

Why a new Computer Science Supplementary Authorization?

COMMISSION ON TEACHER CREDENTIALING
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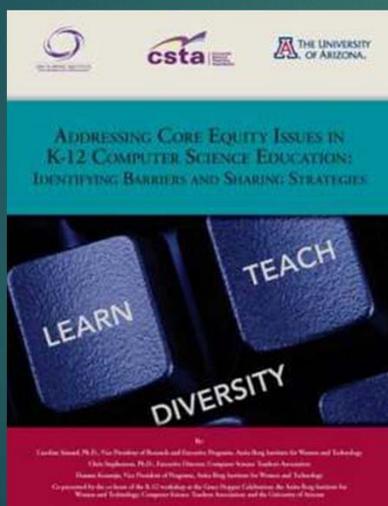
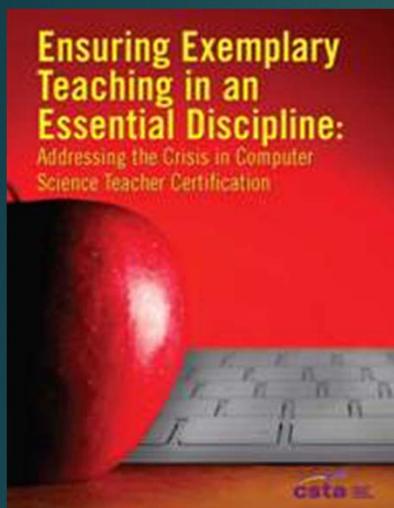


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**Alliance for California Computing
Education for Students and Schools**

Why CS is a Story

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- ▶ Most of the STEM jobs in the next ten years will be in computer science
- ▶ Fewer than half the people we need for these jobs are in the pipeline
- ▶ A fundamental knowledge of computing is critical for today's youth in a world where computers are ubiquitous
- ▶ Parents and administrators often think kids are learning computer science in schools when they are not
- ▶ We are often teaching basic "literacy" while students in the rest of the world are ready for the future

<http://csta.acm.org/Communications/sub/Reports.html>

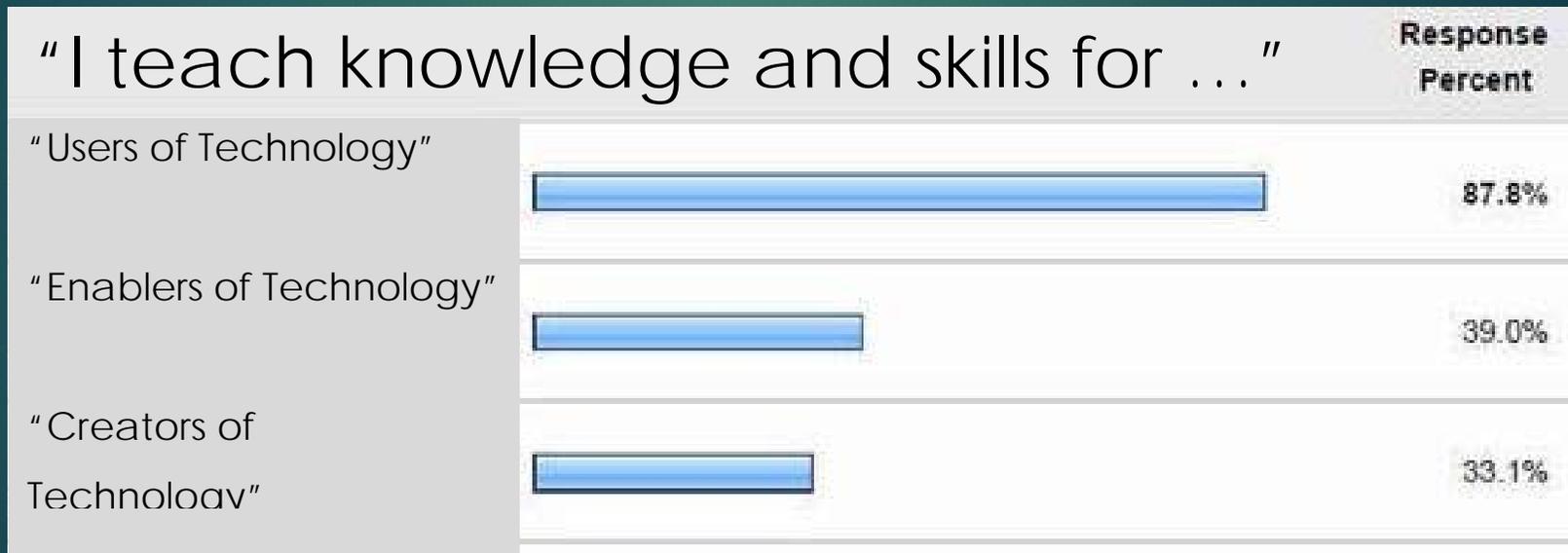
What is Computer Science?

" Computer Science (CS) is the study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society."

- ▶ CS is not *Educational Technology, Computing/Digital Literacy, Information [&Communication] Technology (IT or ICT)*, nor is it simply coding/programming
- ▶ CS builds students' computational and critical thinking skills, which enables them to create—not simply use—the next generation of computing technology innovations
- ▶ CS provides fundamental knowledge needed to prepare students for the 21st Century and equips them with lifelong skills they can use in a wide variety of fields of study and occupations

Variety of "computing-related" courses taught in California:

2453	Computer Science	4603	Business & electronics communications
2454	Computer lab	4604	Networking
2455	Web design	4605	Web site development
2458	Other Computer Education	4606	Graphics and media technology
2470	AP Computer Science A	4615	Information processing
2471	AP Computer Science AB	4618	Telecommunications
		4633	Information systems management
		4649	Other information technology



December 2012 CDE Survey of 187 teachers of "computing-related" courses, by Gary Page, CDE
 NOTE: Some teachers teach more than one course, taught to different knowledge and skills.

Teacher Preparation through Supplementary Authorizations

Computer Concepts & Applications Supplementary Authorization

- ▶ Software evaluation and selection
- ▶ Hardware operation and functions
- ▶ Classroom uses of computers

Focus is on how to **use** computers as tools or **enable** other users

Introduces little more, if any, than the technology requirement in all of today's teaching credentials

