS Discoveries*

History of the MA Computer Science Landscape

Overview of the CS Landscape

- CS Landscape Overview
- Overview of the historic CS landscape nationally and in MA
  - What facts stand out to you/resonate with you and why?
  - What facts raise questions for you?

Establishing a Common Vision for Computer Science

- Education for what?
  - The definition of *computer science* in the MA Frameworks for Digital Literacy and Computer Science comes from the Model Curriculum for K–12 CS at the national level: "Computer science is the study of computers and algorithmic processes, including their principles, hardware and software designs, applications, and their impact on society."
  - CS is not just about programming, nor is it only about using devices or applications. It revolves around what makes those devices and applications work and how we are affected by those phenomena.
- CS Visions Framework
  - Impact area review
    - » You each individually selected your own top five impact areas prior to the meeting. Take a look at everyone's impact areas to begin to work toward consensus on the district's top three impact areas in CS:
    - » What do you notice?
    - » What surprises you?
    - » What impact areas are most important to your district?
    - » Whittle it down to your top three impact areas and discuss as a group.
    - » Craft a vision statement.
    - » Using the rationales for education and the impact areas that are top priority for the DSC, craft a vision statement for CS that will guide your district.
- Each person writes a statement with the sentence stem "We believe in CS because…" in your shared Google doc.
- Group common statements together and have a discussion of how to combine everyone's thinking.

Homework

- Code.org registration
  - Complete Code.org registration and get access to *CS Discoveries*
- View this overview video (2:32) about *CS Discoveries. As you are viewing, consider:*
  - What questions does this video answer for you?
  - What new questions does this video raise for you, if any?
  - What parts of this video do you think would be most important for teachers in your district to see or understand?
- Complete the PACE District Landscape Survey.

Meeting 2 – CS Discoveries Curriculum and Identifying District System Supports and Gaps/Challenges for Development of a CS Pathway

DSC members will develop a shared understanding of the *CS Discoveries* curriculum and training and identify district system supports and gaps/challenges for development of a CS pathway.

Pre-Work

- Code.org registration
  - Complete Code.org registration and get access to *CS Discoveries.*
- View this overview video (2:32) about *CS Discoveries*. As you are viewing, consider:
  - What questions does this video answer for you?
  - What new questions does this video raise for you, if any?
  - What parts of this video do you think would be most important for teachers in your district to see or understand?
- Complete the PACE District Landscape Survey.

CS Discoveries Curriculum Review

Participants are assigned to three teams, with at least one teacher on each team. Each team reviews their assigned section of the CS Discoveries curriculum guide.

- Team 1: pp 1–4 overview; Unit 1; watch the Unit 1 video (*The Problem Solving Process with Zipline*) (in curriculum) and complete the first word search activity p.1 and the reflection on p. 5 in this sample student worksheet.
- Team 2: pp 1–4 overview; Unit 2; watch the Unit 2 video on (*Web Development: Intro to CSS*) (in curriculum) and do the CSS activities puzzle 5 and puzzle 6.
- Team 3: pp 1–4 overview; Unit 3; watch the Unit 3 video on (*Game Lab: Intro to Drawing*) (in curriculum) and do the activity in puzzle 4.

In these teams, discuss the following:

- *CS Discoveries* through the student lens
  - How will students experience this curriculum? What is exciting or unexpected?
  - What did you like and/or find difficult?
- *CS Discoveries* from the teacher perspective
  - In what ways does this unit support and/or challenge your current perception of CS education?
  - What do you predict teachers will like or find challenging?
  - How can inclusive teaching practices be used in this lesson to engage all students, including female students and students of color?
- Large group sharing and discussion
  - Large group discussion: What are common themes, challenges, implications for teacher support?
  - Next steps: what steps need to be taken as follow-up?

Assessing Your District System: Existing Supports for a CS Pathway

1. Revisit the district CS vision statement.

- Is there any part of the draft vision statement you would revise or remove? Why?
- Come to consensus on revised language

2. Participants will use the collaborative data study protocol below to examine district data to identify priority areas to focus DSC efforts to ensure the effective implementation and sustainability of a CS pathway.

Collaborative Data Study Protocol

- **Review** the purpose of examining the data and the question(s) the data are meant to address, in particular any areas that show issues related to equity.
- **Circulate** copies of the data (data infrastructure survey, data landscape survey, DESE CS data) in either graphical or visual ways to support thoughtful analysis. Each person silently studies the data and makes notes of observations and questions.
- **Ask** clarifying questions about the data. Make sure each person fully understands the organization and meaning of the data.
- **Observe** what you see in the data without judgement or interpretation.
- **Interpret/Infer** what the data reveal.
- **Identify** lessons learned.

Note: If your district chooses not to implement CS Discoveries but wants to align with the MA DLCS standards, review the "Grades 6–8 – Selecting Middle DLCS School Curricula" section of the *2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts* (pp 73–130) for core considerations, curricula, and tools.

Meeting 3 – Teacher Capacity and Supports

DSC members will develop a data-informed theory of change for district CS instruction and a shared understanding of CS Discoveries professional learning supports to build teacher capacity for CS instruction within the district.

Pre-Work

- Interview 1–2 district stakeholders (teacher, student, parent, business or community partner) about access gaps. Sample questions:
  - What do you already know, think, or feel about this gap?
  - What experiences or information have helped shape your perceptions?
  - Do you see this gap as an important one for our district to address? Why or why not?
  - What changes or new ideas do you think might help us address this gap?
  - What questions or concerns do you have about this gap and how we address it as a district?
  - What advice do you have for our team as we think about increasing access to CS for all our students?
- Review one promising practice provided by your TA lead when follow-up notes are sent.
- Read "Chapter 1: Build Common Purpose and Understanding" from EDC's *Building a Culture of Continuous Improvement: Guidebook and Toolkit.* Your DSC team will be using this approach to develop a driver diagram representing your theory of change for increasing access to CS for all students in your district.

Systems Analysis: Developing a Theory of Change

Goal: Districts will model and synthesize their goals, needs, and drivers for change into an actionable theory of change to inform strategic planning and continuous improvement for CS instruction.

1. Participants review the driver diagram and reflect on how the Assessment, Improvement, and Monitoring (AIM), gaps and root causes, and drivers have emerged from your discussions and data analysis.
2. Participants mark up the draft driver diagram in response to the prompts below:
   - AIM/Goal: Does this accurately reflect your district CS vision statement?
   - Primary drivers – Does this reflect the priorities and key levers for change identified by this group? What is missing or needs to be changed?
   - Secondary drivers – What is missing or needs to be changed?

- Understanding secondary drivers: Stakeholder interviews:
  - Pair/Share:
    1. Participants pair/share while keeping the editable driver diagram webpage open.
    2. Pairs share who they interviewed, what they learned, and how their findings might influence either the primary drivers, secondary drivers, or potential change practices.
    3. Pairs type any suggested changes based on stakeholder interviews into the notes field at the bottom of the editable driver diagram.

Exploring Change Practices

Goal: Develop a shared understanding of what a change practice is, and explore the key elements of one change practice in depth.

Surfacing existing change practices:

1. Working in the editable driver diagram, participants should add change practices that they already are currently trying or have in place.
2. Once a list has been generated, discuss each practice one at a time as a whole group, using the following questions to guide discussion:
   - What drivers does this change practice support?
   - Do any practices listed not connect to a driver?

Change Practice Deep Dive: CS Discoveries Summer Training

1. Review scope and sequence for summer training, including format, content, and follow-up support.
2. Discuss the following questions:
   - What primary or secondary drivers might this PD address?
   - How will we know if it is actually supporting those drivers? What data could we gather to find out?
   - What else might we need to do or provide to better support these drivers?
3. Share out additional supports needed and record them in the DSC action planning document.

Homework

4. Review *MA Innovation Pathway Criteria* and *High Quality College and Career Pathways*. *After reading, complete the District Pathway Development Survey*. See this survey in (Appendix B - Surveys.)
5. Review the "High School Curricula and Tools" section of the *Massachusetts K-12 Computer Science Curriculum Guide* (pp 63–86). Choose three resources that you think may be promising to implement in your district as a follow-up to *CS Discoveries*, and be prepared to share why you think they are a good fit for your district context.

Meeting 4 – DSC Leadership and Strategic Planning

DSC members will develop a shared understanding of specific high-priority gaps to be addressed through CS pathway development, clear leadership roles, and talking points to communicate to key district stakeholders about *CS Discoveries*, high priority change practices to test that support establishment of a CS pathway, and identification and alignment of systemic supports and standards alignment for 8th grade CS pathway offerings.

Pre-Work

- Review MA Innovation Pathway Criteria and High-Quality College and Career Pathways. After reading, complete the survey provided at this link.
- Review the "Grades 9–12 – Selecting High School DLCS School Curricula" section of the *2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts* (pp 131–172) for core considerations, curricula, and tools. Choose three curricula that you think may be promising to implement in your district as a follow-up to CS Discoveries and be prepared to share why you think they are a good fit for your district context.

Exploring Curriculum Options for Pathway Development

Goal: Explore district-appropriate 8th and 9th grade CS scaffolding experiences that will prepare students for the AP CS Principles course and exam.

