CONNECTICUT STATE BOARD OF EDUCATION Hartford

TO:	State Board of Education
FROM:	Dr. Miguel A. Cardona, Commissioner of Education
DATE:	November 6, 2019
SUBJECT:	Draft Connecticut Computer Science Plan

Executive Summary

Introduction

Today's students are part of a world in which technology is evolving rapidly, forging new fields of study, creating new types of jobs, and requiring new sets of skills. Not only must students understand the use of digital tools can help solve tomorrow's problems, they must also learn how to create those tools. Students need opportunities to improve their learning by effectively leveraging technology and to build an understanding of the principles and practices of computer science.

History/Background

In 2014, the Connecticut State Board of Education (Board) approved the formation of a Connecticut State Department of Education Computer Science Advisory Group to ensure access to the digital area through computer science. Since its inception, the Computer Science Advisory Group has worked closely with the Connecticut State Department of Education (CSDE) to craft the Board's Computer Science Position Statement (2016), prepare the Connecticut Computer Science Standards for adoption (2018), and create the Computer Science Implementation Guidelines (2018).

Computer science and digital citizenship continue to be a priority in Connecticut. In 2016, the Board adopted the Position Statement on Computer Science Education for All Students K–12. The position statement outlines the responsibilities for various stakeholders to build a high-quality, comprehensive, and culturally-responsive computer science education program for all Connecticut students. To better assist students in building the relevant knowledge and skills necessary in this digital age, the CSTA K–12 Computer Science Standards and the ISTE Standards for were adopted by the Board on June 6, 2018.

Next-Steps

The CSDE will continue to work with multiple partners to ensure the development of the Connecticut Computer Science Plan and the implementation of goals and strategies.

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DRAFT Connecticut Computer Science Plan

The Connecticut State Board of Education (Board) believes that computer science is key to developing and integrating 21st Century Skills (e.g., technology, communication, collaboration, critical thinking, problem solving, innovation, creativity, persistence). The Board further believes that all Connecticut public schools must provide challenging and rigorous programs of study in computer science across all grade levels. As such, in 2014, the Board approved the formation of a Connecticut State Department of Education Computer Science Advisory Group to ensure access to the digital area through computer science. Since its inception, the Computer Science Advisory Group has worked closely with the Connecticut State Department of Education (CSDE) to craft the Board's Computer Science Position Statement (2016), prepare the Connecticut Computer Science Standards for adoption (2018), and create the Computer Science Implementation Guidelines (2018).

In the summer of 2019, the Computer Science Advisory Group completed a draft Connecticut Computer Science Plan to provide a statewide vision to assist in the coherent implementation of K–12 computer science instruction and opportunities for all Connecticut K–12 students to engage in high-quality computer science education. The format of this plan was provided by Code.org as part of the efforts to assist state's in broadening computer science access to students. The Draft Connecticut Computer Science Plan defines implementation goals, supports the expansion of teachers' knowledge and skills, proposes policy reforms, and outlines potential costs.

Addressed in the Draft Connecticut Computer Science Plan are key policy and implementation issues related to standards, certification, course pathways, graduation requirements, IHE entrance requirements, and professional learning. Bringing this plan to scale will require a coordinated effort by multiple stakeholders as well as oversight to ensure success.

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1. Current Landscape and Strategic Goals

What is going on in our state, what are our goals, and how close are we to meeting them?

The development of a state plan benefits from collecting data and administering a survey to understand the current landscape of computer science education in the state. The data is used to inform the overall goals and metrics for the state plan.

Landscape Report

In this section, the objective is to gather relevant data on the current policy and implementation landscape for K-12 computer science and use them to define the goals and metrics for the state plan. This section includes examples of data that could be collected to determine a baseline for computer science implementation.