Proposed Computer Science Supplementary Authorization

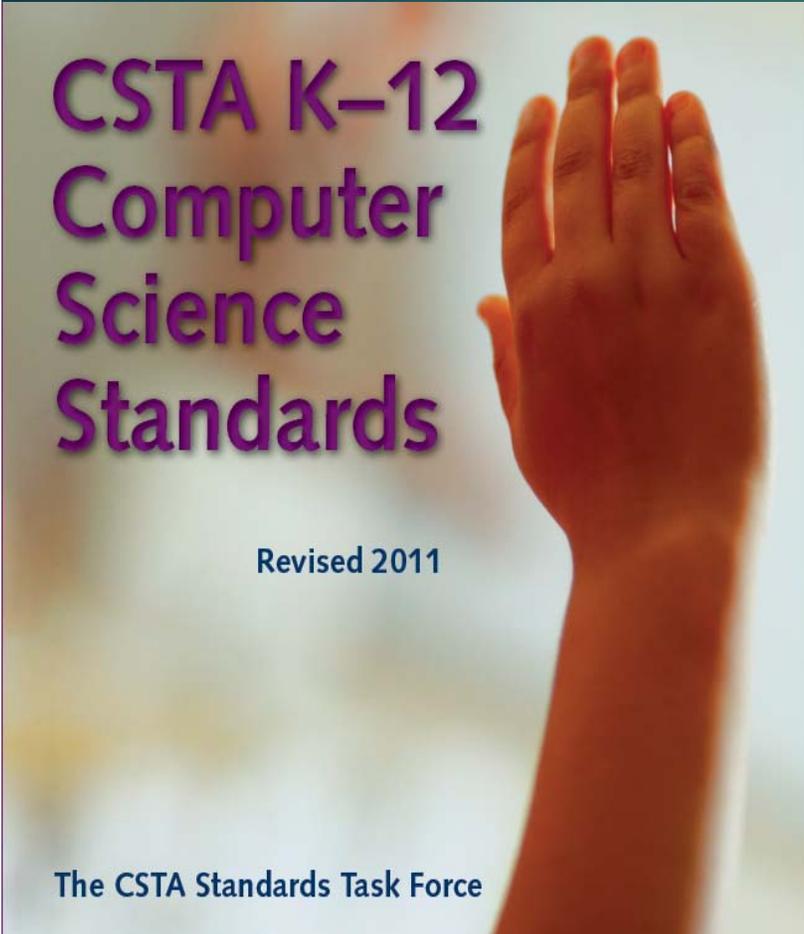
- ▶ Programming
- ▶ Data structure and algorithms
- ▶ Computer hardware and organization
- ▶ Software design
- ▶ Impacts of computing

Focus is on how to **create** new applications or technology

Modeled after **CSTA** and **ISTE** curriculum recommendations for K-12 Computer Science

Computer Science Teachers Association K-12 Computer Science Standards

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CSTA K-12 Computer Science Standards

Revised 2011

The CSTA Standards Task Force

- ▶ We consider it critical that students be able to read and write and understand the fundamentals of math, biology, chemistry, physics.
- ▶ To be well-educated citizens in today's computing-intensive world, students must also have a deeper understanding of computing fundamentals.
- ▶ CSTA standards represent the body of knowledge for the CS discipline as it applies to K-12.
- ▶ Standards shape expectations for teacher preparation and authorization.

<http://csta.acm.org/Curriculum/sub/K12Standards.html>

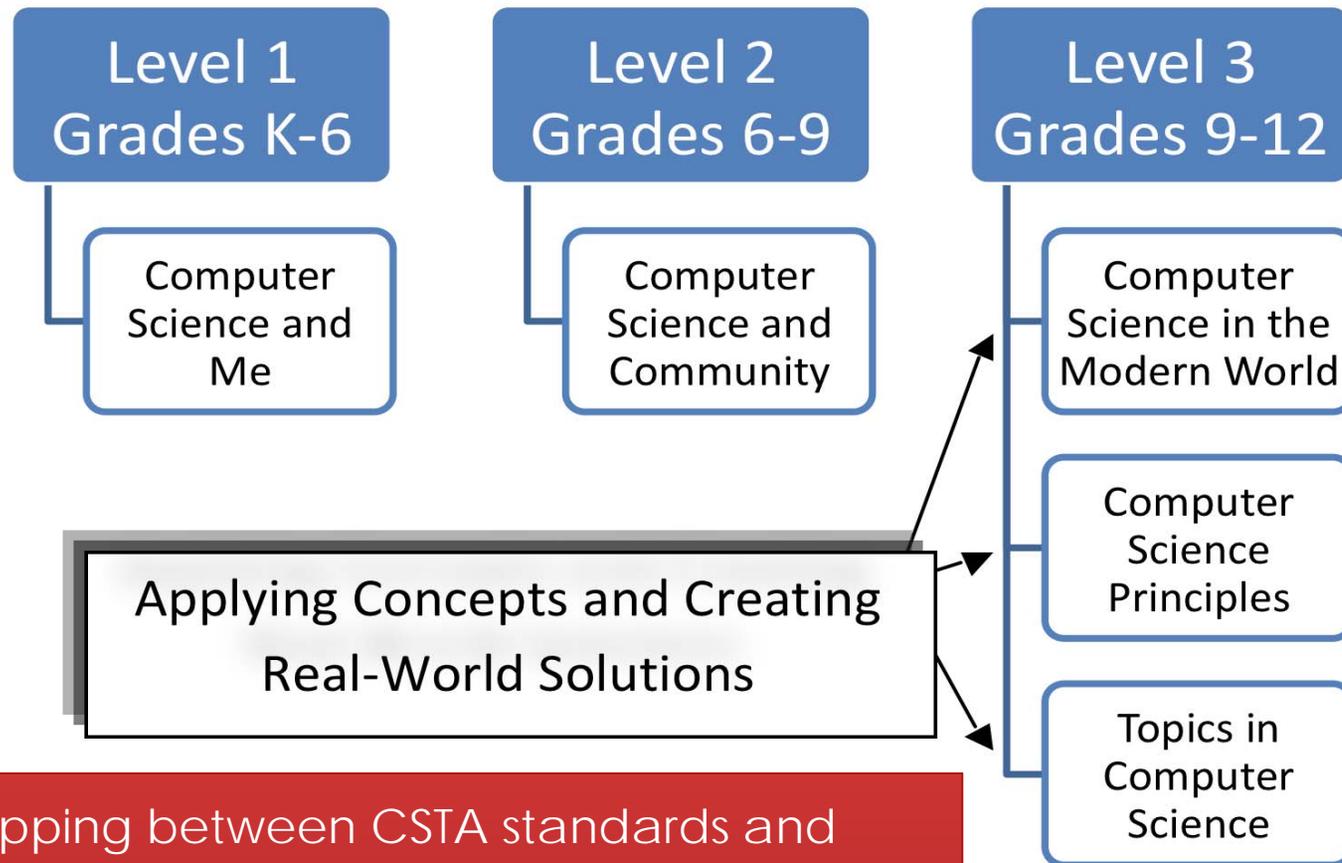
Learning Outcomes organized by Strands

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Standards Organized by Levels