1. Participants review the existing CS course offerings in the district by grade level and identify overlaps and gaps in CS offerings.
2. Identify possible additional course offerings that would help to develop a coherent CS pathway using the *2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts* (updated June, 2025) to identify possibilities.
3. Come to agreement on possible course offerings and next steps for implementing them.

Promising High-Impact Change Practices

Goal: Participants choose high-impact change practices they would like to explore further.

1. Review the two high-quality guiding principles that the DSC has identified as highest priority and the change practices associated with them.
2. In two breakout groups, one for each guiding principle, discuss:
   - What key structures and processes seem to be essential to this change practice?
   - Do you or anyone in your district have experience with this practice? What have you learned from these experiences?
   - How does this change practice promote or support access for all students?
3. Is this a promising practice to explore for our district? What more would you like to learn about it?

YEAR 2

Meeting 1

DSC members will support implementation of middle school CS courses and high school pathway courses through continuous improvement practices. DSC will study data collected on change practices identified in Year 1 to determine improvements that should be made.

Pre-Work

- Review CS goal, theory of change, and change practices identified in Year 1 and be prepared to share:
  - Any changes to the goal, theory of change, and/or change practices you think would help your district
  - Ways to determine whether the change practices are being implemented as planned
  - Key metrics to determine if you are achieving your goals

Review district CS goal, theory of change, and change practices identified in Year 1.

Goal: DSC members agree on the goal, theory of change, and change practices to focus on for Year 2

- Review the CS goal, theory of change, and change practices and ask:
  - Does this goal still meet the needs of the district?
  - Are any changes to the goal needed to better meet the needs of the district?
- Given what we know are the root causes of CS-related issues, are the drivers and change practices in the theory of change the ones that will most likely lead to achieving the goal?
- Are any changes needed to the drivers and change practices to better achieve the goal?
- Have the change practices discussed as priority changes to implement been incorporated into the theory of change?
- Make any changes to the CS goal, theory of change, and change practices as a result of the discussion.

Create a continuous improvement plan for identified change practices.

Goal: To develop a plan to collect implementation and outcome data for each change practice and determine when to study the data for improvement.

- Create a measurement plan for each change practice:
- Determine how you will know whether the change practice is being implemented as planned.
- Determine near-term measures for knowing if your change practice is having its desired impact.
- Determine who will create the measures (if needed), who will collect and compile the data, when the data will be collected and compiled, and when the data will be studied to inform improvements.
- Use the Continuous Improvement Planning Template in Appendix G to help you keep track of data to be collected and record learnings from studying the data.
- Create a DSC meeting schedule based on the data review plan and assign tasks as outlined in the continuous improvement plan.
- Based on the continuous improvement plan, create a DSC meeting schedule. Future DSC meetings will be used to examine continuous improvement data to inform improvements to implementation.
- Assign tasks for team members based on the continuous improvement plan. These will include implementing change practices and collecting and compiling continuous improvement data to be shared with the DSC prior to the next meeting.

Homework

- Prior to the next DSC meeting, implement change practices agreed upon in the last meeting and collect and compile continuous improvement data for those change practices.
- DSC members should review the compiled data prior to the next DSC meeting and be ready to discuss the following questions:
  - What clarifying questions do you have about the data?
  - What patterns and trends do you see in the data? (use sentence stems: “I see…” “I notice…” “I observe…” “The patterns and trends I see are…”)
  - What interpretations and inferences can you make from these patterns and trends?
  - What do these interpretations and inferences suggest as next steps? Should you make a change to improve implementation of the change practice? Should you make a change to the change practice to make it more effective? Should you abandon the change practice and try something else instead?

Meetings 2–4

The remaining meetings in Year 2 will use the following agenda.

DSC members will review continuous improvement data to learn how implementation of change practices is going and determine potential improvements to better achieve goals.

Pre-Work

- Collect and compile continuous improvement data for change practices to study at the scheduled DSC meeting.
- DSC members should review the compiled data prior to the next DSC meeting and be ready to discuss the following questions:
  - What clarifying questions do you have about the data?
  - What patterns and trends do you see in the data? (use sentence stems: "I see..." "I notice..." "I observe..." "The patterns and trends I see are...")
  - What interpretations and inferences can you make from these patterns and trends?
  - What do these interpretations and inferences suggest as next steps? Should you make a change to improve implementation of the change practice? Should you make a change to the change practice to make it more effective? Should you abandon the change practice and try something else instead?

Study continuous improvement data for improvements to change practices.

Goal: To understand how implementation of change practices is going and whether they are achieving their aims.

- The person who collected and compiled the data for the meeting reviews how they collected and compiled the data.
- Each team member reviews the compiled data silently and asks any clarifying questions as they come up.
- Each team member says one pattern or trend they observed in the data using sentence stems "I see..." "I notice..." "I observe..." "The patterns and trends I see are..."
- Meeting facilitator summarizes observations and facilitates a conversation about what these patterns and trends indicate. What interpretations and inferences can you make from these patterns and trends?
- The team brainstorms and agrees upon next steps to take as a result of the data. These could be:
  - Make a change to improve implementation of the change practice
  - Make a change to the change practice to make it more effective
  - Abandon the change practice and try something else that might be more effective
  - Continue implementing the change practice and scale to new settings
- The team documents the results of the data study and next steps in the continuous improvement template. If necessary, make changes to the continuous improvement plan (what data to collect and when as well as when to study data).

Homework

- Collect and compile continuous improvement data for change practices to study at the next DSC meeting.
- Team members review data prior to the next meeting so they can be prepared to discuss.

YEAR 3

Meetings 1–4

Year 3 meetings use the following agenda.

DSC members will review continuous improvement data to learn how implementation of change practices is going and determine potential improvements to better achieve goals.

Pre-Work

- Collect and compile continuous improvement data for change practices to study at the scheduled DSC meeting.
- DSC members should review the compiled data prior to the next DSC meeting and be ready to discuss the following questions:
  - What clarifying questions do you have about the data?
  - What patterns and trends do you see in the data? (use sentence stems: "I see..." "I notice..." "I observe..." "The patterns and trends I see are...")
  - What interpretations and inferences can you make from these patterns and trends?
  - What do these interpretations and inferences suggest as next steps? Should you make a change to improve implementation of the change practice? Should you make a change to the change practice to make it more effective? Should you abandon the change practice and try something else instead?

Study continuous improvement data for improvements to change practices.

Goal: To understand how implementation of change practices is going and whether they are achieving their aims.

- The person who collected and compiled the data for the meeting reviews how they collected and compiled the data.
- Each team member reviews the compiled data silently and asks any clarifying questions as they come up.
- Each team member says one pattern or trend they observed in the data using sentence stems "I see..." "I notice..." "I observe..." "The patterns and trends I see are..."
- Meeting facilitator summarizes observations and facilitates a conversation about what these patterns and trends indicate. What interpretations and inferences can you make from these patterns and trends?
- The team brainstorms and agrees upon next steps to take as a result of the data. These could be:
  - Make a change to improve implementation of the change practice
  - Make a change to the change practice to make it more effective
  - Abandon the change practice and try something else that might be more effective
  - Continue implementing the change practice and scale to new settings
- The team documents the results of the data study and next steps in the continuous improvement template. If necessary, make changes to the continuous improvement plan (what data to collect and when as well as when to study data).

Homework

- Collect and compile continuous improvement data for change practices to study at the next DSC meeting.
- Team members review data prior to the next meeting so they can be prepared to discuss.