Landscape Report							
Goal 1. Measure the current state of computer science education to inform goals							
Strategies	Start/End	Responsible Party/Partners	Progress		Specific Evidence of		
			Planning	Acting	Success or Completion		
Landscape Report	August 2018	Expanding Computing Educational Pathways (ECEP) Alliance State Leaders		Done	Publicly available report		
Obtain Code.org Connecticut (CT) data for CT	February 2019	Code.org and CSDE		Done	Email correspondences		

					Code.org State Fact Sheet
Cross-reference National Center for Educational Statistics (NCES) Code.org codes with EdSight to get an accurate picture of trends in computer science in CT	April 2019	CSDE		Done	Excel spreadsheet of trend data
Survey CT Superintendents to get baseline information about computer science offerings	April 2019	CAPPS		Done	Report of Survey results
Using the NCES codes obtain demographics of students enrolled in computer science courses	May 2019	Performance Office		Х	Data on # of courses, enrollment, and demographics
Identify workforce needs related to computer science by region in CT	Fall 2019	Department of Labor (DOL)		Х	Regional data will be available to stakeholders
Compare the demographics of the students enrolled in computer science courses with the overall demographics of the school and state to identify the gap	August 2019	CSDE		Х	Comparison data organized in a spreadsheet
Update guidance provided to districts in regards to course reporting to ensure that the data in EdSight is a true picture of computer science in CT	March 2020	Performance Office and Jennifer Michalek	Х		Publicly available guidance document

Strategic Goals

In this section, the strategic goals for Connecticut are identified by defining the overarching vision, goals, and timeline.

Strategic Goals

Overarching Vision Statement for Computer Science Education

By 2024, all K-12 schools in CT will offer computer science instruction aligned to the state approved standards and have a qualified computer science teacher to deliver this instruction. Computer science permeates all facets of the modern world. As a result, CT envisions a future in which students:

- critically engage with computer science topics;
- develop as learners, users, and creators of computer science knowledge and artifacts; and
- understand the role of computing in the world around them.

Goal(s)	Related Subsection of	Start/End	Responsible Party/Partners	Progress	
	Plan			Planning	Acting
Implement K-12 Computer Science Standards with fidelity at all grade bands	Curriculum and Courses	June 2018	CSDE, Local Education Agencies (LEA), Professional Learning Partners. Connecticut Computer Science Teachers Association (CTCSTA)		X
 Develop certification pathways for in-service and pre-service teachers: 1. Establish full certification endorsement for computer science 2. Create cross endorsement options for currently certified teachers 	Teacher Pipeline	Spring 2019/July 2020	CSDE		×

 Establish at least one teacher who is teaching high-quality computer science courses in every school in CT: 1. Establish at least one teacher who is teaching high-quality computer science courses in every high school 2. Establish at least one teacher who is teaching computer science or integrated computer science courses at each elementary and middle school 	Teacher Pipeline	Summer 2019	LEA, Professional Learning Partners, Institutes of IHE (IHE)	X	
 Increase the percentage of students in underrepresented groups enrolling in secondary computer science courses: By 2025, reduce by half the gap in the number of female students enrolled in secondary computer science courses By 2025, reduce by half the gap in the number of high-need students enrolled in secondary computer science courses By 2025, reduce by half the gap in the number of racial minority students enrolled in secondary computer science courses By 2025, reduce by half the gap in the number of racial minority students enrolled in secondary computer science courses By 2025, increase by 20% the number of students enrolled in AP level computer science courses By 2025, have a more diverse representation in the teachers teaching computer science courses 	Diversity	Fall 2019/Fall 2025	CSDE, LEA, IHE and Partner Organizations	X	
Allow computer science credits to count as part of the science, technology, engineering and mathematics (STEM) requirement for graduation	Curriculum and Courses	Fall 2019	CSDE, LEA		х
Message computer science education effectively across all stakeholder groups in CT	Outreach	Fall 2019	CTCSTA, CSDE, Governor's Office	Х	

Provide opportunities for feedback to improve computer science efforts in the state	Outreach	Fall 2019	CSDE, LEA	Х	
 Secure funding at the federal, state and local level to support implementation of the state plan: 1. Secure federal, state, philanthropic and local industry/business funding to advance computer science education statewide 2. Coordinate a collaborative funding stream to ensure effective implementation of the computer science state plan 	Funding	Fall 2019	Business and Industry Partners, Connecticut State Agencies, CSDE		X

2. Diversity

How will we ensure that all students have access to and are engaged in K-12 computer science?

The result of equitable access should be computer science classrooms that are diverse in terms of race, gender, disability, socioeconomic status, and English language proficiency. This section contains the strategies for broadening participation in computing.