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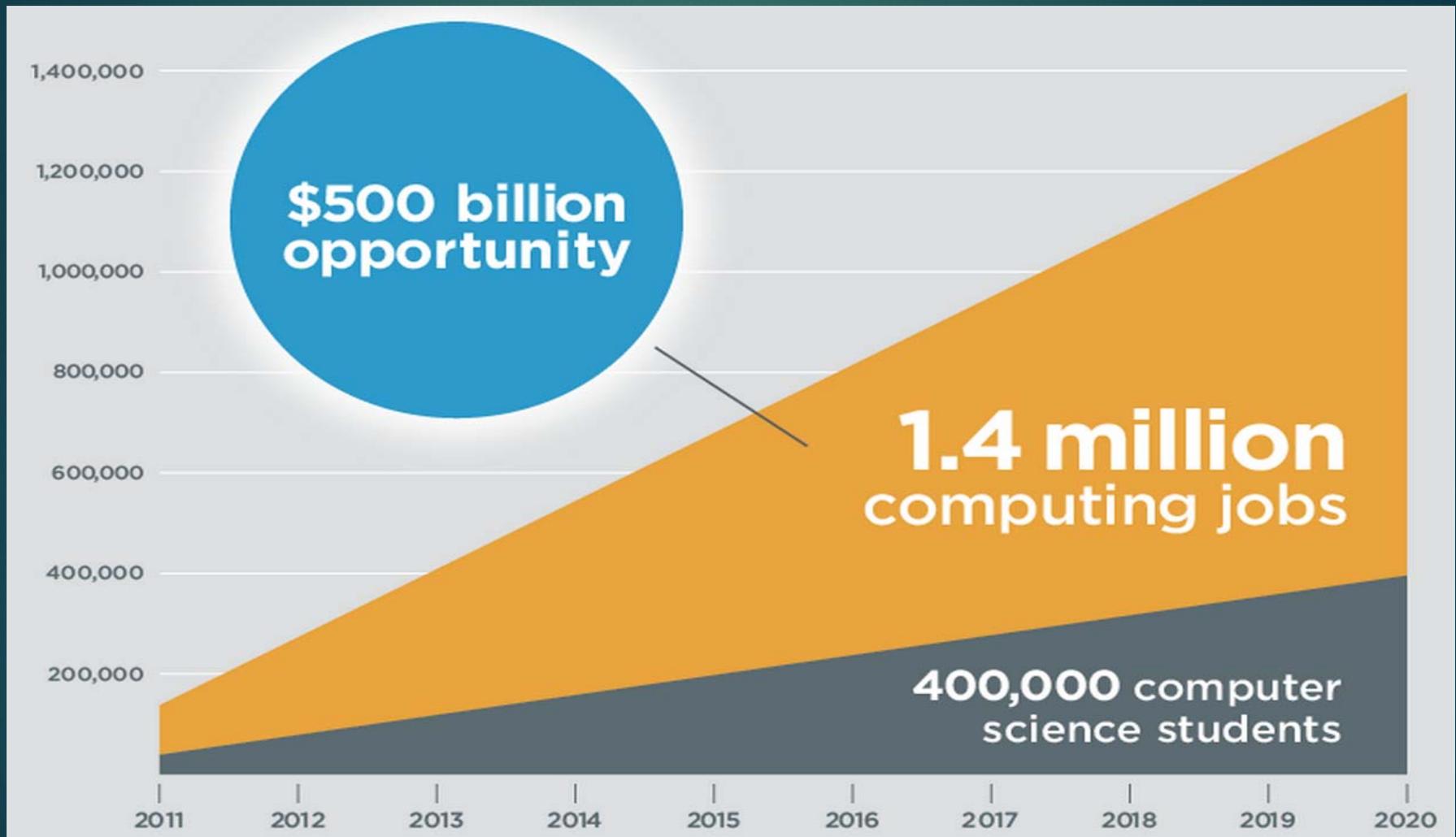


Mapping between CSTA standards and

- STEM Cluster Topics
- Common Core State Standards
- Partnership for 21st Century Skills
- Next Generation Science Standards (underway)

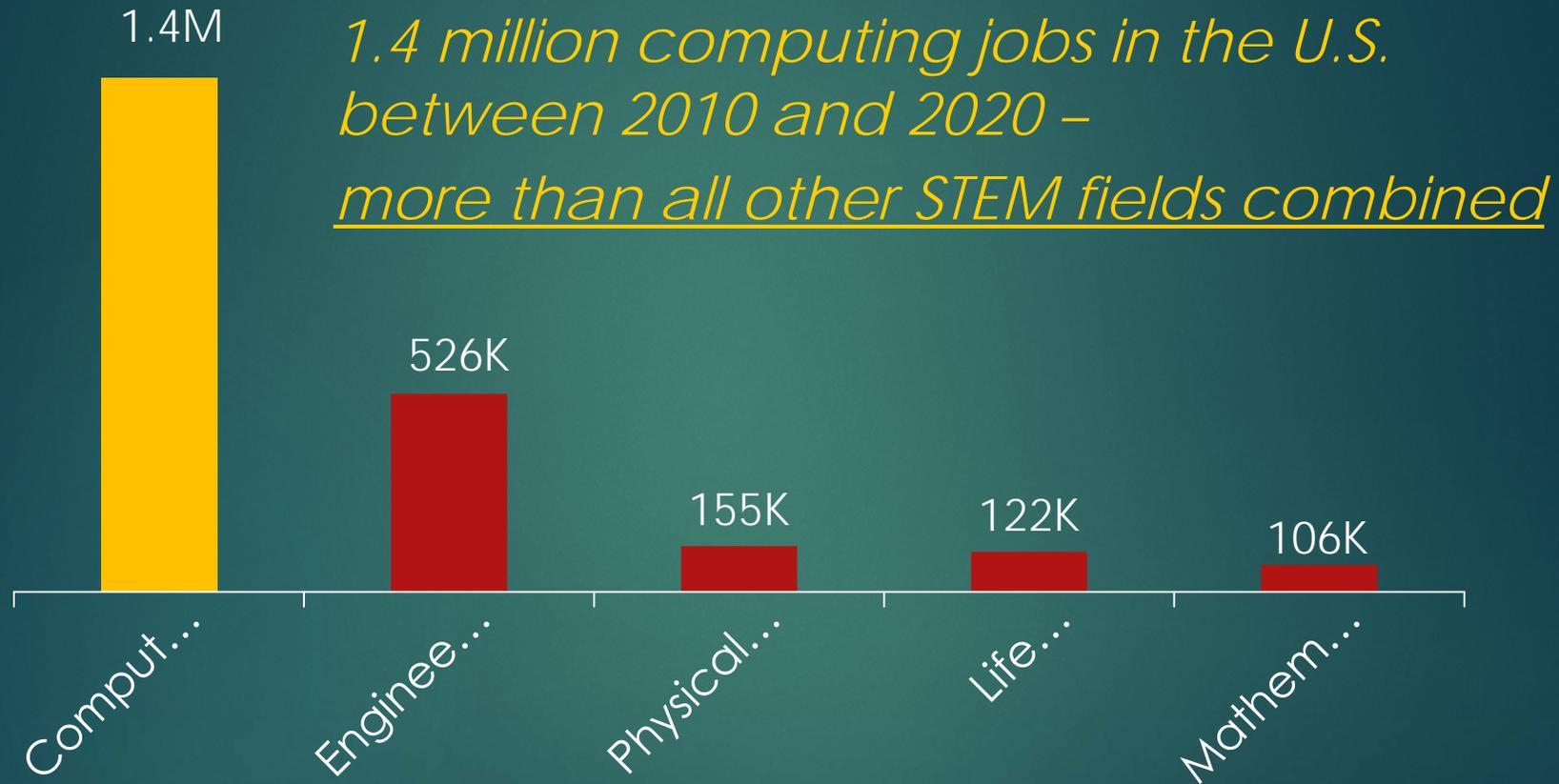
1M more CS jobs than students by 2020

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Infographic Source: Code.org