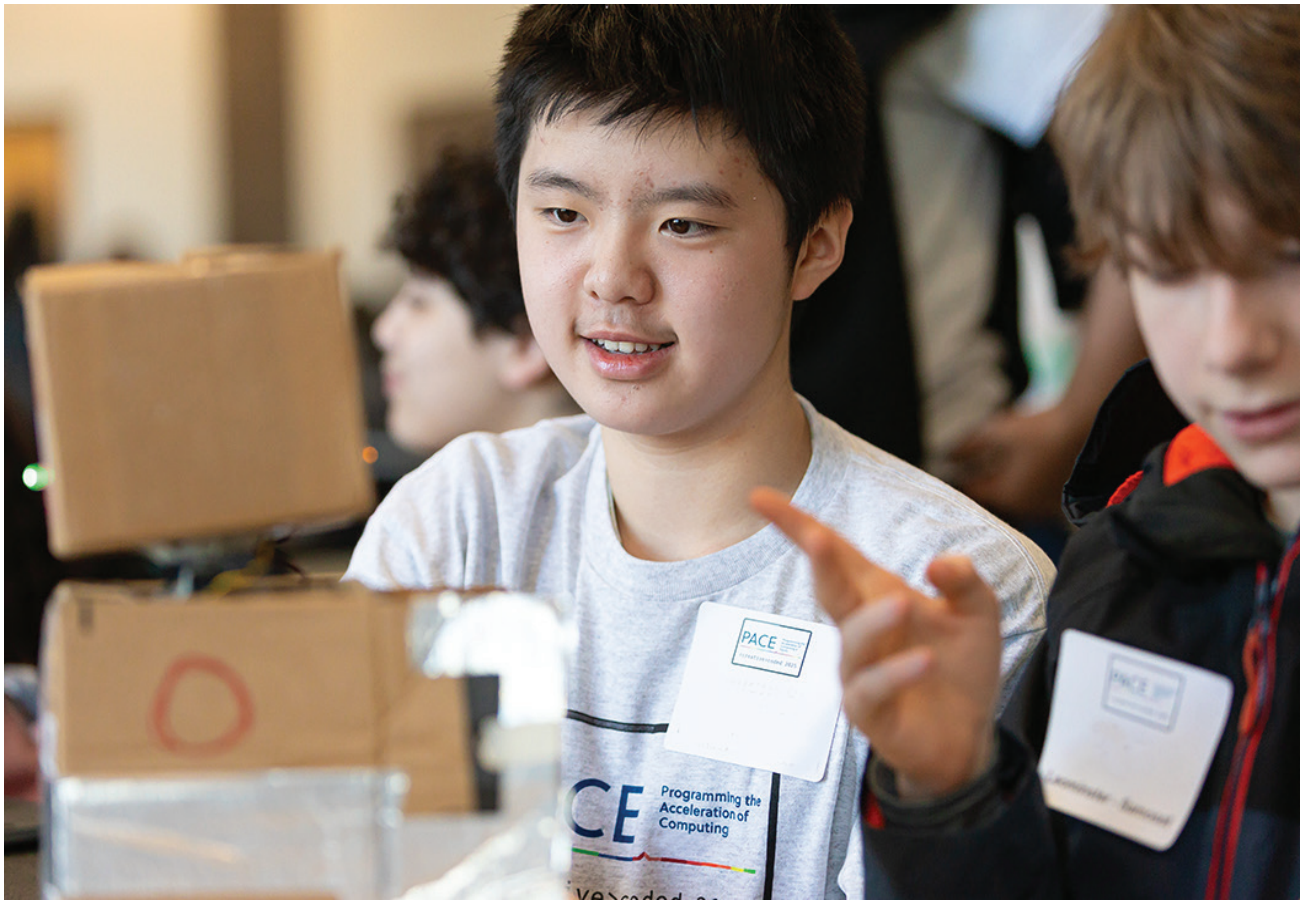
APPENDIX B – SURVEYS

The PACE initiative team developed two surveys for districts to use planning their own PACE implementation and to assess student interest, both prior to and after participating in the program. The surveys appear in full on the following pages.

PACE K-12 District Infrastructure for Computer Science Survey — page 41

PACE Student Interest in Computer Science Survey — page 52

DISTRICT Pathway Development Survey — page 57



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PACE Programming the Acceleration of Computing Education

PACE K-12 District Infrastructure for Computer Science Survey[1]

How long will the survey take to complete?
The survey should take no longer than 25 minutes to complete. If there are questions that you are unable to answer and need to pause to reference materials or information, it may add to total completion time.

What is the purpose of this survey? This survey collects information about the systemic supports, resources, and processes currently in place in your school district for computer science education. It is aligned to frameworks for strong district infrastructure, and was developed by the Programming the Acceleration of Computing and Education project by Education Development Center, with funding from the U.S. Department of Education.

Survey Sections

Section 1. Continuous Improvement
Section 2. Computer Science Curriculum and Materials
Section 3. Computer Science Leadership
Section 4. Computer Science Teacher Capacity and Development
Section 5. Computer Science Partnerships
Section 6. Community Engagement in Computer Science
Section 7. Implementation of Computer Science Infrastructure

The contents of this survey were developed under a grant from the U.S. Department of Education, Education Innovation and Research (EIR) Program. However, those contents do not necessarily represent the policy of the U.S. Department of Education. And you should not assume endorsement by the Federal Government.

[1] The PACE District Infrastructure for Computer Science Survey is based on the CSforAll SCRIPT (Strategic CSforAll Research and Implementation Planning Tool) rubric. CSforALL (2018).

1. Are there any major initiatives (including, but not limited to computer science) underway in your school/district this year? (select all that apply).

- ☐ Digital Now
- ☐ Project Lead the Way
- ☐ School to Work
- ☐ Career and Technical Education (CTE)
- ☐ Social Emotional Learning (SEL)
- ☐ Literacy Mathematics
- ☐ Project Based Learning
- ☐ Workforce Development
- ☐ SCRIPT
- ☐ None of these initiatives are underway in my district
- ☐ Other _____

Section 1. Continuous Improvement

Continuous improvement is an applied science that emphasizes innovation, rapid and iterative cycle testing in the field, and scaling in order to generate learning about what changes produce improvements in particular contexts (Institute for Healthcare Improvement, 2015). The outcomes of each cycle inform the revision, development, and fine-tuning of practices.

For each of the questions below, please indicate which option best describes the continuous improvement initiatives that are in place in your district.

2. Does your district have a continuous improvement initiative in place?

- ○ Our district has a data-based continuous improvement initiative and the initiative itself is also subject to continuous improvement processes.
- ○ Our district has a data-based continuous improvement initiative.
- ○ Our district has a continuous improvement initiative but does not use data to inform decisions.
- ○ No continuous improvement initiative.

2a. Does your district have systematic engagement in the continuous improvement initiative?

- ○ Teachers and staff have access to continuous improvement planning documents and reports. Continuous improvement teams include individuals from all levels (support, classroom, building, central office) of the district. An organized professional learning community exists for continually improving CS education in the district.
- ○ Our district has regular continuous improvement meetings. Continuous improvement practices are developed during in-service trainings.
- ○ Our district has infrequent continuous improvement meetings. There is no coherent team addressing CI initiatives.
- ○ No systematic engagement in the continuous improvement initiative.

Section 2. Computer Science Curriculum and Materials

The selection of appropriate, sequential, and vision-aligned computer science materials and curricula is done through a process that engages teachers and leaders. The selection process includes focus on sustainability, rigor, and inclusion of diverse students in the consideration of the curriculum and supporting materials.

For each of the questions below, please indicate which option best describes the computer science instruction in place in your district.

3. How well does your district select computer science curricula?

- ○ The selected CS curricula is sequential, and student learning builds each year in alignment with national standards and other district initiatives. There is a process for both grade level and multiple grade teams to meet and discuss or refine the curriculum based on individual needs of schools/students.
- ○ One or more CS curricula is selected with communication between teachers and across grades. Selected CS curricula address a majority of relevant state or national CS Education standards or K-12 CS Framework concepts and practices.
- ○ Some CS is taught in schools and the CS curriculum is selected by individual teachers with no communication for pathway options.
- ○ No CS curriculum selected for any grade levels.

4. How well are computer science classes sequenced and aligned in your district?

- ○ The vision and 12th grade outcomes for students are clearly defined and all teachers of CS can describe how their curriculum fits in a multiyear sequence to arrive at those outcomes. Additionally, advanced pathways or electives exist for students who would like to pursue

either more rigor (advanced placement or dual enrollment) or a specific flavor of CS (media arts or web design).

- ○ Curricular activities are aligned to K-12 DLCS standards or the K12 CS framework. Activities are sequential and connected to the vision/outcomes for the school or district.
- ○ CS curricular activities are developmentally appropriate for students but are disconnected and do not have a clear sequence to 12th grade for students.
- ○ There is no alignment or progression to any CS activities that occur in the district. (Schools may engage in one-off activities like Hour of Code, but do not sequence the activities for student learning).

5. How well are diverse learners supported with CS materials in your district?

- ○ Working groups of CS/content teachers and special education teachers proactively review curricula and materials for accessibility and potential bias. Together, the teams produce guidance documents for all teachers with best practices in the project-based computer science classroom. The teams apply Universal Design for Learning (UDL) principles used in other disciplines for potential areas of relevance.
- ○ Teachers use Universal Design for Learning principles when creating CS materials for diverse learners. The teachers are connected to appropriate special educators and the teams have district support for necessary material development and refinement.
- ○ Individual teachers create CS materials for diverse learners based upon a limited understanding of students in their class.
- ○ There is no support for the creation or identification of CS materials for diverse learners.

Section 3. Computer Science Leadership

The selection of appropriate, sequential, and vision-aligned computer science materials and curricula is done through a process that engages teachers and leaders. The selection process includes focus on sustainability, rigor, and inclusion of diverse students in the consideration of the curriculum and supporting materials.

For each of the questions below, please indicate which option best describes the ways leadership works to support CS instruction.

6. What role does district-level leadership play in the planning and development of CS curriculum?

- ○ District leadership proactively establishes a clear vision and plan that includes incentives for plan execution and engagement with CS education activities.
- ○ District leadership actively participates in vision and goal setting activities for CS and coordinates across schools for coherent CS objectives.
- ○ District leadership recognizes CS education efforts but is not engaged in coordination or shared planning processes (if they exist).
- ○ District leadership does not play a role in CS education efforts in the schools.

7. What role does school-level leadership play in the planning and development of CS curriculum?

- ○ Leadership teams make use of data about CS education enrollment and student performance to guide discussions of CS education. The leadership team actively encourages the participation of teacher leaders and collaborates with other schools for best practices and shared experiences. Schools feel connected to CS education outcomes and supported in the pursuit of those outcomes for specific needs of school populations.
- ○ A representative sample of school leaders participate in vision and goal setting activities for CS, and all schools have leaders who are aware of district CS activities and given opportunities to provide feedback on initiative priorities based on individual school needs.
- ○ School leadership recognizes CS education efforts but is not engaged in coordination or a shared planning process in their school.
- ○ School leadership does not play a role in CS education efforts in their school.