Diversity		
Goals		

1. By 2025, reduce by half the gap in the number of female students enrolled in secondary computer science courses

- 2. By 2025, reduce by half the gap in the number of high-need students enrolled in secondary computer science courses
- 3. By 2025, reduce by half the gap in the number of racial minority students enrolled in secondary computer science courses
- 4. By 2025, increase by 20% the number of students enrolled in AP level computer science courses
- 5. By 2025, have a more diverse representation in the teachers teaching computer science courses

Strategies	Start/End	Responsible Party/Partners	Progress		Specific Evidence of Success or	
		P		Acting	Completion	
Advertise and/or sponsor computer science events, trainings, competitions that have a focus on underrepresented student populations	Ongoing	Supporting Community Partners (non and for profit), Regional Education Service Centers (RESC), CSDE, Professional Associations, IHE, Community Colleges Curriculum Providers, DOL		Х	Increased participation of underrepresented student populations	
Identify opportunities and build partnerships with state diversity and equity initiatives to implement the state plan	Ongoing	Supporting Community Partners, Districts, State Agencies	X		Establishment of partnerships that promote diversity in computer science education	
Broaden recruitment efforts for computer science professional learning and cross endorsement	Ongoing	CSDE, Professional Organizations, RESC, Professional Learning Partners		Х	Increased participation in professional learning activities, especially in underrepresented districts; more cross	

				endorsements attained
Determine baseline demographic data of teachers currently teaching computer science	August 2019	CSDE	Х	Spreadsheet with demographic data organized
Identify the gap in statewide demographics and the current percentage of underrepresented populations enrolling in secondary computer science courses	August 2019	CSDE, Landscape Study Leads	Х	Spreadsheet with the demographic data organized
Establish a CS4CT coordination team including representatives from stakeholders including but not limited to CSDE, IHE, Professional Learning Partners, Business and Industry	Spring 2020	CSDE, IHE, Professional Learning Partners, Business and Industry	x	Coordinated efforts for all stakeholders by a steering group to ensure successful implementation and reevaluation of the state plan
Develop a plan to address diversity by RESC region based upon the gap data for students and teachers and workforce needs for the regions	Spring 2020	RESC, CSDE, CS4CT	x	Actionable plan developed and implemented for each RESC region
Provide training focused on recruiting underrepresented populations for district administrators and school counselors	Summer 2020	National Center for Women and Information Technolgy (NCWIT), CAPSS, CAS, CSforAll	Х	Increased participation of underrepresented student populations; more computer science course offerings

Provide guidance to districts on how to incorporate computer science into student success plans	Fall 2020	CSDE	X	Guidance document that leads to increased awareness will result in increased enrollment in computer science courses at the high school
Utilize the metrics and tools from the ECEP Alliance to measure and expand diversity	Contingent upon availability of metrics and tools	CSDE, ECEP State Leads	x	More accurate data to measure diversity gains in computer science over time

3. Teacher Pipeline

Where will the computer science teachers come from?

Connecticut can address the teacher pipeline in three ways: professional learning for existing teachers, certification for ensuring qualified teachers are teaching computer science courses, and the development of preservice preparation programs to maintain a supply of teachers over the long term.

Professional Learning

The purpose of providing professional learning for teachers of other subjects is to leverage the existing pool of teachers and provide a short-term approach for increasing the number of computer science opportunities in schools.

Professional Learning

Goals

- 1. Establish at least one teacher who is teaching high-quality computer science courses in every high school
- 2. Establish at least one teacher who is teaching computer science or integrated computer science courses at each elementary and middle school

Strategies	Start/End	Responsible Party/Partners			Specific Evidence of Success or
					Completion
Post relevant professional learning offerings, including online and in-person opportunities on the CSDE, related professional organizations' Web sites and utilize the CSDE computer science listserv to advertise professional learning opportunities, particularly those that are focuses on broadening participation of underrepresented populations	Summer 2019	CSDE, Professional Associations, IHE		Х	Increased attendance at the professional learning events
Provide incentives and/or recognition to districts and/or teachers for participating in computer science professional learning	Summer 2019	Professional Learning Providers, CSDE, Districts, Private Industry, Community Partners		Х	Increased teacher and district participation across the state
Secure professional learning funding for all levels	Fall 2019	State Agencies, Community Based Educational Partners, Business and Industry		Х	Establishment of a computer science education account to fund needed professional learning