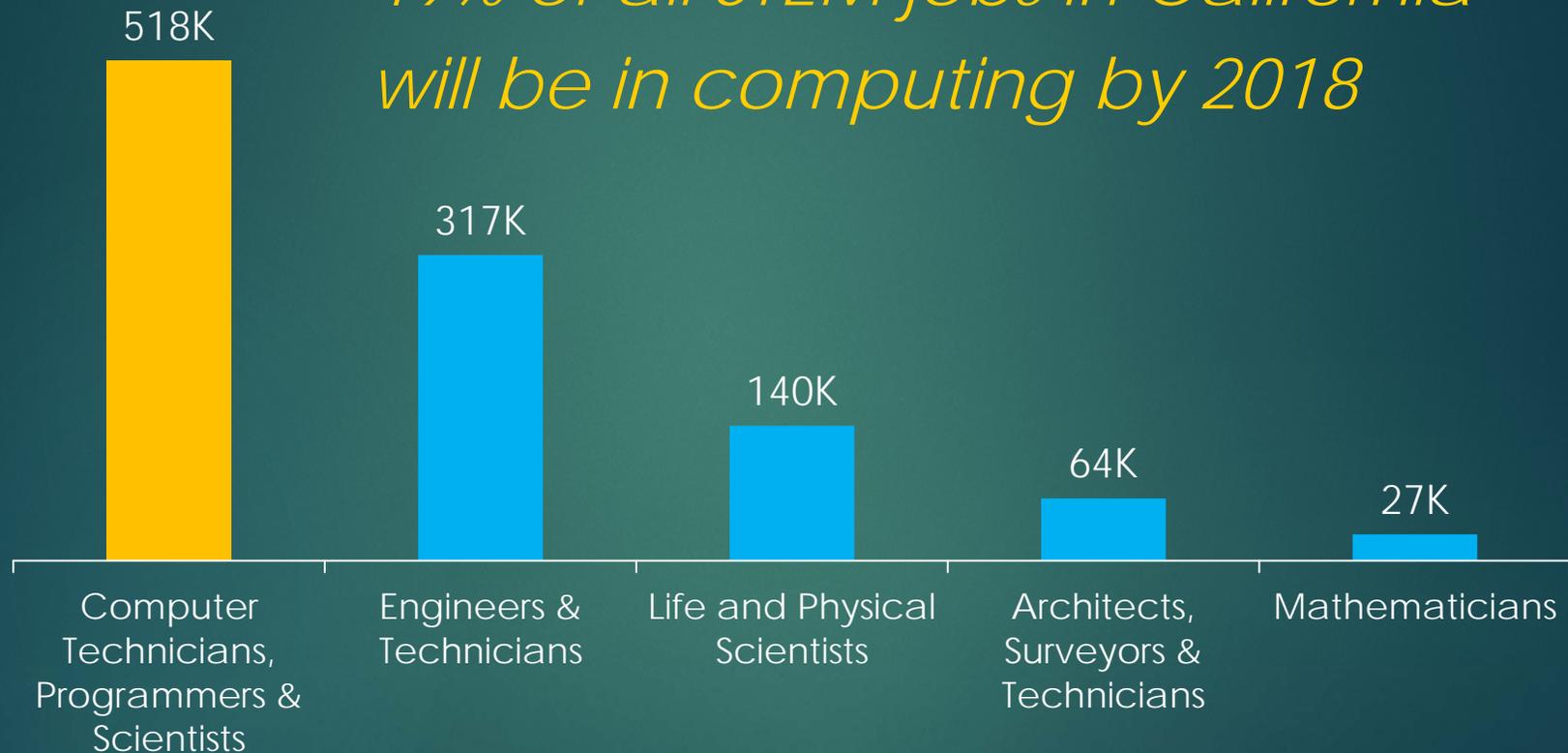
U.S. Employment Projections



*Source: Bureau of Labor Statistics,
Employment Projections 2010-2020*

CA Employment Projections

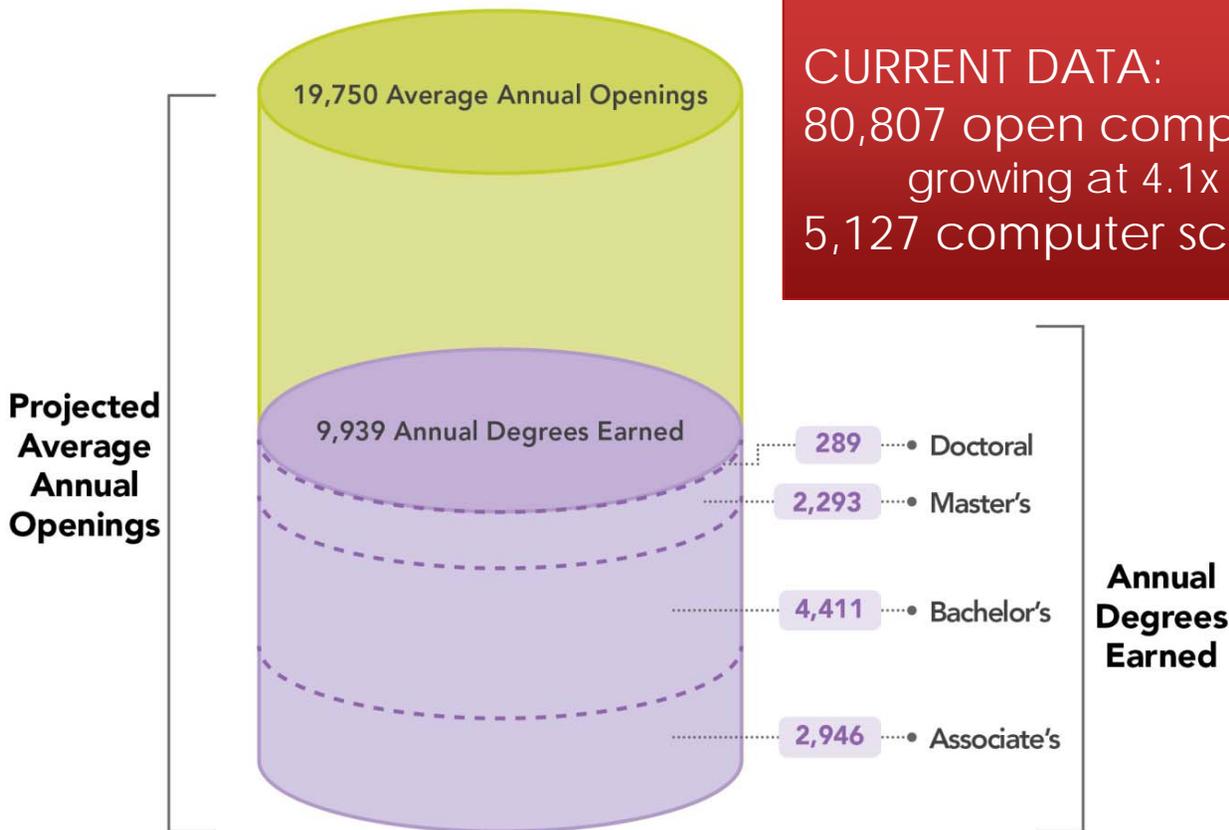
49% of all STEM jobs in California will be in computing by 2018