8. What role does school personnel (support teachers and staff) play in the planning and development of CS curriculum?

- ○ Library media specialists, special educators, and guidance counselors are provided opportunities to engage in CS education PD as appropriate for their roles. They also regularly communicate with teachers and leadership teams about CS education plans and useful connections to their work.
- ○ Library media specialists are aware of and participate in CS education activities in the school. Special educators are engaged in CS education planning, weighing in about curricular and tool choices and how they impact diverse learners. Guidance counselors are

supported with information about pathways for students who are interested in CS, as well as the benefits of CS as a minor for students with other interests.

- ○ School personnel are aware of CS education efforts but are not engaged in coordination or shared planning processes.
- ○ School personnel do not play a role in CS education efforts in the schools.

9. Which of the following best describes your district's plan for computer science education?

- ○ A CS education plan exists that is updated regularly and has the ability for individual schools to use locally with different implementation. The plan was created with a shared process. The plan is actionable, flexible as necessary for multiple schools, and aligned with the district goals.
- ○ A CS education plan exists that was created with a shared process. The plan is actionable, flexible as necessary for multiple schools, and aligned with the district goals.
- ○ A CS education plan exists but does not use a shared process for its creation, and is not specific, actionable, or aligned with district vision for CS education.
- ○ The school district does not have a documented plan for CS education efforts.

10. Which of the following best describes the way computer science education is implemented in your district?

- ○ Data is regularly collected and shared to help drive planning process and updated goals. The implementation of CS education in the district is goal- and vision-aligned. There is coordination of pathways and progressions for students across grades. All students are engaged in CS education efforts, especially traditionally under-represented minority groups and at-risk populations.
- ○ The implementation of CS education in the district is goal and vision aligned. There is coordination of pathways and progressions for students across grades. All students are engaged in CS education efforts, especially traditionally under-represented minority groups and at-risk populations. However, there is no regularly collected data that is incorporated into the process.
- ○ The implementation of CS education is teacher-led with little coordination for pathways or progressions. Electives may be offered at individual schools, but no connected sequence of courses exists.
- ○ There is no implementation of CS education within the district.

11. Which of the following best describes the computer science outcomes that have been set by the district?

- ○ Community level outcomes exist regarding parent education, community engagement, and informal learning opportunities for students. Student level outcomes exist aligned to state/national standards where appropriate. Teacher level outcomes exist related to Teacher development.
- ○ Student level outcomes exist aligned to state/national standards where appropriate. Teacher level outcomes exist related to Teacher development. There are no community level outcomes.
- ○ Course or program level outcomes exist (e.g. offer a class, run an hour of code).
- ○ There are no defined outcomes for CS education within the district.

Section 4. Computer Science Teacher Capacity and Development

All teachers have an understanding of the CS education initiatives in the district, and opportunities for integrated CS projects. Teachers with responsibility for CS content have clearly defined opportunities to learn computer science and expand their pedagogical fluency. There are well defined incentives for participating in such professional development opportunities.

For each of the questions below, please indicate which option best describes the computer science capacity building in your district.

12. Which of the following best describes the computer science teacher professional development in your district?

- ○ Teacher CS professional development is chosen to align with district vision and goals, and teachers are supported in the selection and attendance of the PD.
- ○ Teachers are supported in their selection of CS professional development opportunities and are connected to each other for coherent pathways and grade level consistency.
- ○ Teachers independently identify CS professional development opportunities and participate in CS orientation PD at their own discretion.
- ○ Teachers have not participated in CS education PD or have not had prior CS education experience.

13. Which of the following best describes the computer science teacher working groups in your district?

- ○ There are K-12 working groups for sequential CS education planning in the district, and outcomes from these groups are shared in district communication. Teacher working groups

use student data and artifacts to drive teacher development. Meetings are scheduled and participation is part of incentive structures for teacher performance rating and there is a consistently high attendance rate.

- ○ Teachers participate in CS working groups both at a local and national level as a part of their professional learning network (PLN). Teachers are supported and recognized for this work with PD hours or other standard district incentives for professional learning.
- ○ Participation in CS teacher working groups is entirely driven by individual teachers and mostly consists of participation in national communities such as CSTA or CSforALL Teachers.
- ○ There is no participation by teachers in working groups focused on CS education.

14. Which of the following best describes the district-level resources for the computer science teacher working groups in your district?

- ○ The district supports working groups of administrators and teachers in order to create relevant feedback frameworks for CS education and provide training for their implementation. District-level resources for administrators connect to best practices research for CS education.
- ○ Administrators work with teachers or district teams to understand the relevant goals and best practices in CS education for use in teacher observation and feedback.
- ○ Teacher feedback is aligned to best practices in CS education by individual administrators.
- ○ There is no support for administrators in the observation and teacher feedback and evaluation process for CS teachers or lessons containing CS content.

Section 5. Computer Science Partnerships

Partners are engaged entities who are connected to the district or schools through formal or informal partnerships. They represent trusted entities that can be used to provide opportunities for students or teachers.

For each of the questions below, please indicate which option best describes the computer science partnerships at your district.

15. Which of the following best describes the local partners (including informal education) that engage with computer science education in your district?

- ○ Local partners are included in the district planning and revision processes. Informal enrichment opportunities are included as a part of student pathway options, and efforts are made to engage local partners in curricular efforts for students and learning opportunities

for teachers. Local partners are connected with teachers for PD opportunities (teachers participating in informal activities) or for content specialists who can engage with teachers for knowledge and resource sharing.

- ○ Local partners are engaged by the school district for awareness and integration into any CS education plans. Communications for students and parents include enrichment opportunities from local partners in addition to classroom-based opportunities.
- ○ The district/teachers are aware of some local partners (e.g. Girl Scouts, community centers, etc.) who offer enrichment activities, and activities may be advertised in the school.
- ○ Local partners are not engaged with CS education efforts.

16. Which of the following best describes the professional learning partners that engage with computer science education in your district?

- ○ Professional learning partners are used not only by individual teachers, but as a part of larger development plans. Information from partners is used in CS education plan development and revision, and district activities are shared in relevant networks as exemplars and for feedback.
- ○ Engagement with professional learning partners is recognized by the district and CS education plan as a positive, and incentivized part of teacher development. Teachers new to computer science receive information about relevant partners in mentoring or advising sessions.
- ○ Teachers in the district are aware of and make use of professional learning partners for continued development. Examples could include participating in teacher associations (CSTA) discussion boards (Code.org, CSforAll Teachers) or social network communities (twitter chats, Facebook groups).
- ○ The district or teachers have not identified any professional learning partners outside the district for support.

Section 6. Community Engagement in Computer Science

The engagement of the local community is an important part of sustainability for CS education efforts.

For each of the questions below, please indicate which option best describes the level of community engagement with computer science initiatives in your district.

17. Which of the following best describes the ways families engage with computer science education in your district?

- ○ Teachers and guidance counselors not only share the parent resource, but also regularly review it for updates. The resource may include a calendar for partners and community members to add items (such as hackathons, summer workshops, etc.). Evening and weekend events are planned to engage families in CS education opportunities.
- ○ There is a developed resource for parents offering clarity around the CS education plan of the district, in-school pathways for students, extracurricular activities, and partner opportunities for enrichment.
- ○ Individual teachers or guidance counselors discuss CS education options with parents or families during back-to-school nights, open houses, or parent teacher conferences. District communications including flyers and newsletters include information about CS education efforts.
- ○ Families are not engaged or informed of CS offerings or student pathways.

18. Which of the following best describes the ways the local workforce engages with computer science education in your district?

- ○ Local workforce efforts engage with individual schools to provide materials for student pathways, and clarity for guidance counselors in recommending student experiences. The school community (teachers, students, parents, guidance, and administrators) understand the regional workforce efforts and leverage appropriate resources to supplement district resources.
- ○ Local workforce efforts are connected or consulted by the district in the development of CS education plans. Curricular selection and enrichment activities are designed to not only prepare students for college but also for potential career readiness opportunities locally. Local industry is engaged in opportunities to support district efforts through employee volunteer programs, support for events or initiatives, and engagement in district plans.
- ○ Individual teachers may connect to local workforce efforts, but there is little to no alignment between community workforce development and CS education programs. There may be connections to local industry for one-time events or gifts, but little connection between these interactions and the larger goals or plans of the district.
- ○ Local workforce efforts are not engaged or connected to the CS education efforts of the district.

Section 7. Implementation of Computer Science Infrastructure

This section of the survey is an assessment of the extent that different elements of district infrastructure for computer science have been implemented in your district.

