Changing Computing Education Policy in Your State

CSTA Conference 2015
Tuesday, July 14, 2015
2:45 – 3:45 pm

W. Richards Adrion, UMass Amherst
Mark Guzdial, Georgia Tech
Debra Richardson, UC – Irvine
Moderator: Renee Fall, UMass Amherst
Session Agenda

• Introduction / Overview to CS Education State Change
• Stories of Change in 3 States
  – Massachusetts
  – Georgia
  – California
• Participants group by state/region – discussions
• Reports back and Q&A
Reforming K-20 Computing Education in Massachusetts  -- Rick Adrion

• A new National NSF BPC Alliance formed from 2 very successful BPC regional Alliances
• Goals:
  – Refine and integrate CAITE & Georgia Computes! interventions and practices
  – Take to other states & regions via partners, associates, and others
• Phase 1: ➔ sustainable model in GA and MA
• Phase 2: Working in GA, MA, SC, CA, with other partners, ramp up services: Experts Bureau, Train the Trainers, Summer Camps, Pathways, Evaluation & Ed Reform Advocacy
Why broaden participation in Massachusetts?

• Equity, Economic, Diverse applications
  – WF demand, broader participation in developing and applying technology

• Why community colleges?
  – Gateways to underserved communities
  – Need to create opportunities broadly not just in Cambridge & Metro West
  – Need to create opportunities not just for traditional IT/CS students and workers
Pathways: Community College Transfer

• Best Practices from CAITE
  – “CC Days” @4YR, “CS Days” @CC, CC Visits
  – CC & 4YR faculty and transfer staff summits
  – Roadmaps, Transfer Guidance in lieu of 1-1 articulation
  – Supplemental Peer Instruction

• ECEP
  – Georgia: AACCDD Summits
  – California: UCI Transfer Summit and Student Summit
  – So. Carolina: Consulted
  – Massachusetts: Academic Transfer Pathways
  – Conferences
    • National Institute for the Study of Transfer Students (NISTS)
    • New England Transfer Association (NETA)
K20 Computing Education Reform in Massachusetts

• Continuing to work with DHE to continue to strengthen HE pathways: Summits, materials, curricular alignments, articulation,
• Working with MassCAN to offer PD for teachers: Exploring Computer Science
• Assessing needs and supporting other K12 PD
• Working with MassCAN, DESE, DHE on standards, licensure, making CS count
• Outreach
Standards
What is taught

Curriculum
How computing is taught

Professional Dev
Who teaches computing

Public Awareness
Why to study computing

MassCAN

A partnership of organizations collaborating to inspire and educate Massachusetts students in computing and prepare them to lead and innovate in a future economy that will be dependent on and driven by computer technology.
Sustainability & Outcomes

• How is ECEP-MA being sustained?
  – Active collaboration with MassCAN, DESE, DHE, the UMass campuses and the MGHPCCC

• How will we measure outcomes in the future?
  – Work with MassCAN, DESE
    • CS/DL standards in place by Fall 2015
    • Successful ECS PD and ECS implementation
    • MassCORE modifications to make CS Count
    • Teacher DL/CS endorsement
  – Work with DHE
    • CS part of core DHE transfer program
    • Successful DHE IT Workforce program
Georgia Computes!

• An NSF Funded alliance to Broaden Participation in Computing
  – Led by Mark Guzdial and Barbara Ericson

• Six year effort (2006-2012) to improve and broaden participation in Computing Education in Georgia
  – From weekend workshops and summer camps with Girl Scouts to *generate interest*.
  – To work with policymakers to establish graduation requirements that involve computing.
  – To providing professional development to middle school, high school, and university teachers.
What worked

• Influencing State Policy
  – Important for Sustainability
• Professional Development for middle/high teachers
• Summer Camps

What didn’t
• Trying to change faculty

First one is hard for students to do, but second two are within student reach and are highly effective!
GaComputes influence on State Ed Policy

• GaComputes has been involved in each of the major state computing education public policy decisions since 2006:
  – Establishing a high school CS curriculum based on the ACM/CSTA Model K-12 Curriculum.
  – Creating a CS Teacher Endorsement, based on ISTE/NCATE standards.
  – Making AP CS Level A count towards high school graduation and university admissions.

• Georgia was one of the two highlighted states in the ACM/CSTA Running on Empty report.
Current Push: Coding in Georgia

• Governor’s Initiative: Coding counting for math, science, and foreign language.
  – New courses: AP Physics + Robotics, Internet of Things, etc.
• Science and math teachers can teach CS.
Georgia Growing Computing Teachers

• Funding to Udacity to train 300 new CS teachers.
• Certification Test
• Trying to us TEALS and Georgia Virtual High School to fill in the blanks.

• Question: Broadening Participation in Computing?
Reforming Computing Education in California

Debra Richardson
Professor of Informatics, UCIrvine
Founding Dean, Donald Bren School of Information and Computer Sciences
• **ACCESS – February 2011**
  - statewide network of CS education leaders dedicated to advocating for high-quality K-12 CS education in California accessible to all students, specifically targeting under-represented students

• **ECEP – October 2012**
  - California joins CAITE + GaComputes! as a partner state in state-based CS education reform

• **Related efforts in California**
  - Exploring Computer Science
  - CS:Principles pilots and expansions
Context: I’d argue we’re #1

CURRENT DATA:
80,807 open computing jobs (as of 2/15) growing at 4.1x the state average
5,127 computer science graduates (2014)

Conference Board and Nat’l Center for Educ Stats

http://www.entrepreneur.com/article/228709

http://www.infoworld.com/article/2606736/it-jobs/139789-Top-10-States-for-IT-Jobs.html based on CompTIA’s IT Industry Outlook 2014 report, BLS data, and reports from Payscale.com
Context: CS Education