*Source: "Help Wanted: Projections of Jobs and Education Requirements through 2018"
Georgetown Center on Education and the Workforce*

The California Picture

California: Number of Degrees Earned in CIS vs. Projected Average Annual Number of Computing Job Openings in 2022



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

Sources: Workforce Indicators, Computer and Mathematical Occupations, Bureau of Labor Statistics, Occupational Projections, 2012-2022. Completed Degree Data, Computer and Information Sciences, 2012-2013 National Center for Education Statistics.

Exposure to Computer Science in HS Matters

- ▶ Students who take high school computer science are 8 times more likely to major in CS in college
- ▶ Google employee survey found that:
 - ▶ 98% of the college CS majors reported exposure to CS prior to college, (45% of non-CS majors)
 - ▶ CS majors were more likely than non-majors to have had a CS class in high school
 - ▶ CS majors were more likely to have known that CS was a possible career path when they were in high school

California needs quality K-12 CS education to fill the state's employment gap and to address the digital divide

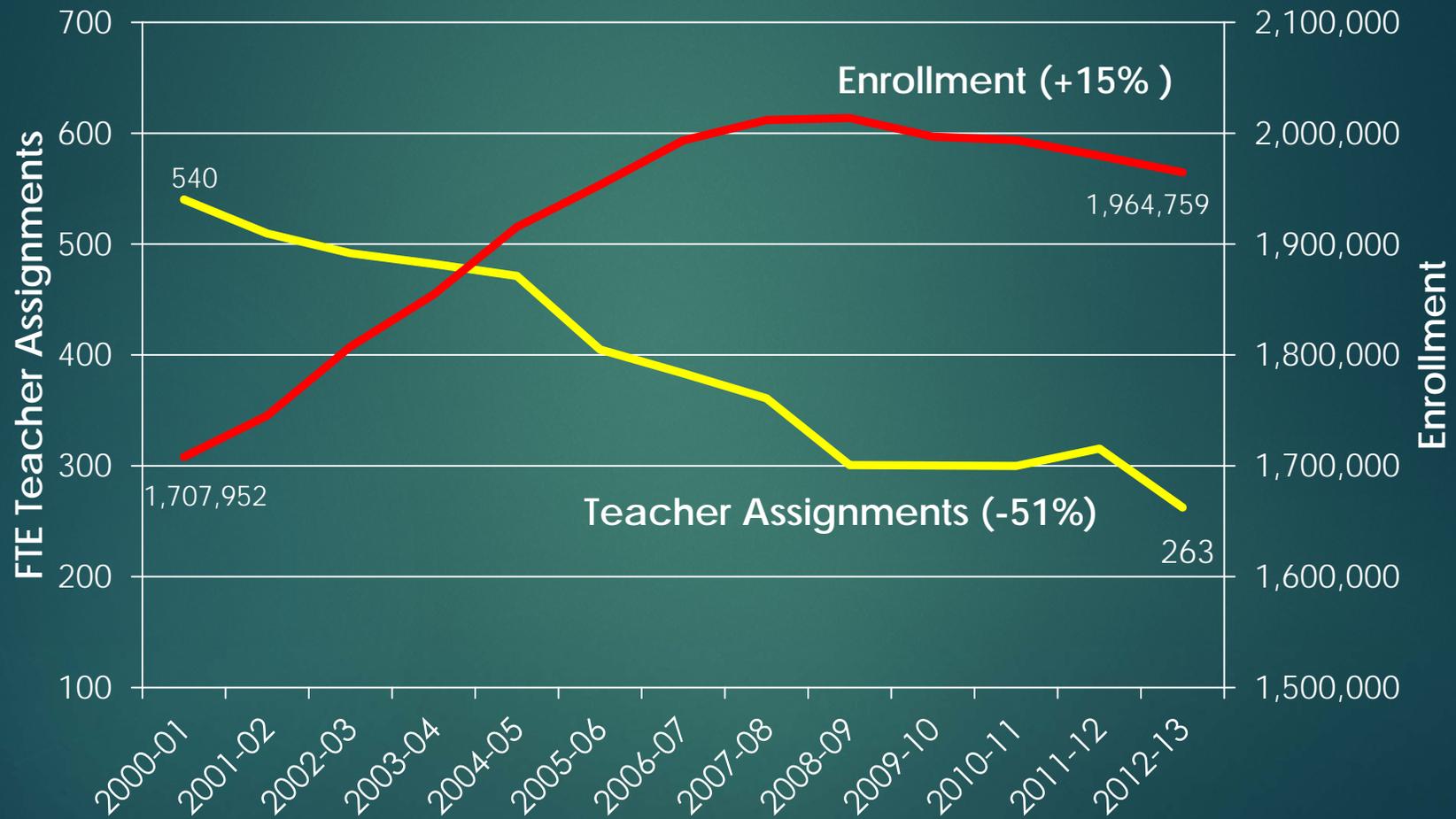
Slide 13

BD1

I made some edits to this slide, Julie, to reduce the text. I hope you don't mind. Please ignore them if you prefer what was there before.