19. To what extent have these strategies and goals been established in your district? (Select a single response that reflects your assessment of the current status in your district)

	Not at all (Nothing is planned or underway)	A little (Planning is underway but few or no actions have been taken)	Somewhat (Steps have been taken and are continuing)	To a great extent (Goals have been reached and strategies are well-established)
All middle grades students receive CS instruction.	○	○	○	○
Equity strategies are employed to support interest and persistence in CS among traditionally underrepresented student groups.	○	○	○	○
Implementation of inclusive CS pathway planning.	○	○	○	○
CS is provided in sequential middle-school years at a minimum of 75 instructional hours per year.	○	○	○	○
There is a district-level CS taskforce that includes representation from major stakeholder groups.	○	○	○	○
CS pathways are integrated with district strategic plan.	○	○	○	○
Information/ technology specialists support CS teachers.	○	○	○	○

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PACE Student Interest in Computer Science Survey

The contents of this survey were developed under a grant from the U.S. Department of Education, Education Innovation and Research (EIR) Program. However, those contents do not necessarily represent the policy of the U.S. Department of Education. And you should not assume endorsement by the Federal Government.

Some items in the PACE Student Interest in Computer Science survey are adapted from the previously published *Assessing Student Interest in Computer Science* survey.[1]

[1] LeadCS.org (2015). Assessing Student Interest in Computer Science. CEMSE, Outlier Research & Evaluation, University of Chicago. http://www.leadCS.org

Welcome to the PACE Student Interest in Computer Science survey for [school district]! This survey asks questions about your perspective on computer science, which is the study of how and why computers work, how computers are changing the world, and how you can use them to design, create, and solve big problems using them – in a career or anything you are interested in.

The questions will ask for your opinions about the importance of computer science skills and opportunities, and your interest and involvement in computer science activities.

Participation in this survey is voluntary, and all responses are confidential.

The survey takes about 8-10 minutes to complete.

Thank you for taking the survey!

Enter your first name _____

Enter your last name _____

1. To what extent do you agree or disagree with these statements about computer science?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Computer science skills are useful in the real world.	○	○	○	○	○
Computer science skills are important for finding a job in the future.	○	○	○	○	○
Having computer science skills is important for finding a **high paying job** in the future.	○	○	○	○	○
Taking computer science classes is necessary for me to accomplish what I want in school.	○	○	○	○	○
Taking computer science classes will help me reach my goals for college/career.	○	○	○	○	○

2. To what extent do you agree or disagree with these statements about your attitude about learning computer science?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I am able to do well in activities that involve computer science skills.	○	○	○	○	○
I feel confident that I can understand computer science ideas.	○	○	○	○	○
I am interested in classes that use computer science skills.	○	○	○	○	○
I work hard in my classes that involve computer science.	○	○	○	○	○
I am interested in careers that use computer science skills.	○	○	○	○	○
I intend to take more computer science courses.	○	○	○	○	○
I plan to take after-school and/or summer activities that involve computer science skills during this school year or next summer.	○	○	○	○	○

3. During the past 12 months, how frequently did you do computer science activities (such as write code, build a website, video game, or app, etc.) outside of your school classes (in an afterschool class or club or on your own free time)?

- ○ Never
- ○ About 1-10 days in the past year
- ○ About 1-2 days each month
- ○ About 1-2 days each week
- ○ 3 days or more each week

4. If you had the chance, how likely are you to engage in each of these computer science activities outside of school (in an after-school class or club or on your own free time).

	Extremely unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Extremely likely
Write code	○	○	○	○	○
Create a video game	○	○	○	○	○
Produce digital music	○	○	○	○	○
Join an afterschool class or club focused on computer science or robotics	○	○	○	○	○
Use 3D maker tools to make a new creation or 3D print a piece for a project	○	○	○	○	○
Use computer- programmed lights and music (for example, as part of a dance)	○	○	○	○	○
Build a website	○	○	○	○	○
Use a computer to collect and organize data on a subject you are interested in	○	○	○	○	○
Program a robot	○	○	○	○	○
Trouble shoot tech problems at home such as computer or Wi-Fi issues	○	○	○	○	○
Create an app	○	○	○	○	○
Help friends or family members understand how to use their computer or phone apps	○	○	○	○	○
Select and edit digital photos	○	○	○	○	○
Other	○	○	○	○	○

5. During the school year, how much time each week do you spend on computer science activities outside of school?

- ○ Zero hours per week
- ○ Less than 1 hour per week
- ○ 1 hour per week
- ○ 2 hours per week
- ○ 3 hours per week
- ○ 4 hours per week
- ○ 5 hours per week
- ○ 6 hours per week
- ○ 7 hours per week
- ○ 8 hours or more per week

6. What is your gender? (select one)

- ○ Male
- ○ Female
- ○ Prefer to self-describe _____
- ○ Prefer not to say

7. Are you currently taking a computer science class at your school?

- ○ Yes, I am.
- ○ No, I am not.

8. What grade are you currently in

- ○ 6th grade
- ○ 7th grade
- ○ 8th grade

DISTRICT PATHWAY DEVELOPMENT SURVEY

Add these questions into a survey format or platform and distribute during the 3rd DSC meeting as homework.

Guiding Principles for Pathways

Please respond to the questions below for each of the guiding principles for Massachusetts Computer Science pathways.

Increased Access for All Students:

To what degree can you envision what this principle looks like in practice for CS?

Respond from 1 (No idea what this looks like in practice) to 5 (Lots of ideas; very familiar with change practices for this)

To what degree do you think your district is already supporting this principle for CS?

Respond from 1 (Little to no support in place for this) to 5 (Lots of supports in place for this)

Please provide optional comments on your ratings for Increased Access for All Students.

Guided Academic Pathways:

To what degree can you envision what this principle looks like in practice for CS?

Respond from 1 (No idea what this looks like in practice) to 5 (Lots of ideas; very familiar with change practices for this)

To what degree do you think your district is already supporting this principle for CS?

Respond from 1 (Little to no support in place for this) to 5 (Lots of supports in place for this)

Please provide optional comments on your ratings for Guided Academic Pathways.

Enhanced Student Support:

To what degree can you envision what this principle looks like in practice for CS?

Respond from 1 (No idea what this looks like in practice) to 5 (Lots of ideas; very familiar with change practices for this)

To what degree do you think your district is already supporting this principle for CS?

Respond from 1 (Little to no support in place for this) to 5 (Lots of supports in place for this)

Please provide optional comments on your ratings for Enhanced Student Support.

Connection To Career:

To what degree can you envision what this principle looks like in practice for CS?

Respond from 1 (No idea what this looks like in practice) to 5 (Lots of ideas; very familiar with change practices for this)

To what degree do you think your district is already supporting this principle for CS?

Respond from 1 (Little to no support in place for this) to 5 (Lots of supports in place for this)

Please provide optional comments on your ratings for Connection to Career.

Effective Partnerships:

To what degree can you envision what this principle looks like in practice for CS?

Respond from 1 (No idea what this looks like in practice) to 5 (Lots of ideas; very familiar with change practices for this)

To what degree do you think your district is already supporting this principle for CS?

Respond from 1 (Little to no support in place for this) to 5 (Lots of supports in place for this)

Please provide optional comments on your ratings for Effective Partnerships.

Priorities:

Please rank the following guiding principles according to which YOU think should be highest priority for your district to address.

Respond from 1 (Highest priority) to 5 (Lowest priority)

- Increased Access for All Students
- Guided Academic Pathways
- Enhanced Student Support
- Connection to Career
- Effective Partnerships

Core Characteristics for Pathways

Please respond to the questions below for each of the core characteristics for Massachusetts Computer Science pathways.

Priorities:

Please rank the following guiding principles according to which YOU think should be highest priority for your district to address.

Respond from 1 (Highest priority) to 5 (Lowest priority)

- Career Advising
- Labor Market Information
- Integrated Instruction
- Work-Based Learning
- Credential Preparation
- Postsecondary Linkages

Postsecondary Linkages

Please comment on the characteristic you ranked as HIGHEST priority for your district. Why do you think so?

Please comment on the characteristic you ranked as LOWEST priority for your district. Why do you think so?

APPENDIX C – PACE RESOURCES

PACE RESOURCES OVERVIEW

Education Development Center is excited to introduce this curated selection of CS resources designed to support you in extending the core curriculum of CS Discoveries (the curriculum chosen by most of the pilot PACE districts), or another high-quality curriculum. These resources were chosen with the goal of fostering engaging learning experiences and connecting you with a network of fellow CS teachers.

We divided the resources into five focused categories of interest. These categories also align with PACE's mission to generate systemic change that improves CS student achievement: Career Exploration and Industry Connections, K-12 Pathways, Supplemental CS Lessons, Out-of-School Activities, and Teacher Support. There is also a link to a section on the PACE website that describes research activities conducted on the PACE pilot implementation.

Each section below includes hyperlinked resources and target descriptions. By utilizing these resources along with the chosen CS curriculum, you'll not only enrich your lesson plans but also forge meaningful connections within a supportive network, enhancing your professional growth and amplifying your impact as a CS educator. *The resource links were validated in November 2024 and are not exhaustive.*

Suggested Usage

- **Teachers:** Integrate supplemental lessons to enrich existing curriculum units.
- **Counselors/Admins:** Use career videos and virtual tours to show real-world relevance.
- **Program Coordinators:** Leverage outofschool options to extend learning beyond the classroom.
- **Educator Networks:** Join teacher groups for continuous learning and collaboration.

Select a category below or read on to begin your exploration!