				Utilize Perkins V funds to support professional learning for Career and Technical Education (CTE) implementation of computer science pathway in the Information Technology cluster
Identify high-quality professional learning at each grade band	Fall 2019 /Spring 2021	CSDE, Professional Learning Partners,	×	Document detailing high-quality professional learning aligned to standards by grade band that is posted on appropriate Web sites and shared with listservs Increase in the number of teachers participating in computer science professional learning
Develop in-depth professional learning about the progression of the Computer Science Standards and host trainings across the state	Fall 2020/ Spring 2021	CSDE, Current Computer Science Educators, RESCs	Х	Trainings available and held across the state

Provide recognition to public and private industry that contribute to computer science professional learning for teachers	Spring 2020	Business and Industry, Community Partners, Professional Organizations, State Agencies	Х	Posting on Web sites and highlighting participation in programs
Provide incentives to institutes of IHE to develop and provide in-depth computer science professional learning aligned to cross endorsement requirements to in-service teachers	Spring 2020	Board of Regents, Office of Higher Education (OHE)	x	Existence of professional learning opportunities for in- service teachers

Certification and Licensure

In this section, the steps towards a certification system that includes short-term steps to allow existing teachers to add a computer science endorsement quickly, as well as long-term steps such as full certification pathways are identified.

Certification and Licensure								
 Goals 1. Establish full certification endorsement for computer science 2. Create cross endorsement options for currently certified teachers 								
Strategies					Specific Evidence of Success or			
			Planning	Acting	Completion			

Determine necessary coursework to obtain a cross endorsement in computer science	September 2019	CSDE		Х	Requirements for cross endorsement will be public and guidance will be provided about related coursework.
Adopt a subject content exam and determine the passing cut score based on the multi-state standard to allow a passing score to qualify a currently certified teacher for a computer science cross endorsement	July 2020	CSDE, Board		Х	Connecticut teachers meeting the satisfactory score on the approved subject area assessment obtain cross endorsement
Develop, approve and offer an alternate route to certification program for computer science	Fall 2020	RESC, IHE, CSDE Program Approval		Х	Increase in the number of teachers certified in computer science as a result of successful completion of an approved alternative route program
Explore micro-credential options for computer science teachers	Fall 2020	CSDE, Micro- credential Providers	Х		Increase the number of in- service teachers cross endorsed in computer science

Target computer science efforts towards teachers who hold certifications in areas that are difficult to find employment	Fall 2020	CSDE, IHE	Х	Increase in the number of computer science teachers, K-12 and higher employment rates of certified teachers
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Preservice Programs

This section contains the steps for promoting new preservice programs at IHE. Long-term sustainability of a teacher pipeline for computer science teachers requires a supply of new teachers graduating from preservice programs with the ability to teach computer science, whether they were part of a dedicated program for computer science or computer science was integrated into another preservice track.

Preservice Programs						
Goals1. Integrate computer science education into all elen2. Develop computer science preservice programs for			itutions of II	IE in the	state	
Strategies	Start/End	Responsible Party/Potential Partners	Progress		Specific Evidence of Success or Completion	
		Planning	Acting			
Present at the quarterly meeting with Deans of IHE the computer science movement, including details on certification pathways and opportunities for directing students to teach	Fall 2019	CSDE, IHE		Х	Meeting documented in the agenda. Increase in the number of IHE	

					that understand and offer programs leading to computer science education
Create a full certification pathway by developing requirements to guide initial computer science certification for pre-service teachers	July 2020	IHE, CSDE		X	Increase in teachers being certified in computer science from pre-service programs
Include computer science as part of all teacher preparation programs as appropriate for grade-level and subject content	Fall 2020	Board of Regents, IHE, CSDE		x	Adjustment to current pre- service course offerings
Provide incentives to IHE to create pre-service teacher prep programs leading to CT certification	Fall 2020	CSDE, IHE	Х		Increase in the number of IHE that offer pre- service programs
Provide incentives for computer science majors who commit to teaching computer science for a set number of years	Fall 2021	State Agencies, IHE, LEA	X		There will be an increase in the number of computer science majors obtaining certification to teach at the secondary level

4. Curriculum and Courses

What courses will teachers be teaching? What curriculum best aligns with the computer science goals in your state?