Baxter, Diane, 9/17/2014

Access to CS Courses Has Fallen

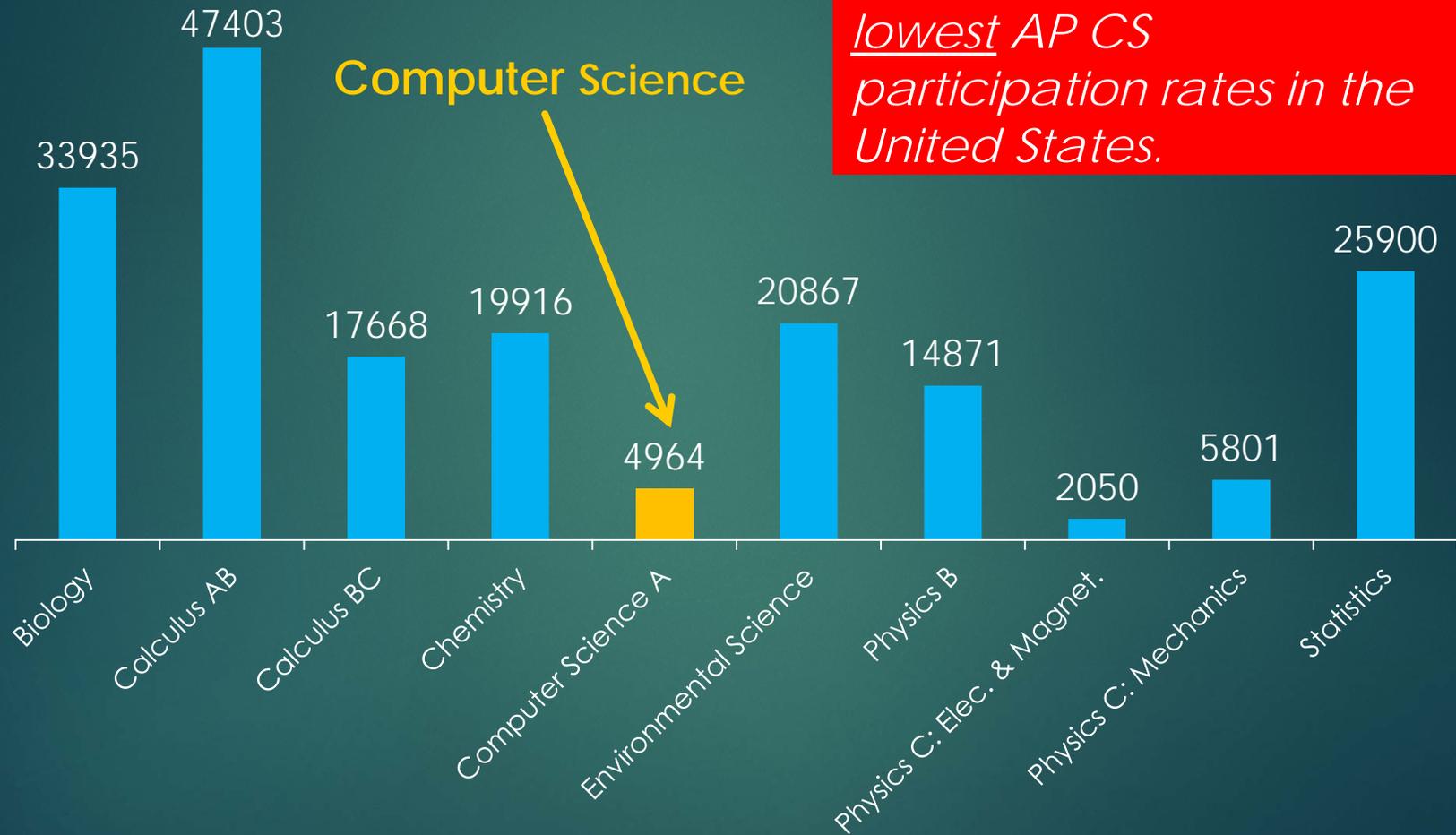


Source: Dataquest, California Department of Education

2013-14 California AP Test Takers

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California has one of the lowest AP CS participation rates in the United States.



Source: <http://research.collegeboard.org/programs/ap/data/participation/2013>

Only 13% of Schools Offer AP CS A

All California High Schools (2013-14)

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	Schools	Teachers	Test Takers
Public	175 (13%)	184	3980
Private	54	62	984
Total	229	246	4964

Source: The College Board

56% of Schools Offer No CS Course

California Public High Schools (2013-14)

Course Title	Schools	Teachers	Classes
AP & IB Comp. Science	121 (9%)	122	177
Comp. Science	148 (11%)	177	404
Comp. Programming	122 (9%)	144	261
Comp. Op. / CS	328 (25%)	431	1015
One or more of the above courses	581 (44%)	780	1857

Source: CBEDS database

California Course Adoption

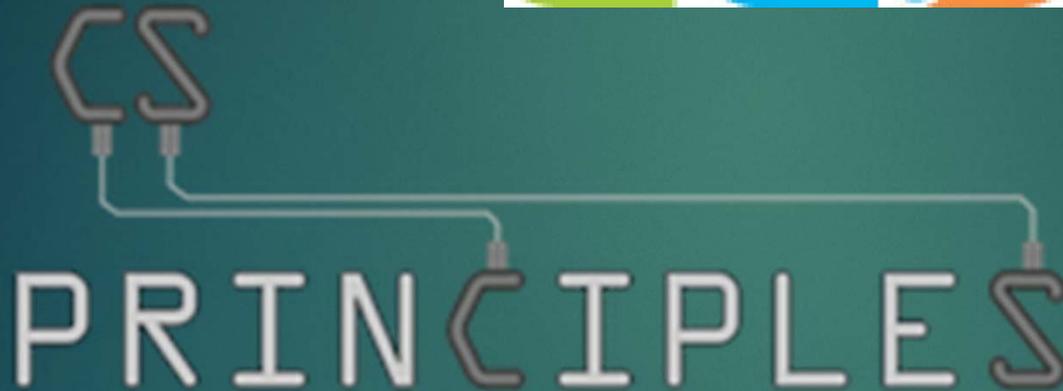
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UCOP Approved Course	2012-13	2013-14	2014-15
AP Computer Science	281	349	376
IB Computer Science	11	12	11
CS:Principles	1	3	32
Exploring CS	55	67	75
Other CS	173	188	194
Computer Programming	191	191	207
Totals:	712	810	895

Source: UCOP Approved Course List (updated: 8/25/2014)

New Computer Science Courses

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Both designed to fill the gap in courses leading to AP CS and committed to democratizing computer science by increasing learning opportunities at the high school level for all students, with a specific focus on under-represented students.

The NSF CS10K Project:

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10,000 computer science teachers in 10,000 schools

Exploring Computer Science

An inquiry-based introduction to the breadth of CS. Designed to appeal to all students, with special attention to women and students of color.

California: UCOP "g" credit and CTE approved. Program Status may be possible through UC Davis Center for C-STEM Center.

Computer Science Principles

A second-level course covering the Computational Thinking Practices and "Big Ideas", Key Concepts, and Supporting Concepts.

The College Board will offer a new AP test for CSP in 2016-17.