Career Exploration & Industry Connections

According to the U.S. Bureau of Labor Statistics employment projections, 67% of all projected new jobs in STEM fields require CS skills. Explore a suite of resources designed to ignite students' career interests and real-world insights into diverse professions. Our curation offers free videos and activities found online and opportunities to invite computer scientists to attend one of your classes.

K-12 Pathways

Discover a sample of middle school and high school CS curricula reviewed by the Massachusetts Department of Elementary and Secondary Education. Our curated collection provides guidance, lesson plans, and materials aligned with state standards, empowering educators to seamlessly adopt curricula for enhanced student learning experiences.

Supplemental Computer Science Lessons

Explore plug-and-play CS lessons to integrate in your classroom. These activities give students additional practice opportunities while demonstrating a wide range of uses for CS.

Out-of-School Opportunities

Explore a spectrum of after-school and summer activities encouraging CS education. Resources such as Code.org, CoderDojo, Project GUTS, and STEAM Ahead provide diverse opportunities for students, spanning clubs, online communities, and in-person programs to foster skills and empower youth.

Teacher Support

Sign-up for professional learning communities and newsletters tailored for CS teachers. These organizations provide crucial support, resources, and insightful pedagogical guidance for new and experienced teachers. Stay up to date on the latest trends and collaborate with fellow educators, enriching your CS teaching journey with shared knowledge and innovation.

Research on PACE

Several research activities were conducted as part of the original PACE grant. This included a rigorous external evaluation by Abt Global on the impact of PACE on student learning outcomes, and studies of implementation of PACE that provide insights from practitioners on leading computer science systems-change at the district-, school-, and classroom-levels. Data collection instructions, such as surveys, and findings from these studies are publicly available at no-cost.

See the PACE website for details.

DETAILED RESOURCE INFORMATION

Career Exploration & Industry Connections

This section is curated for educators to connect students with real-world CS careers. It equips educators with visuals and structured prompts to engage students in CS as a pathway to STEM careers. Discover online videos, professional interviews, virtual activities, and curated tools to help students connect with real-world careers in computing. Sampling of resources:

Code.org CS Journeys Teacher Guide

This Teaching Guide is a free PDF Teaching Guide with strategies and email templates for engaging families and supporting student exploration of CS Journeys through curated content.

Code.org Careers in Computer Science

These two to four-minute videos about careers in computer science include professionals applying CS in an array of industries and for different purposes. Videos in the series include employees at NASA, the entertainment venue Meow Wolf, computer security at Tanium, Instagram, Microsoft, and Google. See one of the videos in the series below.

- Software Engineer at Monterey Bay Aquarium Research Institute
  This video focuses on a CS application in marine biology Marine biology (video length: ~2:22).

Code.org Career Chats

- Career chats are longer-depth (≈30 min) recorded webinar interviews of a diverse group of people who use CS in different careers, including entertainment, science, and health care. Students will learn about their career trajectories and the various ways they can use CS to make a positive impact.
- My Journey: Artificial Intelligence and Sports
  This recording of a 30-minute conversation with a Chief Scientist at a sports data company details ways AI helps analyze sporting events. Examples of sports include basketball, soccer, and tennis. This video can be assigned to watch in full or shown a brief clip in the classroom. *(Suggested clip 9:00–13:00)*
- Teacher Guide: My Journey Chats for Middle and High School Classrooms (PDF)
  PDF with prompts and discussion strategies for engaging students with these CS Journey webinars.

Code.org Virtual Field Trips

Curriculum-aligned virtual tours with facilitator guides and student worksheets. Highlights:

- **Amazon Web Services (AWS) Data Center Tour via Kahoot —** Engage students with a behind-the-scenes look at cloud infrastructure (≈30minute lesson) in this Amazon Future Engineer tour. Students discover how data centers play an important role in streaming their favorite movies and TV shows. Teachers can implement this as a classroom lesson with the facilitator guide and student worksheet in the teacher toolkit. Length: 30 min. (Kahoot activity)
- Additional virtual field trips: visit the Code.org website.

More Computer Science Career Videos & Resources

A variety of broader educational tools and programs:

- ComputerScience.org – Careers: Videos about CS careers and descriptions of required skillsets for each of the roles
- CS Teaching Career Videos: Dozens of videos of computer scientists in different roles and organizations
- Skype a Scientist: Fill out the teacher form and get matched with a computer scientist
- TECHNOLOchicas: Video profiles of Latinas in CS careers

K–12 Pathways

In the 2020-2021 school year, just 5.8% of Massachusetts high school students were enrolled in a CS course. Expanding access to and participation in CS in Massachusetts will require efforts at all levels of education to implement comprehensive CS education. As a resource to state educators, DESE created a guide to provide an "overview of Digital Literacy and Computer Science (DLCS) curricula that align to concepts and skills found in the 2016 Massachusetts DLCS Framework. A variety of curricula are included for each grade span to provide schools a range of options to meet differing program needs and conditions." The guide compiles dozens of CS curricula by grade band, technology needs, professional development offerings, and costs.

- 2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts
  Includes alignment with state DLCS standards and recommendations for Code.org CS Discoveries (grades 6–8) and LEGO Spike Prime Physical Computing (grades 9–12), along with tech requirements, PD overview, and cost info.

Sampling of curricula that have 'comprehensive' and low-cost curriculum materials.

Grades 6–8

- *Computer Science Discoveries* *(Guide pages 79–80).* Code.org
- Foundations of Physical Computing: Lego Spike Prime *(Guide pages 123–124)*. LEGO® Education

Grades 9–12

- *Beauty and Joy of Computing* *(Guide pages 137–138)*. University of California, Berkeley, and Education Development Center (EDC)
- Bootstrap: Data Science: Modules to explore real-world questions through programming and data analysis. *(Guide pages 163–164).* Brown University
- Code.org Computer Science Principles. *(Guide pages 141–142).* Code.org

Supplemental Computer Science Lessons

One of the advantages of learning to code is the ability to bring our ideas to life using free and low-cost online tools. The additional lessons in this category broaden students' understanding of what they can create with their developing CS skills. The following resource list compiles plug-and-play activities for your classroom from Hour of Code, Scratch, and MIT App Inventor.

Sampling of lessons:

Hour of Code Activities: Activities from *Hour of Code* *are organized by grade level, CS experience, and activity length, among other filters.*

Sampling of the activities:

- Robot Repair: Can You Fix the Robot Brain? (Unplugged). Difficulty: Beginner. Length: 60–90 minutes
- NASA: Explore Mars with Scratch. Difficulty: Beginner. Length: A few hours (*NASA Lesson plan*)
- Program in Python with Tracy the Turtle. Difficulty: Comfortable. Length: 1 hour, with possible follow (*Python Lesson*)

Create with Scratch

Projects built on Scratch, supported by tutorials, Coding Cards, and Educator Guides.

Sampling of the activities:

- Animate a Name. Length: 1 hour. (Educator Guide)
- Imagine a World. Length: 1 hour. (Educator Guide)
- Video Sensing. Length: 1 hour. Requires using the computer's built-in camera. (Educator Guide)

MIT App Inventor

Students can develop mobile applications with an MIT App Inventor developer tool, which are ready-to-use lesson plans and activities drawn from trusted educational platforms. Some require mobile devices.

Sampling of activities:

- **BallBounce: A simple game app.** (Tutorial)
- **Introduction to Machine Learning: Image Classification.** Difficulty: Beginner. Length: Two 45-minute lessons. (Lesson plan)
- **Fake Voices:** The Ethics of Deepfakes. Difficulty: Beginner. Length: Three 50-minute lessons. (Lesson plan)

Out-of-School Opportunities

Out-of-school CS opportunities broaden students' horizons by offering diverse, hands-on experiences beyond formal education. They foster creativity, problem-solving, and practical skills, encouraging a deeper engagement with CS. The programs listed below are a combination of online, after-school and summer opportunities for your students to deepen their CS expertise, preparing students for future careers in technology. *Note: Some summer opportunities open closer to the summer.*

Sampling of opportunities:

Code.org Beyond Extracurricular

Code.org's Beyond Extracurricular section offers a curated collection of resources, clubs, community-based programs, and activities beyond the regular school curriculum. It provides links to coding clubs, camps, competitions, and events aimed at encouraging students to engage in CS outside of school hours.

CoderDojo

CoderDojo is a global network of free volunteer-led coding clubs for kids and teens aged 7–17. These clubs offer a supportive and collaborative environment where young learners can explore programming, develop digital skills, and create their own projects. The Massachusetts Dojos are in Concord and Roxbury.

Project GUTS

Project GUTS (Growing Up Thinking Scientifically) is an educational initiative aimed at teaching inquiry-based computational thinking and modeling to middle school students. With a focus on CS and complex systems, Project GUTS provides teachers with curriculum materials, training, and materials to integrate hands-on, inquiry-based activities into classrooms or to offer an after-school club.

S.T.E.A.M. Ahead

A nonprofit offering summer programs designed to encourage interest and participation in science, technology, engineering, arts, and mathematics.

Teacher Support

Communities of practice are instrumental for CS educators to advance their learning, and they build support networks for teachers and create spaces for resource sharing.