- K12 education is extremely decentralized
- No CS standards
- No teacher certification

California has one of the lowest AP CS participation rates in the country.
First Steps and Background

• Building a network
• “In Need of Repair” report:
  – General Course Frameworks
  – Positioning Of Computer Science
  – Teacher Credentialing
  – Teacher Professional Development
  – Funding Opportunities
  – Basic Data (enrollment, diversity, etc.)
  – Addendum: Agenda to Reform CS Education in California
• Stakeholder Interviews
• Map of key influencers (legislators, other education agencies, etc.)
ACCESS/ECEP-CA Now

• Working Groups and Major Activities
  1. Teacher Preparation for K-12 Computer Science
  2. K-12 Computer Science Standards for California
  3. Making Computer Science Count in California
     – Advocacy for K-12 CS Education Policy Reform
     – HS⇒CC⇒4Yr Transfer/Articulation
     – Expanding K-12 Computer Science (ECS and CSP)

while prioritizing EQUITY
Teacher Preparation:
CS Supplementary Authorization

• Proposed new Computer Science Supplementary Authorization (added to full credential to authorize teaching CS)
  – to replace current (1987) Computer Concepts and Applications, which focuses on teaching students how to use computers as tools, not how to create new applications or technology
• Basic requirements: coursework covering
  – programming
  – data structures and algorithms
  – digital devices, systems and networks
  – software design
  – impacts of computing

(consistent with CSTA and ISTE recommendations)

Concept unanimously passed California Commission on Teacher Credentialing last Friday ... now the hard work begins!
Making CS Count in California

• Making CS Count for UC/CSU Admissions
  – Policy brief arguing for AP CS A to count for math for UC & CSU admissions (the “C” subject requirement)
    • change.org petition signed by over 10,000 (original target 5,000)
  – Strategy with UC, College Board and Code.org
  – Status: unfortunately not approved by UC

• Significant state legislation in 2014 for CSEd reform – we analyzed, tracked, and helped craft testimony
  – CS count towards high school graduation
  – CS count for UC/CSU admissions
  – CS standards for K-6, 7-12
## Making CS Count in California:
### Analysis of [advocacy for] State Legislation

<table>
<thead>
<tr>
<th>Passed</th>
<th>Considered</th>
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<tbody>
<tr>
<td>★ AB 1764 (Olson/Buchanan): allows computer science to count toward</td>
<td>★ AB 1530 (Chau): requests the Superintendent of Public Instruction to</td>
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<td>advanced math credit in districts that require &gt;2 math for graduation</td>
<td>identify and recommend model CS curriculum for K-6 for adoption by the</td>
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<td>State Board of Education</td>
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<td>★ SB 1200 (Padilla): requests UC/CSU to establish guidelines for CS</td>
<td>★ AB 2110 (Ting): requires the Instructional Quality Commission to</td>
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<td>classes that satisfy college admission requirements</td>
<td>incorporate CS content into math, science, history, and English curriculum</td>
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<tr>
<td></td>
<td>frameworks</td>
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<td>★ AB 1539 (Hagman): requires the Instructional Quality Commission to</td>
<td>★ AB 1540 (Hagman): allows dual enrollment in high school and community</td>
</tr>
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<td>consider K12 CS content standards 6 for adoption by the State Board of</td>
<td>college computer science courses</td>
</tr>
<tr>
<td>Education</td>
<td></td>
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<td>★ ACR 108 (Hagman): recognizes the week of December 8, 2014 as CSEdWeek</td>
<td>★ AB 1940 (Hagman): defines STEM courses to include CS and establishes or</td>
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<td>(Computer Science Education Week)</td>
<td>expands AP courses with STEM curriculum</td>
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California Community College System is the largest system of higher education in the U.S.
- 112 colleges, 2.1 Million students

Curricular alignment and articulation between CCC and CSU (major reform resulting from legislation)
- Common course numbering and alignment
- Transfer Model Curriculum (including CS)
- Associate Degrees for Transfer guarantee admission and junior standing to certain California State University degree programs (including CS)
  - a model to explore for the University of California?

On a more local level
- Participate in LA/OC Regional CCC ICT/DM Collaborative
- CC Articulation/Transfer Workshops
  - a day for teachers and administrators to discuss hurdles
  - sessions for students to inform about opportunities

CSU: 22 campuses, 470K students
UC: 10 campuses, 240K students
## California CS Course Expansion

<table>
<thead>
<tr>
<th>UCOP Approved Course</th>
<th>2012-13</th>
<th>2013-14</th>
<th>2014-15</th>
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<tbody>
<tr>
<td>AP Computer Science</td>
<td>281</td>
<td>349</td>
<td>376</td>
</tr>
<tr>
<td>IB Computer Science</td>
<td>11</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>CS: Principles</td>
<td>1</td>
<td>3</td>
<td>32</td>
</tr>
<tr>
<td>Exploring CS</td>
<td>55</td>
<td>67</td>
<td>75</td>
</tr>
<tr>
<td>Other CS</td>
<td>173</td>
<td>188</td>
<td>194</td>
</tr>
<tr>
<td>Computer Programming</td>
<td>191</td>
<td>191</td>
<td>207</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>712</strong></td>
<td><strong>810</strong></td>
<td><strong>895</strong></td>
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Exploring Computer Science Expansion in California

SoCal (UCLA, LAUSD+OC)

Northern California (SCU)
CS:Principles Expansion in California

NSF Pilots in California

COMPASS – San Diego
Code.org Partnerships in California

- 13 CA District partnerships for HS professional development
  - PD for teachers (including stipends)
  - CS; Principles and ECS in a blended-learning environment
- Materials to promote CS to parents & students
- Support for all K-12 grades