<http://cs10kcommunity.org>



New Computer Science Courses

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Exploring Computer Science Introductory College Prep & CTE

- ▶ Curricular Units:
 - ▶ Problem Solving
 - ▶ Human Computer Interaction
 - ▶ Web Development
 - ▶ Introduction to Programming
 - ▶ Data Analysis
 - ▶ Robotics
- ▶ prepares students to take
 - ▶ CS Principles as well as Web Design, Graphics, Robotics, Game Design, Data Science, ...

www.exploringcs.org

Computer Science: Principles

New AP course organized around 7 BIG IDEAS:

- ▶ Computing is a creative activity
- ▶ Abstraction reduces information and detail to facilitate focus on relevant concepts
- ▶ Data and information facilitate the creation of knowledge
- ▶ Algorithms are used to develop and express solutions to computational problems
- ▶ Programming enables problem solving, human expression, and creation of knowledge
- ▶ The Internet pervades modern computing
- ▶ Computing has global impacts

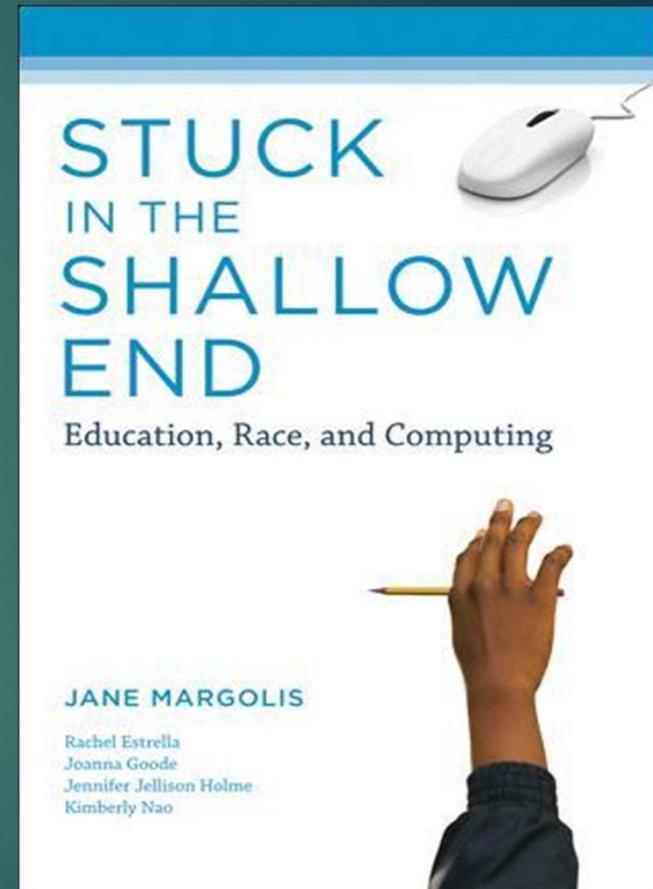
www.csprinciples.org

ECS Curriculum Mappings by SRI Education

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- ▶ CA state learning standards
- ▶ Common Core
- ▶ CA CTE standards
- ▶ CSTA standards
- ▶ ISTE/NETS standards
- ▶ ... and working on NGSS

*SRI is also developing
assessment instruments*



pact.sri.com

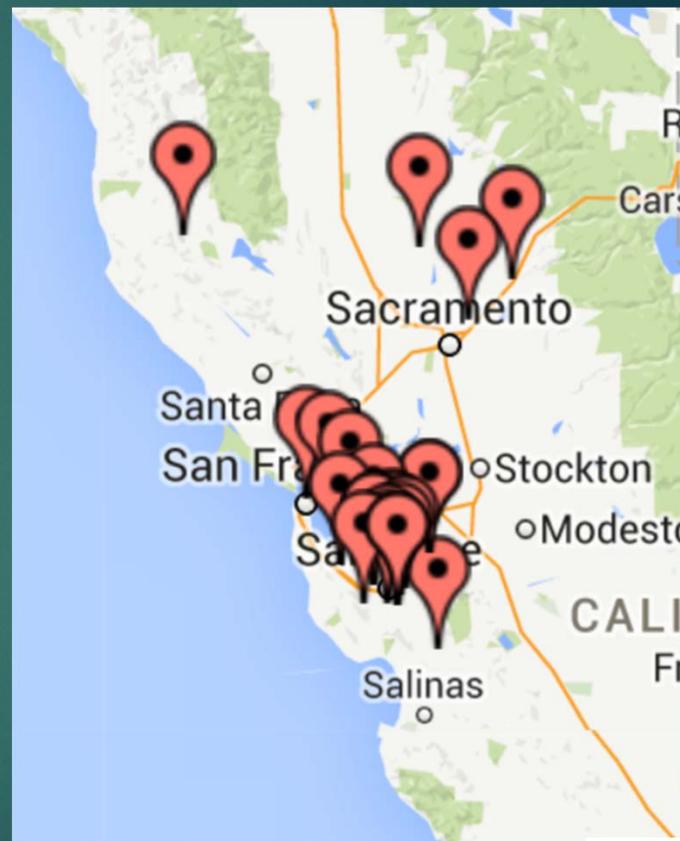
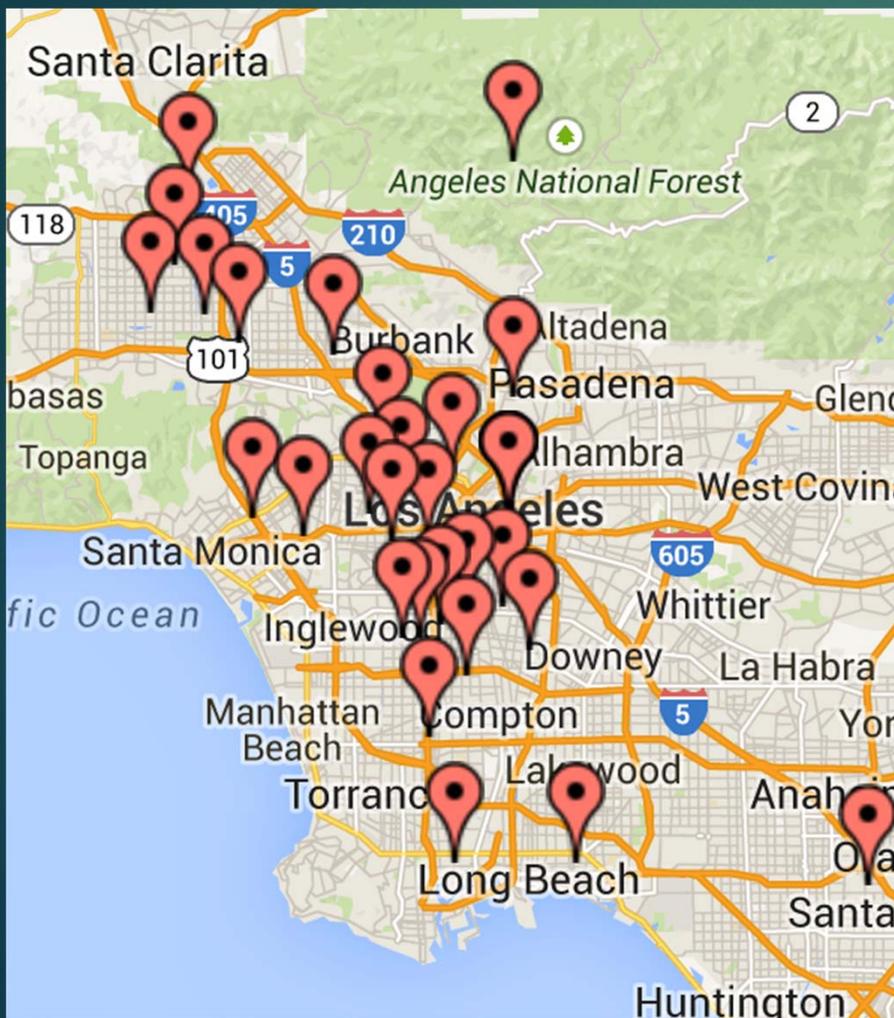