Sampling of professional communities and newsletters. We encourage you to explore others:

Professional Communities

- Computer Science Teachers Association (CSTA)
  - *CSTA Massachusetts*
  - *5 Steps to Getting Started on the CSTA Community*
- **CS Ed Research Weekly Discussion Group**
  Meet with CS educators and researchers to learn about recent research in CS education and how it might be useful to your classrooms (Join CS Ed Research)

Newsletters

- **Massachusetts Department of Elementary and Secondary Education (DESE) STEM Newsletter.** (Sign up for the newsletter)
- **Massachusetts Computer Using Educators (MassCUE).** (Sign up for the newsletter)
- **Code.org. Learn what's happening at Code.org and throughout the CS community.** (Sign up for the newsletter)

APPENDIX D – COMPUTER SCIENCE EXHIBITION RESOURCES

Student CS exhibitions have been a hallmark of the PACE program. These exhibitions provide an opportunity for students to showcase CS projects developed during their learning experiences and to simultaneously learn about real-world CS experiences from industry experts.

The following set of resources are available to support the development and implementation of local student CS exhibitions:

Planning and Implementing Student CS Exhibitions

This PowerPoint slide deck provides background information on PACE Student CS Exhibitions along with guidance for how to plan for, organize, and implement a similar local event.

Sample Student Registration Form

This spreadsheet can be used to keep track of critical student information needed by hosting organizations and/or parties responsible for the event.

Sample Project Plan

This template supports the organization of event details, logistics, and materials.

Reviewer Questions

This document suggests questions to ask students when reviewing their exhibitions. The document also provides suggested student award types for an exhibition event.

APPENDIX E – URLS FOR LINKED CONTENT

This table contains all of the URLs for content that is linked in the toolkit. They are listed here for those who may be using a printed version of the toolkit and so do not have access to links.

Table 2. URLs and page numbers for content linked in the toolkit

Linked Content	URL for Linked Content	Page #
Education Development Center (EDC)	https://edc.org/	2
Massachusetts Department of Elementary and Secondary Education	https://www.doe.mass.edu/	2
Education Innovation and Research (EIR) Program	https://www.ed.gov/grants-and-programs/grants-special-populations/grants-economically-disadvantaged-students/education-innovation-and-research	2
Programming the Acceleration of Computing Education	https://pace.edc.org/	5
Programming the Acceleration of Computing Education	https://pace.edc.org/	6
Friendship Radar	https://studio.code.org/projects/applab/2uXm4-24heOr91U_qHhccxqSePC_YZ3o-fH82WR_BuM	14
Mental Health the Big Bad Stigma	https://studio.code.org/projects/applab/trAOrQCW4SpR02ULYznhKszv6WZx_akT1VIODiXC1S4/view	14
Bully Busters	https://studio.code.org/projects/applab/aRAdlj-8ESpdffHC2Rp2TKuwk4kjM1rai1DzrlTaRf0	14
Baby Shark's Spelling	https://studio.code.org/projects/applab/T9dIO7UslaoX2obgVaCR-5p3efv7u1RkO-vRCb7PLww?authuser=0	14
Dennis-Yarmouth Spotlight Video	https://player.vimeo.com/video/830328678?h=27fe5d1818	14
Two perspectives on vegetables. Bad for you, or good for you?	https://codeprojects.org/projects/weblab/QIxmq_FVsjhTxoosWLNDHxQfYJjFYAwjjVn8HnNgCn8/index.html	14
Don't touch the monsters	https://studio.code.org/projects/gamelab/z1ERF_Ny93ZhT2R_fppbRnNBxwnNxJwL_DE3f2ptR9M	14
Hatfield Spotlight Video	https://player.vimeo.com/video/771183012?h=1ae7d430bc	14
Charity with Us	https://studio.code.org/projects/applab/PzvWR5n3ix32triN70Vms76hQ1nhAbeUv-OwBOXENg0	14

Chill Pill	https://studio.code.org/projects/applab/mYlWDMxMH0kSqXeR0gELgSjPpkTSh-bv4PpdlB3iBY0	14
Mohawk Trail Spotlight video	https://player.vimeo.com/video/771186161?h=b97fee3680	15
Animal Facts	https://pace.edc.org/wp-content/uploads/ware_animal_facts.png	15
Crystals	https://pace.edc.org/wp-content/uploads/ware_crystals.png#	15
Cultural Foods	https://pace.edc.org/wp-content/uploads/ware_cultural_foods.png	15
Hiking	https://pace.edc.org/wp-content/uploads/ware_hiking.png	15
Soccer Positions	https://pace.edc.org/wp-content/uploads/ware_soccer_positions.png	15
MA DESE Digital Literacy and MA DESE Computer Science Curriculum Framework	https://www.doe.mass.edu/frameworks/dlcs.pdf	21
2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts	https://www.doe.mass.edu/stem/dlcs/curriculum-guide.pdf	21
Code.org CS Discoveries curriculum	https://code.org/en-US/curriculum/computer-science-discoveries	21
CS Discoveries	https://code.org/en-US/curriculum/computer-science-discoveries	23
CS Discoveries	https://code.org/en-US/curriculum/computer-science-discoveries	23
Code.org Teacher Section	https://code.org/en-US/teachers	23
Self-paced courses	https://studio.code.org/professional-learning/courses	23
Facilitated workshops	https://studio.code.org/professional-learning/workshops	23
CSforMA	https://www.csforma.org/	23
Teacher Community	https://forum.code.org/	23
CS Discoveries Forum	https://forum.code.org/c/csd/236	23
Teach tab of the Code.org	https://code.org/en-US/teachers	23
contact the PACE support team	https://pace.edc.org/contact/	30
Readiness and Goal Setting	https://pace.edc.org/meeting-1/	32
CS Landscape Overview	https://pace.edc.org/wp-content/uploads/PACE-CS-Landscape-1-pager.pdf	32

CS Visioning Activity Cards	https://pace.edc.org/wp-content/uploads/Visions-CS-handout.pdf	32
CS Landscape	https://pace.edc.org/wp-content/uploads/PACE-CS-Landscape-1-pager.pdf	32
PACE Overview	https://pace.edc.org/wp-content/uploads/PACE-project-overview-1-pager.pdf	32
CS Discoveries	https://pace.edc.org/wp-content/uploads/Getting-Started-with-CSD.pdf	32
CS Landscape Overview	https://pace.edc.org/wp-content/uploads/PACE-CS-Landscape-1-pager.pdf	32
overview video	https://youtu.be/uQim0hBHco0?feature=shared	33
CS Discoveries curriculum guide	https://pace.edc.org/wp-content/uploads/CS-Discoveries-Curriculum-Guide-2020-2021-Google-Docs.pdf	33
The Problem Solving Process with Zipline	https://youtu.be/z7RaFPT3DTE?feature=shared	33
sample student worksheet	https://pace.edc.org/wp-content/uploads/Hatfield-U1L03-Activity-Guide-Using-the-Problem-Solving-Process-2020.pdf	33
Web Development: Intro to CSS	https://youtu.be/EP9QMdoXvXE?feature=shared	33
puzzle 5	https://studio.code.org/courses/csd-2020/units/2/lessons/6/levels/5	33
puzzle 6	https://studio.code.org/courses/csd-2020/units/2/lessons/6/levels/6	33
Game Lab: Intro to Drawing	https://youtu.be/PXn9gKiKKFo?feature=shared	33
puzzle 4	https://studio.code.org/courses/csd-2020/units/3/lessons/3/levels/4	33
2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts	https://www.doe.mass.edu/stem/dlcs/curriculum-guide.pdf	34
Teacher Capacity and Supports	https://pace.edc.org/professional-learning/district-stakeholder-council-meetings/meeting-4/	34
Chapter 1: Build Common Purpose and Understanding	https://drive.google.com/file/d/161Vu2z0vSIcxDkciduQLdPX6g85HgIDg/view?usp=sharing	34
MA Innovation Pathway Criteria	https://drive.google.com/file/d/1GyH2-DNOEYXxibzentBApKFFDSfM24ii/view?usp=sharing	35
High Quality College and Career Pathways	https://drive.google.com/file/d/1zFyjzBx15g2ReAHlOV9cLRi41Q-FsKAn/view	35