Standards are an essential component of a larger education plan and provide a foundation with which to align the other components, such as curriculum, instruction, and policies such as graduation requirements. The expectation that all students learn computer science can be supported by allowing computer science to satisfy a core graduation requirement. The development and selection of curriculum and courses plays a significant role in the access and equity movement in computer science education.

Standards

Standards allow curriculum to be created and selected based on a coherent vision of computer science education that sets learning goals for all students, from kindergarten to high school graduation.

Standards								
Goal 1. Adopt computer science standards K-12 for inclusion in all schools in Connecticut								
Strategies	Start/End	Responsible Party/Partners	Progress		Specific Evidence of Success or			
			Planning	Acting	Completion			
Adopt computer science standards	June 2018	Board		Done	State Board of Education Resolution			
Provide guidance to districts on how to effectively implement the adopted standards	June 2018	CSDE		Done	Implementation guide posted on the computer science page of			

				the CSDE Web site
Prepare a crosswalk document that shows the integration of the Computer Science Standards with other standards including but not limited to Connecticut Core Standards. NGSS, ISTE and the National School Library Standards	January 2020/January 2021	CSDE	Х	Publicly available crosswalk document
Provide professional learning on the standards that is specific to grade level and content domain	Summer 2020	CSDE, Community Partners, Professional Learning Providers	x	Sign-in sheets from professional learning opportunities and increased implementation of the standards

Curriculum

This section contains the process of planning the development and selection of curriculum and courses.

Curriculum							
Goal Implement computer science standards through aligned curriculum with fidelity 							
Strategies	Start/End	Responsible Party/Partners	Progress Specific Evi s of Success				
			Planning	Acting	Completion		

Share information pertaining to CTE pathways in the Information Technology Cluster which includes computer science courses	Spring 2019/Fall 2019	CSDE		Х	Career Cluster, Career Pathway, and Program of Study document
Implement early college experience credit courses in computer science at the high school in partnership with community and state IHE	Fall 2019	IHE, LEA		Х	Increase in college computer science credit awarded in CT high schools
Share aligned curricular resources, both embedded and standalone, that are available at each grade level and within various contents	January 2020	CSDE, CTCSTA	x		Posted resources on the CSDE computer science Web page
Offer regional training for districts to develop a computer science implementation plan (i.e., SCRIPT)	Summer 2020	CSDE, Community Partners, CSforAll	Х		District implementation plans will provide an increase in students having access to and taking part in computer science courses

Graduation Requirements

This section contains the strategies that will be used to enable computer science to count as a core graduation requirement under the requirements that call for nine credits in science, technology, engineering, and math.

Graduation Requirements	
Goal Allow Computer Science credits to count as part of the STEM requirement for graduation 	

Strategies Start/E	Start/End	Party/Partners	Progress		Specific Evidence of Success or
			Planning	Acting	Completion
Send guidance letter to districts about enabling standards aligned computer science courses to fulfill one of the nine required STEM credits	Fall 2019	CSDE	Х		Local graduation requirements will be updated so that computer science fulfills a graduation requirement
Collaborate with IHE to allow computer science to satisfy an admissions requirement	Summer 2021	LEAs, CSDE, IHE, CTCSTA	x		Computer science is permitted to be used as an admission requirement in all CT IHE

5. Outreach

How will people know about the plan to offer computer science to all students and provide input/feedback?

Effective implementation of the statewide computer science initiative requires proactive communication using a variety of methods at the state, district, and school level. Students, educators, administrators, community members, and industry leaders must have open channels of communication to ask questions and provide feedback. This section explains Connecticut's outreach plan.

Outreach

Goals

- Create uniform, coherent, and coordinated messaging for a diversity of audiences
 Establish opportunities to obtain feedback from stakeholders and to measure effectiveness of implementation

Strategies	Start/End	Responsible Party/Partners	Progress		Specific Evidence of Success or
			Planning	Acting	Completion
Maintain the computer science page on the CSDE Web site to provide information relevant to computer science education across the state	July 2019	CSDE		Х	Updated and relevant information posted on the computer science page of the CSDE Web site
Draft and finalize general messaging around goals, benefits, and calls to action of statewide plan	Fall 2019	Governor's Office, CSDE	X		Messaging briefs documenting general messaging, benefits, and calls to action that can be used to develop audience specific materials
Create materials that persuasively present general messaging across multiple channels and multiple audiences	January 2020	Communications, CSDE, CS4CT	X		Postings on CSDE, CTCSTA, and other related Web sites Social Media Accounts and Tags
					One-Page Handout for talking points