ECS Expansion in California

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SoCal (UCLA, LAUSD+OC)

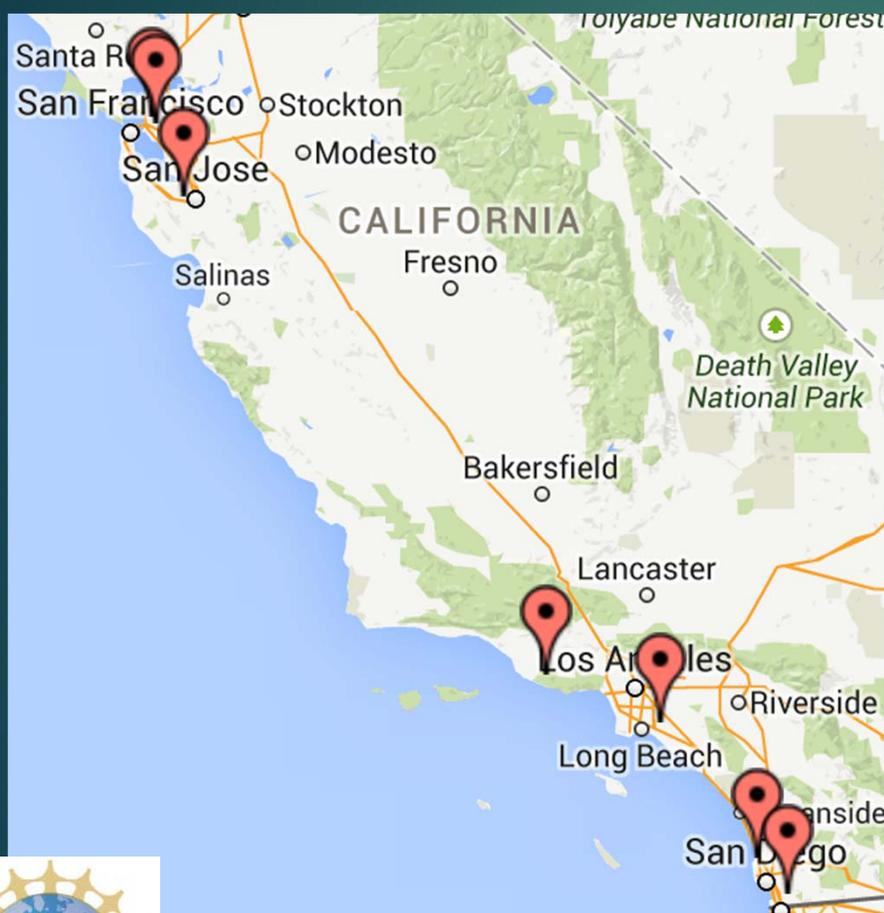
Northern California (SCU)



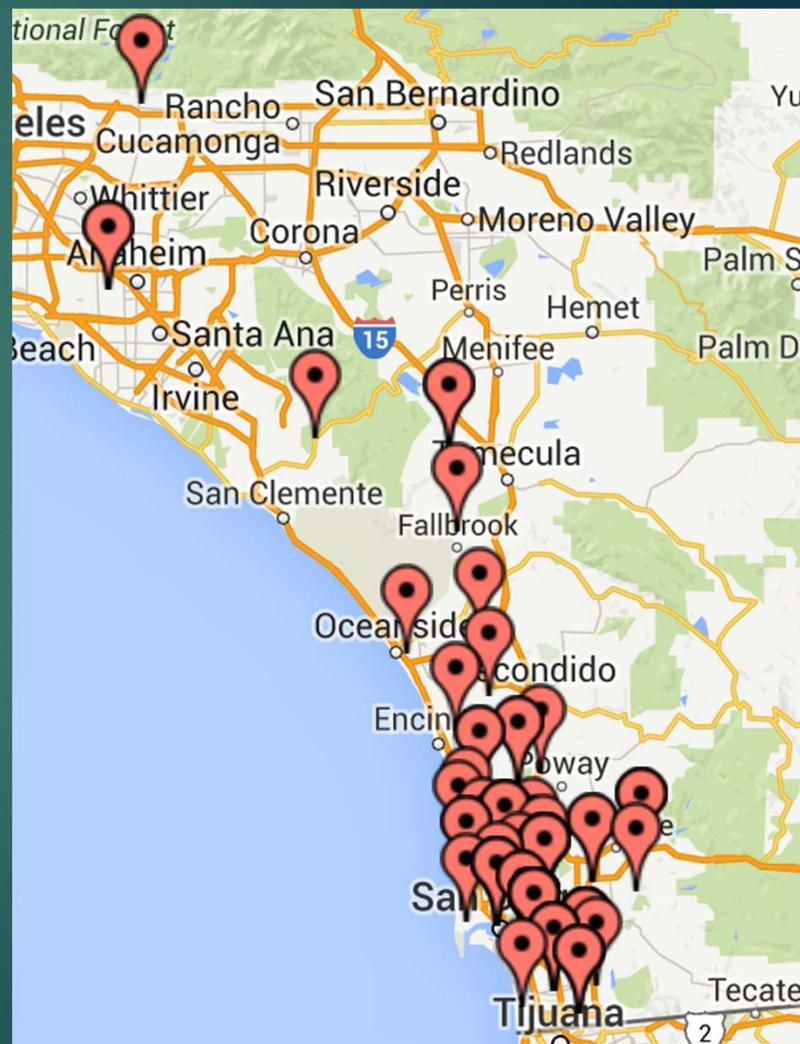
CSP Expansion in California

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NSF Pilots in California



COMPASS – San Diego



Support for Computer Science Supplementary Authorization

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- ▶ CSLNet: It is urgent that California build capacity within K-12 schools to expand CS education and this must include strengthening and expanding the computer science teaching workforce. We support the proposed modifications to the Supplementary Authorization as an important step in that direction and urge the CTC to approve the recommendations.
- ▶ Sweetwater UHSD: Our schools are committed to expanding opportunity for all our students. Providing kids with quality learning experiences in CS is central to that mission. We will not succeed unless SA in that field is examined and significantly revised at the State level.
- ▶ TechNet: Addressing the gap between skilled computer science graduates and growing computer science job opportunities begins with our education system and action on appropriate policy.
- ▶ UC Riverside: As an approved provider of the current SA in CC&A, UCR looks forward to the opportunity to comply with future regulatory changes that would follow approval ... We are in full support of the proposed revisions which reflect an updated and relevant curriculum with a focus on broader preparation inclusive of full K-12 CS education.
- ▶ Code.org: The biggest barrier to meaningful expansion of computer science in K12 is a lack of qualified teachers. To address the gap, Code.org is partnering with 60+ school districts across the country, training inservice teachers to become computer science teachers. We are investing substantial resources to partner with a number of California districts