Massachusetts K-12 Computer Science Curriculum Guide	https://www.doe.mass.edu/stem/dlcs/curriculum-guide.pdf	35
DSC Leadership and Strategic Planning	https://pace.edc.org/professional-learning/district-stakeholder-council-meetings/meeting-5/	36
2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts	https://www.doe.mass.edu/stem/dlcs/curriculum-guide.pdf	36
PACE Website	https://pace.edc.org	60
Teaching Guide	https://code.org/files/csjourneys/csjourneys-teacherguide.pdf	61
careers in computer science	https://code.org/en-US/students/careers-in-computer-science	61
Software Engineer at Monterey Bay Aquarium Research Institute	https://youtu.be/FBTWICxTG08	61
webinar interviews	https://code.org/csjourneys/pastchats	61
Artificial Intelligence and Sports	https://code.zoom.us/rec/play/09veMf1354wOxNcJxSMPqmGgf6qh3vTdvIaSGHTpeyik4_59etRQXEIuPbAQwSzKiYAIMkXpqSRGHO_L.ym6IZsLcInwcxQAG	61
Teacher Guide: My Journey Chats for Middle and High School Classrooms	https://code.org/files/csjourneys/classchats-guide-middlehigh.pdf	61
teacher toolkit	https://www.amazonfutureengineer.com/datatour1kahootguide	61
Kahoot activity	https://create.kahoot.it/details/7e6c2502-7225-4578-9361-daa15529b7ef	61
Code.org	https://code.org/csjourneys/csadventures#trips	61
ComputerScience.org – Careers	https://www.computerscience.org/careers-overview/	62
CS Teaching Career Videos	https://www.inclusivecsteaching.org/careers-in-cs	62
Skype a Scientist	https://www.skypeascientist.com/sign-up.html	62
2025 Digital Literacy and Computer Science Curriculum Guide for Massachusetts Districts	https://pace.edc.org/wp-content/uploads/DLCS-Curriculum-Guide-for-MA-Districts.pdf	62
Computer Science Discoveries	https://www.doe.mass.edu/stem/dlcs/curriculum-guide.pdf	62
Foundations of Physical Computing: Lego Spike Prime	https://education.lego.com/en-us/teacher-resources/lego-education-spike-prime/lesson-planning/lego-education-spike-prime-lesson-planning-courses/	62
Beauty and Joy of Computing	https://bjc.berkeley.edu/	62

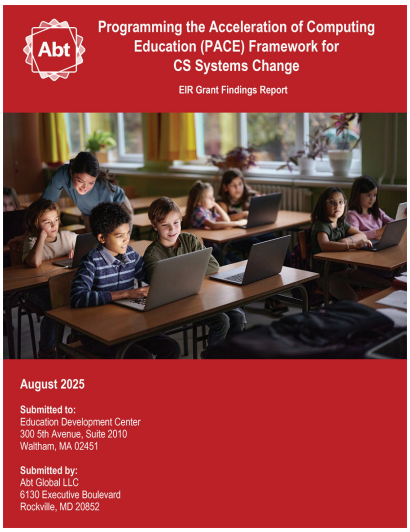
Bootstrap: Data Science	https://bootstrapworld.org/	62
Code.org Computer Science Principles	https://curriculum.code.org/csp-20/	62
Hour of Code	https://hourofcode.com/us/learn	63
NASA Lesson plan	https://www.jpl.nasa.gov/edu/teach/activity/explore-mars-with-scratch/	63
Python Lesson	https://codehs.com/editor/playlist/video/1064850/6642/4751	63
Scratch	https://scratch.mit.edu/ideas	63
Animate a Name	https://resources.scratch.mit.edu/www/guides/en/NameGuide.pdf	63
Imagine a World	https://resources.scratch.mit.edu/www/guides/en/ImagineGuide.pdf	63
Video Sensing	https://resources.scratch.mit.edu/www/guides/en/VideoGuide.pdf	63
MIT App Inventor	https://appinventor.mit.edu/explore/ai2/tutorials	63
BallBounce Tutorial	http://appinventor.mit.edu/explore/sites/all/files/hourofcode/BallBounceTutorial.pdf	63
Machine Learning Lesson Plan	https://appinventor.mit.edu/explore/resources/ai/image-classification-look-extension	63
Fake Voices Lesson Plan	https://appinventor.mit.edu/explore/resources/ai/fake_voices_unit	63
Code.org Beyond Extracurricular	https://code.org/beyond/extracurricular	64
CoderDojo	http://coderdojo.com/	64
Concord	https://coderdojo.com/en/dojos/us/concord-ma/concord-mass-main-library	64
Roxbury	https://coderdojo.com/en/dojos/us/boston-ma/roxbury-boston-ma-enterprise-development	64
Project GUTS	http://projectguts.org/	64
S.T.E.A.M. Ahead	https://www.westeamahead.org/programs	64
Computer Science Teachers Association (CSTA)	https://csteachers.org/	64
CSTA Massachusetts	https://massachusetts.csteachers.org/home	64
5 Steps to Getting Started on the CSTA Community	https://csteachers.org/5-steps-to-getting-started-on-the-csta-community/	64
Join CS Ed Research	https://csedresearch.org/resources/computer-science-education-discussion-group/	64
Sign up: DESE STEM Newsletter	https://mass.us14.list-manage.com/subscribe?u=d8f37d1a90dacd97f207f0b4a&id=0dbe9e13f8	64

Sign up: MassCUE Newsletter	https://www.masscue.org/connect/communications/	64
Sign up: Code.org newsletter	https://code.org/en-US/about#hear-from-us	64
Planning and Implementing Student CS Exhibitions	https://pace.edc.org/wp-content/upoads/Planning-and-Implementing-Student-CS-Exhibitions.pptx	65
Sample Student Registration Form	https://pace.edc.org/wp-content/uploads/Sample-student-registration-form.xlsx	65
Sample Project Plan	https://pace.edc.org/wp-content/uploads/Sample-Project-Plan.docx	65
Reviewer Questions	https://pace.edc.org/wp-content/uploads/Reviewer-Questions-PACE-creative-coded.docx	65
Evaluation Report	https://pace.edc.org/independent-evaluation	72

APPENDIX F – EVALUATION OF THE PACE INTERVENTION

This report provides findings from the Abt Global independent evaluation of the pilot *Programming the Acceleration of Computing Education (PACE) Framework for CS Systems Change* intervention. The PACE Framework was implemented in Massachusetts middle schools by the PACE team, a collaboration between Education Development Center, Inc. (EDC) and the Massachusetts Department of Elementary and Secondary Education (DESE). The evaluation was funded by EDC's Education Innovation and Research (EIR) Early-Phase Grant (Award No. U411C190275) from the U.S. Department of Education.

If interested, read the full report on the PACE website.



APPENDIX G – DSC CONTINUOUS IMPROVEMENT PLANNING TEMPLATE

This template will help DSCs revise their CS Vision Statement and theory of change and monitor change practices in continuous improvement cycles.

PART 1: Refining your district CS Vision Statement, Theory of Change, and Change Practices

Review and refine your district's CS Vision Statement

Individually review the CS vision statement created in year 1 and discuss the following questions:

- Does this goal still meet the needs of the district?
- Are any changes to the goal needed to better meet the needs of the district?

Original CS Vision Statement	Revised CS Vision Statement

Review and refine your theory of change and change practices

Individually review the theory of change (driver diagram from year 1) and change practices decided on in year 1 and discuss the following questions:

- Given what we know are the root causes of CS related issues, are the drivers and change practices in the theory of change the ones that will most likely lead to achieving the goal?
- Are any changes need to the drivers and change practices to better achieve the goal?
- Have the change practices discussed as priority changes to implement been incorporated into the theory of change?

Original Theory of Change

Revised Theory of Change

PART 2: Creating your Continuous Improvement Plan

Create an implementation plan for each change practice

In the table below, list each change practice in your theory of change and how you plan to implement it.

Change Practice	Implementation Action Steps	Who will implement	Due date

Create a measurement plan for each change practice

In the table below, list each change practice in your theory of change and how you plan to collect data that informs whether the change practice was implemented as intended.

Change Practice	Measurement tool used to inform whether the change practice was implemented as intended	Who will collect and compile the data	Due date

Create a measurement plan for expected impacts of change practices

In the table below, list each driver and the overall goal and how you plan to collect data that informs whether the drivers and goal were achieved.

Driver/Goal	Measurement tool used to inform whether the driver or goal was achieved	Who will collect and compile the data	Due date

Create a DSC meeting schedule based on when data will be collected and compiled

Review the measurement plan and create a schedule for when to examine data to inform improvements to practices.

DSC Meeting Date	Change practice(s) to examine for improvements	Data to be studied	Additional people to invite to the meeting

PART 3: Documenting Continuous Improvement Cycles

Continuous Improvement for Change Practices

As you study the data for each change practice, document data observations and lessons learned as well as next steps. These can include:

- Making a change to improve implementation of the change practice
- Making a change to the change practice to make it more effective
- Abandoning the change practice and trying something else that might be more effective
- Continuing to implement the change practice and scaling to new settings

Also, be sure to update your measurement plan based on any proposed changes.

Teams may find it easier to copy the continuous improvement template into excel so that you can add additional cycles.

Change Practice	Cycle 1	Cycle 2	Cycle 3
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:

	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:

	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:

	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:
	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:	Date, Data Observations, and Lessons Learned: Next Steps: Changes to the measurement plan:

Programming the Acceleration of Computing Education Toolkit

Authors: Heidi Larson, Anne Wang, Joyce Malyn-Smith, Deborah Boisvert, Neil Schiavo, and Nadia Foster, EDC

Designed by: Digital Design Group, EDC

Photo credits: Burt Granofsky and Heidi Larson, EDC

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EDC.ORG

PACE Programming the Acceleration of Computing Education

The PACE model is designed to invest multiple stakeholders with agency and accountability to successfully support adoption of computer science as an important component of middle school education. The approach provides access to high quality, CS instruction and supports for all students enrolled in middle schools in participating districts. PACE represents a district-wide systems change model with a strategy that better prepares all students to succeed.