				Press releases
				Video Spots for Web and TV
Establish and track the impact of outreach and communication activities to drive future outreach planning	Spring 2020	Communications, CS4CT, CSDE	Х	Defined success and impact measures Impact report
				including activities and progress of impact as defined by the measures
Develop standard presentation materials and slide deck to meet the needs of various audiences.	Spring 2020	CSDE, CS4CT	X	PowerPoint slide deck and related presentation materials that can be customizable to specific audiences
Establish, follow, and track a schedule of coordinated outreach efforts across formats and media	Winter 2020	Communications, CS4CT, Community Partners	X	Media Purchasing Plan Shared Schedule of Presentations
				Log of Activity
Obtain feedback from stakeholders for review, response, and action based on feedback provided	Winter 2020	Communications	X	Web and print feedback forms and/or surveys

				Updates to the state plan as needed
Conduct focus groups with key leadership organizations, including CABE, CAPSS, and CAS as well as teacher unions to solicit feedback on the state plan	Winter 2020	CSDE, CS4CT, Governor's Office	Х	Feedback from focus group meetings

6. Funding

How will we pay for this effort?

Funding is required to achieve many of the goals in a plan. Approaches and uses of funding can differ over the short-term and longterm of implementing K—12 computer science. In the short-term, dedicated funding for computer science should be allocated and the funding should emphasize the professional learning of existing teachers for the purpose of building an initial teacher force. Funding priority should be given to districts in which a demonstrable effort will be made to engage underrepresented groups. In the long-term, states should secure sustained funding streams to support a system of high-quality computer science education. This section explains the plan to secure funding to support the execution of the Connecticut Computer Science Plan.

Funding					
Goals Secure federal, state, philanthropic, and local indu Coordinate a collaborative funding stream to ensure 					
Strategies	Start/End	Responsible Party/Partners	Prog	ress	Specific Evidence of Success or
			Planning	Acting	Completion

Establish avenues for philanthropic funds to be able to be used to support computer science implementation	Summer 2019	Advocacy Group, Appropriate Grant Application Entities		Х	Funding for computer science initiatives
Partner with researchers and apply for National Science Foundation (NSF) and United States Department of Education (USDE) grants to support computer science implementation	Summer 2019	IHE, CSDE, LEA, Community Partners		X	A multi-year NSF or USDE grant
Work with the Connecticut's Department of Economic and Community Development (DECD) to set aside funding and in-kind support for the advancement of computer science education	Fall 2019	DECD, Computer Science Advisory Group, CTCSTA, CS4CT		X	A line item in the economic development budget for K–12 computer science initiatives
Provide guidance to districts on establishing a CTE pathway for computer science that can be supported with the use of Perkins funds	Fall 2019	CSDE, LEA		Х	Computer science pathways established in secondary schools
Work with the Connecticut General Assembly and the Governor's office to propose a bill to fund computer science education	January 2020/May 2020	Advocacy Group, Legislative Leaders, Community Partners, Business and Industry Partners		Х	A bill signed by the Governor providing ongoing funding for computer science initiatives
Utilize AmeriCorps VISTA volunteers to increase human capital to support computer science initiatives	Summer 2020	AmeriCorps VISTA, CS4CT	Х		Increased number of trainers for computer science implementation

Work with Connecticut Department of Labor (DOL) to include computer science education training in funding opportunities	Fall 2020	Regional Workforce Development Boards, DOL, CSDE	Х	Computer science included as a priority for the Regional Workforce Development Boards
Establish avenues for corporate support including funding and in-kind donations to be able to be used to support computer science implementation	Fall 2020	Advocacy Group, Industry Organizations and Companies	х	Funding and staff for computer science initiatives
Obtain free or reduced rate services from vendors of curriculum and training	Winter 2020	CSDE, Vendors	X	Free or reduced rates compared to public offerings
Provide input to include computer science funding in Title I, II, or IV as part of Connecticut's ESSA Plan	Contingent upon timeline for ESSA review	CSDE	Х	Computer science included as a priority in the state's ESSA plan